

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

FORM 3

AMENDED REPORT

APPLICATION FOR PERMIT TO DRILL						1. WELL NAME and NUMBER CW-8				
2. TYPE OF WORK DRILL NEW WELL <input checked="" type="checkbox"/> REENTER P&A WELL <input type="checkbox"/> DEEPEN WELL <input type="checkbox"/>						3. FIELD OR WILDCAT WILDCAT				
4. TYPE OF WELL Gas Storage Well Coalbed Methane Well: NO						5. UNIT or COMMUNITIZATION AGREEMENT NAME				
6. NAME OF OPERATOR MAGNUM NGLS SOLUTION MINING LLC						7. OPERATOR PHONE 801 993-7001				
8. ADDRESS OF OPERATOR 3165 East Millrock Drive Suite 330, Holladay, UT, 84121						9. OPERATOR E-MAIL tjames@westernenergyhub.com				
10. MINERAL LEASE NUMBER (FEDERAL, INDIAN, OR STATE) 51573-OBA			11. MINERAL OWNERSHIP FEDERAL <input type="checkbox"/> INDIAN <input type="checkbox"/> STATE <input checked="" type="checkbox"/> FEE <input type="checkbox"/>			12. SURFACE OWNERSHIP FEDERAL <input type="checkbox"/> INDIAN <input type="checkbox"/> STATE <input checked="" type="checkbox"/> FEE <input type="checkbox"/>				
13. NAME OF SURFACE OWNER (if box 12 = 'fee')						14. SURFACE OWNER PHONE (if box 12 = 'fee')				
15. ADDRESS OF SURFACE OWNER (if box 12 = 'fee')						16. SURFACE OWNER E-MAIL (if box 12 = 'fee')				
17. INDIAN ALLOTTEE OR TRIBE NAME (if box 12 = 'INDIAN')			18. INTEND TO COMMINGLE PRODUCTION FROM MULTIPLE FORMATIONS YES <input type="checkbox"/> (Submit Commingling Application) NO <input checked="" type="checkbox"/>			19. SLANT VERTICAL <input checked="" type="checkbox"/> DIRECTIONAL <input type="checkbox"/> HORIZONTAL <input type="checkbox"/>				
20. LOCATION OF WELL		FOOTAGES		QTR-QTR	SECTION	TOWNSHIP		RANGE	MERIDIAN	
LOCATION AT SURFACE		805 FSL 548 FWL		SWSW	23	15.0 S		7.0 W	S	
Top of Uppermost Producing Zone		805 FSL 548 FWL		SWSW	23	15.0 S		7.0 W	S	
At Total Depth		805 FSL 548 FWL		SWSW	23	15.0 S		7.0 W	S	
21. COUNTY MILLARD			22. DISTANCE TO NEAREST LEASE LINE (Feet) 876			23. NUMBER OF ACRES IN DRILLING UNIT 2				
27. ELEVATION - GROUND LEVEL 4625			25. DISTANCE TO NEAREST WELL IN SAME POOL (Applied For Drilling or Completed) 817			26. PROPOSED DEPTH MD: 5000 TVD: 5000				
28. BOND NUMBER B009096			29. SOURCE OF DRILLING WATER / WATER RIGHTS APPROVAL NUMBER IF APPLICABLE 68-396							
Hole, Casing, and Cement Information										
String	Hole Size	Casing Size	Length	Weight	Grade & Thread	Max Mud Wt.	Cement	Sacks	Yield	Weight
SURF	34	30	0 - 750	234.2	X-56 Casing	9.5	Class A	887	1.18	15.6
I1	28	24	0 - 950	156.1	X-56 Casing	10.2	Class A	3171	1.18	15.6
			950 - 3100	245.6	X-52 Casing	10.2	None			
			3100 - 3300	303.7	X-52 Casing	10.2	None			
I2	24	20	0 - 1500	129.3	X-52 Casing	10.2	Class G	2710	1.24	16.3
			1500 - 3500	202.9	X-52 Casing	10.2	None			
PROD	22	16	0 - 2400	97.0	N-80 Buttress	10.2	Class G	3610	1.24	16.3
			2400 - 3600	109.0	P-110 Other	10.2	None			
ATTACHMENTS										
VERIFY THE FOLLOWING ARE ATTACHED IN ACCORDANCE WITH THE UTAH OIL AND GAS CONSERVATION GENERAL RULES										
<input checked="" type="checkbox"/> WELL PLAT OR MAP PREPARED BY LICENSED SURVEYOR OR ENGINEER					<input checked="" type="checkbox"/> COMPLETE DRILLING PLAN					
<input checked="" type="checkbox"/> AFFIDAVIT OF STATUS OF SURFACE OWNER AGREEMENT (IF FEE SURFACE)					<input checked="" type="checkbox"/> FORM 5. IF OPERATOR IS OTHER THAN THE LEASE OWNER					
<input type="checkbox"/> DIRECTIONAL SURVEY PLAN (IF DIRECTIONALLY OR HORIZONTALLY DRILLED)					<input checked="" type="checkbox"/> TOPOGRAPHICAL MAP					
NAME Tiffany A. James			TITLE Vice President Project Development			PHONE 801 993-7001				
SIGNATURE			DATE 10/30/2014			EMAIL tjames@westernenergyhub.com				
API NUMBER ASSIGNED 43027500050000			APPROVAL  Permit Manager							



Application for Permit to Drill Magnum Cavern Well 8

Drilling Plan



Application for Permit to Drill Magnum Cavern Well 8

Drilling Plan

11/17/2014

CONFIDENTIAL

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Section 1

Drilling/Well Construction Plan

1.1 Plan Summary

This Application for Permit to Drill has incorporated all of the sections in the DOGM APD Checklist. Additional requirements for the drilling program are listed on the Instructions page of the Application. The discussion below is intended to respond directly to the drilling program additional requirements.

1. The estimated tops of important geologic markers:

Important geologic markers are shown in **Exhibit A: Magnum Cavern Well 8 Wellhead Casing Design**. General geologic markers include clay-confining layers that generally delineate the shallow unconfined aquifer, the shallow artesian aquifer, the deep artesian aquifer, and the basement artesian aquifer. The main marker identified on site is the transition between the alluvial aquifers and the salt structure which begins at approximately 3,350 feet.

2. The estimated depths at which the top and the bottom of anticipated water, oil, gas, or other mineral-bearing formations are expected to be encountered, and the owners or operator's plans for protecting such resources:

The shallow water table has been found on site to be at an approximate depth of 60 feet. Water continues to be encountered until entering the salt structure, which in and of itself is unsaturated. Significant decreases in water quality occur within the salt transition zone starting at about 3,000 feet.

Protection of the ground water resource will be ensured through the casing and cementing program proposed to be implemented as provided on **Exhibit A: Magnum Cavern Well 8 Wellhead Casing Design**, the Casing Design report, and the Well Drilling/Construction Plan.

No oil or gas has been found on site, nor is it expected.

3. The owner's or operator's minimum specifications for pressure control equipment to be used and a schematic diagram thereof showing sizes, pressure ratings or API series, proposed testing procedures and testing frequency:

See the **Exhibit A: Magnum Cavern Well 8 Wellhead Casing Design**, the "16-Inch Drilling/Well Construction Plan" and the "Conceptual 16-Inch Well Casing Program" for the descriptions of the drilling equipment and casing program.

4. Any supplementary information more completely describing the drilling equipment and casing program as shown on this form:

See the "16-Inch Drilling/Well Construction Plan" and the "Conceptual 16-Inch Well Casing Program" for the descriptions of the drilling equipment and casing program.

5. *The type and characteristics of the proposed circulating medium or mediums to be employed in drilling, the quantities and types of mud and weighting material to be maintained, and the monitoring equipment to be used on the mud system:*

The Fluids Program will be completed by the drilling contractor's mud engineer prior to well drilling. In general, the water bearing zones above 3,000 feet will be drilled with a water/bentonite mud and the salt section will be drilled with a brine/aggapulite mud. The Reserve Pit will be lined with a 20-mil HDPE liner. See **Exhibit B: Magnum Cavern Well 8 Well Pad** and **Exhibit C: Magnum Cavern Well 8 Well Pad Cross Sections** for details of the Reserve Pit.

6. *The anticipated type and amount of testing, logging, and coring:*

See the "16-Inch Drilling/Well Construction Plan."

7. *The expected bottom hole pressure and any anticipated abnormal pressures or temperatures or potential hazards, such as hydrogen sulfide, expected to be encountered, along with contingency plans for mitigating such identified hazards:*

See the "Operating Plan and Procedures" for the operating pressures. No abnormal pressures, temperatures, or potential hazards were encountered in the drilling of exploratory well MH-1, CW-5 and CW-6 nor are they anticipated on future wells.

8. *Any other facets of the proposed operation which the lessee or operator desires to point out for the division's consideration of the application:*

None.

1.2 16-Inch Drilling/Well Construction Plan

The following is the general program to be used to drill Magnum Natural Gas Liquid Storage Well CW-8. Depths shown are approximate, **from Ground Level**. Casing lengths, grades and wall thicknesses may change as determined by availability and drilling conditions.

1. Rig up drilling rig.
2. Drill 40" hole for or drive 36" 0.75" wall thickness, 282.35 lb/ft, Grade X-52 conductor pipe to approximately 150 feet.
3. Drill a 17-1/2" hole to ± 770 feet and log.
4. Open 17-1/2" hole up to 34" with hole openers as appropriate.
5. Run and cement 750 feet of 30" O.D., 0.75" wall thickness, API 5L Grade X-56 pipe. Centralizers to be placed every other casing section.
6. Allow the cement to set a minimum of 18 hours. Pressure test the casing in accordance with State rules.
7. After the cement sets, cut off the 30" casing and attach appropriate mud piping.
8. Drill a 17-1/2" hole to about 3,300 feet, slightly above top of salt structure estimated to be $\pm 3,250$ feet. Lost circulation may occur over this interval; control as necessary by the use of lost circulation material, cement plugs or drill without returns.
9. Run gamma ray, neutron, density, SP induction and resistivity logs as specified.
10. Open the 17-1/2" hole to 28" with hole openers of increasing size.

11. Run X-Y caliper log.
12. Run and cement ± 200 feet of 24" O.D. 1.25" wall thickness, API 5L X-52, 2,150 feet of 24" O.D., 1" wall thickness, API 5L X-52 and 950 feet of 24" O.D. 0.625" wall thickness API 5L X-56 or equivalent threaded and coupled pipe to top of salt structure. *Casing string weight is approximately 737,228 pounds in air.* Use the stab-in cementing method. Centralizers to be placed every other casing section.
13. After the cement sets for 48 hours, pressure test the casing in accordance with State rules.
14. Cut off the 24" casing and connect appropriate mud flow equipment.
15. Drill out cement and shoe with 22" bit.
16. Switch to salt saturated mud after drilling out cement.
17. Drill a 12-1/4" hole to $\pm 3,650$ feet.
18. Run gamma ray, SP induction, neutron and bulk density logs as specified.
19. Open the 12-1/4" hole to 24" to about 3,520 feet with hole openers and underreamers of increasing size.
20. Run X-Y caliper log.
21. Run and cement 2,000 feet of 20", 1.0" wall thickness, X-52, threaded and coupled pipe and 1,500 feet of 20", 0.625" wall thickness, X-52 threaded and coupled pipe. *Casing string weight is approximately 600,000 pounds in air.* Use the stab-in cementing method. Centralizers to be placed on each of the first 10 joints and then every other casing section.
22. Allow the cement to set a minimum of 72 hours.
23. Cut off the 20" casing and weld on a 21-1/4" flange. Nipple up an annular BOP or blind flange for testing. Pressure test the casing in accordance with State rules.
24. Drill out cement, shoe and about 5 feet of formation. Pressure test casing seat in accordance with state regulations.
25. Open the 12-1/4" hole up to 22" to about 3,620 feet using hole openers and underreamers.
26. Run X-Y caliper log.
27. Run and cement 1,200 feet of 16" 0.656" wall thickness, P-110 BT&C API pipe and 2,400 feet of 16" 0.575" wall thickness N-80 casing. Use the stab-in cementing method. Centralizers to be placed every casing joint.
28. Allow the cement to set a minimum of 96 hours. Pressure test the casing in accordance with State rules.
29. Install blowout preventer on the 20" casing.
30. Drill out plug and ten feet of salt formation.
31. Install the BOP on the 20-inch casing after the 16-inch casing is cemented in place in order to support the drilling of the 12-1/4-inch pilot hole below 3,600 feet. The BOP will be installed on a temporary flange welded to the 20-inch casing. The exact size of the BOP to be used will be at least 13-5/8-inches in diameter and rated at 3,000 psi. Pressure test casing shoe in accordance with the State rules and regulations.
32. Drill a 12-1/4" hole to $\pm 5,000$ feet.
33. Log cuttings and check for loss of drilling fluid indicating a porous formation is encountered. If so, perform a tightness test over this interval.
34. Run gamma ray, neutron and bulk density logs as specified.
35. If logs indicate a porous zone in the salt section, perform tightness test over the zone.
36. If no gas has been encountered, nipple down BOP.
37. Under ream the 12-1/4" hole to 24" down to a depth of about 4,350 feet.
38. Flush hole with clean brine, approximately 1,100 barrels.

39. Run X-Y caliper log.
40. Run casing inspection and cement bond logs in 16" casing from shoe to surface.
41. Run in approx. 4,300 feet of 13-3/8" 0.514" wall thickness, 72 lb/ft N-80, BT&C pipe.
42. Install and test the upper wellhead assembly.
43. Run in approx. 3,950 feet of 8-5/8" 0.352" wall thickness, 32 lb/ft, K-55, BT&C pipe and 1,000 feet of 8-5/8", 0.55" wall thickness, 44 lb/ft, N-80, BT&C casing.
44. Install remainder of wellhead.
45. Rig down and move out rig from location.
46. Clean up location.

1.3 Welding Protocol

1. Lift ring welding and inspection to be performed in accordance with AWS (American Welding Society) D1.1 Structural Welding Code. Perform nondestructive testing (NDT) on the welds using ultrasonic shear wave equipment as specified in AWS D1.1 and interpreted by a NDT Level II or III Certified Technician who is qualified under ASNT CP-189, Standard for Qualification and Certification for Nondestructive Testing Personnel, 2006 Edition and CP-105, ASNT Standard Topical Outlines for Qualification of Nondestructive Testing Personnel, 2006 Edition.
2. Casing double joint welding shall be performed in accordance with API Standard 1104 Welding of Pipelines and Related Facilities. Pipe base material's carbon equivalency will be computed from the material composition as written in the Material Test Report (MTR) that is provided when the pipe is purchased. The welding contractor will provide a Welding Procedure Specification (WPS) that matches the base material and Procedure Qualification Report (PQR) and welders who are qualified to the WPS with Welders Qualification Report (WQR). The welding contractor will provide the WQR for each potential welder prior to beginning production welding. The field supervisor will verify that the WQR and welder's photo identification match. Perform nondestructive testing (NDT) on the butt welds using radiography as specified in API Standard 1104 and interpreted by a NDT Level II or III Certified Technician who is qualified under ASNT CP-189, Standard for Qualification and Certification for Nondestructive Testing Personnel, 2006 Edition and CP-105, ASNT Standard Topical Outlines for Qualification of Nondestructive Testing Personnel, 2006 Edition. Each completed girth, butt weld shall be radiograph tested to API Standard 1104 qualifications. The radiograph methods and qualifications shall comply with API Standard 1104 –"Certification of Nondestructive Testing Personnel" and "Acceptance Methods for Nondestructive Testing Personnel".
3. Casing rig welding shall be performed in accordance with API Standard 1104 Welding of Pipelines and Related Facilities. Pipe base material's carbon equivalency will be computed from the material composition as written in the Material Test Report (MTR) that is provided when the pipe is purchased. The welding contractor will provide a Welding Procedure Specification (WPS) that matches the base material and Procedure Qualification Report (PQR) and welders who are qualified to the WPS with Welders Qualification Report (WQR). The welding contractor will provide the WQR for each potential welder prior to beginning production welding. The field supervisor will verify that the WQR and welder's photo identification match. Perform nondestructive testing (NDT) on the butt welds using

radiography as specified in API Standard 1104 and interpreted by a NDT Level II or III Certified Technician who is qualified under ASNT CP-189, Standard for Qualification and Certification for Nondestructive Testing Personnel, 2006 Edition and CP-105, ASNT Standard Topical Outlines for Qualification of Nondestructive Testing Personnel, 2006 Edition. Each completed girth, butt weld shall be nondestructively tested to API Standard 1104 qualifications. The test methods and qualifications shall comply with API Standard 1104 "Certification of Nondestructive Testing Personnel" and "Acceptance Methods for Nondestructive Testing Personnel".

1.4 Specifications for Cementing Services and Materials

This specification covers the requirements to supply cement, equipment and services for storage wells located near Delta, UT. The work will be conducted from a land rig. Cementing operations will be visually verified at the time of cementing via the observance of cement rising within the outer well annulus to the surface.

Proposed wellbore configuration (Depths RKB)

- 36" Conductor Pipe: 0 - Approx. 150 feet (Driven or set in 40" hole)
- 30" Surface Casing: 0 - Approx. 750 feet (Approx. 34" Open Hole)
- 24" Intermediate Casing: 0 - 3,300 feet (Approx. 28" Open Hole)
- 20" Next to Last Casing: 0 - 3,500 feet (Approx. 24" Open Hole)
- 16" Last Cemented Casing: 0 - 3,600 feet (Approx. 22" Open Hole)
- Top of Salt: Approx. 3,400 feet

1. Cement specifications for the 30" Surface casing. Cement job will be pumped through a stabbed-in 5-1/2" DP.
 - Cement to surface: Class A (Standard) + Defoamer (if deemed necessary)
 - Water Ratio 5.2 gals/sack
 - Slurry Weight 15.6 lbs/gal.
 - Slurry Volume 1.18 cu. ft./sack
 - Excess 50% Open Hole Volume (Caliper Available)
2. Cement specifications for the 24" Intermediate. Cement job will be pumped through a stabbed-in 5-1/2" DP.
 - Cement to surface: Class A (Standard) + Defoamer (if deemed necessary).
 - Water Ratio 5.2 gals/sk
 - Slurry Weight 15.6 lbs/gal.
 - Slurry Volume 1.18 cu. ft./sack
 - Excess 50% Open Hole Volume (Caliper Available)
3. Cement specifications for the 20" Next to Last Casing. Cement job will be pumped through a stabbed-in 5-1/2" DP.
 - Cement to surface: Class G (Premium) + 37.2% Salt + Defoamer (as necessary).
 - Water Ratio 5.0 gals/sk
 - Slurry Weight 16.3 lbs/gal.
 - Slurry Volume 1.24 cu. ft./sack
 - Excess 30% Open Hole Volume (Caliper Available)

4. Cement specifications for the 16" Last Casing. Cement job will be pumped through a stabbed-in 5-1/2" DP.

Cement to surface: Class G (Premium) + 37.2% Salt + Defoamer (as necessary).

Water Ratio 5.0 gals/sk

Slurry Weight 16.3 lbs/gal.

Slurry Volume 1.24 cu. ft./sack

Excess 30% Open Hole Volume (Caliper Available)

1.5 Well Conditioning

Before commencing drilling operations (spudding the well), Magnum will provide detailed procedures for conditioning the hole prior to cementing casing. The pre-flush procedure will ensure that the wellbore is properly conditioned for cementing operations in accordance with recommendations from the cementing contractor.

The well is conditioned to circulate the drilling fluids, sweep cuttings out of the hole, obtain consistent fluid properties, and adjust the fluid viscosity and density in an attempt to prevent cement channeling through the fluid. Detailed procedures for this process have not been written at this time as it is a typical task during drilling, but when the drilling fluids contractor is hired his mud engineer will be tasked to write a program for the fluids.

1.6 Reporting

The casing cement jobs shall be documented by an affidavit from the cementing company showing the amount and type of cementing materials and the method of placement.

Three samples of the cement slurry for each of the salt casings shall be collected in suitable sized and shaped containers so that the hardened cement can be tested for compressive strength.

Table 1-1: 16-Inch Injection Well Proposed Casing and Cementing Program

Hole Size	Driven	34-inch	28-inch	24-inch	22-inch
Casing Size	36-inch	30-inch	24-inch	20-inch	16-inch
Mud Weight Type	N/A	9.5 ppg Fresh Water	10.2 ppg Fresh Water	10.2 ppg Saturated Brine	10.2 ppg Saturated Brine
Slurry Weight	N/A	15.6 ppg Fresh Water	15.6 ppg Fresh Water	16.3 ppg Saturated Brine	16.3 ppg Saturated Brine
Cement Type	N/A	Class A Standard	Class A Standard	Class G Premium	Class G Premium
Cement Yield	N/A	1.18cu ft/sk	1.18 cu ft/sk	1.24 cu ft/sk	1.24 cu ft/sk
Cement Volume	N/A	887 Sacks	3,171 Sacks	2,710 Sacks	3,610 Sacks

Section 2

Conceptual 16-Inch Injection Well Casing Program

2.1 General Well Design

The wells for the Magnum Natural Gas Liquid (NGL) storage caverns will be drilled from surface to more than a thousand feet into the salt. The well will have a surface casing, water protection string cemented below the fresh water aquifers and two casing strings (intermediate and production casings) cemented into the upper section salt. The casing strings will be run in a wellbore about four inches larger diameter than the casing and cemented into place. This report does not present the drilling and cementing programs for the wells.

The well in general is sized so as to allow injection and production of NGL into or from the completed cavern at 1,500 gpm with a velocity about 10 feet per second. The casing sizes also allow use of tubing strings for mining that will maintain fluid velocities at about 16 feet per second. This is slightly faster than usual in mining operations, but is in an acceptable range.

The various casing strings are sized to withstand foreseeable collapse, burst and tensile forces that might act upon the casing. The goal of the design was to specify casing sizes and grades that allow a safety factor of about 1.1 for collapse, 1.2 for burst and 1.6 for tensile forces based on published strength data.

In normal operations collapse forces generally are greatest during cementing of the casing string when the inside of the casing is filled with drilling mud and the annulus is filled with heavier cement slurry. In normal operations the collapse forces resulting from the weight difference between cement and drilling mud are low. At 4,000 feet this can amount to about 1,000 psi. However, in keeping with generally accepted practices (such as ERCB Directive 10) the collapse pressures are calculated with the assumption that the annulus is filled with cement and the inside of the casing is air-filled.

In the case of the outer mining tubing string, the collapse pressures also result from the use of nitrogen as a blanket material. The nitrogen blanket pressure will be greatest at the start of mining when the nitrogen blanket is at its deepest location. At the worst case (for collapse calculations) the largest pressures occur during reverse mining when the cavern is shut-in. In this instance, water is in the outer tubing string, and the brine in the cavern is unsaturated and continues to dissolve salt. The continued dissolution increases space in the cavern so that the wellhead fluid pressures fall to a vacuum. If at the same time the borehole has closed around the hanging tubing, the nitrogen pressure will be locked in at its normal operating pressure. The full nitrogen pressure of about 2,000 psi will be acting against the 13-3/8-inch tubing with a vacuum on the inside. The tubing has been sized to withstand this event, however it is unlikely.

Burst forces again are generally greatest during cementing operations but are normally very low during normal operations. The worst case occurs if the casing has been run in the well, the float shoe/collar gets stuck shut and a gas blowout occurs at the bottom of the hole. In this event the full hydrostatic pressure of the drilling mud in the casing would be acting against a low-pressure gas-filled annulus. The pressure of the annulus was conservatively assumed to be "0" psi.

In the case of the final cemented casing, significant burst forces occur during mining operations due to the use of nitrogen as the blanket material. After mining is completed, lesser pressures will act inside the final cemented casing as a result of normal liquid storage operations.

The purpose of the heavier wall tubing at the bottom of the 8-5/8" string is to have a compatible set of hanging strings (13-3/8" and 8-5/8") that sonar caliper tools may be able to survey through without the necessity of a workover to pull pipe in order to obtain a good survey of the cavern.

The conceptual casing program designed for the Magnum NGL storage wells is summarized in Table 2-1 and shown in Figure 1. In the event that these casing and pipe sizes are not available, the next higher grade or increased wall thickness should be chosen. Calculations for forces acting on the various strings are given in Appendix A. The safety factors for the various loading scenarios are summarized in Table 2.

Table 2-1: Summary of Casings for Magnum Gas Storage Well

Casing String	Size – inches	Weight – pounds/foot	Grade	Depth – feet
Conductor	36	282.35	X-52	0 – 150
Surface	30"	234.29	X-56	0 - 750
Intermediate	24"	156.17	X-56	0 – 950
Intermediate	24"	245.64	X-52	950 – 3,100
Intermediate Final cemented depth 3,300 feet	24"	303.7	X-52	3,100 – 3,300
First Salt	20"	129.33	X-52	0 – 1,500
First Salt Final cemented depth 3,500 feet	20"	202.92	X-52	1,500 – 3,500
Production (2 nd Salt)	16"	97	N-80	0 – 2,400
Production (2 nd Salt) Final cemented depth 3,600 feet	16"	109	P-110	2,400 – 3,600
Outer Mining String	13-3/8"	72	N-80	0 – 4,300
Inner Mining String	8-5/8"	32	K-55	0 – 3,950
Inner Mining String	8-5/8"	44	N-80	3,950 – 4,950

Table 2-2: Summary of Calculated Factors of Safety

Casing String	Safety Factor		
	Collapse – 1.1	Burst – 1.2	Tensile – 1.6
36-inch Conductor	N/A	N/A	N/A
30-inch Surface	5.03	3.91	18.20
24-inch Intermediate	1.13	5.06	2.52
24-inch Intermediate	1.10	2.31	6.38
24-inch Intermediate	1.20	1.82	N/A
20-inch First Salt String	1.14	4.91	3.30
20-inch First Salt String	1.53	1.98	N/A
16-inch Production (2 nd Salt String)	1.12	3.88	4.02
16-inch Production (2 nd Salt String)	1.14	4.04	N/A
13-3/8-inch Outer Mining String	1.19	1.84	5.46
8-5/8-inch Inner Mining String	1.23	1.91	4.05
8-5/8-inch Inner Mining String	3.24	3.14	N/A

2.2 Casing Design Calculations

2.2.1 Conductor Pipe

36-inch, wall thickness 1-inch, grade X-52, plain end, welded pipe from 0 feet to approximately 150 feet. Pipe is to be cemented in an open hole.

2.2.2 Surface Casing

30-Inch, 234.29 lb/ft, wall thickness 0.75-inch, grade X-56 pipe, with Frank's DDS connections from 0 feet to 750 feet.

2.2.2.1 Collapse Calculations

Assume that the bottom hole depth of the 30-inch surface casing is at ± 750 feet from surface, with a welded float shoe located at the bottom of the casing string. The worst-case scenario for collapse pressure would be a full column of cement in the casing/hole annulus, and a column of gas inside the 30-inch surface casing.

1. (750 feet) (0.052 psi/ft) (15.6 lb/gal cement) = 608 psi hydrostatic pressure exerted on the exterior of the 30-inch casing, at 750 feet.
2. 0 psi hydrostatic pressure is exerted on the interior of the 30-inch casing, at 750 feet.
3. Differential pressure, (collapse pressure) annulus pressure versus pressure inside the 30-inch casing equals: 608 psi – 0 psi = 608 psi.

The 30-inch surface casing has a collapse rating of 898 psi. According to the above differential calculations, the proposed 30-inch surface casing to be used has a collapse rating of 1,631 psi, greater than any outside pressure that will be exerted against the exterior of the casing.

2.2.2.2 Burst Calculations

Assume that the bottom hole depth of the 30-inch surface casing is at ± 750 feet from surface, with a welded float shoe located at the bottom of the casing string. The 30-inch surface casing will be loaded with 9.5 lb per gallon drilling mud. The worst case for burst is if the

float shoe becomes stuck closed and a gas blowout occurs at the shoe. In this case there would be a column of gas outside of the casing and a full column of drilling mud inside the casing.

1. (750 feet) (0.052 psi/ft/lb/gal) (9.5 lb/gal drilling mud) = 371 psi hydrostatic pressure exerted on the interior of the 30-inch casing, at 750 feet.
2. Differential pressure, (burst pressure) inside pressure verses annulus pressure on the outside of the 30-inch casing equals: 371 psi – 0 psi = 371 psi.

According to API Bulletin 5L the 30-inch surface casing has a minimum test pressure of 2,100 psi. According to the above differential calculations, the proposed 30-inch surface casing to be used has a minimum test pressure greater than any inside pressure that will be exerted against the interior of the casing.

2.2.2.3 Tensile Calculations

The proposed 30-inch surface casing weighs 234.29 lb/ft and will be set at approximately 750 feet, for a total string weight of 175,717.5 lbs.

The 30-inch, welded surface casing proposed has a tensile rating of 3,584,000 lbs, which is greater than tensile weight exerted by the weight of the casing.

2.2.3 Intermediate String Casing

24-inch, 156.17 lb/ft, Wall Thickness 0.625-inch, X-56 Grade, Plain end fitted with threaded connections from 0 feet to 950 feet

24-inch, 245.64 lb/ft, Wall Thickness 1.0-inch, X-52 Grade, Plain end fitted with threaded connections from 950 feet to 3,100 feet

24-inch, 303.70 lb/ft, Wall Thickness 1.25-inch, X-52 Grade, Plain end fitted with threaded connections from 3,100 feet to 3,300 feet

2.2.3.1 Collapse Calculations

Assume that the bottom hole depth of the 24-inch 303.7lb/ft casing (pipe) at ±3,300 feet from surface, with a welded float shoe located at the bottom of the casing string. The worst-case scenario for collapse pressure would be a full column of cement in the casing/hole annulus, and an empty column inside the 24-inch surface casing.

1. (950 feet) (0.052 psi/ft/lb/gal) (15.6 lb/gal cement) = 771 psi hydrostatic pressure exerted on the exterior of the 24-inch casing, at 950 feet.
- 1a. (3,100 feet) (0.052 psi/ft/lb/gal) (15.6 lb/gal cement) = 2,515 psi hydrostatic pressure exerted on the exterior of the 24-inch casing, at 3,100 feet.
- 1b. (3,300 feet) (0.052 psi/ft/lb/gal) (15.6 lb/gal cement) = 2,677 psi hydrostatic pressure exerted on the exterior of the 24-inch casing, at 3,300 feet.
2. Differential pressure, (collapse pressure) annulus pressure verses pressure inside the 24-inch casing at 1,600 feet equals: 771 psi – 0 psi = 771 psi.
- 2a. Differential pressure, (collapse pressure) annulus pressure verses pressure inside the 24-inch casing at 3,100 feet equals: 2,515 psi – 0 psi = 2,515 psi.

- 2b Differential pressure, (collapse pressure) annulus pressure verses pressure inside the 24-inch casing at 3,300 feet equals: $2,677 \text{ psi} - 0 \text{ psi} = 2,677 \text{ psi}$.

According to Frank's 2008, the 24-inch outer string casing at 950 feet has a collapse rating of 874 psi, at 3,100 feet the collapse rating is 2,761 psi and at 3,300 feet a collapse rating of 3,213 psi. According to the above differential Calculations, the proposed 24-inch outer string casing to be used has a collapse rating greater than any outside pressure that will be exerted against the exterior of the casing.

2.2.3.2 **Burst Calculations**

Assume that the bottom hole depth of the 24-inch surface casing is at $\pm 3,300$ feet from surface, with a welded float shoe located at the bottom of the casing string. The 24-inch surface casing will be loaded with 10.2 lb per gallon drilling mud. The actual cement process will be down drill pipe, which will be stung into the float shoe at 3,300 feet so that the casing is not filled with cement. The worst case for burst is if the float shoe becomes stuck closed and a gas blowout occurs at the shoe. In this case there would be a column of gas outside the outside of the casing and a full column of drilling mud inside the casing.

1. (950 feet) (0.052 psi/ft/lb/gal) (10.2 lb/gal drilling mud) = 504 psi hydrostatic pressure exerted on the interior of the 24-inch casing, at 950 feet.
 - 1a. (3,100 feet) (0.052 psi/ft/lb/gal) (10.2 lb/gal drilling mud) = 1,644 psi hydrostatic pressure exerted on the interior of the 24-inch casing, at 3,100 feet.
 - 1b. (3,300 feet) (0.052 psi/ft/lb/gal) (10.2 lb/gal drilling mud) = 1,750 psi hydrostatic pressure exerted on the interior of the 24-inch casing, at 3,300 feet.
2. Differential pressure, (burst pressure) inside pressure verses annulus pressure on the outside of the 24-inch casing at 950 feet equals: $504 \text{ psi} - 0 \text{ psi} = 504 \text{ psi}$
 - 2a. Differential pressure, (burst pressure) inside pressure verses annulus pressure on the outside of the 24-inch casing at 3,100 feet equals: $1,644 \text{ psi} - 0 \text{ psi} = 1,644 \text{ psi}$
 - 2b. Differential pressure, (burst pressure) inside pressure verses annulus pressure on the outside of the 24-inch casing at 3,300 feet equals: $1,750 \text{ psi} - 0 \text{ psi} = 1,750 \text{ psi}$

According to Frank's, the 24-inch outer sting casing has a minimum burst pressure of 3,281 psi above 950 feet, 4,375 psi between 950 feet and 3,100 feet and 3,190 psi for the deeper segment of the string. According to the above differential calculations, the proposed 24-inch surface casing to be used has a minimum test pressure greater than any inside pressure that will be exerted against the interior of the casing.

2.2.3.3 **Tensile Calculations**

The proposed 24-inch outer string casing weighs 156.17 lb/ft, 245.64 lb/ft and 303.70 lb/ft and will be set at approximately 3,300 feet, for a total string weight of 737,228 lbs.

The proposed 24-inch, welded intermediate casing has a tensile rating of 1,856,000 lbs, which is greater than tensile weight exerted by the casing.

2.2.4 **First Salt String Casing**

20-Inch, 129.33 lb/ft, wall thickness 0.625-inch, grade X-52 pipe, DDS connection, Casing from 0 to 1,500 feet.

20-Inch, 202.92 lb/ft, wall thickness 1.0-inch, grade X-56 pipe, DDS connection from 1,500 to 3,500 feet.

2.2.4.1 **Collapse Calculations**

Assume that the bottom hole depth of the 20-inch first salt string of casing is at ± 3500 feet from surface, with a float shoe located at the bottom of the casing string. The casing string will be made up of two weights of casing.

Above 1,500 feet the casing will be 129.33 lb/ft X-52 casing. From 1,500 feet to 3,500 feet the casing will be 202.92 lb/ft X-52 casing. This string will have proprietary connections on the entire string. The worst-case scenario for collapse pressure would be a full column of cement in the casing/hole annulus, and an empty inside the 20-inch surface casing.

1. (1,500 feet) (0.052 psi/ft/lb/gal) (16.3 lb/gal cement) = 1,271 psi hydrostatic pressure exerted on the exterior of the 20-inch casing, at 1,500 feet.
- 1a. (3,500 feet) (0.052 psi/ft/lb/gal) (16.3 lb/gal cement) = 2,967 psi hydrostatic pressure exerted on the exterior of the 20-inch casing, at 3,500 feet.
2. At 1,500 feet, the differential pressure equals: $1,271 \text{ psi} - 0 \text{ psi} = 1,271 \text{ psi}$. According to API, the 20-inch 129.33-lb/ft casing has a collapse rating of 1,445 psi. According to the above differential calculations, the proposed 20-inch first salt string casing to be used has a collapse rating greater than any outside pressure that will be exerted against the exterior of the casing.
- 2a. At 3,500 feet, the differential pressure equals: $2,967 \text{ psi} - 0 \text{ psi} = 2,967 \text{ psi}$. The 20-inch 202.92 lb/ft pipe has a collapse rating of 4,550 psi according to Frank's. According to the above differential calculations, the proposed 20-inch first salt string casing to be used has a collapse rating greater than any outside pressure that will be exerted against the exterior of the casing.

2.2.4.2 **Burst Calculations**

Assume that the bottom hole depth of the 20-inch surface casing is at $\pm 3,500$ feet from surface, with a welded float shoe located at the bottom of the casing string. The 20-inch surface casing will be loaded with 10.2 lb per gallon drilling mud. The actual cement process will be down drill pipe, which will be stung into the float shoe at 3,500 feet so the casing will not be filled with cement. The worst case for burst considerations would be if there was a gas blowout in the salt after the casing was set but before it was cemented. This could potentially leave a column of gas along the outside of the casing and a full column of drilling mud inside the casing.

1. (1,500 feet) (0.052 psi/ft/lb/gal) (10.2 lb/gal drilling mud) = 796 psi hydrostatic pressure exerted on the interior of the 20-inch casing, at 1,500 feet.
- 1a. (3,500 feet) (0.052 psi/ft/lb/gal) (10.2 lb/gal drilling mud) = 1,856 psi hydrostatic pressure exerted on the interior of the 20-inch casing, at 3,500 feet.
2. Differential pressure (burst pressure), inside pressure verses annulus pressure on the outside of the 20-inch casing equals: $796 \text{ psi} - 0 \text{ psi} = 796 \text{ psi}$.
2. Differential pressure (burst pressure), inside pressure verses annulus pressure on the outside of the 20-inch casing equals: $1,856 \text{ psi} - 0 \text{ psi} = 1,856 \text{ psi}$.

The 20-inch pipe has a minimum burst pressure of 3,904 psi above 1,500 feet and 3,675 psi for the deeper segment of the string. According to the above differential calculations, the proposed 20-inch surface casing to be used has a minimum test pressure greater than any inside pressure that will be exerted against the interior of the casing.

2.2.4.3 Tensile Calculations

The 20-inch surface casing proposed weighs 129.33 lb/ft set at 1,500 feet and 202.92 lb/ft set at approximately 3,500 feet, for a total string weight of 599,835 lbs.

Franks provides a tensile strength for the DSS connection on the casing at the top of the string of 1,978,000 pounds; which exceeds the above-calculated weight of the 20-inch casing.

2.2.5 Production String Casing

16-inch, 97 lb/ft, grade N-80 pipe, wall thickness 0.575-inch, buttress connection, casing from 0 to 2,400 feet.

16-inch, 109 lb/ft, grade P-110 pipe, wall thickness 0.656-inch, buttress connection, casing from 2,400 to 3,600 feet.

2.2.5.1 Collapse Calculations

Assume that the bottom hole depth of the 16-inch production string of casing is at $\pm 3,600$ feet from surface, with a welded float shoe located at the bottom of the casing string. This string will have buttress connections. The worst-case scenario for collapse pressure would be a full column of cement in the casing/hole annulus, and gas (from a blowout) inside the 16-inch surface casing.

1. (2,400 feet) (0.052 psi/ft/lb/gal) (16.3 lb/gal cement) = 2,034 psi hydrostatic pressure exerted on the exterior of the 16-inch casing, at 2,400 feet.
- 1a. (3,600 feet) (0.052 psi/ft/lb/gal) (16.3 lb/gal cement) = 3,051 psi hydrostatic pressure exerted on the exterior of the 16-inch casing, at 3,600 feet.
2. Differential pressure, collapse pressure), annulus pressure verses pressure inside the 16-inch casing equals: $2,034 \text{ psi} - 0 \text{ psi} = 2,034 \text{ psi}$.
- 2a. Differential pressure, collapse pressure), annulus pressure verses pressure inside the 16-inch casing equals: $3,051 \text{ psi} - 0 \text{ psi} = 3,051 \text{ psi}$.

According to API, the 16-inch N-80 97 lb/ft casing has a collapse rating of 2,270 psi and the 16-inch P-110, 109-lb/ft casing has a collapse rating of 3,470 psi. According to the above differential calculations, the proposed 16-inch casing to be used has a collapse rating greater than any outside pressure that will be exerted against the exterior of the casing.

2.2.5.2 Burst Calculations

Assume that the bottom hole depth of the 16-inch surface casing is at $\pm 3,600$ feet from surface, with a welded float shoe located at the bottom of the casing string. The 16-inch surface casing will be loaded with 10.2 lb per gallon drilling mud. The actual cement process will be down drill pipe, which will be stung into the float shoe at 3,600 feet so the inside of the casing will not be filled with cement. The worst case for burst considerations would be if there was a gas blowout in the salt after the casing was set but before it was cemented. This could potentially leave a column of gas along the outside of the casing.

1. (2,400 feet) (0.052 psi/ft/lb/gal) (10.4 lb/gal drilling mud) = 1,298 psi hydrostatic pressure exerted on the interior of the 16-inch casing, at 2,400 feet.
- 1a. (3,600 feet) (0.052 psi/ft/lb/gal) (10.4 lb/gal drilling mud) = 1,947 psi hydrostatic pressure exerted on the interior of the 16-inch casing, at 3,600 feet.
2. Differential pressure (burst pressure), inside pressure versus annulus pressure on the outside of the 16-inch casing equals: 1,298 psi – 0 psi = 1,298 psi. The 16-inch casing above 2,400 feet has a minimum test pressure of 5,030 psi. According to the above differential calculations, the proposed 16-inch surface casing to be used has a minimum test pressure greater than any inside pressure that will be exerted against the interior of the casing.
- 2a. Differential pressure (burst pressure), inside pressure versus annulus pressure on the outside of the 16-inch casing equals: 1,947 psi – 0 psi = 1,947 psi. According to API, the 16-inch casing has a minimum test pressure of 7,870 psi. According to the above differential calculations, the proposed 16-inch surface casing to be used has a minimum test pressure greater than any inside pressure that will be exerted against the interior of the casing.
3. During mining operations, the 16" casing annulus will be filled with nitrogen used as a blanket during mining operations. At the surface, the maximum gas pressure will be about 1,872 psi / (e ^ (0.00003347 * 0.58 * depth) = 1,770 psi. The wellhead gas pressure is below the rated burst pressure of 5,030 psi of the 16" casing at the surface.

2.2.5.3 Tensile Calculations

The 16-inch surface casing will be set at approximately 3,600 feet, for a total string weight of 363,600 lbs.

The tensile strength for buttress end casing is about 2,229,000 pounds; which exceeds the above-calculated weight of the 16-inch casing.

2.2.6 Outer String of Mining Tubing

13-3/8-inch, 72 lb/ft, wall thickness 0.514-inch, grade N-80 pipe, buttress connection, casing from 0 to 4,300 feet.

2.2.6.1 Collapse Calculations

Assume that the nitrogen roof blanket will be at a depth of ±3,600 feet from surface, the maximum differential pressure exerted against the 13-3/8-inch casing will be at the surface.

The worst-case scenario for collapse pressure would be a column of fluid in the casing (during the first steps of mining) that goes on a vacuum when the well is shut-in and the brine in the cavern continues to dissolve salt; and nitrogen is in the annulus.

1. (3,600 feet) (0.052 psi/ft/lb/gal) (10.0 lb/gal brine) = 1,872 psi hydrostatic pressure exerted on the exterior of the 13-3/8-inch casing, at 3,600 feet. The nitrogen pressure on the outside of the string and the brine pressure in the cavern are balanced at this point.
- 1a. Pressure outside the 13-3/8-inch at the surface is (nitrogen blanket pressure) / (1.000316 ^ blanket level depth) = 1,872 / (1.0000316 ^ 3600) = 1,770 psi
2. (3,600 feet) (0.052 psi/ft/lb/gal) (10.0 lb/gal brine) = 1,872 psi hydrostatic pressure exerted on the interior of the 13-3/8-inch casing, at 3,600 feet.

- 2a. Differential pressure, collapse pressure, annulus pressure verses pressure inside the 13-3/8- casing at the surface equals: 1,770 psi – (-100 psi) (vacuum) = 1,870 psi. According to API Bulletin 5C2, the 13-3/8-inch string casing has a collapse rating of 2,670 psi. According to the above differential calculations, the proposed 13-3/8-inch casing to be used has a collapse rating greater than the pressure that will be exerted against the exterior of the casing.

2.2.6.2 **Burst Calculations**

Assume that the bottom hole depth of the 13-3/8-inch surface casing is at $\pm 4,300$ feet from surface, with an open end of the casing string. The 13-3/8-inch surface casing will be loaded with water during reverse mining steps. The worst case for burst considerations would be if the nitrogen blanket bled off and the bottom of the 13-3/8-inch tubing was salted into the 16-inch production casing during normal operations with a salt plug at or near the bottom of the 13-3/8" x 8-5/8" annulus. This could potentially leave a column of gas along the outside of the tubing and high-pressure fluid on the inside of the tubing string.

1. 0 psi hydrostatic pressure is exerted on the exterior of the 13-3/8-inch casing, at the 16-inch casing shoe.
2. Pump pressure (Value unknown but assumed) 780 psi exerted on the 13-3/8-inch casing.
3. Fluid pressure at 3,600 feet of (3,600 feet) (0.052 psi/ft/lb/gal) (8.34 lb/gal water) = 1,561 psi exerted on the interior of the 13-3/8-inch casing at 3,600 feet.
4. Differential pressure (burst pressure), inside pressure verses annulus pressure on the outside of the 13-3/8-inch casing equals: 1,561 psi + 780 psi (assumed pump pressure) – 0 psi = 2,341 psi.

According to API Bulletin 5C2, the 13-3/8-inch casing has a minimum test pressure of 5,380 psi. According to the above differential Calculations, the proposed 13-3/8-inch surface casing to be used has a minimum test pressure greater than any inside pressure that will be exerted against the interior of the casing.

2.2.6.3 **Tensile Strength**

The outer sting tubing is 72 lb/ft casing set at 4,300 feet. Based on these depths, the maximum sting weight will be 309,600 lbs. This is well below the maximum tensile strength at the surface of 1,693,000 lbs.

2.2.7 **Inner String of Mining Tubing**

8-5/8-inch, 32 lb/ft, Wall Thickness 0.352-inch, K-55 Grade, Buttress Connection, Casing from 0 to 3,950 feet

8-5/8-inch, 44 lb/ft, Wall Thickness 0.55-inch, N-80 Grade, Buttress Connection, Casing from 3,950 to 4,950 feet.

2.2.7.1 **Burst and Collapse Calculations**

The 8-5/8-inch inner wash string has the similar circumstance as the 13-3/8-inch outer string tubing, in that the tubing will basically have equal weight of fluids (brine water) on the outside as well as the inside, internal and external pressures will be equal. Therefore, since there will not be

any differential pressures exerted externally or internally, burst and collapse calculations are not necessary. The 8-5/8-inch tubing will not have nitrogen acting against it.

2.2.7.2 Tensile Strength

The deepest depth for the inner tubing is estimated at approximately 4,950 feet. Based on this depth, the maximum sting weight will be 170,400 lbs. This is well below the maximum tensile 690,000 lbs.

2.3 Sources

American Petroleum Institute, Specification for Line Pipe, API Specification 5L.

American Petroleum Institute, Bulletin on Performance Properties of Casing, Tubing and Drill Pipe, API Specification 5C2.

American Petroleum Institute, Technical Report on Equations and Calculations for Casing, Tubing and Line Pipe Used as Casing or Tubing; and Performance Properties Tables for Casing and Tubing, API Technical Report 5C3.

Energy Resource Conservation Board, 2008. Minimum Casing Design Requirements, Directive 010.

Frank's Casing, 2008, DDS Double Drive Shoulder Connector.

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Section 3

Mechanical Integrity Testing

Several testing methods will be employed to demonstrate mechanical integrity of the well/cavern system. These methods vary depending upon the stage of development of the well or cavern.

3.1 During Drilling

After cementing the 16-inch production casing, the casing will be tested before continuing drilling. A hydraulic pressure test of the 16-inch production casing will be conducted before drilling out the plug (shoe) and after waiting at least 72 hours to allow the cement to set. The test pressure shall be 125% of the anticipated working pressure during product storage, about 2,340 psi at the cement plug or about 470 psi at the surface. The test will last 30 minutes. The test will be considered good if the pressure loss is less than 5%.

After drilling out the cement plug and drilling about 10 feet of salt below the casing shoe, a hydraulic pressure test of casing seat and cement in 16-inch production casing will be run. Install the BOP on the 20-inch casing after the 16-inch casing is cemented in place in order to support the drilling of the 12-1/4-inch pilot hole below 3,600 feet. The BOP will be installed on a temporary flange welded to the 20-inch casing. The exact size of the BOP to be used will be at least 13-5/8-inches in diameter and rated at 3,000 psi. The surface test pressure will be 80% of the lithostatic pressure as calculated at the casing seat minus the hydrostatic pressure of the test fluid, or about 1,010 psi. The test will last 60 minutes. The test will be considered good if the pressure loss is less than 5%.

3.2 Test of the 16-Inch Casing and the Cavern during Development

Prior to initiating solution mining and again at the completion of solution mining, the cavern will be tested using the nitrogen mechanical integrity technique or other appropriate method approved by the Department of Water Quality. The test pressure at the shoe of the 16-inch cemented casing will be about 0.75 psi per foot of depth, or about 0.23 psi per foot greater than the normal operating pressure (0.52 psi per foot of depth) to ensure that the casing and cement are not leaking.

The nitrogen mechanical integrity test technique essentially involves pressuring the well, and cavern after mining, to the desired test pressure, and injecting nitrogen in the outer annulus of the well (the space between the cemented 16-inch casing and the hanging 13-3/8-inch tubing) to a depth about 50 to 100 feet below the casing shoe.

The well will then be shut-in for 24 to 48 hours to allow the nitrogen temperature to equalize with the in-situ temperature. The initial depth of the nitrogen/brine interface below the casing shoe and the temperature of the wellbore will then be measured with a wireline tool. After a period of time, not less than 24 hours, determined by the size of the borehole below the casing shoe, a second interface and temperature survey will be run. The pressure at the wellhead will be monitored and recorded continuously during testing.

The change in the calculated volume of the nitrogen between the two interface measurements will be determined from the surface nitrogen pressure, the well temperature logs and the change in the level of the nitrogen/brine interface. The change in the nitrogen volume will then be converted to an equivalent fluid loss.

The temperature stabilization period, the duration of the test and the desired depth of the initial nitrogen/brine interface level will be determined from logs run during and after well construction. The selection of these features will be made so as to ensure that the test has a minimum detectable leak rate (test sensitivity) of no more than 1,000 barrels per year of nitrogen. An acceptable test will be a demonstration that the calculated leak rate is less than the minimum detectable leak rate.

All pressure monitoring instruments will be calibrated in accordance with manufacturer's recommendations. Testing will be performed under the supervision of a degreed engineer experienced in salt cavern testing. The report will be submitted to the Executive Secretary within 60 days of completion of the test.

3.3 Storage Operations

Following the post-completion mechanical integrity test, the caverns will be tested on a periodic basis using methods and procedures in accordance with requirements set forth by the State of Utah.

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Section 4

Operating Plan and Procedures

4.1 16-Inch Injection Well Operating Plan and Procedures

The injection well operating plan and procedures is outlined within the report “Conceptual Solution Mining Plans for Development of 16-Inch Injection Wells at Delta, Utah”. A Cavern Well Schematic is also shown in **Exhibit A: Magnum Cavern Well 8 Wellhead Casing Design**. The report generally defines the following operating criteria:

- Average Daily Rate: 2,500 gpm
- Maximum Daily Rate: 2,800 gpm
- Volume of Fluid to be Injected during Solution Mining (1 MMbbl cavern): 12 MMbbls of brine (504 million gallons), (see DWQ UIC Modification, October 21, 2011, Permit UTU-27-AP-9232389)
- Average Injection Pressure: 750 psi
- Maximum Injection Pressure: 800 psi

Exhibit A: Magnum Cavern Well 8 Wellhead Casing Design and the “16-Inch Well Construction Plan” also includes information related to the mining methods and stages, tubing placements, testing, and information related to potential problems that could be associated with cavern creation.

Injected water will be obtained from local ground water sources within confined aquifers located generally at depths greater than 1,450 feet. Representative water quality data collected from exploratory well MH-1 within potential source zones was previously provided in the DWQ Underground Injection Control Permit application. Because the source of water is a new source, no quality range data is available for the source. However, little variation is expected due to the limiting nature of the confined aquifer.

Section 5

Plugging and Abandonment Plan

5.1 16-Inch Injection Well Plugging and Abandonment Plan

The following procedures are provided as a general guideline. Actual plugging measures will be submitted in advance to DWQ (prior to commencement of product storage) or DOGM (after commencement of storage operations) for approval.

1. Form DOGM-9 will be submitted (after commencement of product storage) for procedural approval.
2. All stored product will be removed and the cavern will be filled with saturated brine water.
3. All free hanging tubing will be pulled from the well.
4. The exact depth to the bottom of the cemented production casing will be determined.
5. A drillable plug capable of supporting a cement plug will be installed in the cemented casing with the bottom of the plug within 10 feet of the end of the casing.
6. The following plugs will be placed. All cement plugs will be Class G cement with no additives and the slurry weight will be 14.5 pounds per gallon or more.
 - a. Bottom plug: A 300-foot plug from the plug at the bottom of the production casing upward.
 - b. Surface casing plug: A 150-foot plug from 75 feet below the bottom of the surface casing upward.
 - c. Top plug: A 75-foot plug from 75 feet below surface grade upward to surface.
7. The casing between each of the plugs shall be filled with a non-corrosive mud slurry of at least 10 pounds per gallon weight.
8. An alternative technique that could be used involves filling the entire wellbore with cement.

Upon completion of the plugging operation, all reports will be filed in accordance with DWQ or DOGM rules as applicable.

Appendix A

Exhibits

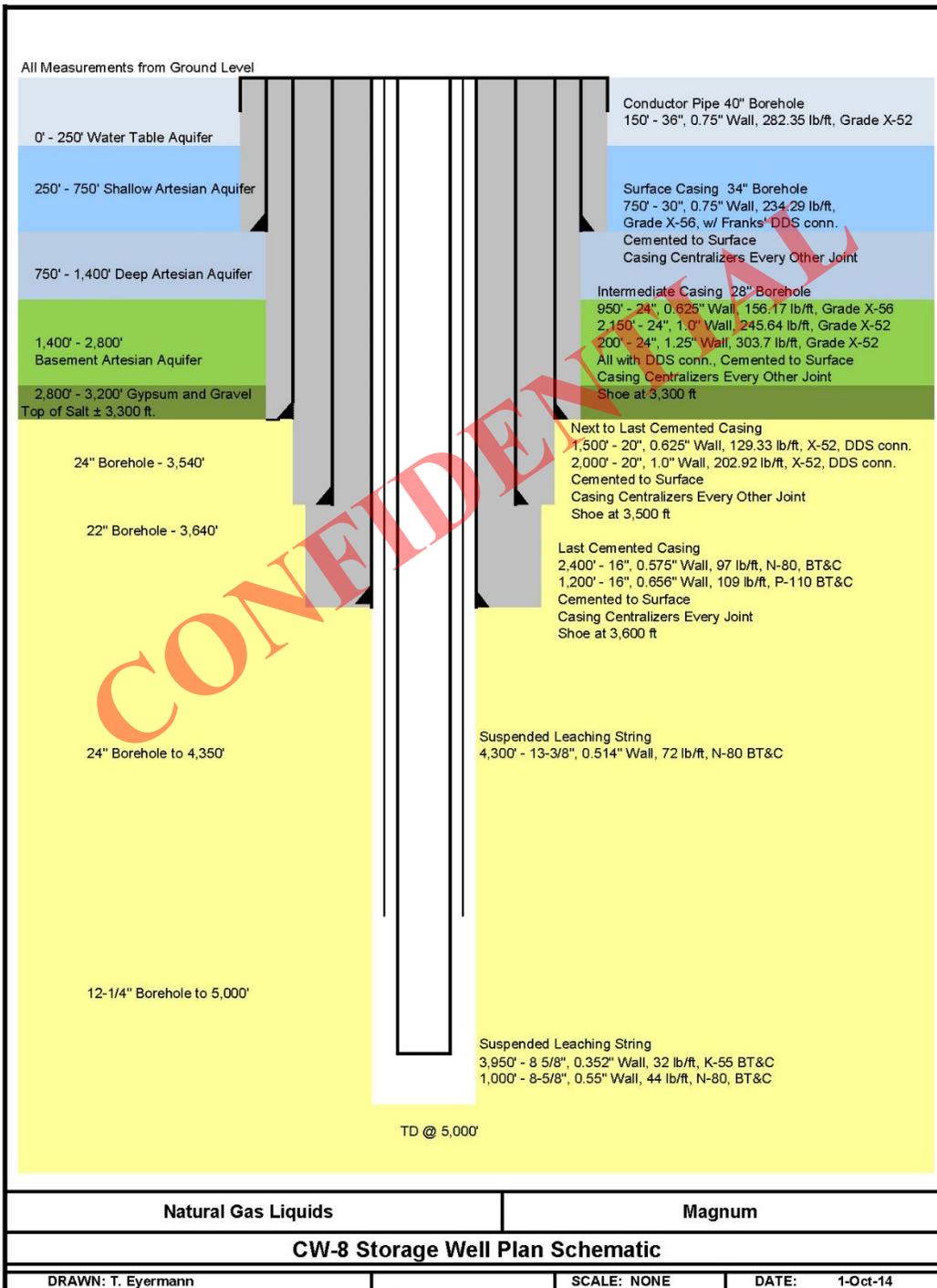


Exhibit A: Magnum Cavern Well 8 Wellhead Casing Design

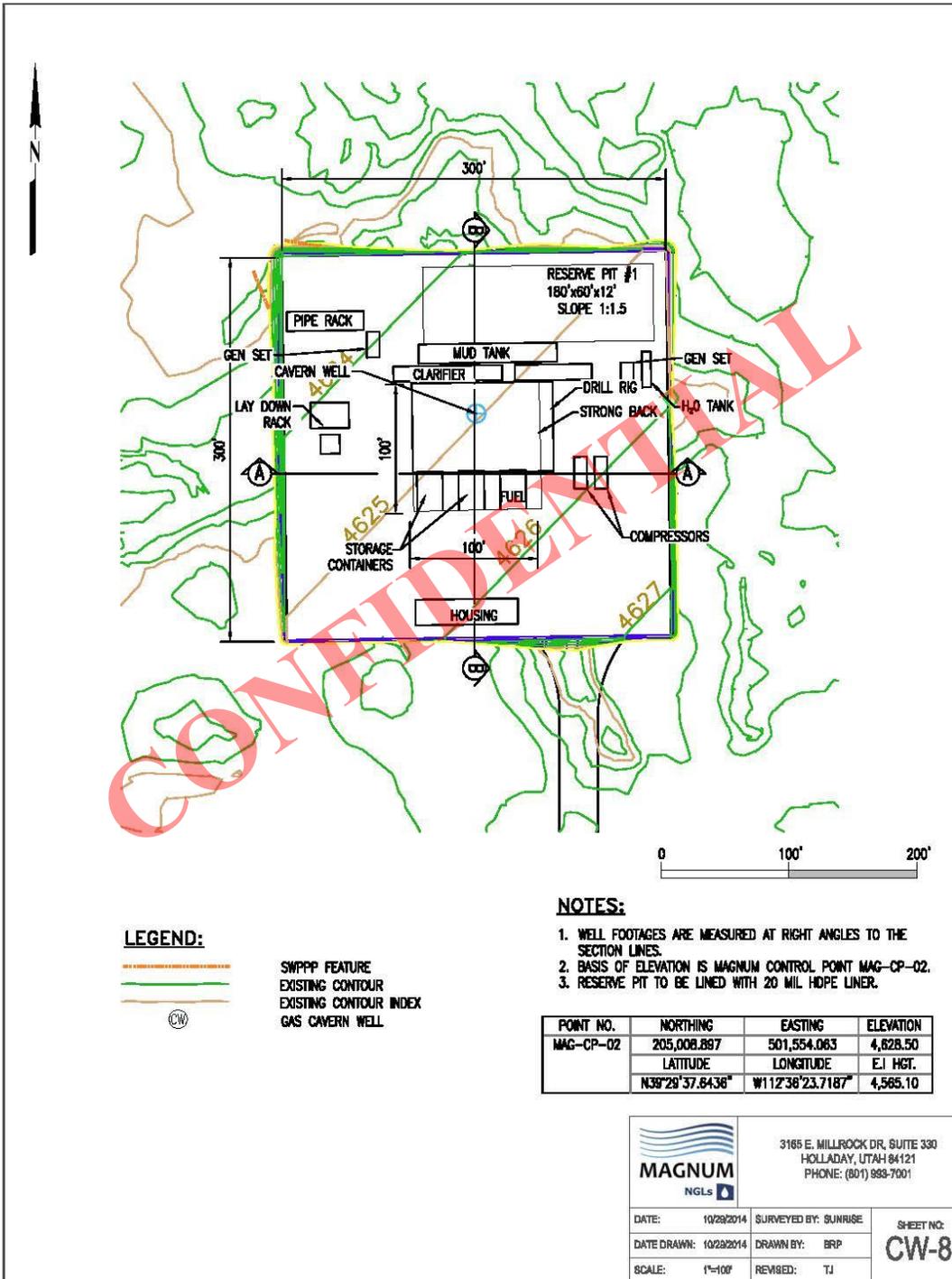


EXHIBIT B: MAGNUM CAVERN WELL 8 WELL PAD

Exhibit B: Magnum Cavern Well 8 Well Pad

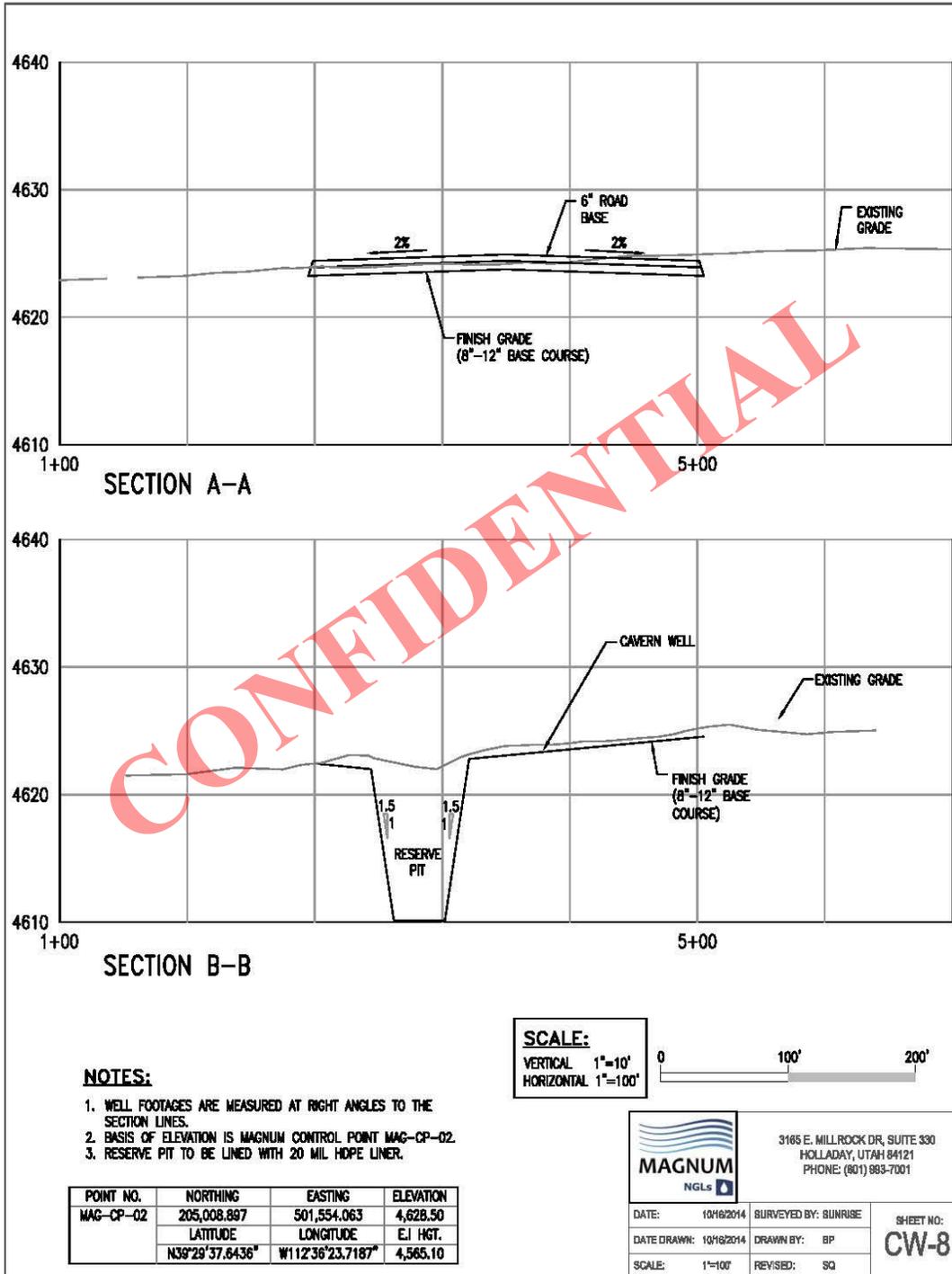


EXHIBIT C: MAGNUM CAVERN WELL 8 WELL PAD CROSS SECTIONS

Exhibit C: Magnum Cavern Well 8 Well Pad Cross Sections

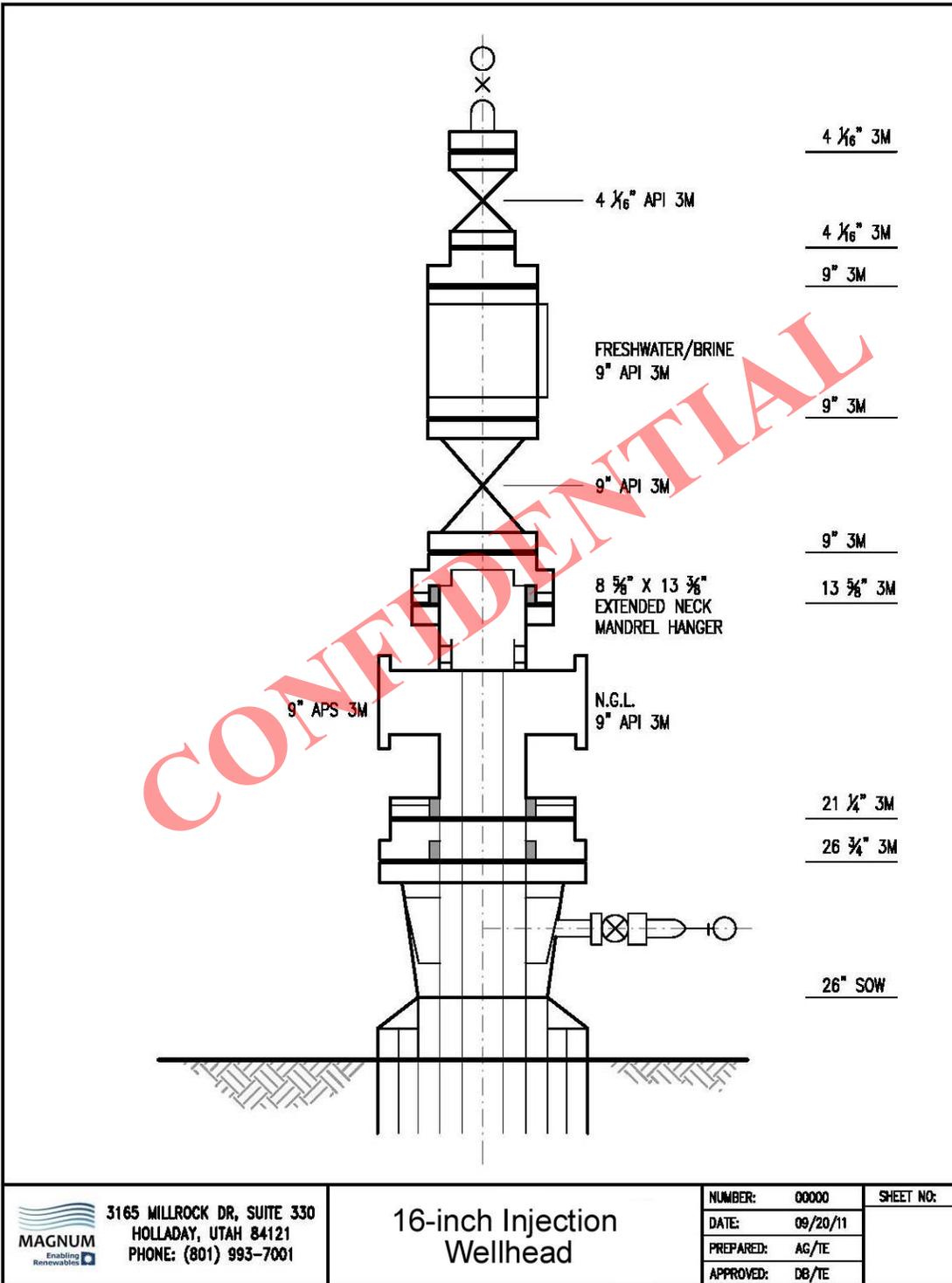
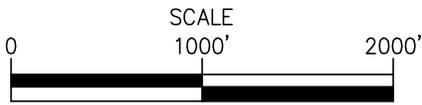
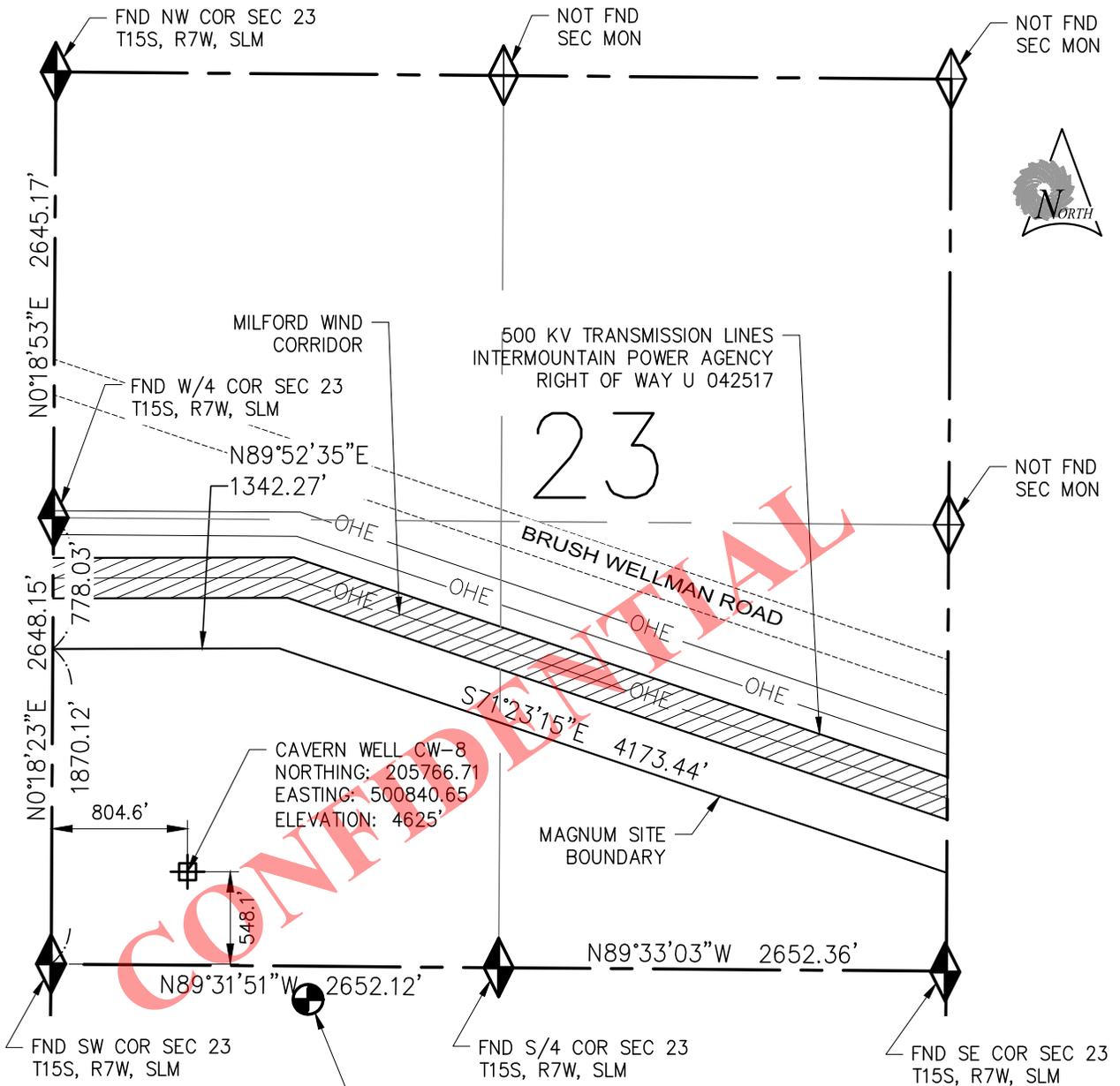


Exhibit D: Magnum Cavern Well 8 Injection Wellhead Design



HORIZ: 1" = 1000'

SURVEYOR'S CERTIFICATE

I, DALE J. ROBINSON, DO HEREBY CERTIFY THAT I AM A PROFESSIONAL LAND SURVEYOR, AND THAT I HOLD LICENSE NUMBER 189369 AS PRESCRIBED UNDER THE LAWS OF THE STATE OF UTAH.



SECTION MONUMENT

NOTES:

1. WELL FOOTAGES ARE MEASURED AT RIGHT ANGLES TO THE SECTION LINES.
2. BASIS OF ELEVATION IS MAGNUM CONTROL POINT MAG-CP-02

POINT NO.	NORTHING	EASTING	ELEVATION
MAG-CP-02	205008.897	501554.063	4,628.50
	LATITUDE	LONGITUDE	EL. HEIGHT
	N39°29'37.6436"	W112°36'23.7187"	4,565.10



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 www.sunrise-eng.com

CW-8

U:\MagnumGS\000000 Well Monitoring\Design3D\CWB-Exhibit.dwg Oct 15, 2014 9:14am drobinson

Application for Permit to Drill Magnum Cavern Well 8

Topographical Maps

10/29/2014

CONFIDENTIAL

Prepared by

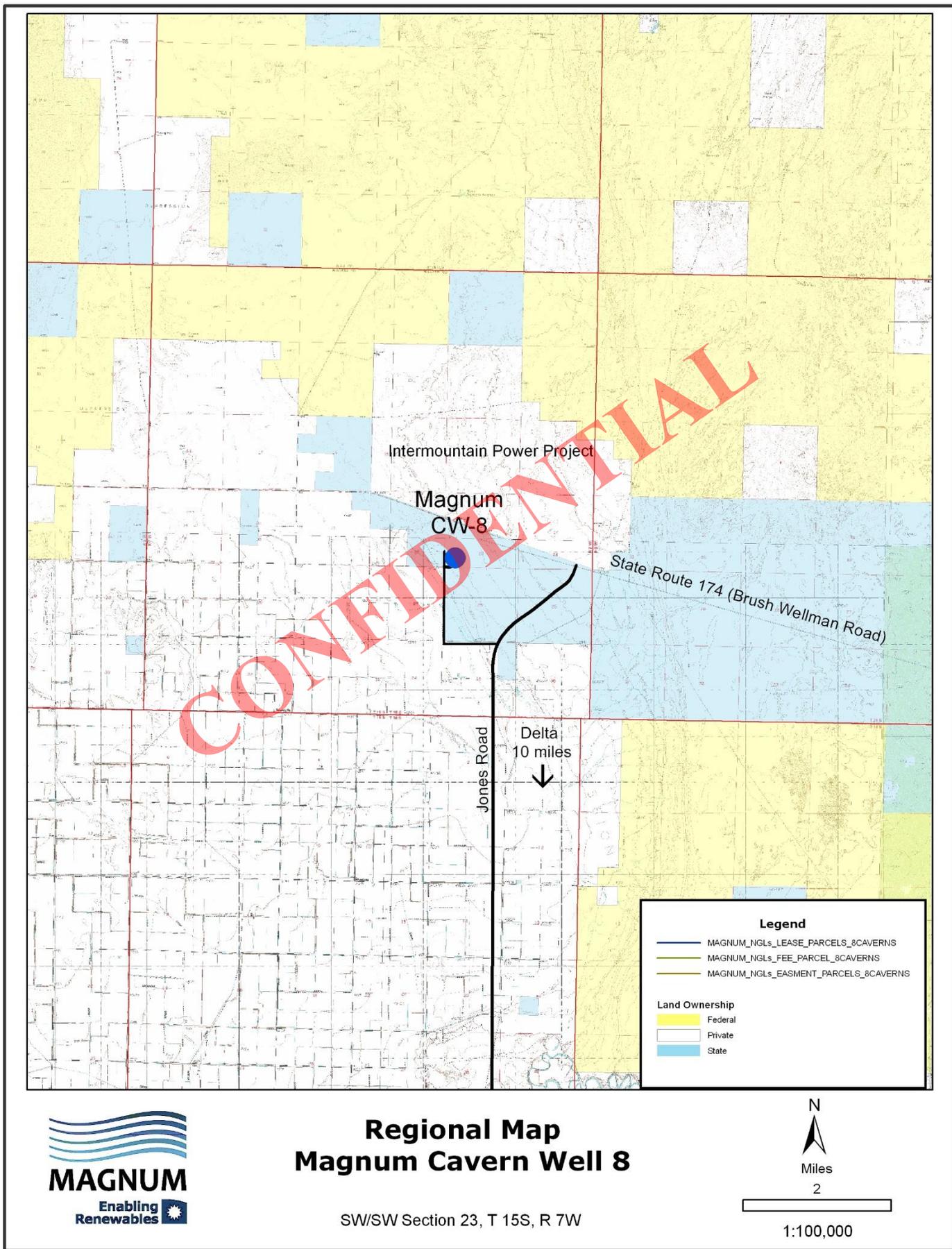
Magnum

3165 E. Millrock Dr., Suite 330

Holladay, Utah 84121

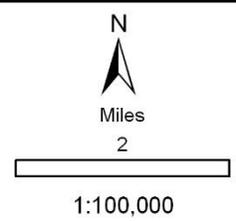
Tel 801 993 7001 Fax 801 993 7025

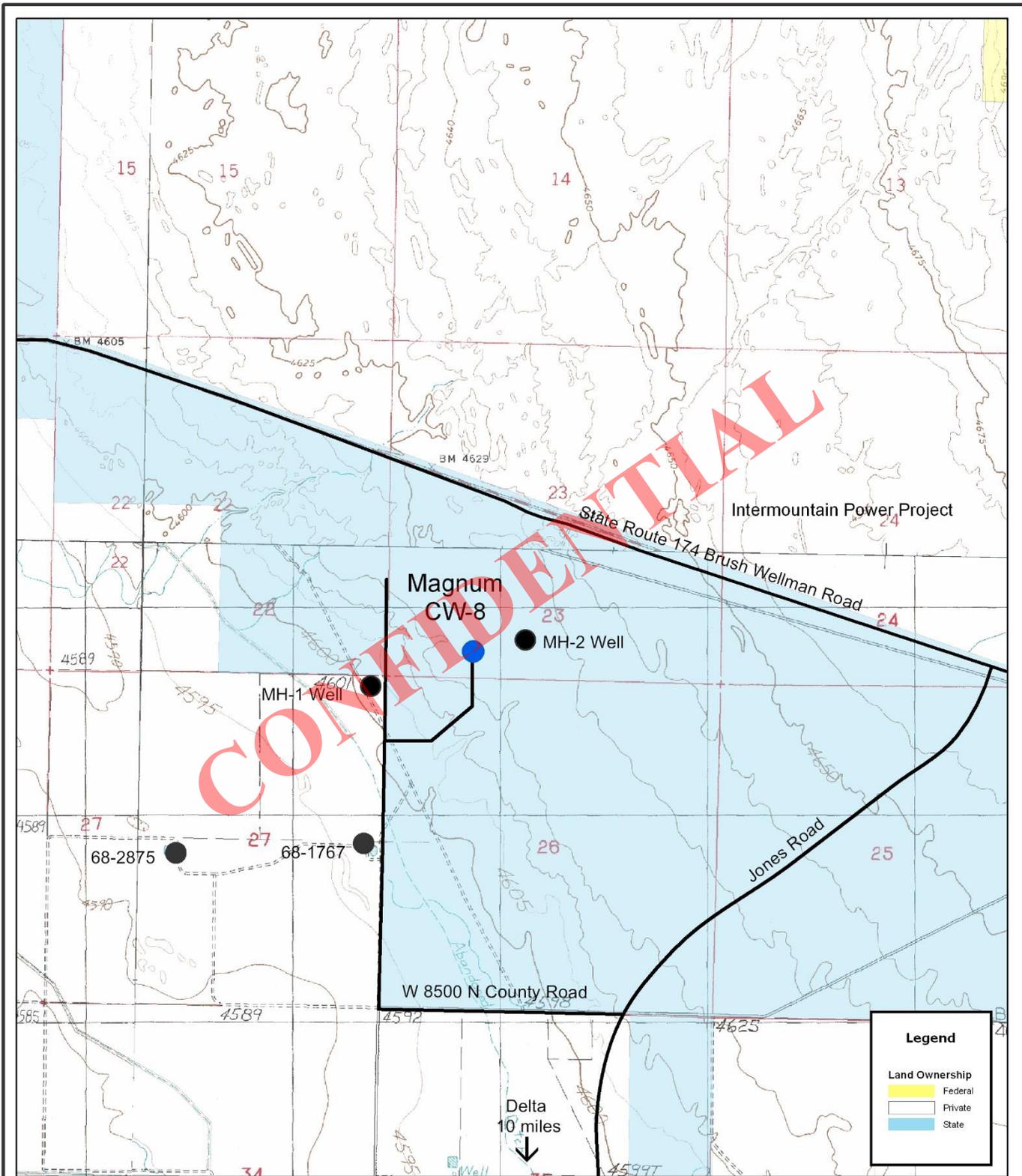
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Regional Map Magnum Cavern Well 8

SW/SW Section 23, T 15S, R 7W





Location Map Magnum Cavern Well 8

SW/SW Section 23, T15S, R7W



Miles
0.5



1:24,000

Application for Permit to Drill Storage Cavern Well 8

Affidavit of Surface Owner Agreement

10/29/2014

CONFIDENTIAL

Prepared by

Magnum

3165 E. Millrock Dr., Suite 330

Holladay, Utah 84121

Tel 801 993 7001 Fax 801 993 7025

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SECOND AMENDMENT

To

ENERGY STORAGE AND DEVELOPMENT LEASE

STATE OF UTAH LEASE NUMBER 51573-OBA

Between

**THE STATE OF UTAH, acting through
the SCHOOL AND INSTITUTIONAL
TRUST LAND ADMINISTRATION,
as Lessor**

and

**MAGNUM HOLDINGS, LLC
a Utah limited liability company,
as Lessee**

Effective as March 29, 2013

CONFIDENTIAL

SECOND AMENDMENT

To

**ENERGY STORAGE AND DEVELOPMENT LEASE
STATE OF UTAH LEASE NUMBER ML 51573-OBA**

THIS SECOND AMENDMENT TO ENERGY STORAGE AND DEVELOPMENT LEASE (“Second Amendment”), is entered into effective as of the 29th day of March, 2013, by and between the **STATE OF UTAH**, acting by and through the **SCHOOL AND INSTITUTIONAL TRUST LANDS ADMINISTRATION (“Lessor”)**, and **MAGNUM HOLDINGS, LLC**, a Utah limited liability company (“Lessee”). Lessor and Lessee are sometimes referred to herein as a “Party” or collectively as “Parties.”

RECITALS:

A. The Parties have previously entered into that certain Energy Storage and Development Lease, State of Utah Lease Number ML 51573-OBA, dated January 22, 2009 (“Lease”), which Lease the Parties amended effective June 1, 2009 by executing the First Amendment to Energy Storage and Development Lease, State of Utah Lease Number ML 51573-OBA (“First Amendment”). Capitalized terms used, but not otherwise defined in the Second Amendment, shall have the meanings assigned under the Lease and First Amendment.

B. Based on the results of planning by Lessee, the Parties desire to amend the Lease to include certain Adjacent Lands in the Leased Lands as provided in this Second Amendment and described more particularly on **Exhibit A (“Leased Lands”)** and **Exhibit D (“Project Area Map”)**.

C. With the exception of these adjustments in the Leased Lands, and corresponding adjustments in the annual rent and other provisions regarding Lessee’s use of and Lessor’s retained rights in the Leased Lands all remaining provisions of the Lease remain in full force and effect.

AGREEMENT:

IN CONSIDERATION of the foregoing recitals, the mutual promises contained herein and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Lessor and Lessee hereby agree as follows:

1.1 Pursuant to Lease **Section 6.2(a)**, “Possible Addition of Adjacent Lands,” Lessor hereby adds and Lessee hereby accepts the addition of the following lands to the Leased Lands. The Parties agree that the existing terms and conditions of the Lease constitute market based terms, and that the addition of these lands to the Leased Lands under these terms constitute a lease on market based terms is the intended meaning of Lease **Section 6.2(a)**:

<u>Township 15 South, Range 6 West, SLB&M</u>	<u>Surface/ Mineral Acres</u>
Section 31: All	639.09

- 1.2 The reference in Lease **Recital A**, as modified by First Amendment Section 1.3, to the number of surface and mineral acres in the Leased Lands is amended from "3,628" to "4,267"
- 1.3 Exhibit A, "**Leased Lands**," and Exhibit D, "**Project Area Map**" attached hereto and by this reference incorporated herein, are hereby amended and replaced in their entirety to conform with and reflect the adjustments to the Leased Lands effected by Sections 1.1 and 1.2 of this Second Amendment.
- 1.4 The following sentence is added to the end of Lease **Section 2.7**: "Lessor agrees, to the extent it is able, to cancel any grazing permits authorizing activities on the Leased Lands, or portion thereof, within ninety (90) days of a written request from Lessee."
- 1.5 The Annual Rent payable by Lessee under Lease **Sections 4.1 and 4.2**, as modified by First Amendment Section 1.5, prior to the Operations Commencement Date is amended
[REDACTED]
- 1.6 Natural gas liquids ("NGLs") shall be treated as Refined Products under the Lease, including for purposes of rent, royalty and fee calculation under Lease **Article 4**.
- 1.7 With the exception of the foregoing amendments, the Lease and its prior First Amendment, and all remaining provisions thereof, remain as currently drafted and in full force and effect, including without limitation Lessor's reserved rights under Lease **Section 2.7** to, among other things, establish new rights of way and easements upon, through or over the Leased Lands and/or execute new leases in favor of third parties to utilize the surface and mineral estate of the Leased Lands for exploration, development and extraction of oil, native natural gas, geothermal resources, metalliferous resources and all other minerals subject to lease by Lessor, so long as such grants to third parties do not unreasonably interfere with Lessee's Authorized Uses under this Lease.

EXECUTED as of the date first written above.

LESSOR:

**STATE OF UTAH, ACTING THROUGH THE
SCHOOL AND INSTITUTIONAL TRUST
LANDS ADMINISTRATION**

By _____

Kevin Carter, Director

Approved as to Form:


John W. Andrews, Special Assistant
Attorney General

LESSEE:

MAGNUM HOLDINGS, LLC, a Utah limited liability company


By Robert W Webster
Name/Position: CEO

CONFIDENTIAL

EXHIBIT A**LEASED LANDS**

<u>Township 15 South, Range 7 West, SLB&M</u>	<u>Surface/ Mineral Acres</u>
Section 16: E/2, E/2NW, SWNW, SESW	480.00
Section 21: NENE	40.00
Section 22: Lots 3 (8.65), 5 (22.21), 7 (34.95), 8 (35.45) SWNE, SE	381.26
Section 23: Lots 2 (21.95), 4 (8.82), 7 (22.70), 8 (35.45), SW, S/2SE	329.34
Section 24: Lots 3 (9.36), 4 (36.01), 6 (22.63), 8 (9.30), SWSW	117.30
Section 25: All	640.00
Section 26: All	640.00
 <u>Township 15 South, Range 6 West, SLB&M</u>	 <u>Surface/ Mineral Acres</u>
Section 19: E/2, SESW	360.00
Section 30: All (Lot 5 (39.99), N/2, SW, N/2SE, SWSE)	639.99
Section 31: All	639.09
 <u>Township 15 South, Range 7 West, SLB&M</u>	 <u>Mineral Only Acres</u>
Section 14: SW	160.00
Section 15: S/2NE, SENW, E/2SW, SE	360.00
Section 22: Lots 1 (40.34), 2 (31.73), 4 (18.13), 6 (14.08), 9 (5.05)	109.33
Section 23: Lots 1 (18.17), 3(31.27), 5 (39.88), 6 (21.26), N/2N/2, SENE	311.28

EXHIBIT D

PROJECT AREA MAP (REPLACEMENT)

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Application for Permit to Drill Magnum Cavern Well 8

Surface Use Plan



Application for Permit to Drill Magnum Cavern Well 8

Surface Use Plan

10/29/2014

CONFIDENTIAL

Prepared by

Magnum

3165 E. Millrock Dr., Suite 330

Holladay, Utah 84121

Tel 801 993 7001 Fax 801 993 7025

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Section 1

Surface Use Plan

1.1 Existing Roads

Access to the project from the east will be on State Route 174 (Brush Wellman Road) and Jones Road from the south. Existing roads will not be improved or changed (see **Magnum Gas Storage Regional Topographical Map**).

1.1.1 Directions to location

From Delta, Utah, head north on Road N 1000 W for 1.6 miles. Just after the road turns west and into Road W 1500 N, turn north onto Jones Road for approximately 7.4 miles. Turn west onto W 8500 N County Road, approximately 1.5 miles south of the intersection of Brush Wellman Road, south of the Intermountain Power Plant. Travel approximately .75 miles to the east and .75 miles north to Cavern Well 6 (CW-6). From CW-6, travel east 950 feet then 650 feet north to Cavern Well 8 (CW-8) well pad.

1.2 Access Roads

An access road exists north from the W 8500 N County Road. An additional access road has been constructed from the CW-6 well pad approximately 950 feet east and 650 feet north to the CW-8 well pad. Access roads will generally be constructed to Millard County Road Design Standards. Construction will use the materials in place and additional material will be purchased from regional commercial pits and hauled to the site.

1.3 Location of Existing Wells within One Mile

There are four wells currently located within one mile of the proposed CW-7 (see **Magnum Gas Storage Location Topographical Map**):

- MH-1 supply well;
- MH-5 supply well;
- 68-1767: abandoned well; and
- 68-2875: private irrigation well.

1.4 Location of Production Facilities

Production facilities will be installed on the newly constructed drilling pad for CW-8 (see **Magnum Cavern Well 8 Location Topographical Map**). Five utility lines will be constructed:

- Electric supply line;
- Brine discharge/supply line;
- Raw water line;

- Well water supply line; and
- Natural gas products line.

All of the utility lines will enter the drilling pad from the southeast corner. All temporary disturbed areas related to production facilities will be reclaimed.

1.5 Location and Type of Water Supply

Water for drilling will be supplied by Magnum MH-1 and MH-5 wells. Both MH-1 and MH-5 are located to the west and south of the proposed CW-8 well (See **Magnum Cavern Well 8 Location Topographical Map**).

1.6 Construction Materials

Soil for construction will come from the site. Gravel will be purchased from a local supply vendor. Piping will be purchased from a supply vendor and stored on site.

1.7 Methods of Disposing of Waste Materials

Drill cuttings will settle out in the reserve pit. The reserve pit will be lined with a 20-mil HDPE liner (see **Magnum Cavern Well 8 Well Pad**). Liquids in the pit will be evaporated and the cuttings will be covered with a 20-mil HDPE liner, covered with 3 foot of soil, and reclaimed. Sewage facilities and disposal will be furnished and maintained by a local vendor. All garbage will be stored in appropriate containers and regularly hauled off-site to an approved facility.

1.8 Ancillary Facilities

After drilling is complete, modular solution mining facilities will be installed in the southeast portion of the CW-8 well pad for solution mining of the storage cavern.

1.9 Well Site Layout

Magnum Cavern Well 8 Well Pad and Magnum Cavern Well 8 Cross Sections depicts the well site layout. As shown: the drill rig will be set up in the center portion of the pad east of the CW-8; the reserve pit will be located to the south of the pad; the pipe racks will be located in the southwest corner of the pad.

1.10 Plan for Restoration of Surface

Restoration of all temporarily disturbed areas around the CW-8 well pad will be graded and reseeded according to The Utah School and Institutional Trust Lands Administration (SITLA) requirements.

1.11 Surface Ownership

SITLA is the owner and land administrator for Section 23 T15S, R7W. Magnum Holdings, LLC currently holds an Energy Storage and Development Lease (Number 51573-OBA) from SITLA to develop the property. A redacted copy of the Second Amendment to the Lease Agreement describing the leased land has been provided in the Affidavit of Surface Owner Agreement. SITLA can be reached at:

Application for Permit to Drill
Magnum Cavern Well 8

State Institutional Trust Lands Administration
675 East 500 South
Suite 500
Salt Lake City, UT 84102
801-538-5100
Attn: LaVonne Garrison

1.12 Evidence of Water Rights

The State Engineer has approved multiple Temporary Change Applications allowing use of existing water rights at the Project site. The Order approving the Temporary Change Application for the City of Delta (Number 68-396) is representative of the Orders received by Magnum for the Project. A copy of the Order has been provided in **Appendix A**. At this time, water will be withdrawn from the existing MH-1 and MH-5 wells (see **Magnum Cavern Well 8 Location Topographical Map** for details).

1.13 Other Information

- Current vegetation at the site consists of open scrub/shrub with sagebrush, greasewood, rabbitbrush, saltbush, and mixed bunchgrasses.
- Magnum has received all environmental clearances from Division of Wildlife Resources and Utah State Historic Preservation Office.

1.14 Company Representative

Tiffany A. James
Vice President, Project Development
and Government Affairs
Magnum NGLs Solution Mining, LLC
3165 East Millrock Drive, Suite 330
Holladay, UT 84121
Phone: (801) 993-7001
Cell: (801) 719-9131
tjames@westernenergyhub.com

Appendix A

Evidence of Water Rights

CONFIDENTIAL



GARY R. HERBERT
Governor
SPENCER J. COX
Lieutenant Governor

State of Utah
DEPARTMENT OF NATURAL RESOURCES
Division of Water Rights

MICHAEL R. STYLER KENT L. JONES
Executive Director State Engineer/Division Director

ORDER OF THE STATE ENGINEER
For Temporary Change Application Number 68-396 (t39557)

Temporary Change Application Number 68-396 (t39557) in the names of Delta City Corporation, and Magnum Energy was filed on January 27, 2014, to change the points of diversion, places of use, uses, and storage of 1029.29 acre-feet (af) of water as evidenced by Water Right Numbers 68-2835, 68-2909, and 68-396. Heretofore, the water has been diverted from the following points located: (1) Well - North 4517 feet and West 1173 feet from the SE Corner of Section 3, T17S, R6W, SLB&M (existing 16-inch well, 580 feet deep); (2) Well - North 2761 feet and West 144 feet from the E $\frac{1}{4}$ Corner of Section 12, T17S, R7W, SLB&M (existing 12-inch well, 860 feet deep); (3) Well - South 594 feet and West 1334 feet from the NE Corner of Section 12, T17S, R7W, SLB&M (existing 10-inch well, 703 feet deep); (4) Well - North 1590 feet and East 719 feet from the SW Corner of Section 6, T17S, R6W, SLB&M (existing 14-inch well, 737 feet deep); (5) Well - South 30 feet and West 20 feet from the NE Corner of Section 17, T17S, R6W, SLB&M (existing 16-inch well, 834 feet deep); (6) Well - South 340 feet and West 1550 feet from the E $\frac{1}{4}$ Corner of Section 12, T17S, R7W, SLB&M (existing 16-inch well, 856 feet deep); (7) Well - North 1590 feet and East 719 feet from the SW Corner of Section 6, T17S, R7W, SLB&M (existing 14-inch well, 737 feet deep); (8) Well - South 331 feet and West 1517 feet from the E $\frac{1}{4}$ Corner of Section 12, T17S, R7W, SLB&M (existing 16-inch well, 856 feet deep). The water was used for municipal purposes within the service area of Delta. The water has been used in all or portion(s) of Sections 33, 34, T16S, R6W, SLB&M; and Sections 3, 4, T17S, R6W, SLB&M.

Hereafter, it is proposed to divert 998.49 acre-feet of water from points of diversion changed to: (1) Well - North 345 feet and East 1205 feet from the SW Corner of Section 23, T15S, R7W, SLB&M (20-inch well, 1500-2300 feet deep); (2) Well - North 1070 feet and East 1305 feet from the SW Corner of Section 23, T15S, R7W, SLB&M (20-inch well, 1500-2300 feet deep); (3) Well - North 715 feet and East 780 feet from the SW Corner of Section 23, T15S, R7W, SLB&M (20-inch well, 1500-2300 feet deep); (4) Well - North 420 feet and East 2320 feet from the SW Corner of Section 23, T15S, R7W, SLB&M (20-inch well, 1500-2300 feet deep); (5) Well - South 110 feet and West 125 feet from the NE Corner of Section 27, T15S, R7W, SLB&M (20-inch well, 1500-2300 feet deep); (6) Well - South 2390 feet and East 140 feet from the NW Corner of Section 26, T15S, R7W, SLB&M (20-inch well, 1500-2300 feet deep); (7) Well - South 2205 feet and East 2735 feet from the NW Corner of Section 26, T15S, R7W, SLB&M (20-inch well, 1500-2300 feet deep). The water is to be used for other purposes. The water is to be used for industrial purposes (Industrial processes and associated activities to create underground gas caverns). The place of use of the water is being changed to all or portion(s) of Sections 19, 30, T15S, R6W, SLB&M; and Sections 22, 23, 24, 25, 26, 27, T15S, R7W, SLB&M.

1594 West North Temple, Suite 220, PO Box 146300, Salt Lake City, UT 84114-6300
telephone (801) 538-7240 • facsimile (801) 538-7467 • www.waterrights.utah.gov

ORDER OF THE STATE ENGINEER
Temporary Change Application Number
68-396 (t39557)
Page 2

Notice of this temporary change application was not published in a newspaper. It is the opinion of the State Engineer that it meets the criteria of Section 73-3-3 of the Utah Code for the approval of temporary change applications.

Review has been made of the proposed changes, the underlying right, and the protest. In order to approve this temporary change application without enlarging the underlying water rights the quantification limiting water right 68-2909 (a27062) to 172.43 acre-feet, as described in the approval memorandum for change application (a27062), must be continued. The quantified amounts for water right 68-396 is 0.893 cfs or 646.5 acre-feet and water right 68-2835 is 1.10 cfs or 179.56 acre-feet. Therefore, the total amount limited under these rights is: (172.43 acre-feet + 646.5 acre-feet + 179.56 acre-feet = 998.49 acre-feet).

In evaluating applications which propose to change the nature of use of a water right, the State Engineer believes it is appropriate to examine the rates and amounts of hydrologic depletion associated with the historical water use as compared to the proposed use to assure that there is no enlargement of the underlying water right. In this case, it is believed that the historical water uses would have incurred the following rates and amounts of hydrologic depletion:

<u>Prior Beneficial Use</u>	<u>Rate of Diversion</u>	<u>Amount of Diversion</u>	<u>*Rate of Depletion</u>	<u>Amount of Depletion</u>
Municipal	998.49acre-feet	998.49 acre-feet	100 percent	998.49 acre-feet

The rate and amount of hydrologic depletion associated with the proposed use is as follows:

<u>Proposed Beneficial Use</u>	<u>Rate of Diversion</u>	<u>Amount of Diversion</u>	<u>*Rate of Depletion</u>	<u>Amount of Depletion</u>
Industrial Use	998.49 acre-feet	998.49acre-feet	100 percent	998.49 acre-feet

**Consumptive Use of Irrigated Crops in Utah, Research Report 145, Utah Agricultural Experiment Station, Utah State University, Logan, Utah, October 1994, Delta Station.*

Based upon the above analysis, it appears that the proposed use will not exceed the hydrologic depletion limitations associated with the historical uses, thus causing an enlargement of the underlying water right.

It is the opinion of the State Engineer that this application can be approved without adversely affecting prior rights provided certain conditions are imposed. Therefore, the applicant is put on notice that diligence must be shown in pursuing the development of this application, which can be demonstrated by the completion of the project as approved in this order of the State Engineer.

It is, therefore, **ORDERED** and Temporary Change Application Number 68-396 (t39557) is hereby **APPROVED** subject to prior rights and the following condition(s):

ORDER OF THE STATE ENGINEER
Temporary Change Application Number
68-396 (t39557)
Page 3

- 1) The amount of water diverted by the applicant from the wells shall be limited to 2.6305 cfs or 998.49 acre-feet annually to be used for industrial use. The depletion shall be limited to the historical depletion of 998.49 acre-feet.
- 2) To accommodate the use approved under this application, the historic municipal use shall cease.
- 3) Section 73-5-4 of the Utah Code provides that "every person using water in this state shall construct or install and maintain ...controlling works...and measuring device at each point where water is diverted or turned out, for the purpose of regulating and measuring the quantity of water that may be used..." Adequate measuring and totalizing devices shall be installed on the heretofore and hereafter points of diversions. The applicant must maintain a record and prepare a report of the amount of water diverted from each diversion point. This annual report of water diverted shall be submitted to the State Engineer on or before December 31st of each operational year of the project. Failure to comply could result in an order to cease the use of water and/or the revocation of this approval.
- 4) **This application shall automatically expire one year from the date of this approval.**

It is the applicants' responsibility to maintain a current address with this office and to update ownership of their water right. Please notify this office immediately of any change of address or for assistance in updating ownership.

Your contact with this office, should you need it, is with the Sevier River/Southern Regional Office. The telephone number is 435-896-4429.

This Order is subject to the provisions of Administrative Rule R655-6-17 of the Division of Water Rights and to Sections 63G-4-302, 63G-4-402, and 73-3-14 of the Utah Code which provide for filing either a Request for Reconsideration with the State Engineer or an appeal with the appropriate District Court. A Request for Reconsideration must be filed with the State Engineer within 20 days of the date of this Order. However, a Request for Reconsideration is not a prerequisite to filing a court appeal. A court appeal must be filed within 30 days after the date of this Order, or if a Request for Reconsideration has been filed, within 30 days after the date the Request for Reconsideration is denied. A Request for Reconsideration is considered denied when no action is taken 20 days after the Request is filed.

Application for Permit to Drill
Magnum Cavern Well 8

ORDER OF THE STATE ENGINEER
Temporary Change Application Number
68-396 (139557)
Page 4

Dated this 4 day of February, 2014.

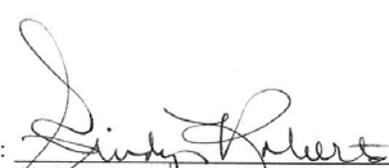

Kirk Forbush, P.E., Regional Engineer

Mailed a copy of the foregoing Order this 4th day of February, 2014 to:

Delta City Corporation
76 North 200 West
Delta UT 84624

Magnum Energy
Samuel Quigley
3165 E Millrock Dr., Ste. 330
Holladay, UT 84121

Division of Water Rights
Water Use Program

BY: 
Cindy Roberts, Region Secretary

CONFIDENTIAL



Application for Permit to Drill Magnum Cavern Well 8

Surface Use Plan



Application for Permit to Drill Magnum Cavern Well 8

Surface Use Plan

10/29/2014

CONFIDENTIAL

Prepared by

Magnum

3165 E. Millrock Dr., Suite 330

Holladay, Utah 84121

Tel 801 993 7001 Fax 801 993 7025

www.westernenergyhub.com

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Section 1

Surface Use Plan

1.1 Existing Roads

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An access road exists north from the W 8500 N County Road. An additional access road has been constructed from the CW-6 well pad approximately 950 feet east and 650 feet north to the CW-8 well pad. Access roads will generally be constructed to Millard County Road Design Standards. Construction will use the materials in place and additional material will be purchased from regional commercial pits and hauled to the site.

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There are four wells currently located within one mile of the proposed CW-7 (see **Magnum Gas Storage Location Topographical Map**):

- MH-1 supply well;
- MH-5 supply well;
- 68-1767: abandoned well; and
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Production facilities will be installed on the newly constructed drilling pad for CW-8 (see **Magnum Cavern Well 8 Location Topographical Map**). Five utility lines will be constructed:

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- Brine discharge/supply line;
- Raw water line;

- Well water supply line; and
- Natural gas products line.

All of the utility lines will enter the drilling pad from the southeast corner. All temporary disturbed areas related to production facilities will be reclaimed.

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Soil for construction will come from the site. Gravel will be purchased from a local supply vendor. Piping will be purchased from a supply vendor and stored on site.

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Drill cuttings will settle out in the reserve pit. The reserve pit will be lined with a 20-mil HDPE liner (see **Magnum Cavern Well 8 Well Pad**). Liquids in the pit will be evaporated and the cuttings will be covered with a 20-mil HDPE liner, covered with 3 foot of soil, and reclaimed. Sewage facilities and disposal will be furnished and maintained by a local vendor. All garbage will be stored in appropriate containers and regularly hauled off-site to an approved facility.

1.8 Ancillary Facilities

After drilling is complete, modular solution mining facilities will be installed in the southeast portion of the CW-8 well pad for solution mining of the storage cavern.

1.9 Well Site Layout

Magnum Cavern Well 8 Well Pad and Magnum Cavern Well 8 Cross Sections depicts the well site layout. As shown: the drill rig will be set up in the center portion of the pad east of the CW-8; the reserve pit will be located to the south of the pad; the pipe racks will be located in the southwest corner of the pad.

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Restoration of all temporarily disturbed areas around the CW-8 well pad will be graded and reseeded according to The Utah School and Institutional Trust Lands Administration (SITLA) requirements.

1.11 Surface Ownership

SITLA is the owner and land administrator for Section 23 T15S, R7W. Magnum Holdings, LLC currently holds an Energy Storage and Development Lease (Number 51573-OBA) from SITLA to develop the property. A redacted copy of the Second Amendment to the Lease Agreement describing the leased land has been provided in the Affidavit of Surface Owner Agreement. SITLA can be reached at:

Application for Permit to Drill
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State Institutional Trust Lands Administration
675 East 500 South
Suite 500
Salt Lake City, UT 84102
801-538-5100
Attn: LaVonne Garrison

1.12 Evidence of Water Rights

The State Engineer has approved multiple Temporary Change Applications allowing use of existing water rights at the Project site. The Order approving the Temporary Change Application for the City of Delta (Number 68-396) is representative of the Orders received by Magnum for the Project. A copy of the Order has been provided in **Appendix A**. At this time, water will be withdrawn from the existing MH-1 and MH-5 wells (see **Magnum Cavern Well 8 Location Topographical Map** for details).

1.13 Other Information

- Current vegetation at the site consists of open scrub/shrub with sagebrush, greasewood, rabbitbrush, saltbush, and mixed bunchgrasses.
- Magnum has received all environmental clearances from Division of Wildlife Resources and Utah State Historic Preservation Office.

1.14 Company Representative

Tiffany A. James
Vice President, Project Development
and Government Affairs
Magnum NGLs Solution Mining, LLC
3165 East Millrock Drive, Suite 330
Holladay, UT 84121
Phone: (801) 993-7001
Cell: (801) 719-9131
tjames@westernenergyhub.com

Appendix A

Evidence of Water Rights

CONFIDENTIAL



GARY R. HERBERT
Governor
SPENCER J. COX
Lieutenant Governor

State of Utah
DEPARTMENT OF NATURAL RESOURCES
Division of Water Rights

MICHAEL R. STYLER KENT L. JONES
Executive Director State Engineer/Division Director

ORDER OF THE STATE ENGINEER
For Temporary Change Application Number 68-396 (t39557)

Temporary Change Application Number 68-396 (t39557) in the names of Delta City Corporation, and Magnum Energy was filed on January 27, 2014, to change the points of diversion, places of use, uses, and storage of 1029.29 acre-feet (af) of water as evidenced by Water Right Numbers 68-2835, 68-2909, and 68-396. Heretofore, the water has been diverted from the following points located: (1) Well - North 4517 feet and West 1173 feet from the SE Corner of Section 3, T17S, R6W, SLB&M (existing 16-inch well, 580 feet deep); (2) Well - North 2761 feet and West 144 feet from the E $\frac{1}{4}$ Corner of Section 12, T17S, R7W, SLB&M (existing 12-inch well, 860 feet deep); (3) Well - South 594 feet and West 1334 feet from the NE Corner of Section 12, T17S, R7W, SLB&M (existing 10-inch well, 703 feet deep); (4) Well - North 1590 feet and East 719 feet from the SW Corner of Section 6, T17S, R6W, SLB&M (existing 14-inch well, 737 feet deep); (5) Well - South 30 feet and West 20 feet from the NE Corner of Section 17, T17S, R6W, SLB&M (existing 16-inch well, 834 feet deep); (6) Well - South 340 feet and West 1550 feet from the E $\frac{1}{4}$ Corner of Section 12, T17S, R7W, SLB&M (existing 16-inch well, 856 feet deep); (7) Well - North 1590 feet and East 719 feet from the SW Corner of Section 6, T17S, R7W, SLB&M (existing 14-inch well, 737 feet deep); (8) Well - South 331 feet and West 1517 feet from the E $\frac{1}{4}$ Corner of Section 12, T17S, R7W, SLB&M (existing 16-inch well, 856 feet deep). The water was used for municipal purposes within the service area of Delta. The water has been used in all or portion(s) of Sections 33, 34, T16S, R6W, SLB&M; and Sections 3, 4, T17S, R6W, SLB&M.

Hereafter, it is proposed to divert 998.49 acre-feet of water from points of diversion changed to: (1) Well - North 345 feet and East 1205 feet from the SW Corner of Section 23, T15S, R7W, SLB&M (20-inch well, 1500-2300 feet deep); (2) Well - North 1070 feet and East 1305 feet from the SW Corner of Section 23, T15S, R7W, SLB&M (20-inch well, 1500-2300 feet deep); (3) Well - North 715 feet and East 780 feet from the SW Corner of Section 23, T15S, R7W, SLB&M (20-inch well, 1500-2300 feet deep); (4) Well - North 420 feet and East 2320 feet from the SW Corner of Section 23, T15S, R7W, SLB&M (20-inch well, 1500-2300 feet deep); (5) Well - South 110 feet and West 125 feet from the NE Corner of Section 27, T15S, R7W, SLB&M (20-inch well, 1500-2300 feet deep); (6) Well - South 2390 feet and East 140 feet from the NW Corner of Section 26, T15S, R7W, SLB&M (20-inch well, 1500-2300 feet deep); (7) Well - South 2205 feet and East 2735 feet from the NW Corner of Section 26, T15S, R7W, SLB&M (20-inch well, 1500-2300 feet deep). The water is to be used for other purposes. The water is to be used for industrial purposes (Industrial processes and associated activities to create underground gas caverns). The place of use of the water is being changed to all or portion(s) of Sections 19, 30, T15S, R6W, SLB&M; and Sections 22, 23, 24, 25, 26, 27, T15S, R7W, SLB&M.

1594 West North Temple, Suite 220, PO Box 146300, Salt Lake City, UT 84114-6300
telephone (801) 538-7240 • facsimile (801) 538-7467 • www.waterrights.utah.gov

ORDER OF THE STATE ENGINEER
Temporary Change Application Number
68-396 (t39557)
Page 2

Notice of this temporary change application was not published in a newspaper. It is the opinion of the State Engineer that it meets the criteria of Section 73-3-3 of the Utah Code for the approval of temporary change applications.

Review has been made of the proposed changes, the underlying right, and the protest. In order to approve this temporary change application without enlarging the underlying water rights the quantification limiting water right 68-2909 (a27062) to 172.43 acre-feet, as described in the approval memorandum for change application (a27062), must be continued. The quantified amounts for water right 68-396 is 0.893 cfs or 646.5 acre-feet and water right 68-2835 is 1.10 cfs or 179.56 acre-feet. Therefore, the total amount limited under these rights is: (172.43 acre-feet + 646.5 acre-feet + 179.56 acre-feet = 998.49 acre-feet).

In evaluating applications which propose to change the nature of use of a water right, the State Engineer believes it is appropriate to examine the rates and amounts of hydrologic depletion associated with the historical water use as compared to the proposed use to assure that there is no enlargement of the underlying water right. In this case, it is believed that the historical water uses would have incurred the following rates and amounts of hydrologic depletion:

<u>Prior Beneficial Use</u>	<u>Rate of Diversion</u>	<u>Amount of Diversion</u>	<u>*Rate of Depletion</u>	<u>Amount of Depletion</u>
Municipal	998.49acre-feet	998.49 acre-feet	100 percent	998.49 acre-feet

The rate and amount of hydrologic depletion associated with the proposed use is as follows:

<u>Proposed Beneficial Use</u>	<u>Rate of Diversion</u>	<u>Amount of Diversion</u>	<u>*Rate of Depletion</u>	<u>Amount of Depletion</u>
Industrial Use	998.49 acre-feet	998.49acre-feet	100 percent	998.49 acre-feet

**Consumptive Use of Irrigated Crops in Utah, Research Report 145, Utah Agricultural Experiment Station, Utah State University, Logan, Utah, October 1994, Delta Station.*

Based upon the above analysis, it appears that the proposed use will not exceed the hydrologic depletion limitations associated with the historical uses, thus causing an enlargement of the underlying water right.

It is the opinion of the State Engineer that this application can be approved without adversely affecting prior rights provided certain conditions are imposed. Therefore, the applicant is put on notice that diligence must be shown in pursuing the development of this application, which can be demonstrated by the completion of the project as approved in this order of the State Engineer.

It is, therefore, **ORDERED** and Temporary Change Application Number 68-396 (t39557) is hereby **APPROVED** subject to prior rights and the following condition(s):

ORDER OF THE STATE ENGINEER
Temporary Change Application Number
68-396 (t39557)
Page 3

- 1) The amount of water diverted by the applicant from the wells shall be limited to 2.6305 cfs or 998.49 acre-feet annually to be used for industrial use. The depletion shall be limited to the historical depletion of 998.49 acre-feet.
- 2) To accommodate the use approved under this application, the historic municipal use shall cease.
- 3) Section 73-5-4 of the Utah Code provides that "every person using water in this state shall construct or install and maintain ...controlling works...and measuring device at each point where water is diverted or turned out, for the purpose of regulating and measuring the quantity of water that may be used..." Adequate measuring and totalizing devices shall be installed on the heretofore and hereafter points of diversions. The applicant must maintain a record and prepare a report of the amount of water diverted from each diversion point. This annual report of water diverted shall be submitted to the State Engineer on or before December 31st of each operational year of the project. Failure to comply could result in an order to cease the use of water and/or the revocation of this approval.
- 4) **This application shall automatically expire one year from the date of this approval.**

It is the applicants' responsibility to maintain a current address with this office and to update ownership of their water right. Please notify this office immediately of any change of address or for assistance in updating ownership.

Your contact with this office, should you need it, is with the Sevier River/Southern Regional Office. The telephone number is 435-896-4429.

This Order is subject to the provisions of Administrative Rule R655-6-17 of the Division of Water Rights and to Sections 63G-4-302, 63G-4-402, and 73-3-14 of the Utah Code which provide for filing either a Request for Reconsideration with the State Engineer or an appeal with the appropriate District Court. A Request for Reconsideration must be filed with the State Engineer within 20 days of the date of this Order. However, a Request for Reconsideration is not a prerequisite to filing a court appeal. A court appeal must be filed within 30 days after the date of this Order, or if a Request for Reconsideration has been filed, within 30 days after the date the Request for Reconsideration is denied. A Request for Reconsideration is considered denied when no action is taken 20 days after the Request is filed.

Application for Permit to Drill
Magnum Cavern Well 8

ORDER OF THE STATE ENGINEER
Temporary Change Application Number
68-396 (139557)
Page 4

Dated this 4 day of February, 2014.

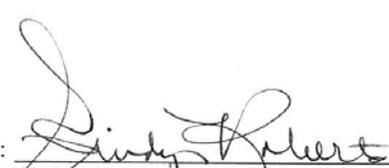

Kirk Forbush, P.E., Regional Engineer

Mailed a copy of the foregoing Order this 4th day of February, 2014 to:

Delta City Corporation
76 North 200 West
Delta UT 84624

Magnum Energy
Samuel Quigley
3165 E Millrock Dr., Ste. 330
Holladay, UT 84121

Division of Water Rights
Water Use Program

BY: 
Cindy Roberts, Region Secretary

CONFIDENTIAL

Application for Permit to Drill Magnum Cavern Well 8

Blowout Preventer

11/17/2014

CONFIDENTIAL

Prepared by

Magnum

3165 E. Millrock Dr., Suite 330
Holladay, Utah 84121
Tel 801 993 7001 Fax 801 993 7025
www.westernenergyhub.com

16-Inch Cavern Well Blowout Preventer Equipment

The geology of the area is well known from wells drilled by Magnum (CW-5, CW-6, CW-7, MH-5, and MH-1) in the vicinity of CW-8 and the other wells drilled on adjacent lands (Delta Egg Farm and IPA commercial and industrial water wells; Argonaut oil and gas exploration well). These wells demonstrate that the formations above the salt, and the salt itself, are gas-free. The Argonaut Well penetrated the entire sequence of salt to a depth of 11,266 feet bgs and the Magnum wells penetrated the salt to a depth of 6,420 feet bgs. This is deeper than the intended Cavern Well 8 depth of 5,000 bgs. Numerous other wells including CW-5, CW-6, CW-7 and MH-5 (drilled by Magnum) in the immediate vicinity of CW-8 showed no gas in the aquifers overlying the salt structure. Additionally, the geophysical lines that run over the area show there are no structures present in the overlying formations that could trap gas. This is typical of the basin and range deposits that have been explored for hydrocarbon production.

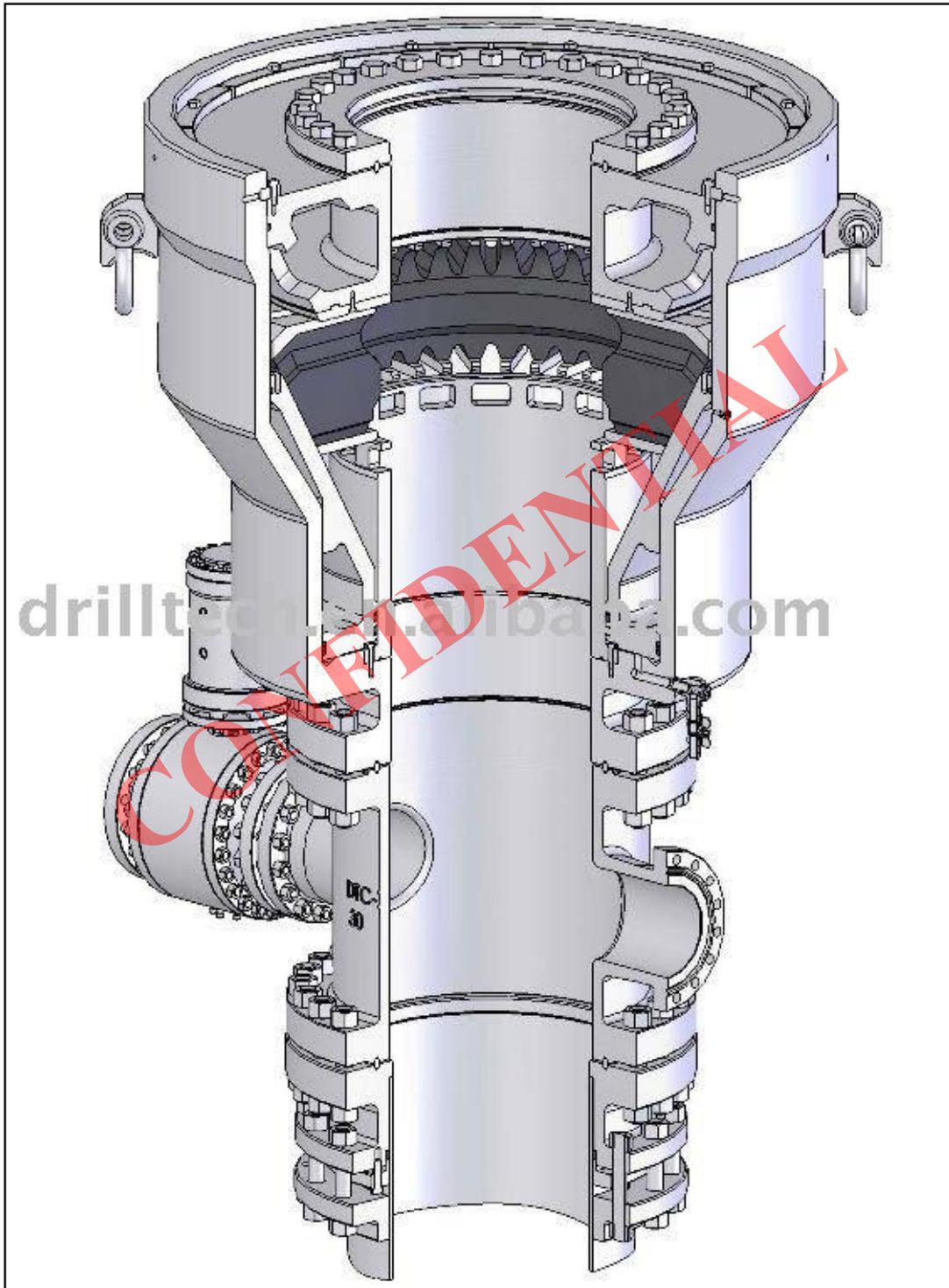
Wells drilled into salt generally utilize some kind of blowout control equipment. The blowout control equipment almost always includes an annular, bag-type blowout preventer. Magnum will follow industry practice and use an annular blowout preventer (BOP) when drilling Cavern Well 8 (see **Blowout Preventer**). Additional equipment used in deep oil and gas wells, such as shear and pipe rams, will not be used for drilling Magnum's cavern well.

Magnum intends to install BOP measures beginning with the 16-inch surface casing at a depth of 3,600 feet. The BOP will be installed on the 20-inch casing after the 16-inch casing is cemented in place in order to support the drilling of the 12-1/4-inch pilot hole below 3,600 feet. The BOP will be installed on a temporary flange welded to the 20-inch casing. The exact size of the BOP to be used will be at least 13-5/8-inches in diameter and rated at 3,000 psi. Installation of the BOP measures are described in detail in Section 1.2 of the Drilling/Well Construction Plan and both the installation and testing process is summarized below.

Once the BOP is installed, testing of the equipment will follow oil and gas industry standards. Functionality testing of the equipment is conducted every time it is installed. The BOP will be connected to the closing unit by high-pressure hydraulic hoses. A joint of drill pipe will be picked up by the rig and run into the BOP. The BOP will then be closed from the control unit and checked that the bag has sealed around the drill pipe. If the closing is visually correct, the BOP will be opened, the drill pipe removed and rig activities will continue.

Sources

<https://www.drilltech.en.alibaba.com>



Magnum Cavern Well 8 Blowout Preventer

Rated at 3,000psi



3165 E. Millrock Dr., #330
Holladay, Utah 84121
520-429-6662

www.westernenergyhub.com

October 29, 2014

Division of Oil, Gas and Mining
1594 West North Temple
Suite 1210
Salt Lake City, Utah 84114-5801

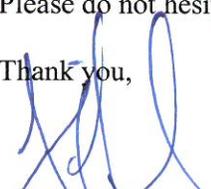
Re; Exception Location Request

Magnum is proposing to drill and solution mine a storage cavern well in a subsurface salt formation in Millard County, Utah. This storage cavern well is located on State Trust Lands leased to Magnum (Energy Storage and Development Lease 51537-OBA) by the School and Institutional Trust Lands Administration (SITLA) in the SW/4 of Section 23 in Township 15 South, Range 7 West (Figure 1). Additionally, Magnum is the sole working interest owner of both the surface and minerals within 2,500 feet of the well bore.

Magnum is requesting an exception to Utah Rule R649-3-2 due to the location of the well not being drilled within or in proximity to a hydrocarbon bearing formation as well as the intended purpose of the well is not for hydrocarbon production. The purpose of the well is to solution mine a storage cavern within the salt formation for the storage of hydrocarbons. The location of the well should therefore not have any impact on oil and gas correlative rights. SITLA, as the landowner, has approved the location of this well in an email correspondence to DOGM dated September 15, 2014 (see attached).

Please do not hesitate to contact me if there are any questions.

Thank you,



Tiffany James
Vice President
Project Development
and Government Affairs

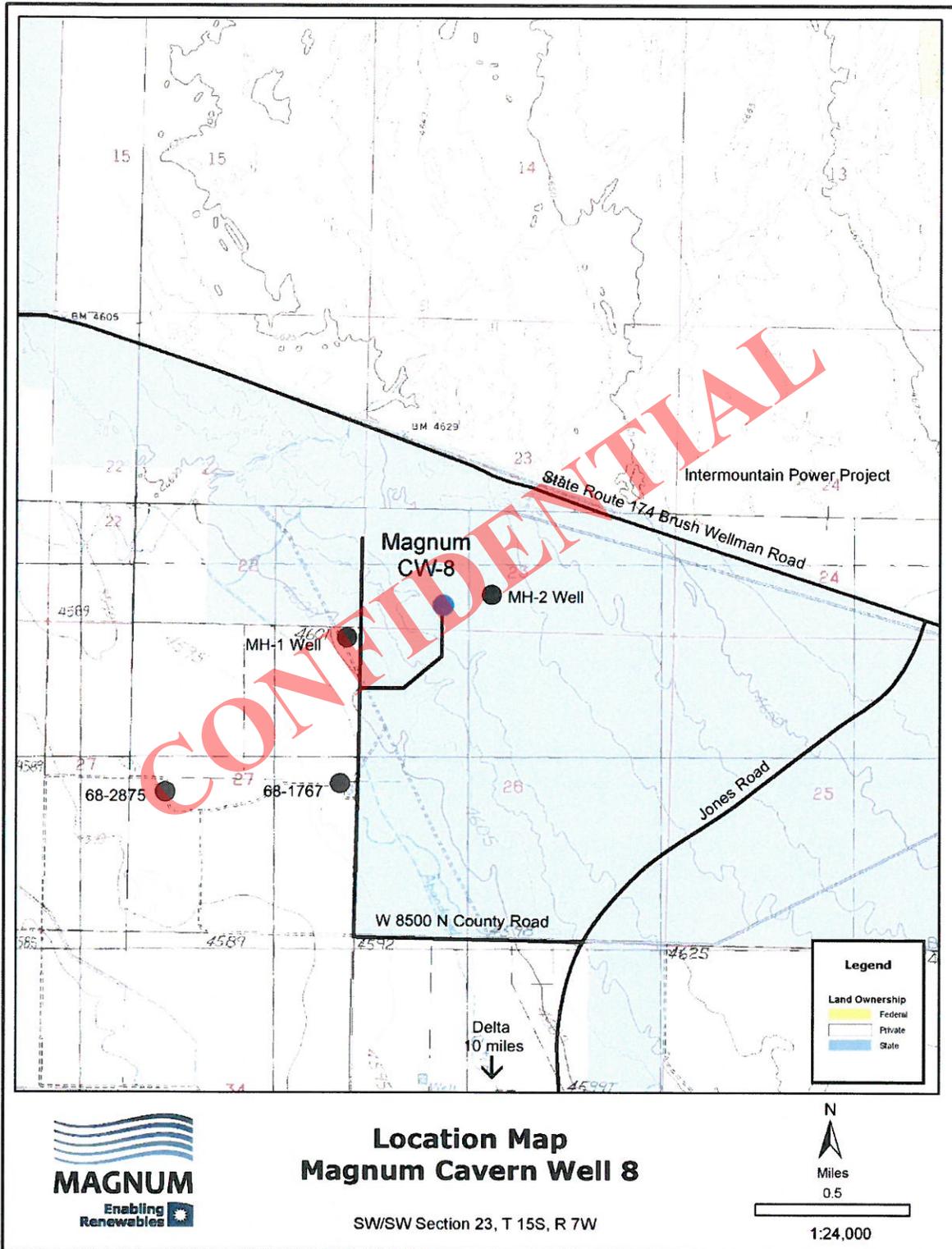


Figure 2: Location Map
Cavern Well 8
SW/SW Section 23 T15S, R7W
Millard County, Utah

CONFIDENTIAL

Application for Permit to Drill Magnum Cavern Well 8

Evidence of Water Rights

10/29/2014

CONFIDENTIAL

Prepared by

Magnum

3165 E. Millrock Dr., Suite 330

Holladay, Utah 84121

Tel 801 993 7001 Fax 801 993 7025

www.westernenergyhub.com



GARY R. HERBERT
Governor
SPENCER J. COX
Lieutenant Governor

State of Utah
DEPARTMENT OF NATURAL RESOURCES
Division of Water Rights

MICHAEL R. STYLER KENT L. JONES
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ORDER OF THE STATE ENGINEER
 Temporary Change Application Number
 68-396 (t39557)
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Municipal	998.49acre-feet	998.49 acre-feet	100 percent	998.49 acre-feet

The rate and amount of hydrologic depletion associated with the proposed use is as follows:

<u>Proposed Beneficial Use</u>	<u>Rate of Diversion</u>	<u>Amount of Diversion</u>	<u>*Rate of Depletion</u>	<u>Amount of Depletion</u>
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ORDER OF THE STATE ENGINEER
Temporary Change Application Number
68-396 (t39557)
Page 4

Dated this 4 day of February, 2014.

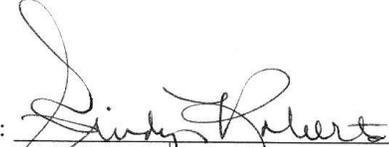

Kirk Forbush, P.E., Regional Engineer

Mailed a copy of the foregoing Order this 4th day of February, 2014 to:

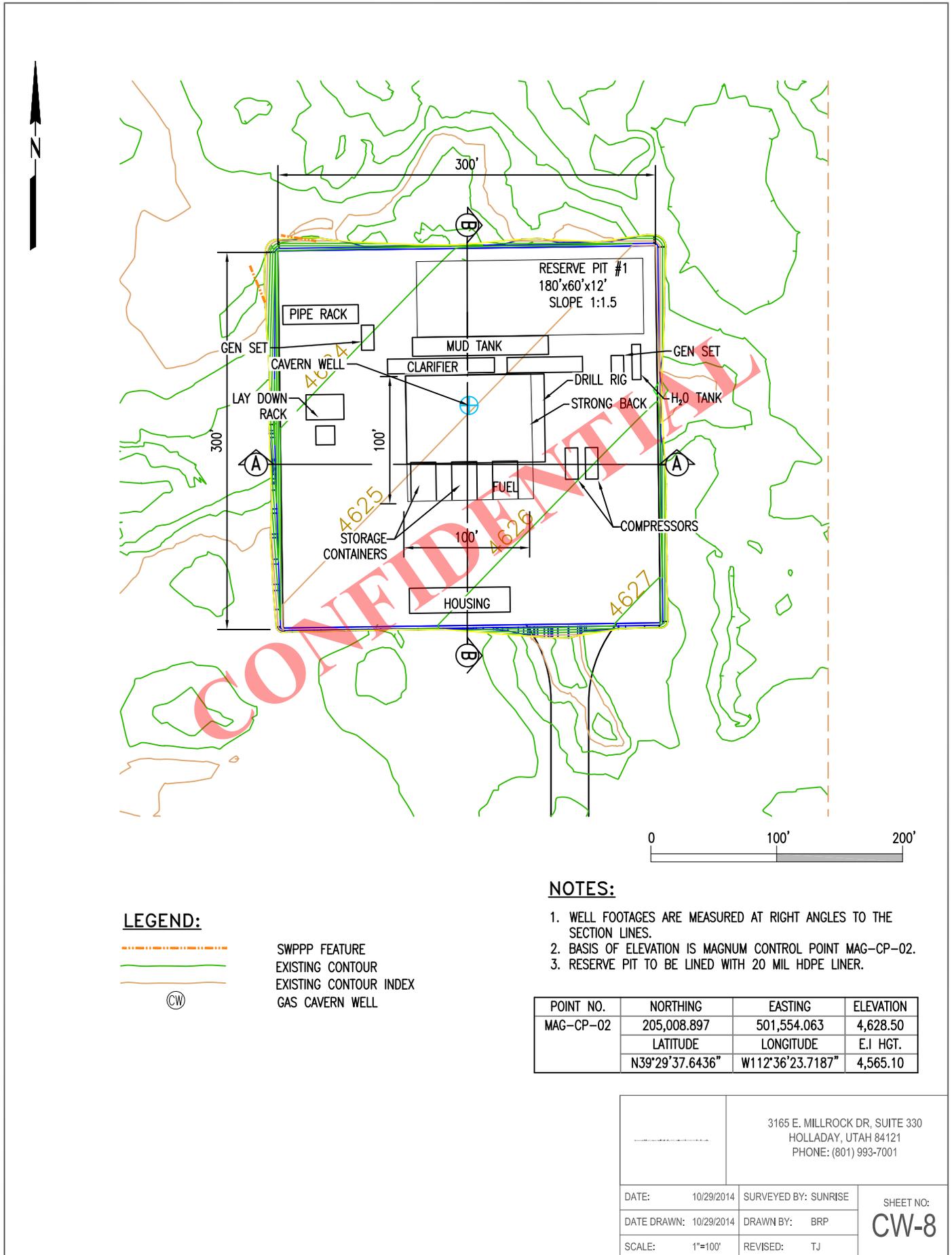
Delta City Corporation
76 North 200 West
Delta UT 84624

Magnum Energy
Samuel Quigley
3165 E Millrock Dr., Ste. 330
Holladay, UT 84121

Division of Water Rights
Water Use Program

BY: 
Cindy Roberts, Region Secretary

CONFIDENTIAL



LEGEND:

- - - - - SWPPP FEATURE
- EXISTING CONTOUR
- EXISTING CONTOUR INDEX
- CW GAS CAVERN WELL

NOTES:

1. WELL FOOTAGES ARE MEASURED AT RIGHT ANGLES TO THE SECTION LINES.
2. BASIS OF ELEVATION IS MAGNUM CONTROL POINT MAG-CP-02.
3. RESERVE PIT TO BE LINED WITH 20 MIL HDPE LINER.

POINT NO.	NORTHING	EASTING	ELEVATION
MAG-CP-02	205,008.897	501,554.063	4,628.50
	LATITUDE	LONGITUDE	E.I. HGT.
	N39°29'37.6436"	W112°36'23.7187"	4,565.10

3165 E. MILLROCK DR, SUITE 330 HOLLADAY, UTAH 84121 PHONE: (801) 993-7001	
DATE: 10/29/2014	SURVEYED BY: SUNRISE
DATE DRAWN: 10/29/2014	DRAWN BY: BRP
SCALE: 1"=100'	REVISED: TJ
SHEET NO: CW-8	

EXHIBIT B: MAGNUM CAVERN WELL 8 WELL PAD



Diana Mason <dianawhitney@utah.gov>

Fwd: Magnum NGLs CW-8 and CW-9 Layout

Jim Davis <jimdavis1@utah.gov>

Mon, Nov 10, 2014 at 4:49 PM

To: Diana Mason <dianawhitney@utah.gov>, Brian Pugh <brian@westernenergyhub.com>

Diana,

I'm forwarding this email which I sent to Brad back in September. Please consider it SITLA's approval of the APD for the CW-8 (4302750005). Thanks.

-Jim

Begin Forwarded Message -----

From: Jim Davis <jimdavis1@utah.gov>

Date: Mon, Sep 15, 2014 at 2:47 PM

Subject: Re: Magnum NGLs CW-8 and CW-9 Layout

To: Brian Pugh <brian@westernenergyhub.com>

Cc: Brad Hill <BRADHILL@utah.gov>, Ammon McDonald <ammonmcdonald@utah.gov>, Lavonne Garrison <LAVONNEGARRISON@utah.gov>, Tiffany James <tiffanyjames@westernenergyhub.com>

Brian,

Please consider this email SITLA's approval of Magnum's request to begin construction of the CW-8 and CW-9 locations in advance of APD submission. This approval includes the roads and well pads only.

NO DRILLING may occur until an approved APD has been issued by Utah DOGM.

If approved APDs have not been obtained by Magnum for these wells by 9/15/2015 any unused pads or road segments relating to the CW-8 and CW-9 must be reclaimed by 1/15/2016.

Thank you.

-Jim Davis

Supervisor, Oil & Gas Field Operations

SITLA

On Fri, Aug 29, 2014 at 4:17 PM, Brian Pugh <brian@westernenergyhub.com> wrote:

Jim,

Here is the layout for CW-8 and CW-9. The pads are the same size and CW-5, -6, and -7. The construction methods will be the same as the existing well pads. The attached drawing of CW-7 can be considered typical. As we complete the engineering drawings for each pad, we will forward them to you.

Thank you.

*Brian Pugh
Environmental and Government
Services Manager*

*Magnum
3165 East Millrock Drive Suite 330
Holladay, UT 84121*

*801.993.7001 office
520.429.6662 cell
bpugh@westernenergyhub.com*

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jimdavis1@utah.gov
Office: (801) 538-5156
Cell: (801) 699-3463

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jimdavis1@utah.gov
Office: (801) 538-5156
Cell: (801) 699-3463

CONFIDENTIAL

Well Name	MAGNUM NGLS SOLUTION MINING LLC CW-8 43027500050000			
String	SURF	I1	I2	PROD
Casing Size(")	30.000	24.000	20.000	16.000
Setting Depth (TVD)	750	3300	3500	3600
Previous Shoe Setting Depth (TVD)	0	750	3300	3500
Max Mud Weight (ppg)	9.5	10.2	10.2	10.2
BOPE Proposed (psi)	500	500	500	3000
Casing Internal Yield (psi)	1280	2450	2552	3675
Operators Max Anticipated Pressure (psi)	800			4.3

Calculations	SURF String	30.000	"
Max BHP (psi)	.052*Setting Depth*MW=	371	
			BOPE Adequate For Drilling And Setting Casing at Depth?
MASP (Gas) (psi)	Max BHP-(0.12*Setting Depth)=	281	YES <input type="checkbox"/> diverter
MASP (Gas/Mud) (psi)	Max BHP-(0.22*Setting Depth)=	206	YES <input type="checkbox"/> OK
			*Can Full Expected Pressure Be Held At Previous Shoe?
Pressure At Previous Shoe	Max BHP-.22*(Setting Depth - Previous Shoe Depth)=	206	NO <input type="checkbox"/> OK
Required Casing/BOPE Test Pressure=		500	psi
*Max Pressure Allowed @ Previous Casing Shoe=		0	psi *Assumes 1psi/ft frac gradient

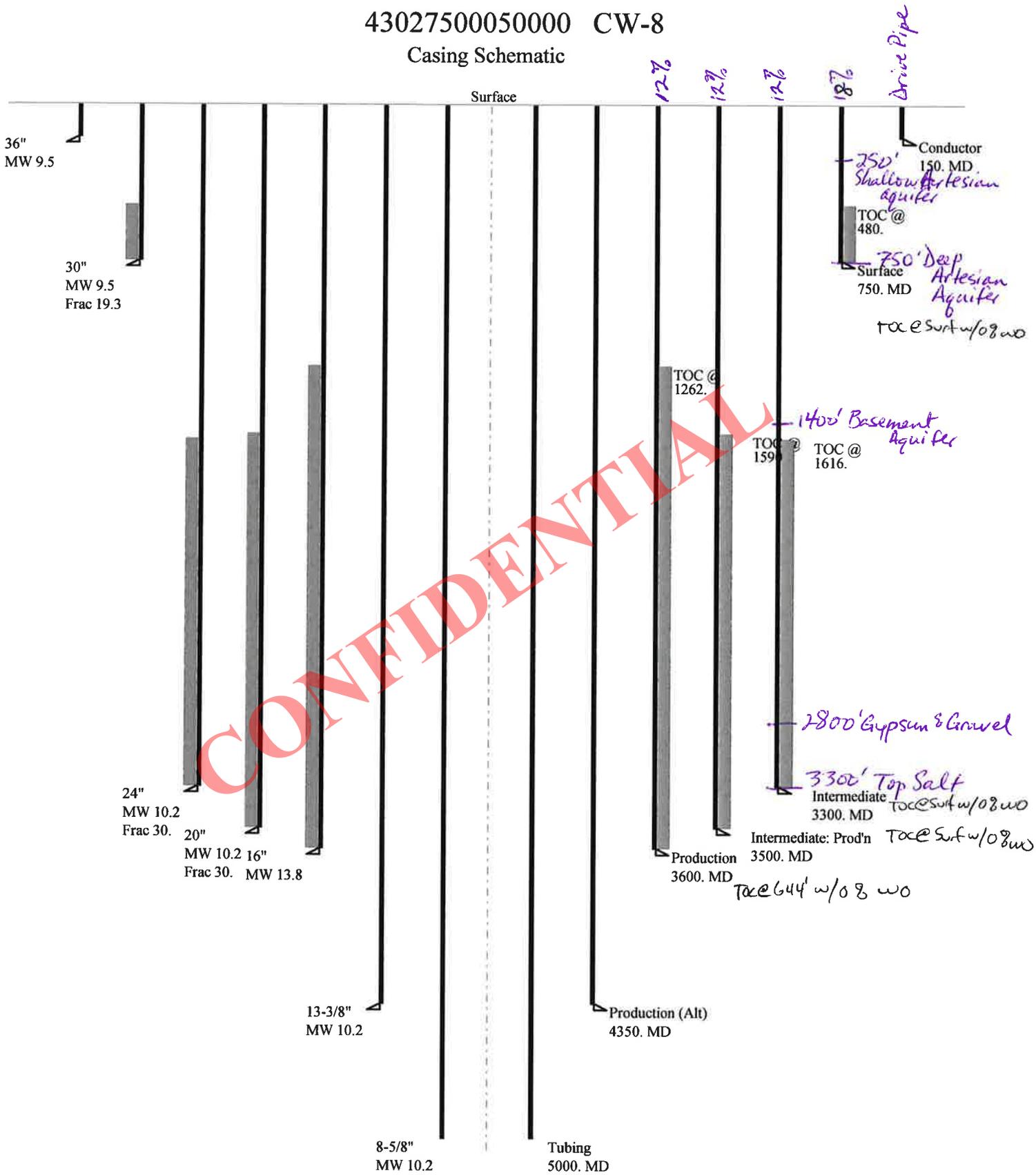
Calculations	I1 String	24.000	"
Max BHP (psi)	.052*Setting Depth*MW=	1750	
			BOPE Adequate For Drilling And Setting Casing at Depth?
MASP (Gas) (psi)	Max BHP-(0.12*Setting Depth)=	1354	NO <input type="checkbox"/> diverter
MASP (Gas/Mud) (psi)	Max BHP-(0.22*Setting Depth)=	1024	NO <input type="checkbox"/> OK
			*Can Full Expected Pressure Be Held At Previous Shoe?
Pressure At Previous Shoe	Max BHP-.22*(Setting Depth - Previous Shoe Depth)=	1189	NO <input type="checkbox"/> No expected pressure
Required Casing/BOPE Test Pressure=		500	psi
*Max Pressure Allowed @ Previous Casing Shoe=		750	psi *Assumes 1psi/ft frac gradient

Calculations	I2 String	20.000	"
Max BHP (psi)	.052*Setting Depth*MW=	1856	
			BOPE Adequate For Drilling And Setting Casing at Depth?
MASP (Gas) (psi)	Max BHP-(0.12*Setting Depth)=	1436	NO <input type="checkbox"/> diverter
MASP (Gas/Mud) (psi)	Max BHP-(0.22*Setting Depth)=	1086	NO <input type="checkbox"/> OK
			*Can Full Expected Pressure Be Held At Previous Shoe?
Pressure At Previous Shoe	Max BHP-.22*(Setting Depth - Previous Shoe Depth)=	1812	YES <input type="checkbox"/> OK
Required Casing/BOPE Test Pressure=		1786	psi
*Max Pressure Allowed @ Previous Casing Shoe=		2450	psi *Assumes 1psi/ft frac gradient

Calculations	PROD String	16.000	"
Max BHP (psi)	.052*Setting Depth*MW=	1909	
			BOPE Adequate For Drilling And Setting Casing at Depth?
MASP (Gas) (psi)	Max BHP-(0.12*Setting Depth)=	1477	YES <input type="checkbox"/> 3M BOP, annular with diverter
MASP (Gas/Mud) (psi)	Max BHP-(0.22*Setting Depth)=	1117	YES <input type="checkbox"/> OK
			*Can Full Expected Pressure Be Held At Previous Shoe?
Pressure At Previous Shoe	Max BHP-.22*(Setting Depth - Previous Shoe Depth)=	1887	YES <input type="checkbox"/> OK, no expected pressure
Required Casing/BOPE Test Pressure=		2573	psi
*Max Pressure Allowed @ Previous Casing Shoe=		2552	psi *Assumes 1psi/ft frac gradient

43027500050000 CW-8

Casing Schematic



Well name:	43027500050000 CW-8		Project ID:	43-027-50005
Operator:	MAGNUM NGLS SOLUTION MINING LLC			
String type:	Conductor			
Location:	MILLARD	COUNTY		

Design parameters:

Collapse

Mud weight: 9.500 ppg
 Design is based on evacuated pipe.

Minimum design factors:

Collapse:

Design factor 1.125

Burst:

Design factor 1.00

Environment:

H2S considered? No
 Surface temperature: 74 °F
 Bottom hole temperature: 76 °F
 Temperature gradient: 1.40 °F/100ft
 Minimum section length: 12 ft

Burst

Max anticipated surface pressure: 56 psi
 Internal gradient: 0.120 psi/ft
 Calculated BHP 74 psi

No backup mud specified.

Tension:

8 Round STC: 1.80 (J)
 8 Round LTC: 1.70 (J)
 Buttress: 1.60 (J)
 Premium: 1.50 (J)
 Body yield: 1.50 (B)

Non-directional string.

Tension is based on air weight.
 Neutral point: 128 ft

Run Seq	Segment Length (ft)	Size (in)	Nominal Weight (lbs/ft)	Grade	End Finish	True Vert Depth (ft)	Measured Depth (ft)	Drift Diameter (in)	Est. Cost (\$)
1	150	36	282.39	A-53 B	Plain End	150	150	33	19800
Run Seq	Collapse Load (psi)	Collapse Strength (psi)	Collapse Design Factor	Burst Load (psi)	Burst Strength (psi)	Burst Design Factor	Tension Load (kips)	Tension Strength (kips)	Tension Design Factor
1	74	440	5.944	74	1280	17.29	42.4	2907	68.63 B

Prepared by: Helen Sadik-Macdonald
 Div of Oil, Gas & Mining

Phone: 801 538-5357
 FAX: 801-359-3940

Date: November 13, 2014
 Salt Lake City, Utah

Remarks:

Collapse is based on a vertical depth of 150 ft, a mud weight of 9.5 ppg. The casing is considered to be evacuated for collapse purposes. Collapse strength is based on the Westcott, Dunlop & Kemler method of biaxial correction for tension.

Burst strength is not adjusted for tension.

Well name:	43027500050000 CW-8		
Operator:	MAGNUM NGLS SOLUTION MINING LLC		
String type:	Surface	Project ID:	43-027-50005
Location:	MILLARD COUNTY		

Design parameters:

Collapse

Mud weight: 9.500 ppg
 Design is based on evacuated pipe.

Minimum design factors:

Collapse:

Design factor 1.125

Burst:

Design factor 1.00

Environment:

H2S considered? No
 Surface temperature: 74 °F
 Bottom hole temperature: 84 °F
 Temperature gradient: 1.40 °F/100ft
 Minimum section length: 12 ft
 Cement top: 480 ft

Burst

Max anticipated surface pressure: 660 psi
 Internal gradient: 0.120 psi/ft
 Calculated BHP 750 psi

No backup mud specified.

Tension:

8 Round STC: 1.80 (J)
 8 Round LTC: 1.70 (J)
 Butress: 1.60 (J)
 Premium: 1.50 (J)
 Body yield: 1.50 (B)

Tension is based on air weight.
 Neutral point: 641 ft

Non-directional string.

Re subsequent strings:

Next setting depth: 3,300 ft
 Next mud weight: 10,200 ppg
 Next setting BHP: 1,749 psi
 Fracture mud wt: 19,250 ppg
 Fracture depth: 750 ft
 Injection pressure: 750 psi

Run Seq	Segment Length (ft)	Size (in)	Nominal Weight (lbs/ft)	Grade	End Finish	True Vert Depth (ft)	Measured Depth (ft)	Drift Diameter (in)	Est. Cost (\$)
1	750	30	234.29	X-56	Plain End	750	750	28.312	64350
Run Seq	Collapse Load (psi)	Collapse Strength (psi)	Collapse Design Factor	Burst Load (psi)	Burst Strength (psi)	Burst Design Factor	Tension Load (kips)	Tension Strength (kips)	Tension Design Factor
1	370	770	2.080	750	2450	3.27	175.7	3859	21.96 J

Prepared by: Helen Sadik-Macdonald
 Div of Oil, Gas & Mining

Phone: 801 538-5357
 FAX: 801-359-3940

Date: November 13, 2014
 Salt Lake City, Utah

Remarks:

Collapse is based on a vertical depth of 750 ft, a mud weight of 9.5 ppg. The casing is considered to be evacuated for collapse purposes. Collapse strength is based on the Westcott, Dunlop & Kemler method of biaxial correction for tension.

Burst strength is not adjusted for tension.

Well name:	43027500050000 CW-8	
Operator:	MAGNUM NGLS SOLUTION MINING LLC	
String type:	Intermediate	Project ID: 43-027-50005
Location:	MILLARD COUNTY	

Design parameters:

Collapse

Mud weight: 10.200 ppg
Design is based on evacuated pipe.

Burst

Max anticipated surface pressure: 1,085 psi
Internal gradient: 0.220 psi/ft
Calculated BHP: 1,811 psi

No backup mud specified.

Minimum design factors:

Collapse:

Design factor: 1.125

Burst:

Design factor: 1.00

Tension:

8 Round STC: 1.80 (J)
8 Round LTC: 1.80 (J)
Buttress: 1.60 (J)
Premium: 1.50 (J)
Body yield: 1.60 (B)

Tension is based on air weight.
Neutral point: 2,859 ft

Estimated cost: 341,880 (\$)

Environment:

H2S considered? No
Surface temperature: 74 °F
Bottom hole temperature: 120 °F
Temperature gradient: 1.40 °F/100ft
Minimum section length: 1,000 ft

Cement top: 1,616 ft

Non-directional string.

Re subsequent strings:

Next setting depth: 3,500 ft
Next mud weight: 10.200 ppg
Next setting BHP: 1,855 psi
Fracture mud wt: 30.000 ppg
Fracture depth: 3,300 ft
Injection pressure: 5,143 psi

Run Seq	Segment Length (ft)	Size (in)	Nominal Weight (lbs/ft)	Grade	End Finish	True Vert Depth (ft)	Measured Depth (ft)	Drift Diameter (in)	Est. Cost (\$)
3	1000	24	156.17	X-56	DDS	1000	1000	22.5	99000
2	2100	24	245.60	X-52	DDS	3100	3100	20.625	221760
1	200	24	303.70	X-52	DDS	3300	3300	20.625	21120

Run Seq	Collapse Load (psi)	Collapse Strength (psi)	Collapse Design Factor	Burst Load (psi)	Burst Strength (psi)	Burst Design Factor	Tension Load (kips)	Tension Strength (kips)	Tension Design Factor
3	530	830	1.566	1305	2552	1.96	732.7	2570	3.51 J
2	1643	2602	1.584	1767	3791	2.15	576.5	1724	2.99 J
1	1749	4227	2.417	1811	4739	2.62	60.7	2170	35.73 J

Prepared by: Helen Sadik-Macdonald
Div of Oil, Gas & Mining

Phone: 801 538-5357
FAX: 801-359-3940

Date: November 13, 2014
Salt Lake City, Utah

Remarks:

Collapse is based on a vertical depth of 3300 ft, a mud weight of 10.2 ppg. The casing is considered to be evacuated for collapse purposes. Collapse strength is based on the Westcott, Dunlop & Kemler method of biaxial correction for tension.

Burst strength is not adjusted for tension.

Well name:	43027500050000 CW-8		
Operator:	MAGNUM NGLS SOLUTION MINING LLC		
String type:	Intermediate: Prod'n	Project ID:	43-027-50005
Location:	MILLARD COUNTY		

Design parameters:

Collapse

Mud weight: 10.200 ppg
 Design is based on evacuated pipe.

Burst

Max anticipated surface pressure: 1,116 psi
 Internal gradient: 0.220 psi/ft
 Calculated BHP: 1,886 psi

 No backup mud specified.

Minimum design factors:

Collapse:

Design factor 1.125

Burst:

Design factor 1.00

Tension:

8 Round STC: 1.80 (J)
 8 Round LTC: 1.80 (J)
 Buttress: 1.60 (J)
 Premium: 1.50 (J)
 Body yield: 1.60 (B)

Tension is based on air weight.
 Neutral point: 3,039 ft

Estimated cost: 290,400 (\$)

Environment:

H2S considered? No
 Surface temperature: 74 °F
 Bottom hole temperature: 123 °F
 Temperature gradient: 1.40 °F/100ft
 Minimum section length: 1,000 ft

Cement top: 1,590 ft

Non-directional string.

Production liner info:

Liner setting depth: 3,600 ft
 Pore pressure equivalent: 10,200 ppg
 Assumed BHP at TD: 1,908 psi

Run Seq	Segment Length (ft)	Size (in)	Nominal Weight (lbs/ft)	Grade	End Finish	True Vert Depth (ft)	Measured Depth (ft)	Drift Diameter (in)	Est. Cost (\$)
2	1500	20	129.33	X-56	Plain End	1500	1500	18.45	79200
1	2000	20	202.90	X-52	DDS	3500	3500	18	211200

Run Seq	Collapse Load (psi)	Collapse Strength (psi)	Collapse Design Factor	Burst Load (psi)	Burst Strength (psi)	Burst Design Factor	Tension Load (kips)	Tension Strength (kips)	Tension Design Factor
2	795	1384	1.742	1446	3675	2.54	599.8	2130	3.55 J
1	1855	3904	2.105	1886	4550	2.41	405.8	1425	3.51 J

Prepared by: Helen Sadik-Macdonald
 Div of Oil, Gas & Mining

Phone: 801 538-5357
 FAX: 801-359-3940

Date: November 13, 2014
 Salt Lake City, Utah

Remarks:

Collapse is based on a vertical depth of 3500 ft, a mud weight of 10.2 ppg. The casing is considered to be evacuated for collapse purposes. Collapse strength is based on the Westcott, Dunlop & Kemler method of biaxial correction for tension.

Burst strength is not adjusted for tension.

Well name:	43027500050000 CW-8	
Operator:	MAGNUM NGLS SOLUTION MINING LLC	
String type:	Production	Project ID: 43-027-50005
Location:	MILLARD COUNTY	

Design parameters:

Collapse

Mud weight: 10.200 ppg
Design is based on evacuated pipe.

Burst

Max anticipated surface pressure: 1,116 psi
Internal gradient: 0.220 psi/ft
Calculated BHP: 1,908 psi

No backup mud specified.

Minimum design factors:

Collapse:

Design factor 1.125

Burst:

Design factor 1.00

Tension:

8 Round STC: 1.80 (J)
8 Round LTC: 1.80 (J)
Buttress: 1.60 (J)
Premium: 1.50 (J)
Body yield: 1.60 (B)

Tension is based on air weight.
Neutral point: 3,090 ft

Estimated cost: 136,731 (\$)

Environment:

H2S considered? No
Surface temperature: 74 °F
Bottom hole temperature: 124 °F
Temperature gradient: 1.40 °F/100ft
Minimum section length: 100 ft

Cement top: 1,263 ft

Non-directional string.

Run Seq	Segment Length (ft)	Size (in)	Nominal Weight (lbs/ft)	Grade	End Finish	True Vert Depth (ft)	Measured Depth (ft)	Drift Diameter (in)	Est. Cost (\$)
2	2400	16	97.00	N-80	Buttress	2400	2400	14.75	84459
1	1200	16	109.00	P-110	Big Omega	3600	3600	14.501	52272

Run Seq	Collapse Load (psi)	Collapse Strength (psi)	Collapse Design Factor	Burst Load (psi)	Burst Strength (psi)	Burst Design Factor	Tension Load (kips)	Tension Strength (kips)	Tension Design Factor
2	1272	2232	1.755	1644	5030	3.06	363.6	2194	6.03 J
1	1908	3460	1.814	1908	7890	4.14	130.8	3302	25.24 J

Prepared by: Helen Sadik-Macdonald
Div of Oil, Gas & Mining

Phone: 801 538-5357
FAX: 801-359-3940

Date: November 12, 2014
Salt Lake City, Utah

Remarks:

Collapse is based on a vertical depth of 3600 ft, a mud weight of 10.2 ppg. The casing is considered to be evacuated for collapse purposes. Collapse strength is based on the Westcott, Dunlop & Kemler method of biaxial correction for tension.

Burst strength is not adjusted for tension.

Well name:	43027500050000 CW-8	
Operator:	MAGNUM NGLS SOLUTION MINING LLC	
String type:	Production (Alt)	Project ID: 43-027-50005
Location:	MILLARD COUNTY	

Design parameters:

Collapse

Mud weight: 10.200 ppg
Design is based on evacuated pipe.

Minimum design factors:

Collapse:

Design factor 1.125

Environment:

H2S considered? No
Surface temperature: 74 °F
Bottom hole temperature: 135 °F
Temperature gradient: 1.40 °F/100ft
Minimum section length: 1,000 ft

Burst:

Design factor 1.00

Burst

Max anticipated surface pressure: 1,783 psi
Internal gradient: 0.120 psi/ft
Calculated BHP 2,305 psi

No backup mud specified.

Tension:

8 Round STC: 1.80 (J)
8 Round LTC: 1.80 (J)
Buttress: 1.60 (J)
Premium: 1.50 (J)
Body yield: 1.60 (B)

Non-directional string.

Tension is based on air weight.
Neutral point: 3,685 ft

Run Seq	Segment Length (ft)	Size (in)	Nominal Weight (lbs/ft)	Grade	End Finish	True Vert Depth (ft)	Measured Depth (ft)	Drift Diameter (in)	Est. Cost (\$)
1	4350	13.375	72.00	N-80	Buttress	4350	4350	12.25	103873
Run Seq	Collapse Load (psi)	Collapse Strength (psi)	Collapse Design Factor	Burst Load (psi)	Burst Strength (psi)	Burst Design Factor	Tension Load (kips)	Tension Strength (kips)	Tension Design Factor
1	2305	2670	1.158	2305	5380	2.33	313.2	1661.4	5.30 B

Prepared by: Helen Sadik-Macdonald
Div of Oil, Gas & Mining

Phone: 801 538-5357
FAX: 801-359-3940

Date: November 14, 2014
Salt Lake City, Utah

Remarks:

Collapse is based on a vertical depth of 4350 ft, a mud weight of 10.2 ppg. The casing is considered to be evacuated for collapse purposes. Collapse strength is based on the Westcott, Dunlop & Kemler method of biaxial correction for tension.

Burst strength is not adjusted for tension.

Well name:	43027500050000 CW-8	
Operator:	MAGNUM NGLS SOLUTION MINING LLC	
String type:	Tubing	Project ID: 43-027-50005
Location:	MILLARD COUNTY	

Design parameters:

Collapse

Mud weight: 10.200 ppg
Design is based on evacuated pipe.

Minimum design factors:

Collapse:

Design factor 1.125

Burst:

Design factor 1.00

Environment:

H2S considered? No
Surface temperature: 74 °F
Bottom hole temperature: 144 °F
Temperature gradient: 1.40 °F/100ft
Minimum section length: 1,000 ft

Burst

Max anticipated surface pressure: 3,279 psi
Internal gradient: 0.120 psi/ft
Calculated BHP 3,879 psi

No backup mud specified.

Tension:

API - tubing: 1.50 (J)
8 Round LTC: 1.80 (J)
Buttress: 1.60 (J)
Premium: 1.50 (J)
Body yield: 1.60 (B)

Non-directional string.

Tension is based on air weight.
Neutral point: 4,406 ft

Estimated cost: 51,539 (\$)

Run Seq	Segment Length (ft)	Size (in)	Nominal Weight (lbs/ft)	Grade	End Finish	True Vert Depth (ft)	Measured Depth (ft)	Drift Diameter (in)	Est. Cost (\$)
2	4000	8.625	32.00	K-55	Buttress	4000	4000	7.875	36722
1	1000	8.625	44.00	N-80	Buttress	5000	5000	7.5	14817

Run Seq	Collapse Load (psi)	Collapse Strength (psi)	Collapse Design Factor	Burst Load (psi)	Burst Strength (psi)	Burst Design Factor	Tension Load (kips)	Tension Strength (kips)	Tension Design Factor
2	2119	2465	1.163	3759	3930	1.05	172	503.2	2.93 B
1	2649	6950	2.623	3879	8120	2.09	44	1021	23.20 B

Prepared by: Helen Sadik-Macdonald
Div of Oil, Gas & Mining

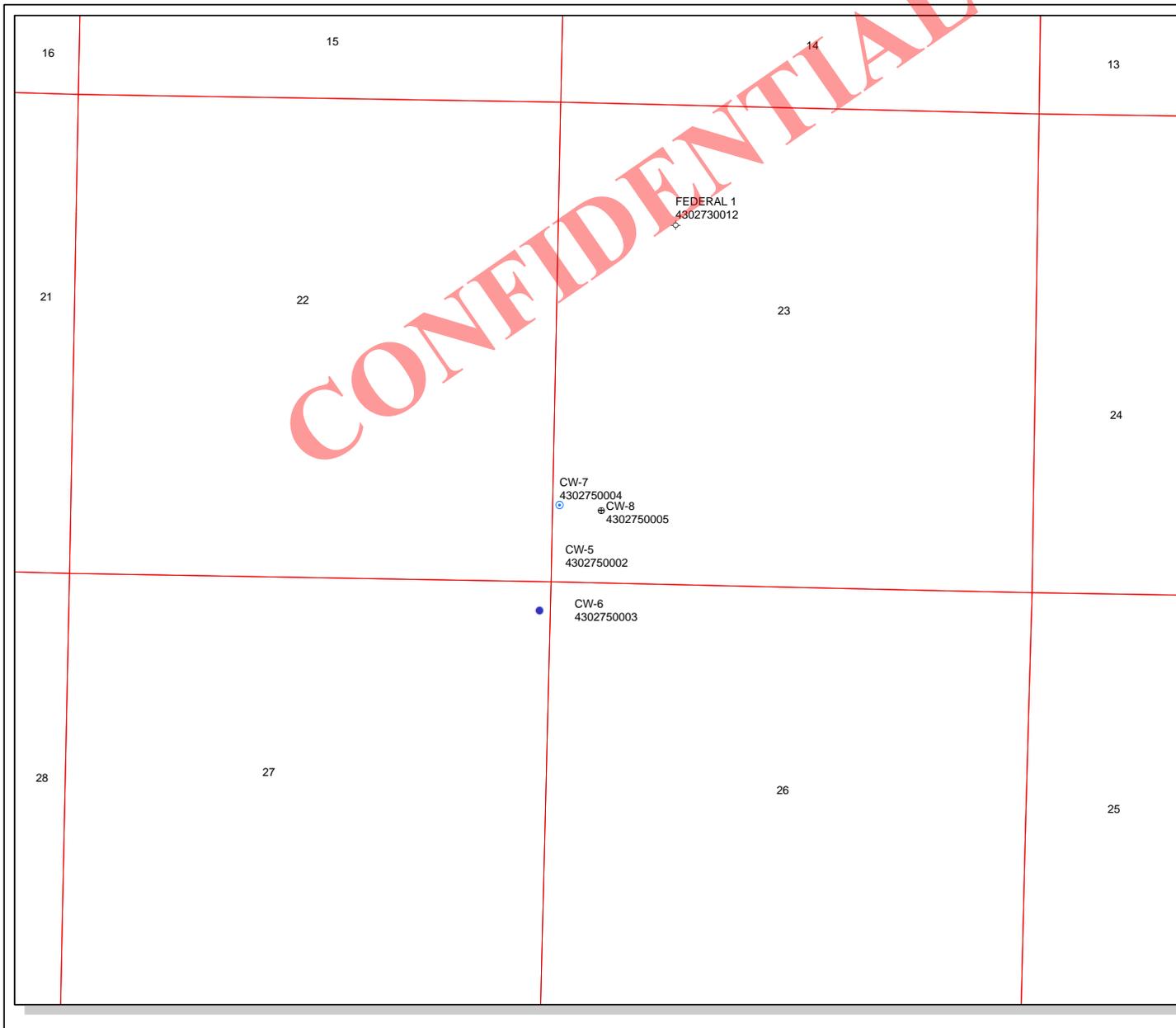
Phone: 801 538-5357
FAX: 801-359-3940

Date: November 14, 2014
Salt Lake City, Utah

Remarks:

Collapse is based on a vertical depth of 5000 ft, a mud weight of 10.2 ppg. The casing is considered to be evacuated for collapse purposes. Collapse strength is based on the Westcott, Dunlop & Kemler method of biaxial correction for tension.

Burst strength is not adjusted for tension.



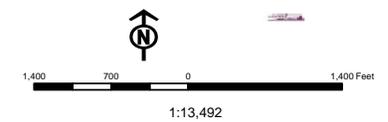
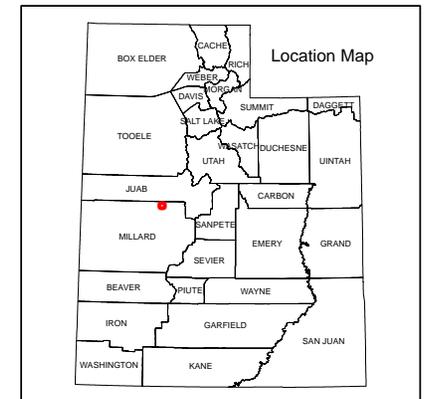
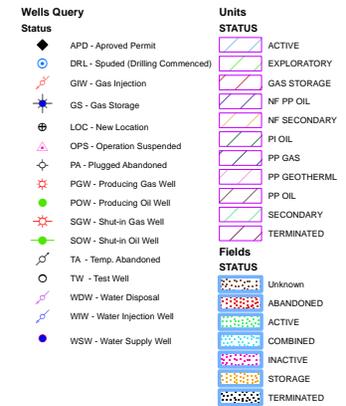
API Number: 4302750005

Well Name: CW-8

Township: T15.0S Range: R07.0W Section: 23 Meridian: S

Operator: MAGNUM NGLS SOLUTION MINING LLC

Map Prepared: 11/20/2014
Map Produced by Diana Mason



Application for Permit to Drill Statement of Basis

Utah Division of Oil, Gas and Mining

APD No	API WellNo	Status	Well Type	Surf Owner	CBM
10563	43027500050000	LOCKED	GS	S	No
Operator	MAGNUM NGLS SOLUTION MINING LLC		Surface Owner-APD		
Well Name	CW-8		Unit		
Field	WILDCAT		Type of Work	DRILL	
Location	SWSW 23 15S 7W S 805 FSL	548 FWL	GPS Coord		
	(UTM) 361557E	4373119N			

Geologic Statement of Basis

The proposed well location is in western Utah within the Basin & Range physiographic province. The mountains that bound the valley are composed of various sedimentary, metamorphic, and igneous rocks and the valley fill is composed of sands, silts, and gravels. These Tertiary and Quaternary aged valley deposits can be as thick as 7,000'. Oligocene and Miocene evaporite deposits have flowed over time to form a large salt dome, which is the drilling target. Magnum has proposed 150' of conductor pipe, 750' of surface casing, and 3,300' intermediate casing for this well. The holes for all three strings will be drilled with fresh water mud and the surface casing and intermediate casing will be cemented back to surface. A search of the Division of Water Rights database indicates that there are over 25 water wells within a 10,000' radius of the proposed location. These wells range in depth from 55' to 940'. Most of these wells are used for the source water for Magnum's project and the Intermountain Power Plant. Four wells near the outside radius and directly south are used for a combination of irrigation and/or stock watering. Magnum drilled several test wells during the initial phase of this project. These wells provided data to define the groundwater quality at depth for the proposed well. This data indicates that ground water quality begins to diminish below 2,500' and becomes saline at 3,000'. The proposed casing and cementing program should adequately protect usable groundwater in this area.

Ammon McDonald
APD Evaluator

11/25/2014
Date / Time

Surface Statement of Basis

This area is easily accessed off State Highway 174. The proposed CW-8 pad runs in an east to west direction and is located in the Sevier Desert valley. The construction material needed for this location and access road will be obtained from a local gravel pit. The pad is located on a slight slope to the west. SITLA has requested that the reserve pit be lined with a 20 mil thick liner and that a sub-liner be placed between the ground and liner. The selected location for this well is suitable for drilling.

Ammon McDonald
Onsite Evaluator

11/25/2014
Date / Time

Conditions of Approval / Application for Permit to Drill

Category	Condition
Pits	A synthetic liner with a minimum thickness of 20 mils and an appropriate thickness of felt sub-liner to cushion the liner shall be properly installed and maintained in the reserve pit.
Pits	The reserve pit should be fenced upon completion of drilling operations.
Surface	Drainages adjacent to the proposed pad shall be diverted around the location.

CONFIDENTIAL

WORKSHEET APPLICATION FOR PERMIT TO DRILL

APD RECEIVED: 10/30/2014

API NO. ASSIGNED: 43027500050000

WELL NAME: CW-8

OPERATOR: MAGNUM NGLS SOLUTION MINING LLC (N3995)

PHONE NUMBER: 801 993-7001

CONTACT: Tiffany A. James

PROPOSED LOCATION: SWSW 23 150S 070W

Permit Tech Review:

SURFACE: 0805 FSL 0548 FWL

Engineering Review:

BOTTOM: 0805 FSL 0548 FWL

Geology Review:

COUNTY: MILLARD

LATITUDE: 39.49655

LONGITUDE: -112.61008

UTM SURF EASTINGS: 361557.00

NORTHINGS: 4373119.00

FIELD NAME: WILDCAT

LEASE TYPE: 3 - State

LEASE NUMBER: 51573-OBA

PROPOSED PRODUCING FORMATION(S): SALT

SURFACE OWNER: 3 - State

COALBED METHANE: NO

RECEIVED AND/OR REVIEWED:

- PLAT
- Bond: STATE - B009096
- Potash
- Oil Shale 190-5
- Oil Shale 190-3
- Oil Shale 190-13
- Water Permit: 68-396
- RDCC Review: 2014-11-25 00:00:00.0
- Fee Surface Agreement
- Intent to Commingle

Commingle Approved

LOCATION AND SITING:

- R649-2-3.
- Unit:
- R649-3-2. General
- R649-3-3. Exception
- Drilling Unit
- Board Cause No: R649-3-2
- Effective Date:
- Siting:
- R649-3-11. Directional Drill

Comments: Presite Completed

Stipulations: 5 - Statement of Basis - bhll
9 - Cement casing to Surface - ddoucet
23 - Spacing - dmason



GARY R. HERBERT
Governor

SPENCER J. COX
Lieutenant Governor

State of Utah

DEPARTMENT OF NATURAL RESOURCES

MICHAEL R. STYLER
Executive Director

Division of Oil, Gas and Mining

JOHN R. BAZA
Division Director

Permit To Drill

Well Name: CW-8

API Well Number: 43027500050000

Lease Number: 51573-OBA

Surface Owner: STATE

Approval Date: 11/25/2014

Issued to:

MAGNUM NGLS SOLUTION MINING LLC, 3165 East Millrock Drive Suite 330,
Holladay, UT 84121

Authority:

Pursuant to Utah Code Ann. 40-6-1 et seq., and Utah Administrative Code R649-3-1 et seq., the Utah Division of Oil, Gas and Mining issues conditions of approval, and permit to drill the listed well. This permit is issued in accordance with the requirements of R649-3-2. The expected producing formation or pool is the SALT Formation(s), completion into any other zones will require filing a Sundry Notice (Form 9). Completion and commingling of more than one pool will require approval in accordance with R649-3-22.

Duration:

This approval shall expire one year from the above date unless substantial and continuous operation is underway, or a request for extension is made prior to the expiration date

General:

Compliance with the requirements of Utah Admin. R. 649-1 et seq., the Oil and Gas Conservation General Rules, and the applicable terms and provisions of the approved Application for permit to drill.

Conditions of Approval:

The cement volumes for the 30", 24", 20" and 16" casing shall be determined from actual hole conditions and the setting depth of the casing in order to place cement from the pipe setting depth back to the surface.

This proposed well is located in an area for which drilling units (well spacing patterns) have not been established through an order of the Board of Oil, Gas and Mining (the "Board"). In order to avoid the possibility of waste or injury to correlative rights, the operator is requested, once the well has been drilled, completed, and has produced, to analyze geological and engineering data generated therefrom, as well as any similar data from surrounding areas if available. As soon as is practicable after completion of its analysis, and if the analysis suggests an area larger than the quarter-quarter section upon which the well is located is being drained, the operator is requested to seek an appropriate order from the Board establishing drilling and spacing units in conformance with such analysis by filing

a Request for Agency Action with the Board.

Compliance with the Conditions of Approval/Application for Permit to Drill outlined in the Statement of Basis (copy attached).

Additional Approvals:

The operator is required to obtain approval from the Division of Oil, Gas and mining before performing any of the following actions during the drilling of this well:

- Any changes to the approved drilling plan - contact Dustin Doucet
- Significant plug back of the well - contact Dustin Doucet
- Plug and abandonment of the well - contact Dustin Doucet

Notification Requirements:

The operator is required to notify the Division of Oil, Gas and Mining of the following actions during drilling of this well:

- Within 24 hours following the spudding of the well - contact Carol Daniels
OR
submit an electronic sundry notice (pre-registration required) via the Utah Oil & Gas website
at <http://oilgas.ogm.utah.gov>
- 24 hours prior to testing blowout prevention equipment - contact Dan Jarvis
- 24 hours prior to cementing or testing casing - contact Dan Jarvis
- Within 24 hours of making any emergency changes to the approved drilling program
- contact Dustin Doucet
- 24 hours prior to commencing operations to plug and abandon the well - contact Dan Jarvis

Contact Information:

The following are Division of Oil, Gas and Mining contacts and their telephone numbers (please leave a voicemail message if the person is not available to take the call):

- Carol Daniels 801-538-5284 - office
- Dustin Doucet 801-538-5281 - office
801-733-0983 - after office hours
- Dan Jarvis 801-538-5338 - office
801-231-8956 - after office hours

Reporting Requirements:

All reports, forms and submittals as required by the Utah Oil and Gas Conservation General Rules will be promptly filed with the Division of Oil, Gas and Mining, including but not limited to:

- Entity Action Form (Form 6) - due within 5 days of spudding the well
- Monthly Status Report (Form 9) - due by 5th day of the following calendar month
- Requests to Change Plans (Form 9) - due prior to implementation
- Written Notice of Emergency Changes (Form 9) - due within 5 days
- Notice of Operations Suspension or Resumption (Form 9) - due prior to implementation
- Report of Water Encountered (Form 7) - due within 30 days after completion
- Well Completion Report (Form 8) - due within 30 days after completion or

plugging

Approved By:

A handwritten signature in black ink, appearing to read "J. Rogers", written in a cursive style.

For John Rogers
Associate Director, Oil & Gas

STATE OF UTAH DEPARTMENT OF NATURAL RESOURCES DIVISION OF OIL, GAS, AND MINING		FORM 9
		5. LEASE DESIGNATION AND SERIAL NUMBER: 51573-OBA
SUNDRY NOTICES AND REPORTS ON WELLS		6. IF INDIAN, ALLOTTEE OR TRIBE NAME:
Do not use this form for proposals to drill new wells, significantly deepen existing wells below current bottom-hole depth, reenter plugged wells, or to drill horizontal laterals. Use APPLICATION FOR PERMIT TO DRILL form for such proposals.		7. UNIT or CA AGREEMENT NAME:
		8. WELL NAME and NUMBER: CW-8
1. TYPE OF WELL Gas Storage Well	9. API NUMBER: 43027500050000	
2. NAME OF OPERATOR: MAGNUM SOLUTION MINING, LLC	9. FIELD and POOL or WILDCAT: WILDCAT	
3. ADDRESS OF OPERATOR: 3165 E Millrock Dr , Holladay, UT, 84124	PHONE NUMBER: 801 993-7001 Ext	COUNTY: MILLARD
4. LOCATION OF WELL FOOTAGES AT SURFACE: 0805 FSL 0548 FWL QTR/QTR, SECTION, TOWNSHIP, RANGE, MERIDIAN: Qtr/Qtr: SWSW Section: 23 Township: 15.0S Range: 07.0W Meridian: S	STATE: UTAH	
11. CHECK APPROPRIATE BOXES TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA		
TYPE OF SUBMISSION	TYPE OF ACTION	
<input type="checkbox"/> NOTICE OF INTENT Approximate date work will start: <input checked="" type="checkbox"/> SUBSEQUENT REPORT Date of Work Completion: 12/15/2014 <input type="checkbox"/> SPUD REPORT Date of Spud: <input type="checkbox"/> DRILLING REPORT Report Date:	<input type="checkbox"/> ACIDIZE <input type="checkbox"/> ALTER CASING <input type="checkbox"/> CASING REPAIR <input type="checkbox"/> CHANGE TO PREVIOUS PLANS <input type="checkbox"/> CHANGE TUBING <input type="checkbox"/> CHANGE WELL NAME <input type="checkbox"/> CHANGE WELL STATUS <input type="checkbox"/> COMMINGLE PRODUCING FORMATIONS <input type="checkbox"/> CONVERT WELL TYPE <input type="checkbox"/> DEEPEN <input type="checkbox"/> FRACTURE TREAT <input type="checkbox"/> NEW CONSTRUCTION <input type="checkbox"/> OPERATOR CHANGE <input type="checkbox"/> PLUG AND ABANDON <input type="checkbox"/> PLUG BACK <input type="checkbox"/> PRODUCTION START OR RESUME <input type="checkbox"/> RECLAMATION OF WELL SITE <input type="checkbox"/> RECOMPLETE DIFFERENT FORMATION <input type="checkbox"/> REPERFORATE CURRENT FORMATION <input type="checkbox"/> SIDETRACK TO REPAIR WELL <input type="checkbox"/> TEMPORARY ABANDON <input type="checkbox"/> TUBING REPAIR <input type="checkbox"/> VENT OR FLARE <input type="checkbox"/> WATER DISPOSAL <input type="checkbox"/> WATER SHUTOFF <input type="checkbox"/> SI TA STATUS EXTENSION <input type="checkbox"/> WILDCAT WELL DETERMINATION <input checked="" type="checkbox"/> OTHER	
12. DESCRIBE PROPOSED OR COMPLETED OPERATIONS. Clearly show all pertinent details including dates, depths, volumes, etc. Completed the cementing of 36" O.D. x .750" conductor casing; four joints set to 159 feet bgs. 6570 gallons / 32.5 cy of cement was placed.		
Accepted by the Utah Division of Oil, Gas and Mining FOR RECORD ONLY January 07, 2015		
NAME (PLEASE PRINT) Tiffany A. James	PHONE NUMBER 801 993-7001	TITLE Vice President Project Development
SIGNATURE N/A	DATE 12/17/2014	

STATE OF UTAH DEPARTMENT OF NATURAL RESOURCES DIVISION OF OIL, GAS, AND MINING		FORM 9
SUNDRY NOTICES AND REPORTS ON WELLS Do not use this form for proposals to drill new wells, significantly deepen existing wells below current bottom-hole depth, reenter plugged wells, or to drill horizontal laterals. Use APPLICATION FOR PERMIT TO DRILL form for such proposals.		5. LEASE DESIGNATION AND SERIAL NUMBER: 51573-OBA
		6. IF INDIAN, ALLOTTEE OR TRIBE NAME:
1. TYPE OF WELL Gas Storage Well		7. UNIT or CA AGREEMENT NAME:
2. NAME OF OPERATOR: MAGNUM NGLS SOLUTION MINING LLC		8. WELL NAME and NUMBER: CW-8
3. ADDRESS OF OPERATOR: 3165 East Millrock Drive Suite 330 , Holladay, UT, 84121		9. API NUMBER: 43027500050000
PHONE NUMBER: 801 993-7001 Ext		9. FIELD and POOL or WILDCAT: WILDCAT
4. LOCATION OF WELL FOOTAGES AT SURFACE: 0805 FSL 0548 FWL QTR/QTR, SECTION, TOWNSHIP, RANGE, MERIDIAN: Qtr/Qtr: SWSW Section: 23 Township: 15.0S Range: 07.0W Meridian: S		COUNTY: MILLARD
		STATE: UTAH

11.

CHECK APPROPRIATE BOXES TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

TYPE OF SUBMISSION	TYPE OF ACTION		
<input type="checkbox"/> NOTICE OF INTENT Approximate date work will start:	<input type="checkbox"/> ACIDIZE	<input type="checkbox"/> ALTER CASING	<input type="checkbox"/> CASING REPAIR
<input checked="" type="checkbox"/> SUBSEQUENT REPORT Date of Work Completion: 1/12/2015	<input type="checkbox"/> CHANGE TO PREVIOUS PLANS	<input type="checkbox"/> CHANGE TUBING	<input type="checkbox"/> CHANGE WELL NAME
<input type="checkbox"/> SPUD REPORT Date of Spud:	<input type="checkbox"/> CHANGE WELL STATUS	<input type="checkbox"/> COMMINGLE PRODUCING FORMATIONS	<input type="checkbox"/> CONVERT WELL TYPE
<input type="checkbox"/> DRILLING REPORT Report Date:	<input type="checkbox"/> DEEPEN	<input type="checkbox"/> FRACTURE TREAT	<input type="checkbox"/> NEW CONSTRUCTION
	<input type="checkbox"/> OPERATOR CHANGE	<input type="checkbox"/> PLUG AND ABANDON	<input type="checkbox"/> PLUG BACK
	<input type="checkbox"/> PRODUCTION START OR RESUME	<input type="checkbox"/> RECLAMATION OF WELL SITE	<input type="checkbox"/> RECOMPLETE DIFFERENT FORMATION
	<input type="checkbox"/> REPERFORATE CURRENT FORMATION	<input type="checkbox"/> SIDETRACK TO REPAIR WELL	<input type="checkbox"/> TEMPORARY ABANDON
	<input type="checkbox"/> TUBING REPAIR	<input type="checkbox"/> VENT OR FLARE	<input type="checkbox"/> WATER DISPOSAL
	<input type="checkbox"/> WATER SHUTOFF	<input type="checkbox"/> SI TA STATUS EXTENSION	<input type="checkbox"/> APD EXTENSION
	<input type="checkbox"/> WILDCAT WELL DETERMINATION	<input checked="" type="checkbox"/> OTHER	OTHER: <input type="text" value="Cement 30"/>

12. DESCRIBE PROPOSED OR COMPLETED OPERATIONS. Clearly show all pertinent details including dates, depths, volumes, etc.

CW-8 API # 4302750005 On 1/12/2015 Boart Longyear completed the cementing of 30" O.D. x .750" casing; the casing was set to 756 feet bgs. and 14,883 gallons of cement was pumped into the annular space.

**Accepted by the
Utah Division of
Oil, Gas and Mining
FOR RECORD ONLY
January 14, 2015**

NAME (PLEASE PRINT) Tiffany A. James	PHONE NUMBER 801 993-7001	TITLE Vice President Project Development
SIGNATURE N/A	DATE 1/14/2015	

STATE OF UTAH DEPARTMENT OF NATURAL RESOURCES DIVISION OF OIL, GAS, AND MINING		FORM 9
SUNDRY NOTICES AND REPORTS ON WELLS Do not use this form for proposals to drill new wells, significantly deepen existing wells below current bottom-hole depth, reenter plugged wells, or to drill horizontal laterals. Use APPLICATION FOR PERMIT TO DRILL form for such proposals.		5. LEASE DESIGNATION AND SERIAL NUMBER: 51573-OBA
1. TYPE OF WELL Gas Storage Well		6. IF INDIAN, ALLOTTEE OR TRIBE NAME: 7. UNIT or CA AGREEMENT NAME:
2. NAME OF OPERATOR: MAGNUM NGLS SOLUTION MINING LLC		8. WELL NAME and NUMBER: CW-8
3. ADDRESS OF OPERATOR: 3165 East Millrock Drive Suite 330 , Holladay, UT, 84121		9. API NUMBER: 43027500050000
4. LOCATION OF WELL FOOTAGES AT SURFACE: 0805 FSL 0548 FWL QTR/QTR, SECTION, TOWNSHIP, RANGE, MERIDIAN: Qtr/Qtr: SWSW Section: 23 Township: 15.0S Range: 07.0W Meridian: S		9. FIELD and POOL or WILDCAT: WILDCAT
11. CHECK APPROPRIATE BOXES TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA		COUNTY: MILLARD
11. CHECK APPROPRIATE BOXES TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA		STATE: UTAH
TYPE OF SUBMISSION	TYPE OF ACTION	
<input type="checkbox"/> NOTICE OF INTENT Approximate date work will start:	<input type="checkbox"/> ACIDIZE <input type="checkbox"/> ALTER CASING <input type="checkbox"/> CASING REPAIR <input type="checkbox"/> CHANGE TO PREVIOUS PLANS <input type="checkbox"/> CHANGE TUBING <input type="checkbox"/> CHANGE WELL NAME <input type="checkbox"/> CHANGE WELL STATUS <input type="checkbox"/> COMMINGLE PRODUCING FORMATIONS <input type="checkbox"/> CONVERT WELL TYPE <input checked="" type="checkbox"/> SUBSEQUENT REPORT Date of Work Completion: 1/13/2015	
<input type="checkbox"/> SPUD REPORT Date of Spud:	<input type="checkbox"/> DEEPEN <input type="checkbox"/> FRACTURE TREAT <input type="checkbox"/> NEW CONSTRUCTION <input type="checkbox"/> OPERATOR CHANGE <input type="checkbox"/> PLUG AND ABANDON <input type="checkbox"/> PLUG BACK <input type="checkbox"/> PRODUCTION START OR RESUME <input type="checkbox"/> RECLAMATION OF WELL SITE <input type="checkbox"/> RECOMPLETE DIFFERENT FORMATION <input type="checkbox"/> REPERFORATE CURRENT FORMATION <input type="checkbox"/> SIDETRACK TO REPAIR WELL <input type="checkbox"/> TEMPORARY ABANDON <input type="checkbox"/> TUBING REPAIR <input type="checkbox"/> VENT OR FLARE <input type="checkbox"/> WATER DISPOSAL <input type="checkbox"/> WATER SHUTOFF <input type="checkbox"/> SI TA STATUS EXTENSION <input type="checkbox"/> WILDCAT WELL DETERMINATION <input checked="" type="checkbox"/> OTHER	
<input type="checkbox"/> DRILLING REPORT Report Date:	<input type="checkbox"/> APD EXTENSION OTHER: <input style="width: 50px;" type="text" value="30"/>	
12. DESCRIBE PROPOSED OR COMPLETED OPERATIONS. Clearly show all pertinent details including dates, depths, volumes, etc. CW-8 API# 4302750005. Completed the pressure test of BOP and 30" diameter casing on 1/13/2015. The bottom of the casing is set at 756 bgs. Casing is 30"x.75" wall thickness. BOP: 21-1/4_2000 R73, CRA Serial No. 01337. Pressure Recorder: Barton, Instrument No. 118730. Calibration date: 11/8/13. Duration of test was 1.0 hours with a starting pressure of 530psi. Pressure loss was 5psi over the duration of the test (
Accepted by the Utah Division of Oil, Gas and Mining FOR RECORD ONLY January 15, 2015		
NAME (PLEASE PRINT) Tiffany A. James	PHONE NUMBER 801 993-7001	TITLE Vice President Project Development
SIGNATURE N/A	DATE 1/14/2015	

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

FORM 9

	5. LEASE DESIGNATION AND SERIAL NUMBER: 51573-OBA
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SUNDRY NOTICES AND REPORTS ON WELLS

Do not use this form for proposals to drill new wells, significantly deepen existing wells below current bottom-hole depth, reenter plugged wells, or to drill horizontal laterals. Use APPLICATION FOR PERMIT TO DRILL form for such proposals.

1. TYPE OF WELL OIL WELL <input type="checkbox"/> GAS WELL <input type="checkbox"/> OTHER <u>Gas Storage Well</u>	6. IF INDIAN, ALLOTTEE OR TRIBE NAME: 7. UNIT or CA AGREEMENT NAME: 8. WELL NAME and NUMBER: CW-8
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2. NAME OF OPERATOR: Magnum NGLs Solution Mining, LLC	9. API NUMBER: 4302750005
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3. ADDRESS OF OPERATOR 3165 East Millrock Drive Suit Holladay UT 84121	PHONE NUMBER: (801) 993-7001	10. FIELD AND POOL, OR WILDCAT: Undesignated
--	--	--

4. LOCATION OF WELL

FOOTAGES AT SURFACE: **805FSL 548 FWL** COUNTY: **Millard**

QTR/QTR, SECTION, TOWNSHIP, RANGE, MERIDIAN: **SWSW 23 15S 07W S** STATE: **UTAH**

11. CHECK APPROPRIATE BOXES TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

TYPE OF SUBMISSION	TYPE OF ACTION		
<input type="checkbox"/> NOTICE OF INTENT (Submit in Duplicate) Approximate date work will start: 	<input type="checkbox"/> ACIDIZE	<input type="checkbox"/> DEEPEN	<input type="checkbox"/> REPERFORATE CURRENT FORMATION
	<input type="checkbox"/> ALTER CASING	<input type="checkbox"/> FRACTURE TREAT	<input type="checkbox"/> SIDETRACK TO REPAIR WELL
<input checked="" type="checkbox"/> SUBSEQUENT REPORT (Submit Original Form Only) Date of work completion: 1/13/2015	<input type="checkbox"/> CASING REPAIR	<input type="checkbox"/> NEW CONSTRUCTION	<input type="checkbox"/> TEMPORARILY ABANDON
	<input type="checkbox"/> CHANGE TO PREVIOUS PLANS	<input type="checkbox"/> OPERATOR CHANGE	<input type="checkbox"/> TUBING REPAIR
	<input type="checkbox"/> CHANGE TUBING	<input type="checkbox"/> PLUG AND ABANDON	<input type="checkbox"/> VENT OR FLARE
	<input type="checkbox"/> CHANGE WELL NAME	<input type="checkbox"/> PLUG BACK	<input type="checkbox"/> WATER DISPOSAL
	<input type="checkbox"/> CHANGE WELL STATUS	<input type="checkbox"/> PRODUCTION (START/RESUME)	<input type="checkbox"/> WATER SHUT-OFF
	<input type="checkbox"/> COMMINGLE PRODUCING FORMATIONS	<input type="checkbox"/> RECLAMATION OF WELL SITE	<input checked="" type="checkbox"/> OTHER: <u>30" Casing Pressure Test</u>
	<input type="checkbox"/> CONVERT WELL TYPE	<input type="checkbox"/> RECOMPLETE - DIFFERENT FORMATION	

12. DESCRIBE PROPOSED OR COMPLETED OPERATIONS. Clearly show all pertinent details including dates, depths, volumes, etc.

Completed Pressure test of BOP and 30" diameter casing on 13 January 2015.
 Bottom of casing set at 756 feet bgs. Casing:30" x 0.75" wall thickness.
 BOP: 21-1/4 2000 R73, CRA Serial No. 01337 Pressure Recorder: Barton, Instrument No.118730, Calibration Date 11/8/13
 Duration of test was 1.0 hrs with a starting pressure of 530psi.
 Pressure loss was 5 psi over the duration of the test (<10%).
 The pressure testing and results were performed in accordance with Project Specifications & DOGM APD Permit Requirements.

NAME (PLEASE PRINT) _____	TITLE _____
SIGNATURE _____	DATE _____

(This space for State use only)

INSTRUCTIONS

This form shall be submitted by the operator to show the intention and/or completion of the following:

- miscellaneous work projects and actions for which other specific report forms do not exist;
- all other work and events as identified in section 11, Type of Action, or as required by the Utah Oil and Gas Conservation General Rules, including:
 - minor deepening of an existing well bore,
 - plugging back a well,
 - recompleting to a different producing formation within an existing well bore (intent only),
 - reperforating the current producing formation,
 - drilling a sidetrack to repair a well,
 - reporting monthly the status of each drilling well.

This form is not to be used for proposals to

- drill new wells,
- reenter previously plugged and abandoned wells,
- significantly deepen existing wells below their current bottom-hole depth,
- drill horizontal laterals from an existing well bore,
- drill hydrocarbon exploratory holes such as core samples and stratigraphic tests.

Use Form 3, Application for Permit to Drill (APD) for such proposals.

NOTICE OF INTENT - A notice of intention to do work on a well or to change plans previously approved shall be submitted in duplicate and must be received and approved by the division before the work is commenced. The operator is responsible for receipt of the notice by the division in ample time for proper consideration and action. In cases of emergency, the operator may obtain verbal approval to commence work. Within five days after receiving verbal approval, the operator shall submit a Sundry Notice describing the work and acknowledging the verbal approval.

SUBSEQUENT REPORT - A subsequent report shall be submitted to the division within 30 days of the completion of the outlined work. Specific details of the work performed should be provided, including dates, well depths, placement of plugs, etc.

WELL ABANDONMENT - Proposals to abandon a well and subsequent reports of abandonment should include reasons for the abandonment; data on any former or present productive zones, or other zones with present significant fluid contents not sealed off by cement or otherwise; depths (top and bottom) and method of placement of cement plugs; mud or other material placed below, between and above plugs; amount, size, and method of parting of any casing, liner, or tubing pulled and the depth to top of any left in the hole; method of closing top of well; and date well site conditioned for final inspection looking to approval of the abandonment.

In addition to any Sundry Notice forms submitted, **Form 8, Well Completion or Recompletion Report and Log** must be submitted to the division to report the results of the following operations:

- completing or plugging a new well,
- reentering a previously plugged and abandoned well,
- significantly deepening an existing well bore below the current bottom-hole depth,
- drilling horizontal laterals from an existing well bore,
- drilling hydrocarbon exploratory holes such as core samples and stratigraphic tests,
- recompleting to a different producing formation.

Send to:

Utah Division of Oil, Gas and Mining
1594 West North Temple, Suite 1210
Box 145801
Salt Lake City, Utah 84114-5801

Phone: 801-538-5340

Fax: 801-359-3940

STATE OF UTAH DEPARTMENT OF NATURAL RESOURCES DIVISION OF OIL, GAS, AND MINING		FORM 9
SUNDRY NOTICES AND REPORTS ON WELLS Do not use this form for proposals to drill new wells, significantly deepen existing wells below current bottom-hole depth, reenter plugged wells, or to drill horizontal laterals. Use APPLICATION FOR PERMIT TO DRILL form for such proposals.		5. LEASE DESIGNATION AND SERIAL NUMBER: 51573-OBA
		6. IF INDIAN, ALLOTTEE OR TRIBE NAME:
1. TYPE OF WELL Gas Storage Well		7. UNIT or CA AGREEMENT NAME:
2. NAME OF OPERATOR: MAGNUM NGLS SOLUTION MINING LLC		8. WELL NAME and NUMBER: CW-8
3. ADDRESS OF OPERATOR: 3165 East Millrock Drive Suite 330 , Holladay, UT, 84121		9. API NUMBER: 43027500050000
PHONE NUMBER: 801 993-7001 Ext		9. FIELD and POOL or WILDCAT: WILDCAT
4. LOCATION OF WELL FOOTAGES AT SURFACE: 0805 FSL 0548 FWL QTR/QTR, SECTION, TOWNSHIP, RANGE, MERIDIAN: Qtr/Qtr: SWSW Section: 23 Township: 15.0S Range: 07.0W Meridian: S		COUNTY: MILLARD
		STATE: UTAH

11.

CHECK APPROPRIATE BOXES TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

TYPE OF SUBMISSION	TYPE OF ACTION		
<input type="checkbox"/> NOTICE OF INTENT Approximate date work will start:	<input type="checkbox"/> ACIDIZE	<input type="checkbox"/> ALTER CASING	<input type="checkbox"/> CASING REPAIR
<input type="checkbox"/> SUBSEQUENT REPORT Date of Work Completion:	<input type="checkbox"/> CHANGE TO PREVIOUS PLANS	<input type="checkbox"/> CHANGE TUBING	<input type="checkbox"/> CHANGE WELL NAME
<input checked="" type="checkbox"/> SPUD REPORT Date of Spud: 12/12/2014	<input type="checkbox"/> CHANGE WELL STATUS	<input type="checkbox"/> COMMINGLE PRODUCING FORMATIONS	<input type="checkbox"/> CONVERT WELL TYPE
<input type="checkbox"/> DRILLING REPORT Report Date:	<input type="checkbox"/> DEEPEN	<input type="checkbox"/> FRACTURE TREAT	<input type="checkbox"/> NEW CONSTRUCTION
	<input type="checkbox"/> OPERATOR CHANGE	<input type="checkbox"/> PLUG AND ABANDON	<input type="checkbox"/> PLUG BACK
	<input type="checkbox"/> PRODUCTION START OR RESUME	<input type="checkbox"/> RECLAMATION OF WELL SITE	<input type="checkbox"/> RECOMPLETE DIFFERENT FORMATION
	<input type="checkbox"/> REPERFORATE CURRENT FORMATION	<input type="checkbox"/> SIDETRACK TO REPAIR WELL	<input type="checkbox"/> TEMPORARY ABANDON
	<input type="checkbox"/> TUBING REPAIR	<input type="checkbox"/> VENT OR FLARE	<input type="checkbox"/> WATER DISPOSAL
	<input type="checkbox"/> WATER SHUTOFF	<input type="checkbox"/> SI TA STATUS EXTENSION	<input type="checkbox"/> APD EXTENSION
	<input type="checkbox"/> WILDCAT WELL DETERMINATION	<input type="checkbox"/> OTHER	OTHER: <input style="width: 100px;" type="text"/>

12. DESCRIBE PROPOSED OR COMPLETED OPERATIONS. Clearly show all pertinent details including dates, depths, volumes, etc.

Magnum Cavern Well 8, API Well Number 4302750005. APD No. 10563.
Spud Date/Time 12/12/2014/0900 hours.

**Accepted by the
Utah Division of
Oil, Gas and Mining
FOR RECORD ONLY
February 05, 2015**

NAME (PLEASE PRINT) Tiffany A. James	PHONE NUMBER 801 993-7001	TITLE Vice President Project Development
SIGNATURE N/A	DATE 12/12/2014	

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

FORM 6

ENTITY ACTION FORM

Operator: Magnum NGLs Solution Mining, LLC Operator Account Number: N 3995
Address: 3165 E. Millrock Drive Suite 330
city Holladay
state Ut zip 84121 Phone Number: (801) 993-7001

Well 1

API Number	Well Name		QQ	Sec	Twp	Rng	County
4302750005	CW-8		SWSW	23	15S	7W	Millard
Action Code	Current Entity Number	New Entity Number	Spud Date			Entity Assignment Effective Date	
B		19046	12/12/2014			12/12/2014	
Comments: Magnum Cavern Well #CW-8 API Well Number: 43027500050000. APD No. 10563 Spud Date/Time: 12 December 2014/09:00 Hours.							

Well 2

API Number	Well Name		QQ	Sec	Twp	Rng	County
Action Code	Current Entity Number	New Entity Number	Spud Date			Entity Assignment Effective Date	
Comments:							

Well 3

API Number	Well Name		QQ	Sec	Twp	Rng	County
Action Code	Current Entity Number	New Entity Number	Spud Date			Entity Assignment Effective Date	
Comments:							

ACTION CODES:

- A - Establish new entity for new well (single well only)
- B - Add new well to existing entity (group or unit well)
- C - Re-assign well from one existing entity to another existing entity
- D - Re-assign well from one existing entity to a new entity
- E - Other (Explain in 'comments' section)

Tiffany A. James

Name (Please Print)

Signature

VP Project Development

Title

12/12/2014

Date

STATE OF UTAH DEPARTMENT OF NATURAL RESOURCES DIVISION OF OIL, GAS, AND MINING		FORM 9	
SUNDRY NOTICES AND REPORTS ON WELLS		5. LEASE DESIGNATION AND SERIAL NUMBER: 51573-OBA	
Do not use this form for proposals to drill new wells, significantly deepen existing wells below current bottom-hole depth, reenter plugged wells, or to drill horizontal laterals. Use APPLICATION FOR PERMIT TO DRILL form for such proposals.		6. IF INDIAN, ALLOTTEE OR TRIBE NAME:	
		7. UNIT or CA AGREEMENT NAME:	
1. TYPE OF WELL Gas Storage Well		8. WELL NAME and NUMBER: CW-8	
2. NAME OF OPERATOR: MAGNUM NGLS SOLUTION MINING LLC		9. API NUMBER: 43027500050000	
3. ADDRESS OF OPERATOR: 3165 East Millrock Drive Suite 330 , Holladay, UT, 84121	PHONE NUMBER: 801 993-7001 Ext	9. FIELD and POOL or WILDCAT: DELTA SALT CAVERN STORAGE	
4. LOCATION OF WELL FOOTAGES AT SURFACE: 0805 FSL 0548 FWL QTR/QTR, SECTION, TOWNSHIP, RANGE, MERIDIAN: Qtr/Qtr: SWSW Section: 23 Township: 15.0S Range: 07.0W Meridian: S		COUNTY: MILLARD	
		STATE: UTAH	
11. CHECK APPROPRIATE BOXES TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA			
TYPE OF SUBMISSION	TYPE OF ACTION		
<input type="checkbox"/> NOTICE OF INTENT Approximate date work will start: <input checked="" type="checkbox"/> SUBSEQUENT REPORT Date of Work Completion: 2/16/2015 <input type="checkbox"/> SPUD REPORT Date of Spud: <input type="checkbox"/> DRILLING REPORT Report Date:	<input type="checkbox"/> ACIDIZE <input type="checkbox"/> CHANGE TO PREVIOUS PLANS <input type="checkbox"/> CHANGE WELL STATUS <input type="checkbox"/> DEEPEN <input type="checkbox"/> OPERATOR CHANGE <input type="checkbox"/> PRODUCTION START OR RESUME <input type="checkbox"/> REPERFORATE CURRENT FORMATION <input type="checkbox"/> TUBING REPAIR <input type="checkbox"/> WATER SHUTOFF <input type="checkbox"/> WILDCAT WELL DETERMINATION <input type="checkbox"/> ALTER CASING <input type="checkbox"/> CHANGE TUBING <input type="checkbox"/> COMMINGLE PRODUCING FORMATIONS <input type="checkbox"/> FRACTURE TREAT <input type="checkbox"/> PLUG AND ABANDON <input type="checkbox"/> RECLAMATION OF WELL SITE <input type="checkbox"/> SIDETRACK TO REPAIR WELL <input type="checkbox"/> VENT OR FLARE <input type="checkbox"/> SI TA STATUS EXTENSION <input checked="" type="checkbox"/> OTHER		<input type="checkbox"/> CASING REPAIR <input type="checkbox"/> CHANGE WELL NAME <input type="checkbox"/> CONVERT WELL TYPE <input type="checkbox"/> NEW CONSTRUCTION <input type="checkbox"/> PLUG BACK <input type="checkbox"/> RECOMPLETE DIFFERENT FORMATION <input type="checkbox"/> TEMPORARY ABANDON <input type="checkbox"/> WATER DISPOSAL <input type="checkbox"/> APD EXTENSION OTHER: <input style="width: 100px;" type="text" value="Cement 24"/>
12. DESCRIBE PROPOSED OR COMPLETED OPERATIONS. Clearly show all pertinent details including dates, depths, volumes, etc.			
CW-8 API# 4302750005. Boart Longyear and Ridge Cement completed the cementing of 2086.55 ft of 24" x 1" and 949.45 ft of 24" x 0.625" wall thickness casing on well CW-8; the casing was set to 3036 feet bgs. Ridge Cement mixed 924 bbl. of cement. Cement was pumped into the annular space around the casing using the stab-in cementing method. 106bbl of cement were returned to the surface.		Accepted by the Utah Division of Oil, Gas and Mining FOR RECORD ONLY March 04, 2015	
NAME (PLEASE PRINT) Tiffany A. James	PHONE NUMBER 801 993-7001	TITLE Vice President Project Development	
SIGNATURE N/A		DATE 2/27/2015	

STATE OF UTAH DEPARTMENT OF NATURAL RESOURCES DIVISION OF OIL, GAS, AND MINING		FORM 9
		5. LEASE DESIGNATION AND SERIAL NUMBER: 51573-OBA
SUNDRY NOTICES AND REPORTS ON WELLS		6. IF INDIAN, ALLOTTEE OR TRIBE NAME:
Do not use this form for proposals to drill new wells, significantly deepen existing wells below current bottom-hole depth, reenter plugged wells, or to drill horizontal laterals. Use APPLICATION FOR PERMIT TO DRILL form for such proposals.		7. UNIT or CA AGREEMENT NAME:
1. TYPE OF WELL Gas Storage Well		8. WELL NAME and NUMBER: CW-8
2. NAME OF OPERATOR: MAGNUM NGLS SOLUTION MINING LLC		9. API NUMBER: 43027500050000
3. ADDRESS OF OPERATOR: 3165 East Millrock Drive Suite 330 , Holladay, UT, 84121	PHONE NUMBER: 801 993-7001 Ext	9. FIELD and POOL or WILDCAT: DELTA SALT CAVERN STORAGE
4. LOCATION OF WELL FOOTAGES AT SURFACE: 0805 FSL 0548 FWL QTR/QTR, SECTION, TOWNSHIP, RANGE, MERIDIAN: Qtr/Qtr: SWSW Section: 23 Township: 15.0S Range: 07.0W Meridian: S		COUNTY: MILLARD
		STATE: UTAH
11. CHECK APPROPRIATE BOXES TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA		
TYPE OF SUBMISSION	TYPE OF ACTION	
<input type="checkbox"/> NOTICE OF INTENT Approximate date work will start: <input checked="" type="checkbox"/> SUBSEQUENT REPORT Date of Work Completion: 2/19/2015 <input type="checkbox"/> SPUD REPORT Date of Spud: <input type="checkbox"/> DRILLING REPORT Report Date:	<input type="checkbox"/> ACIDIZE <input type="checkbox"/> ALTER CASING <input type="checkbox"/> CHANGE TO PREVIOUS PLANS <input type="checkbox"/> CHANGE TUBING <input type="checkbox"/> CHANGE WELL STATUS <input type="checkbox"/> COMMINGLE PRODUCING FORMATIONS <input type="checkbox"/> DEEPEN <input type="checkbox"/> FRACTURE TREAT <input type="checkbox"/> OPERATOR CHANGE <input type="checkbox"/> PLUG AND ABANDON <input type="checkbox"/> PRODUCTION START OR RESUME <input type="checkbox"/> RECLAMATION OF WELL SITE <input type="checkbox"/> REPERFORATE CURRENT FORMATION <input type="checkbox"/> SIDETRACK TO REPAIR WELL <input type="checkbox"/> TUBING REPAIR <input type="checkbox"/> VENT OR FLARE <input type="checkbox"/> WATER SHUTOFF <input type="checkbox"/> SI TA STATUS EXTENSION <input type="checkbox"/> WILDCAT WELL DETERMINATION <input checked="" type="checkbox"/> OTHER	
		OTHER: <input style="width: 50px;" type="text" value="24"/>
12. DESCRIBE PROPOSED OR COMPLETED OPERATIONS. Clearly show all pertinent details including dates, depths, volumes, etc.		
CW-8 API #4302750005. Completed Pressure test of BOP and 24" diameter casing on 19 February 2015. Bottom of casing set at 3036 feet bgs. Casing: 1262.36ft of 24" x 1" and 1577.73ft of 24" x 0.75" wall thickness. BOP: 21-1/4_2000 R73, CRA Serial No. 01337 Pressure Recorder: Barton, Instrument No. 118730, Calibration Date 11/8/13. Duration of test was 1 hr. with a starting pressure of 945 psi. Pressure loss was 5 psi over the duration of the test (Accepted by the Utah Division of Oil, Gas and Mining FOR RECORD ONLY March 04, 2015
NAME (PLEASE PRINT) Tiffany A. James	PHONE NUMBER 801 993-7001	TITLE Vice President Project Development
SIGNATURE N/A		DATE 2/27/2015

INSTRUCTIONS

This form shall be submitted by the operator to show the intention and/or completion of the following:

- miscellaneous work projects and actions for which other specific report forms do not exist;
- all other work and events as identified in section 11, Type of Action, or as required by the Utah Oil and Gas Conservation General Rules, including:
 - minor deepening of an existing well bore,
 - plugging back a well,
 - recompleting to a different producing formation within an existing well bore (intent only),
 - re-perforating the current producing formation,
 - drilling a sidetrack to repair a well,
 - reporting monthly the status of each drilling well.

This form is not to be used for proposals to

- drill new wells,
- reenter previously plugged and abandoned wells,
- significantly deepen existing wells below their current bottom-hole depth,
- drill horizontal laterals from an existing well bore,
- drill hydrocarbon exploratory holes such as core samples and stratigraphic tests.

Use Form 3, Application for Permit to Drill (APD) for such proposals.

NOTICE OF INTENT - A notice of intention to do work on a well or to change plans previously approved shall be submitted in duplicate and must be received and approved by the division before the work is commenced. The operator is responsible for receipt of the notice by the division in ample time for proper consideration and action. In cases of emergency, the operator may obtain verbal approval to commence work. Within five days after receiving verbal approval, the operator shall submit a Sundry Notice describing the work and acknowledging the verbal approval.

SUBSEQUENT REPORT - A subsequent report shall be submitted to the division within 30 days of the completion of the outlined work. Specific details of the work performed should be provided, including dates, well depths, placement of plugs, etc.

WELL ABANDONMENT - Proposals to abandon a well and subsequent reports of abandonment should include reasons for the abandonment; data on any former or present productive zones, or other zones with present significant fluid contents not sealed off by cement or otherwise; depths (top and bottom) and method of placement of cement plugs; mud or other material placed below, between and above plugs; amount, size, and method of parting of any casing, liner, or tubing pulled and the depth to top of any left in the hole; method of closing top of well; and date well site conditioned for final inspection looking to approval of the abandonment.

In addition to any Sundry Notice forms submitted, **Form 8, Well Completion or Recompletion Report and Log** must be submitted to the division to report the results of the following operations:

- completing or plugging a new well,
- reentering a previously plugged and abandoned well,
- significantly deepening an existing well bore below the current bottom-hole depth,
- drilling horizontal laterals from an existing well bore,
- drilling hydrocarbon exploratory holes such as core samples and stratigraphic tests,
- recompleting to a different producing formation.

Send to:

Utah Division of Oil, Gas and Mining
1594 West North Temple, Suite 1210
Box 145801
Salt Lake City, Utah 84114-5801

Phone: 801-538-5340

Fax: 801-359-3940

STATE OF UTAH DEPARTMENT OF NATURAL RESOURCES DIVISION OF OIL, GAS, AND MINING		FORM 9	
SUNDRY NOTICES AND REPORTS ON WELLS Do not use this form for proposals to drill new wells, significantly deepen existing wells below current bottom-hole depth, reenter plugged wells, or to drill horizontal laterals. Use APPLICATION FOR PERMIT TO DRILL form for such proposals.		5. LEASE DESIGNATION AND SERIAL NUMBER: 51573-OBA	
		6. IF INDIAN, ALLOTTEE OR TRIBE NAME:	
1. TYPE OF WELL Gas Storage Well		7. UNIT or CA AGREEMENT NAME:	
2. NAME OF OPERATOR: MAGNUM NGLS SOLUTION MINING LLC		8. WELL NAME and NUMBER: CW-8	
3. ADDRESS OF OPERATOR: 3165 East Millrock Drive Suite 330 , Holladay, UT, 84121		9. API NUMBER: 43027500050000	
PHONE NUMBER: 801 993-7001 Ext		9. FIELD and POOL or WILDCAT: DELTA SALT CAVERN STORAGE	
4. LOCATION OF WELL FOOTAGES AT SURFACE: 0805 FSL 0548 FWL QTR/QTR, SECTION, TOWNSHIP, RANGE, MERIDIAN: Qtr/Qtr: SWSW Section: 23 Township: 15.0S Range: 07.0W Meridian: S		COUNTY: MILLARD	
		STATE: UTAH	
11. CHECK APPROPRIATE BOXES TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA			
TYPE OF SUBMISSION	TYPE OF ACTION		
<input type="checkbox"/> NOTICE OF INTENT Approximate date work will start: <input checked="" type="checkbox"/> SUBSEQUENT REPORT Date of Work Completion: 2/28/2015 <input type="checkbox"/> SPUD REPORT Date of Spud: <input type="checkbox"/> DRILLING REPORT Report Date:	<input type="checkbox"/> ACIDIZE <input type="checkbox"/> CHANGE TO PREVIOUS PLANS <input type="checkbox"/> CHANGE WELL STATUS <input type="checkbox"/> DEEPEN <input type="checkbox"/> OPERATOR CHANGE <input type="checkbox"/> PRODUCTION START OR RESUME <input type="checkbox"/> REPERFORATE CURRENT FORMATION <input type="checkbox"/> TUBING REPAIR <input type="checkbox"/> WATER SHUTOFF <input type="checkbox"/> WILDCAT WELL DETERMINATION	<input type="checkbox"/> ALTER CASING <input type="checkbox"/> CHANGE TUBING <input type="checkbox"/> COMMINGLE PRODUCING FORMATIONS <input type="checkbox"/> FRACTURE TREAT <input type="checkbox"/> PLUG AND ABANDON <input type="checkbox"/> RECLAMATION OF WELL SITE <input type="checkbox"/> SIDETRACK TO REPAIR WELL <input type="checkbox"/> VENT OR FLARE <input type="checkbox"/> SI TA STATUS EXTENSION <input checked="" type="checkbox"/> OTHER	<input type="checkbox"/> CASING REPAIR <input type="checkbox"/> CHANGE WELL NAME <input type="checkbox"/> CONVERT WELL TYPE <input type="checkbox"/> NEW CONSTRUCTION <input type="checkbox"/> PLUG BACK <input type="checkbox"/> RECOMPLETE DIFFERENT FORMATION <input type="checkbox"/> TEMPORARY ABANDON <input type="checkbox"/> WATER DISPOSAL <input type="checkbox"/> APD EXTENSION OTHER: <input type="text" value="Monthly Status Dec-Feb"/>
12. DESCRIBE PROPOSED OR COMPLETED OPERATIONS. Clearly show all pertinent details including dates, depths, volumes, etc.			
Magnum Cavern Well CW-8 Monthly Status Reports for December 2014, January 2015, February 2015 (API No. 4302750005); See Attachment Summary Reports. Drilling activities were in direct accordance with project specifications and Utah DOGM Application Permit to Drill requirements.			
Accepted by the Utah Division of Oil, Gas and Mining FOR RECORD ONLY March 13, 2015			
NAME (PLEASE PRINT) Adam Richins		PHONE NUMBER 801 993-7001	TITLE Compliance Manager
SIGNATURE N/A		DATE 3/13/2015	

Magnum CW-8 December 2014 Monthly Status Report Summary

12/1/2014	Continued to move equipment from CW-7 well pad to CW-8 well pad.
12/2-12/2014	Set up CW-8 well pad and rigged up the drill and equipment for CW-8.
12/12-14/2014	Drilled from 15' bgs to 167' bgs with 42" tooling.
12/14-15/2014	Installed 161 feet of 36x.750" casing to a depth of 159' bgs.
12/15/2015	Completed cementing of 36" casing using 877.5 ft ³ of cement.
12/16/2014	Drilled out cement from 149' bgs to 167' bgs with 17-1/2" tooling.
12/16-18/2014	Drilled from 167' bgs to 576' bgs with 17-1/2" tooling. On 12/18/2014 tooling was seized in hole by flowing sand.
12/18-23/2014	Attempted to free locked drill string with various methods such as air and convectional mud pumping, pumping annulus using tremie pipe, and injection of penetrol.
12/23-28/2014	Holiday Break. Boart Longyear in Salt Lake assembled wash-over equipment and shipped to site.
12/28-31/2014	Set-up wash-over tooling onsite and began to drill around seized 17-1/2" tooling from 145' bgs to 340' bgs.

Magnum CW-8 January 2015 Monthly Status Report Summary

1/1-3/2015 Continued to wash-over 17-1/2" tooling from 304' bgs to 473' bgs.

1-/3-4/2015 Loosened 17-1/2" tooling from sand and tripped wash-over tooling and 17-1/2" tooling from hole. Tripped 17-1/2" tooling to bottom.

1/4-6/2015 Drilled pilot hole from 474' bgs to 770' bgs with 17-1/2" tooling.

1/6/2015 Century performed open hole gamma wireline logging.

1/7-9/2015 Reamed hole to 24 inches from 175' bgs to 762' bgs.

1/9-10/2015 B&L installed 758 feet of 30x.750" casing set to 756' bgs.

1/10/2015 Thermasource completed cementing of 30" casing using 1989.6 ft³ of cement.

1/11-13/2015 Allowed cement to cure.

1/13/2015 Assembled BOP and pressure tested 30" casing. The surface pressure test was completed successfully and was within project and permit specifications.

30" Casing Test Results: 30-minute test. Surface pressure 520 psi. Pressure loss: 0 psi (<10%).

1/14-30/2015 Drilled out cement and shoe from 740' bgs to 770' bgs and continued pilot hole from 770' bgs to 3200' bgs.

1/31/2015 Century performed open hole gamma, neutron, density, SP, and resistivity wireline logging.

Magnum CW-8 February 2015 Monthly Status Report Summary

2/1-13/2015 Reamed pilot hole to 28 inches from 744' bgs to 3050' bgs.

2/14/2015 Century performed open hole deviation and caliper wireline logging.

2/14-15/2015 B&L installed 2086.55 feet of 24x1" and 949.45 feet of 24x.625" casing set to 3036' bgs.

2/15-16/2015 Thermasource cemented 24" casing using 3890.9 ft³ of cement.

2/16-19/2015 Allowed cement to cure.

2/19/2015 Assembled BOP and pressure tested 24" casing. The surface pressure test was completed successfully and was within project and permit specifications.

24" Casing Test Results: 60-minute test. Surface pressure 945 psi. Pressure loss: 5 psi (<5%).

2/20-21/2015 Drilled out cement and shoe from 2922' bgs to 3050' bgs with 21-1/2" tooling.

2/21-26/2015 Drilled pilot hole from 3030' bgs to 3800' bgs with 12-1/4" tooling.

2/27/2015 Jet West performed open hole gamma, neutron, density, sonic, and deviation wireline logging.

2/27-28/2015 Reamed pilot hole to 24 inches from 3040' bgs to 3115' bgs.

STATE OF UTAH DEPARTMENT OF NATURAL RESOURCES DIVISION OF OIL, GAS, AND MINING		FORM 9
SUNDRY NOTICES AND REPORTS ON WELLS		5. LEASE DESIGNATION AND SERIAL NUMBER: 51573-OBA
Do not use this form for proposals to drill new wells, significantly deepen existing wells below current bottom-hole depth, reenter plugged wells, or to drill horizontal laterals. Use APPLICATION FOR PERMIT TO DRILL form for such proposals.		6. IF INDIAN, ALLOTTEE OR TRIBE NAME:
		7. UNIT or CA AGREEMENT NAME:
1. TYPE OF WELL Gas Storage Well		8. WELL NAME and NUMBER: CW-8
2. NAME OF OPERATOR: MAGNUM NGLS SOLUTION MINING LLC		9. API NUMBER: 43027500050000
3. ADDRESS OF OPERATOR: 3165 East Millrock Drive Suite 330 , Holladay, UT, 84121	PHONE NUMBER: 801 993-7001 Ext	9. FIELD and POOL or WILDCAT: DELTA SALT CAVERN STORAGE
4. LOCATION OF WELL FOOTAGES AT SURFACE: 0805 FSL 0548 FWL QTR/QTR, SECTION, TOWNSHIP, RANGE, MERIDIAN: Qtr/Qtr: SWSW Section: 23 Township: 15.0S Range: 07.0W Meridian: S		COUNTY: MILLARD
		STATE: UTAH
11. CHECK APPROPRIATE BOXES TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA		
TYPE OF SUBMISSION	TYPE OF ACTION	
<input type="checkbox"/> NOTICE OF INTENT Approximate date work will start: <input checked="" type="checkbox"/> SUBSEQUENT REPORT Date of Work Completion: 3/7/2015 <input type="checkbox"/> SPUD REPORT Date of Spud: <input type="checkbox"/> DRILLING REPORT Report Date:	<input type="checkbox"/> ACIDIZE <input type="checkbox"/> ALTER CASING <input type="checkbox"/> CASING REPAIR <input type="checkbox"/> CHANGE TO PREVIOUS PLANS <input type="checkbox"/> CHANGE TUBING <input type="checkbox"/> CHANGE WELL NAME <input type="checkbox"/> CHANGE WELL STATUS <input type="checkbox"/> COMMINGLE PRODUCING FORMATIONS <input type="checkbox"/> CONVERT WELL TYPE <input type="checkbox"/> DEEPEN <input type="checkbox"/> FRACTURE TREAT <input type="checkbox"/> NEW CONSTRUCTION <input type="checkbox"/> OPERATOR CHANGE <input type="checkbox"/> PLUG AND ABANDON <input type="checkbox"/> PLUG BACK <input type="checkbox"/> PRODUCTION START OR RESUME <input type="checkbox"/> RECLAMATION OF WELL SITE <input type="checkbox"/> RECOMPLETE DIFFERENT FORMATION <input type="checkbox"/> REPERFORATE CURRENT FORMATION <input type="checkbox"/> SIDETRACK TO REPAIR WELL <input type="checkbox"/> TEMPORARY ABANDON <input type="checkbox"/> TUBING REPAIR <input type="checkbox"/> VENT OR FLARE <input type="checkbox"/> WATER DISPOSAL <input type="checkbox"/> WATER SHUTOFF <input type="checkbox"/> SI TA STATUS EXTENSION <input type="checkbox"/> WILDCAT WELL DETERMINATION <input checked="" type="checkbox"/> OTHER	
	OTHER: <input style="width: 100px;" type="text" value="Cement 20"/>	
12. DESCRIBE PROPOSED OR COMPLETED OPERATIONS. Clearly show all pertinent details including dates, depths, volumes, etc.		
<p>On 3/7/2015 Boart Longyear and Ridge Cement completed the cementing of 1982.49 ft of 20"x 1" and 1545.51 ft of 20" x 0.625" wall thickness casing on well CW-8; the casing was set to 3528 feet bgs. Ridge Cement mixed 394.3 bbl. of cement, and was pumped into the annular space around the casing using the stab-in cementing method, 84.3 bbl. of cement were returned to the surface.</p>		
<p>Accepted by the Utah Division of Oil, Gas and Mining FOR RECORD ONLY March 16, 2015</p>		
NAME (PLEASE PRINT) Adam Richins	PHONE NUMBER 801 993-7001	TITLE Compliance Manager
SIGNATURE N/A		DATE 3/13/2015

STATE OF UTAH DEPARTMENT OF NATURAL RESOURCES DIVISION OF OIL, GAS, AND MINING		FORM 9	
SUNDRY NOTICES AND REPORTS ON WELLS		5. LEASE DESIGNATION AND SERIAL NUMBER: 51573-OBA	
Do not use this form for proposals to drill new wells, significantly deepen existing wells below current bottom-hole depth, reenter plugged wells, or to drill horizontal laterals. Use APPLICATION FOR PERMIT TO DRILL form for such proposals.		6. IF INDIAN, ALLOTTEE OR TRIBE NAME:	
		7. UNIT or CA AGREEMENT NAME:	
1. TYPE OF WELL Gas Storage Well		8. WELL NAME and NUMBER: CW-8	
2. NAME OF OPERATOR: MAGNUM NGLS SOLUTION MINING LLC		9. API NUMBER: 43027500050000	
3. ADDRESS OF OPERATOR: 3165 East Millrock Drive Suite 330 , Holladay, UT, 84121	PHONE NUMBER: 801 993-7001 Ext	9. FIELD and POOL or WILDCAT: DELTA SALT CAVERN STORAGE	
4. LOCATION OF WELL FOOTAGES AT SURFACE: 0805 FSL 0548 FWL QTR/QTR, SECTION, TOWNSHIP, RANGE, MERIDIAN: Qtr/Qtr: SWSW Section: 23 Township: 15.0S Range: 07.0W Meridian: S		COUNTY: MILLARD	
		STATE: UTAH	
11. CHECK APPROPRIATE BOXES TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA			
TYPE OF SUBMISSION	TYPE OF ACTION		
<input type="checkbox"/> NOTICE OF INTENT Approximate date work will start: <input checked="" type="checkbox"/> SUBSEQUENT REPORT Date of Work Completion: 3/11/2015 <input type="checkbox"/> SPUD REPORT Date of Spud: <input type="checkbox"/> DRILLING REPORT Report Date:	<input type="checkbox"/> ACIDIZE <input type="checkbox"/> CHANGE TO PREVIOUS PLANS <input type="checkbox"/> CHANGE WELL STATUS <input type="checkbox"/> DEEPEN <input type="checkbox"/> OPERATOR CHANGE <input type="checkbox"/> PRODUCTION START OR RESUME <input type="checkbox"/> REPERFORATE CURRENT FORMATION <input type="checkbox"/> TUBING REPAIR <input type="checkbox"/> WATER SHUTOFF <input type="checkbox"/> WILDCAT WELL DETERMINATION <input type="checkbox"/> ALTER CASING <input type="checkbox"/> CHANGE TUBING <input type="checkbox"/> COMMINGLE PRODUCING FORMATIONS <input type="checkbox"/> FRACTURE TREAT <input type="checkbox"/> PLUG AND ABANDON <input type="checkbox"/> RECLAMATION OF WELL SITE <input type="checkbox"/> SIDETRACK TO REPAIR WELL <input type="checkbox"/> VENT OR FLARE <input type="checkbox"/> SI TA STATUS EXTENSION <input checked="" type="checkbox"/> OTHER		<input type="checkbox"/> CASING REPAIR <input type="checkbox"/> CHANGE WELL NAME <input type="checkbox"/> CONVERT WELL TYPE <input type="checkbox"/> NEW CONSTRUCTION <input type="checkbox"/> PLUG BACK <input type="checkbox"/> RECOMPLETE DIFFERENT FORMATION <input type="checkbox"/> TEMPORARY ABANDON <input type="checkbox"/> WATER DISPOSAL <input type="checkbox"/> APD EXTENSION OTHER: 20 inch Casing Pressure Tes
12. DESCRIBE PROPOSED OR COMPLETED OPERATIONS. Clearly show all pertinent details including dates, depths, volumes, etc.			
<p>Completed Pressure test of BOP and 20" diameter casing on March 11, 2015. Bottom of csing set at 3528 feet bgs. 1982.49 feet 20" x 1" and 1545.51 feet of 20" x 0.625 wall thickness. BOP: 21-1/4_2000 R73, CRA Serial No. 01337 Pressure Recorder: Barton, Instrument No. 118730. Duration of test was 1 hour with a starting pressure of 900 psi. Pressure loss was 10 psi over the duration of the test (less than 5%) Passing. The pressure testing and results were performed in accordance with Project Specifications & DOGM APD Permit Requirements.</p>		<p>Accepted by the Utah Division of Oil, Gas and Mining FOR RECORD ONLY March 16, 2015</p>	
NAME (PLEASE PRINT) Adam Richins	PHONE NUMBER 801 993-7001	TITLE Compliance Manager	
SIGNATURE N/A		DATE 3/13/2015	

STATE OF UTAH DEPARTMENT OF NATURAL RESOURCES DIVISION OF OIL, GAS, AND MINING		FORM 9
SUNDRY NOTICES AND REPORTS ON WELLS		5. LEASE DESIGNATION AND SERIAL NUMBER: 51573-OBA
Do not use this form for proposals to drill new wells, significantly deepen existing wells below current bottom-hole depth, reenter plugged wells, or to drill horizontal laterals. Use APPLICATION FOR PERMIT TO DRILL form for such proposals.		6. IF INDIAN, ALLOTTEE OR TRIBE NAME:
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TYPE OF SUBMISSION	TYPE OF ACTION	
<input type="checkbox"/> NOTICE OF INTENT Approximate date work will start: <input checked="" type="checkbox"/> SUBSEQUENT REPORT Date of Work Completion: 3/13/2015 <input type="checkbox"/> SPUD REPORT Date of Spud: <input type="checkbox"/> DRILLING REPORT Report Date:	<input type="checkbox"/> ACIDIZE <input type="checkbox"/> ALTER CASING <input type="checkbox"/> CHANGE TO PREVIOUS PLANS <input type="checkbox"/> CHANGE TUBING <input type="checkbox"/> CHANGE WELL STATUS <input type="checkbox"/> COMMINGLE PRODUCING FORMATIONS <input type="checkbox"/> DEEPEN <input type="checkbox"/> FRACTURE TREAT <input type="checkbox"/> OPERATOR CHANGE <input type="checkbox"/> PLUG AND ABANDON <input type="checkbox"/> PRODUCTION START OR RESUME <input type="checkbox"/> RECLAMATION OF WELL SITE <input type="checkbox"/> REPERFORATE CURRENT FORMATION <input type="checkbox"/> SIDETRACK TO REPAIR WELL <input type="checkbox"/> TUBING REPAIR <input type="checkbox"/> VENT OR FLARE <input type="checkbox"/> WATER SHUTOFF <input type="checkbox"/> SI TA STATUS EXTENSION <input type="checkbox"/> WILDCAT WELL DETERMINATION <input checked="" type="checkbox"/> OTHER	
	<input type="checkbox"/> CASING REPAIR <input type="checkbox"/> CHANGE WELL NAME <input type="checkbox"/> CONVERT WELL TYPE <input type="checkbox"/> NEW CONSTRUCTION <input type="checkbox"/> PLUG BACK <input type="checkbox"/> RECOMPLETE DIFFERENT FORMATION <input type="checkbox"/> TEMPORARY ABANDON <input type="checkbox"/> WATER DISPOSAL <input type="checkbox"/> APD EXTENSION OTHER: 20 inch Casing Pressure Test	
12. DESCRIBE PROPOSED OR COMPLETED OPERATIONS. Clearly show all pertinent details including dates, depths, volumes, etc.		
<p>Completed Pressure test of BOP and 20" diameter casing on March 13, 2015. Bottom of casing set at 3528 feet bgs. Casing: 1982.49 feet of 20" x 1" and 1545.51 feet of 20" x 0.625" wall thickness.</p> <p>BOP: 21-1/4_2000 R73, CRA Serial No. 01337 Pressure Recorder: Barton, Instrument No. 118730 Duration of test was 4 hr. with a starting pressure of 900 psi. Pressure loss was 25 psi over the duration of the test (less than 5%) Passing. The pressure testing and results were performed in accordance with Project Specifications & DOGM APD Permit Requirements.</p>		
<p>Accepted by the Utah Division of Oil, Gas and Mining FOR RECORD ONLY March 17, 2015</p>		
NAME (PLEASE PRINT) Adam Richins	PHONE NUMBER 801 993-7001	TITLE Compliance Manager
SIGNATURE N/A		DATE 3/13/2015

STATE OF UTAH DEPARTMENT OF NATURAL RESOURCES DIVISION OF OIL, GAS, AND MINING	FORM 9
SUNDRY NOTICES AND REPORTS ON WELLS Do not use this form for proposals to drill new wells, significantly deepen existing wells below current bottom-hole depth, reenter plugged wells, or to drill horizontal laterals. Use APPLICATION FOR PERMIT TO DRILL form for such proposals.	5. LEASE DESIGNATION AND SERIAL NUMBER: 51573-OBA
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3. ADDRESS OF OPERATOR: 3165 East Millrock Drive Suite 330 , Holladay, UT, 84121	9. API NUMBER: 43027500050000
4. LOCATION OF WELL FOOTAGES AT SURFACE: 0805 FSL 0548 FWL QTR/QTR, SECTION, TOWNSHIP, RANGE, MERIDIAN: Qtr/Qtr: SWSW Section: 23 Township: 15.0S Range: 07.0W Meridian: S	9. FIELD and POOL or WILDCAT: DELTA SALT CAVERN STORAGE COUNTY: MILLARD STATE: UTAH
11. CHECK APPROPRIATE BOXES TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA	

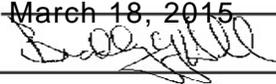
TYPE OF SUBMISSION	TYPE OF ACTION		
<input type="checkbox"/> NOTICE OF INTENT Approximate date work will start:	<input type="checkbox"/> ACIDIZE	<input type="checkbox"/> ALTER CASING	<input type="checkbox"/> CASING REPAIR
<input checked="" type="checkbox"/> SUBSEQUENT REPORT Date of Work Completion: 3/11/2015	<input type="checkbox"/> CHANGE TO PREVIOUS PLANS	<input type="checkbox"/> CHANGE TUBING	<input type="checkbox"/> CHANGE WELL NAME
<input type="checkbox"/> SPUD REPORT Date of Spud:	<input type="checkbox"/> CHANGE WELL STATUS	<input type="checkbox"/> COMMINGLE PRODUCING FORMATIONS	<input type="checkbox"/> CONVERT WELL TYPE
<input type="checkbox"/> DRILLING REPORT Report Date:	<input type="checkbox"/> DEEPEN	<input type="checkbox"/> FRACTURE TREAT	<input type="checkbox"/> NEW CONSTRUCTION
	<input type="checkbox"/> OPERATOR CHANGE	<input type="checkbox"/> PLUG AND ABANDON	<input type="checkbox"/> PLUG BACK
	<input type="checkbox"/> PRODUCTION START OR RESUME	<input type="checkbox"/> RECLAMATION OF WELL SITE	<input type="checkbox"/> RECOMPLETE DIFFERENT FORMATION
	<input type="checkbox"/> REPERFORATE CURRENT FORMATION	<input type="checkbox"/> SIDETRACK TO REPAIR WELL	<input type="checkbox"/> TEMPORARY ABANDON
	<input type="checkbox"/> TUBING REPAIR	<input type="checkbox"/> VENT OR FLARE	<input type="checkbox"/> WATER DISPOSAL
	<input type="checkbox"/> WATER SHUTOFF	<input type="checkbox"/> SI TA STATUS EXTENSION	<input type="checkbox"/> APD EXTENSION
	<input type="checkbox"/> WILDCAT WELL DETERMINATION	<input checked="" type="checkbox"/> OTHER	OTHER: 20 inch Casing Pressure Tes

12. DESCRIBE PROPOSED OR COMPLETED OPERATIONS. Clearly show all pertinent details including dates, depths, volumes, etc.

Completed Pressure test of BOP and 20" diameter casing on March 11, 2015. Bottom of casing set at 3528 feet bgs. 1982.49 feet 20" x 1" and 1545.51 feet of 20" x 0.625 wall thickness. BOP: 21-1/4_2000 R73, CRA Serial No. 01337 Pressure Recorder: Barton, Instrument No. 118730. Duration of test was 1 hour with a starting pressure of 900 psi. Pressure loss was 10 psi over the duration of the test (less than 5%) Passing. The pressure testing and results were performed in accordance with Project Specifications & DOGM APD Permit Requirements.

**Accepted by the
Utah Division of
Oil, Gas and Mining**

Date: March 18, 2015

By: 

NAME (PLEASE PRINT) Adam Richins	PHONE NUMBER 801 993-7001	TITLE Compliance Manager
SIGNATURE N/A	DATE 3/13/2015	

STATE OF UTAH DEPARTMENT OF NATURAL RESOURCES DIVISION OF OIL, GAS, AND MINING		FORM 9	
SUNDRY NOTICES AND REPORTS ON WELLS Do not use this form for proposals to drill new wells, significantly deepen existing wells below current bottom-hole depth, reenter plugged wells, or to drill horizontal laterals. Use APPLICATION FOR PERMIT TO DRILL form for such proposals.		5. LEASE DESIGNATION AND SERIAL NUMBER: 51573-OBA	
		6. IF INDIAN, ALLOTTEE OR TRIBE NAME:	
1. TYPE OF WELL Gas Storage Well		7. UNIT or CA AGREEMENT NAME:	
2. NAME OF OPERATOR: MAGNUM NGLS SOLUTION MINING LLC		8. WELL NAME and NUMBER: CW-8	
3. ADDRESS OF OPERATOR: 3165 East Millrock Drive Suite 330 , Holladay, UT, 84121		9. API NUMBER: 43027500050000	
4. LOCATION OF WELL FOOTAGES AT SURFACE: 0805 FSL 0548 FWL QTR/QTR, SECTION, TOWNSHIP, RANGE, MERIDIAN: Qtr/Qtr: SWSW Section: 23 Township: 15.0S Range: 07.0W Meridian: S		9. FIELD and POOL or WILDCAT: DELTA SALT CAVERN STORAGE	
		COUNTY: MILLARD	
		STATE: UTAH	
11. CHECK APPROPRIATE BOXES TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA			
TYPE OF SUBMISSION	TYPE OF ACTION		
<input type="checkbox"/> NOTICE OF INTENT Approximate date work will start: <input checked="" type="checkbox"/> SUBSEQUENT REPORT Date of Work Completion: 3/16/2015 <input type="checkbox"/> SPUD REPORT Date of Spud: <input type="checkbox"/> DRILLING REPORT Report Date:	<input type="checkbox"/> ACIDIZE <input type="checkbox"/> CHANGE TO PREVIOUS PLANS <input type="checkbox"/> CHANGE WELL STATUS <input type="checkbox"/> DEEPEN <input type="checkbox"/> OPERATOR CHANGE <input type="checkbox"/> PRODUCTION START OR RESUME <input type="checkbox"/> REPERFORATE CURRENT FORMATION <input type="checkbox"/> TUBING REPAIR <input type="checkbox"/> WATER SHUTOFF <input type="checkbox"/> WILDCAT WELL DETERMINATION	<input type="checkbox"/> ALTER CASING <input type="checkbox"/> CHANGE TUBING <input type="checkbox"/> COMMINGLE PRODUCING FORMATIONS <input type="checkbox"/> FRACTURE TREAT <input type="checkbox"/> PLUG AND ABANDON <input type="checkbox"/> RECLAMATION OF WELL SITE <input type="checkbox"/> SIDETRACK TO REPAIR WELL <input type="checkbox"/> VENT OR FLARE <input type="checkbox"/> SI TA STATUS EXTENSION <input checked="" type="checkbox"/> OTHER	<input type="checkbox"/> CASING REPAIR <input type="checkbox"/> CHANGE WELL NAME <input type="checkbox"/> CONVERT WELL TYPE <input type="checkbox"/> NEW CONSTRUCTION <input type="checkbox"/> PLUG BACK <input type="checkbox"/> RECOMPLETE DIFFERENT FORMATION <input type="checkbox"/> TEMPORARY ABANDON <input type="checkbox"/> WATER DISPOSAL <input type="checkbox"/> APD EXTENSION OTHER: <input type="text" value="Cement 16 inch Conductor"/>
12. DESCRIBE PROPOSED OR COMPLETED OPERATIONS. Clearly show all pertinent details including dates, depths, volumes, etc.			
<p>On 3/16/2015 Boart Longyear and Ridge Cement completed the cementing of 893.73 ft of 16" x .656" and 2725.77 ft of 16" x 0.575" wall thickness casing on well CW-8; the casing was set to 3619.5 feet bgs. Ridge Cement mixed 309 bbl. of cement, and was pumped into the annular space around the casing using the stab-in cementing method, 10 bbl of cement were returned to the surface.</p>			
<p>Accepted by the Utah Division of Oil, Gas and Mining FOR RECORD ONLY March 23, 2015</p>			
NAME (PLEASE PRINT) Adam Richins		PHONE NUMBER 801 993-7001	TITLE Compliance Manager
SIGNATURE N/A		DATE 3/23/2015	

STATE OF UTAH DEPARTMENT OF NATURAL RESOURCES DIVISION OF OIL, GAS, AND MINING		FORM 9
SUNDRY NOTICES AND REPORTS ON WELLS Do not use this form for proposals to drill new wells, significantly deepen existing wells below current bottom-hole depth, reenter plugged wells, or to drill horizontal laterals. Use APPLICATION FOR PERMIT TO DRILL form for such proposals.		5. LEASE DESIGNATION AND SERIAL NUMBER: 51573-OBA
1. TYPE OF WELL Gas Storage Well		6. IF INDIAN, ALLOTTEE OR TRIBE NAME:
2. NAME OF OPERATOR: MAGNUM NGLS SOLUTION MINING LLC		7. UNIT or CA AGREEMENT NAME:
3. ADDRESS OF OPERATOR: 3165 East Millrock Drive Suite 330 , Holladay, UT, 84121		8. WELL NAME and NUMBER: CW-8
4. LOCATION OF WELL FOOTAGES AT SURFACE: 0805 FSL 0548 FWL QTR/QTR, SECTION, TOWNSHIP, RANGE, MERIDIAN: Qtr/Qtr: SWSW Section: 23 Township: 15.0S Range: 07.0W Meridian: S		9. API NUMBER: 43027500050000
PHONE NUMBER: 801 993-7001 Ext		9. FIELD and POOL or WILDCAT: DELTA SALT CAVERN STORAGE
		COUNTY: MILLARD
		STATE: UTAH
11. CHECK APPROPRIATE BOXES TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA		
TYPE OF SUBMISSION	TYPE OF ACTION	
<input type="checkbox"/> NOTICE OF INTENT Approximate date work will start:	<input type="checkbox"/> ACIDIZE <input type="checkbox"/> ALTER CASING <input type="checkbox"/> CASING REPAIR <input type="checkbox"/> CHANGE TO PREVIOUS PLANS <input type="checkbox"/> CHANGE TUBING <input type="checkbox"/> CHANGE WELL NAME <input type="checkbox"/> CHANGE WELL STATUS <input type="checkbox"/> COMMINGLE PRODUCING FORMATIONS <input type="checkbox"/> CONVERT WELL TYPE <input type="checkbox"/> DEEPEN <input type="checkbox"/> FRACTURE TREAT <input type="checkbox"/> NEW CONSTRUCTION <input type="checkbox"/> OPERATOR CHANGE <input type="checkbox"/> PLUG AND ABANDON <input type="checkbox"/> PLUG BACK <input type="checkbox"/> PRODUCTION START OR RESUME <input type="checkbox"/> RECLAMATION OF WELL SITE <input type="checkbox"/> RECOMPLETE DIFFERENT FORMATION <input type="checkbox"/> REPERFORATE CURRENT FORMATION <input type="checkbox"/> SIDETRACK TO REPAIR WELL <input type="checkbox"/> TEMPORARY ABANDON <input type="checkbox"/> TUBING REPAIR <input type="checkbox"/> VENT OR FLARE <input type="checkbox"/> WATER DISPOSAL <input type="checkbox"/> WATER SHUTOFF <input type="checkbox"/> SI TA STATUS EXTENSION <input type="checkbox"/> WILDCAT WELL DETERMINATION <input checked="" type="checkbox"/> OTHER	
<input checked="" type="checkbox"/> SUBSEQUENT REPORT Date of Work Completion: 3/22/2015	OTHER: 16 inch Casing Pressure Tes	
<input type="checkbox"/> SPUD REPORT Date of Spud:		
<input type="checkbox"/> DRILLING REPORT Report Date:		
12. DESCRIBE PROPOSED OR COMPLETED OPERATIONS. Clearly show all pertinent details including dates, depths, volumes, etc.		
Completed Pressure test of BOP and 16" diameter casing on 22 March 2015. Bottom of casing set at 3619.5 feet bgs. Casing: 2725.77ft of 16" x .575" and 893.78ft of 16" x 0.656" wall thickness. BOP: 21-1/4_2000 R73, CRA Serial No. 01337 Pressure Recorder: Barton, Instrument No.118730 Duration of test was 4 hr. with a starting pressure of 1,100 psi. Pressure loss was 20 psi over the duration of the test (less than 5 percent). Passing The pressure testing and results were performed in accordance with Project Specifications & DOGM APD Permit Requirements.		
Accepted by the Utah Division of Oil, Gas and Mining FOR RECORD ONLY March 23, 2015		
NAME (PLEASE PRINT) Adam Richins	PHONE NUMBER 801 993-7001	TITLE Compliance Manager
SIGNATURE N/A	DATE 3/23/2015	

STATE OF UTAH DEPARTMENT OF NATURAL RESOURCES DIVISION OF OIL, GAS, AND MINING		FORM 9
SUNDRY NOTICES AND REPORTS ON WELLS		5. LEASE DESIGNATION AND SERIAL NUMBER: 51573-OBA
Do not use this form for proposals to drill new wells, significantly deepen existing wells below current bottom-hole depth, reenter plugged wells, or to drill horizontal laterals. Use APPLICATION FOR PERMIT TO DRILL form for such proposals.		6. IF INDIAN, ALLOTTEE OR TRIBE NAME:
		7. UNIT or CA AGREEMENT NAME:
1. TYPE OF WELL Gas Storage Well		8. WELL NAME and NUMBER: CW-8
2. NAME OF OPERATOR: MAGNUM NGLS SOLUTION MINING LLC		9. API NUMBER: 43027500050000
3. ADDRESS OF OPERATOR: 3165 East Millrock Drive Suite 330 , Holladay, UT, 84121	PHONE NUMBER: 801 993-7001 Ext	9. FIELD and POOL or WILDCAT: DELTA SALT CAVERN STORAGE
4. LOCATION OF WELL FOOTAGES AT SURFACE: 0805 FSL 0548 FWL QTR/QTR, SECTION, TOWNSHIP, RANGE, MERIDIAN: Qtr/Qtr: SWSW Section: 23 Township: 15.0S Range: 07.0W Meridian: S		COUNTY: MILLARD
		STATE: UTAH
11. CHECK APPROPRIATE BOXES TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA		
TYPE OF SUBMISSION	TYPE OF ACTION	
<input type="checkbox"/> NOTICE OF INTENT Approximate date work will start: <input checked="" type="checkbox"/> SUBSEQUENT REPORT Date of Work Completion: 3/20/2015 <input type="checkbox"/> SPUD REPORT Date of Spud: <input type="checkbox"/> DRILLING REPORT Report Date:	<input type="checkbox"/> ACIDIZE <input type="checkbox"/> CHANGE TO PREVIOUS PLANS <input type="checkbox"/> CHANGE WELL STATUS <input type="checkbox"/> DEEPEN <input type="checkbox"/> OPERATOR CHANGE <input type="checkbox"/> PRODUCTION START OR RESUME <input type="checkbox"/> REPERFORATE CURRENT FORMATION <input type="checkbox"/> TUBING REPAIR <input type="checkbox"/> WATER SHUTOFF <input type="checkbox"/> WILDCAT WELL DETERMINATION	<input type="checkbox"/> ALTER CASING <input type="checkbox"/> CHANGE TUBING <input type="checkbox"/> COMMINGLE PRODUCING FORMATIONS <input type="checkbox"/> FRACTURE TREAT <input type="checkbox"/> PLUG AND ABANDON <input type="checkbox"/> RECLAMATION OF WELL SITE <input type="checkbox"/> SIDETRACK TO REPAIR WELL <input type="checkbox"/> VENT OR FLARE <input type="checkbox"/> SI TA STATUS EXTENSION <input checked="" type="checkbox"/> OTHER
		<input type="checkbox"/> CASING REPAIR <input type="checkbox"/> CHANGE WELL NAME <input type="checkbox"/> CONVERT WELL TYPE <input type="checkbox"/> NEW CONSTRUCTION <input type="checkbox"/> PLUG BACK <input type="checkbox"/> RECOMPLETE DIFFERENT FORMATION <input type="checkbox"/> TEMPORARY ABANDON <input type="checkbox"/> WATER DISPOSAL <input type="checkbox"/> APD EXTENSION OTHER: 16 inch Casing Pressure Tes
12. DESCRIBE PROPOSED OR COMPLETED OPERATIONS. Clearly show all pertinent details including dates, depths, volumes, etc.		
<p>Completed Pressure test of BOP and 16" diameter casing on 20 March 2015. Bottom of casing set at 3619.5 feet bgs. Casing: 2725.77ft of 16" x .575" and 893.78ft of 16" x 0.656" wall thickness. BOP: 21-1/4_2000 R73, CRA Serial No. 01337 Pressure Recorder: Barton, Instrument No.118730 Duration of test was 1 hr. with a starting pressure of 1,100 psi. Pressure loss was 15 psi over the duration of the test (less than 5 percent). Passing The pressure testing and results were performed in accordance with Project Specifications & DOGM APD Permit Requirements.</p>		<p>Accepted by the Utah Division of Oil, Gas and Mining FOR RECORD ONLY March 23, 2015</p>
NAME (PLEASE PRINT) Adam Richins	PHONE NUMBER 801 993-7001	TITLE Compliance Manager
SIGNATURE N/A		DATE 3/23/2015

STATE OF UTAH DEPARTMENT OF NATURAL RESOURCES DIVISION OF OIL, GAS, AND MINING		FORM 9	
SUNDRY NOTICES AND REPORTS ON WELLS Do not use this form for proposals to drill new wells, significantly deepen existing wells below current bottom-hole depth, reenter plugged wells, or to drill horizontal laterals. Use APPLICATION FOR PERMIT TO DRILL form for such proposals.		5. LEASE DESIGNATION AND SERIAL NUMBER: 51573-OBA	
		6. IF INDIAN, ALLOTTEE OR TRIBE NAME:	
1. TYPE OF WELL Gas Storage Well		7. UNIT or CA AGREEMENT NAME:	
2. NAME OF OPERATOR: MAGNUM NGLS SOLUTION MINING LLC		8. WELL NAME and NUMBER: CW-8	
3. ADDRESS OF OPERATOR: 3165 East Millrock Drive Suite 330 , Holladay, UT, 84121		9. API NUMBER: 43027500050000	
4. LOCATION OF WELL FOOTAGES AT SURFACE: 0805 FSL 0548 FWL QTR/QTR, SECTION, TOWNSHIP, RANGE, MERIDIAN: Qtr/Qtr: SWSW Section: 23 Township: 15.0S Range: 07.0W Meridian: S		9. FIELD and POOL or WILDCAT: DELTA SALT CAVERN STORAGE	
		COUNTY: MILLARD	
		STATE: UTAH	
11. CHECK APPROPRIATE BOXES TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA			
TYPE OF SUBMISSION	TYPE OF ACTION		
<input type="checkbox"/> NOTICE OF INTENT Approximate date work will start: <input checked="" type="checkbox"/> SUBSEQUENT REPORT Date of Work Completion: 4/5/2015 <input type="checkbox"/> SPUD REPORT Date of Spud: <input type="checkbox"/> DRILLING REPORT Report Date:	<input type="checkbox"/> ACIDIZE <input type="checkbox"/> CHANGE TO PREVIOUS PLANS <input type="checkbox"/> CHANGE WELL STATUS <input type="checkbox"/> DEEPEN <input type="checkbox"/> OPERATOR CHANGE <input type="checkbox"/> PRODUCTION START OR RESUME <input type="checkbox"/> REPERFORATE CURRENT FORMATION <input type="checkbox"/> TUBING REPAIR <input type="checkbox"/> WATER SHUTOFF <input type="checkbox"/> WILDCAT WELL DETERMINATION	<input type="checkbox"/> ALTER CASING <input type="checkbox"/> CHANGE TUBING <input type="checkbox"/> COMMINGLE PRODUCING FORMATIONS <input type="checkbox"/> FRACTURE TREAT <input type="checkbox"/> PLUG AND ABANDON <input type="checkbox"/> RECLAMATION OF WELL SITE <input type="checkbox"/> SIDETRACK TO REPAIR WELL <input type="checkbox"/> VENT OR FLARE <input type="checkbox"/> SI TA STATUS EXTENSION <input checked="" type="checkbox"/> OTHER	<input type="checkbox"/> CASING REPAIR <input type="checkbox"/> CHANGE WELL NAME <input type="checkbox"/> CONVERT WELL TYPE <input type="checkbox"/> NEW CONSTRUCTION <input type="checkbox"/> PLUG BACK <input type="checkbox"/> RECOMPLETE DIFFERENT FORMATION <input type="checkbox"/> TEMPORARY ABANDON <input type="checkbox"/> WATER DISPOSAL <input type="checkbox"/> APD EXTENSION OTHER: Monthly Status Report March
12. DESCRIBE PROPOSED OR COMPLETED OPERATIONS. Clearly show all pertinent details including dates, depths, volumes, etc.			
Magnum Cavern Well CW-8 Monthly Status Report for March, 2015 (API No. 4302750005): See Attached Summary Report. Drilling activities were in direct accordance with project specifications and Utah DOGM Application Permit to Drill requirements.			
Accepted by the Utah Division of Oil, Gas and Mining FOR RECORD ONLY April 08, 2015			
NAME (PLEASE PRINT) Adam Richins	PHONE NUMBER 801 993-7001	TITLE Compliance Manager	
SIGNATURE N/A	DATE 4/7/2015		

Magnum CW-8 March 2015 Monthly Status Report Summary

- 3/1-5-2015** Reamed hole to 24 inches from 3115' bgs to 3535' bgs.
- 3/5/2015** Jet West performed X-Y caliper wireline log.
- 3/6/2015** B&L installed 1982.49ft of 20" x 1" and 1545.51ft of 20" x 0.625" casing to a depth of 3528' bgs.
- 3/7/2015** Ridge Cement cemented the 20" casing using 1305.1 ft³ of cement.
- 3/7-10/2015** Allowed cement to cure.
- 3/11/2015** Assembled BOP and pressure tested 20" casing. The surface pressure test was completed successfully and was within project and permit specifications.
- 20" Casing Test Results: 60-minute test. Surface pressure 900 psi. Pressure loss: 10 psi (<5%).**
- 3/11-12/2015** Drilled out cement and shoe from 3452' bgs to 3538' bgs with 17-1/2" tooling.
- 3/12-13/2015** Assembled BOP and pressure tested 20" casing seat. The surface pressure test was completed successfully and was within project and permit specifications.
- 20" Casing Seat Test Results: 240-minute test. Surface pressure 900 psi. Pressure loss: 25 psi (<5%).**
- 3/13-15/2015** Reamed hole to 22 inches from 3536' bgs to 3630' bgs
- 3/15/2015** Jet West performed X-Y caliper wireline log.
- 3/15-16/2015** B&L installed 893.73ft of 16" x .656" and 2725.77ft of 16" x 0.575" casing to a depth of 3619.5' bgs.
- 3/16/2015** Ridge Cement cemented the 16" casing using 1258.8 ft³ of cement.
- 3/16-20/2015** Allowed cement to cure.
- 3/20-21/2015** Assembled BOP and pressure tested 16" casing. The surface pressure test was completed successfully and was within project and permit specifications.
- 16" Casing Test Results: 60-minute test. Surface pressure 1100 psi. Pressure loss: 15 psi (<5%).**

- 3/21/2015** Drilled out cement and shoe from 3571' bgs to 3630' bgs with 14-3/4" tooling.
- 3/22/2015** Assembled BOP and pressure tested 16" casing seat. The surface pressure test was completed successfully and was within project and permit specifications.
- 16" Casing Seat Test Results: 240-minute test. Surface pressure 1100 psi.**
- Pressure loss: 20 psi (<5%).**
- 3/23/2015** Cleaned rat hole from 3630' bgs to 3800' bgs.
- 3/23-31/2015** Drilled pilot hole with 12-1/4" tooling from 3800' bgs to 4850' bgs

STATE OF UTAH DEPARTMENT OF NATURAL RESOURCES DIVISION OF OIL, GAS, AND MINING		FORM 9
		5. LEASE DESIGNATION AND SERIAL NUMBER: 51573-OBA
SUNDRY NOTICES AND REPORTS ON WELLS		6. IF INDIAN, ALLOTTEE OR TRIBE NAME:
Do not use this form for proposals to drill new wells, significantly deepen existing wells below current bottom-hole depth, reenter plugged wells, or to drill horizontal laterals. Use APPLICATION FOR PERMIT TO DRILL form for such proposals.		7. UNIT or CA AGREEMENT NAME:
1. TYPE OF WELL Gas Storage Well		8. WELL NAME and NUMBER: CW-8
2. NAME OF OPERATOR: MAGNUM NGLS SOLUTION MINING LLC		9. API NUMBER: 43027500050000
3. ADDRESS OF OPERATOR: 3165 East Millrock Drive Suite 330 , Holladay, UT, 84121	PHONE NUMBER: 801 993-7001 Ext	9. FIELD and POOL or WILDCAT: DELTA SALT CAVERN STORAGE
4. LOCATION OF WELL FOOTAGES AT SURFACE: 0805 FSL 0548 FWL QTR/QTR, SECTION, TOWNSHIP, RANGE, MERIDIAN: Qtr/Qtr: SWSW Section: 23 Township: 15.0S Range: 07.0W Meridian: S		COUNTY: MILLARD
		STATE: UTAH
11. CHECK APPROPRIATE BOXES TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA		
TYPE OF SUBMISSION	TYPE OF ACTION	
<input type="checkbox"/> NOTICE OF INTENT Approximate date work will start: <input checked="" type="checkbox"/> SUBSEQUENT REPORT Date of Work Completion: 4/23/2015 <input type="checkbox"/> SPUD REPORT Date of Spud: <input type="checkbox"/> DRILLING REPORT Report Date:	<input type="checkbox"/> ACIDIZE <input type="checkbox"/> ALTER CASING <input type="checkbox"/> CASING REPAIR <input type="checkbox"/> CHANGE TO PREVIOUS PLANS <input type="checkbox"/> CHANGE TUBING <input type="checkbox"/> CHANGE WELL NAME <input type="checkbox"/> CHANGE WELL STATUS <input type="checkbox"/> COMMINGLE PRODUCING FORMATIONS <input type="checkbox"/> CONVERT WELL TYPE <input type="checkbox"/> DEEPEN <input type="checkbox"/> FRACTURE TREAT <input type="checkbox"/> NEW CONSTRUCTION <input type="checkbox"/> OPERATOR CHANGE <input type="checkbox"/> PLUG AND ABANDON <input type="checkbox"/> PLUG BACK <input type="checkbox"/> PRODUCTION START OR RESUME <input type="checkbox"/> RECLAMATION OF WELL SITE <input type="checkbox"/> RECOMPLETE DIFFERENT FORMATION <input type="checkbox"/> REPERFORATE CURRENT FORMATION <input type="checkbox"/> SIDETRACK TO REPAIR WELL <input type="checkbox"/> TEMPORARY ABANDON <input type="checkbox"/> TUBING REPAIR <input type="checkbox"/> VENT OR FLARE <input type="checkbox"/> WATER DISPOSAL <input type="checkbox"/> WATER SHUTOFF <input type="checkbox"/> SI TA STATUS EXTENSION <input type="checkbox"/> WILDCAT WELL DETERMINATION <input checked="" type="checkbox"/> OTHER	
12. DESCRIBE PROPOSED OR COMPLETED OPERATIONS. Clearly show all pertinent details including dates, depths, volumes, etc. Magnum Cavern Well CW-8 Monthly Status Report for April, 2015 (API No. 4302750005). See Attached Summary Report. Drilling activities were in direct accordance with project specifications and Utah DOGM Application to Drill requirements.		
		Accepted by the Utah Division of Oil, Gas and Mining FOR RECORD ONLY May 20, 2015
NAME (PLEASE PRINT) Adam Richins	PHONE NUMBER 801 993-7001	TITLE Compliance Manager
SIGNATURE N/A		DATE 5/20/2015

Magnum CW-8 April 2015 Monthly Status Report Summary

4/1-2/2015 Drilled pilot hole with 12-1/4" tooling from 4850' bgs to 5000' bgs.

4/2/2015 Jet West performed X-Y caliper wireline log.

4/3-11/2015 Reamed hole to 18 inches from 3627' bgs to 4300' bgs

4/11-13/2015 Reamed hole to 22.75 inches from 3627' bgs to 3900' bgs

4/14-15/2015 Jet West performed X-Y caliper wireline log, and Haliburton can the case and cement inspection.

4/15-16/2015 B&L installed 4250.15 ft of 16" x 3/8"
1009.87 ft of 8" x 0.500" casing and 3952.23 ft of 8"x.352" with a landing depth of 4953.27 bgs

4/17-23/2015 Dissassemble the rig and move to CW-9

Division of Oil, Gas and Mining

Operator Change/Name Change Worksheet-for State use only

Effective Date: 2/17/2015

FORMER OPERATOR:	NEW OPERATOR:
Magnum NGLs Solutions Mining, LLC N3995 6965 Union Park Avenue, Suite 27 Midval, UT 84047 801-255-9632	NGL Supply Terminal Solution Mining, LLC N4245 6965 Union Park Avenue, Suite 27 Midval, UT 84047 801-255-9632
CA Number(s):	Unit(s):

WELL INFORMATION:

Well Name	Sec	TWN	RNG	API	Entity	Mineral	Surface	Type	Status
CW-6	26	150S	070W	4302750003	19132	State	State	GS	A
CW-7	23	150S	070W	4302750004	19669	State	State	GS	A
CW-8	23	150S	070W	4302750005		State	State	GS	DRL
CW-9	26	150S	070W	4302750006		State	State	GS	DRL
CW-5	23	150S	070W	4302750002	19046	State	State	GS	I

OPERATOR CHANGES DOCUMENTATION:

1. Sundry or legal documentation was received from the **FORMER** operator on: 4/20/2015
2. Sundry or legal documentation was received from the **NEW** operator on: 4/20/2015
3. New operator Division of Corporations Business Number: 8615504-0160

REVIEW:

1. Surface Agreement Sundry from **NEW** operator on Fee Surface wells received on: 4/20/2015
2. Receipt of Acceptance of Drilling Procedures for APD on: 4/20/2015
3. Reports current for Production/Disposition & Sundries: 7/2/2015
4. OPS/SI/TA well(s) reviewed for full cost bonding: 7/2/2015
5. UIC5 on all disposal/injection/storage well(s) approved on: 4/28/2015
6. Surface Facility(s) included in operator change: N/A
7. Inspections of PA state/fee well sites complete on (only upon operators request): N/A

NEW OPERATOR BOND VERIFICATION:

1. Federal well(s) covered by Bond Number: N/A
2. Indian well(s) covered by Bond Number: N/A
3. State/fee well(s) covered by Bond Number(s): B009096a

DATA ENTRY:

1. Well(s) update in the **OGIS** on: 7/2/2015
2. Entity Number(s) updated in **OGIS** on: 7/2/2015
3. Unit(s) operator number update in **OGIS** on: N/A
4. Surface Facilities update in **OGIS** on: N/A
5. State/Fee well(s) attached to bond(s) in **RBDMS** on: 7/2/2015
6. Surface Facilities update in **RBDMS** on: N/A

LEASE INTEREST OWNER NOTIFICATION:

1. The **NEW** operator of the Fee (Mineral) wells has been contacted and informed by a letter from the Division of their responsibility to notify all interest owners of this change on: N/A

COMMENTS:

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

FORM 9

SUNDRY NOTICES AND REPORTS ON WELLS		5. LEASE DESIGNATION AND SERIAL NUMBER: ML-51573.A-OBA
Do not use this form for proposals to drill new wells, significantly deepen existing wells below current bottom-hole depth, reenter plugged wells, or to drill horizontal laterals. Use APPLICATION FOR PERMIT TO DRILL form for such proposals.		6. IF INDIAN, ALLOTTEE OR TRIBE NAME:
1. TYPE OF WELL OIL WELL <input type="checkbox"/> GAS WELL <input type="checkbox"/> OTHER <u>Gas Storage Wells</u>		7. UNIT or CA AGREEMENT NAME:
2. NAME OF OPERATOR: NGL Supply Terminal Solution Mining, LLC		8. WELL NAME and NUMBER: CW-5
3. ADDRESS OF OPERATOR: 6965 Union Park Ave. Ste 27 CITY <u>Midvale</u> STATE <u>UT</u> ZIP <u>84047</u>		9. API NUMBER: 4302750002
4. LOCATION OF WELL FOOTAGES AT SURFACE: 0147 FSL 0167 FWL QTR/QTR, SECTION, TOWNSHIP, RANGE, MERIDIAN: SWSW 23 15S 7 W S		10. FIELD AND POOL, OR WILDCAT: Undesignated
		COUNTY: Millard County STATE: UTAH

11. CHECK APPROPRIATE BOXES TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA			
TYPE OF SUBMISSION	TYPE OF ACTION		
<input type="checkbox"/> NOTICE OF INTENT (Submit in Duplicate) Approximate date work will start: _____ <input checked="" type="checkbox"/> SUBSEQUENT REPORT (Submit Original Form Only) Date of work completion: <u>2/17/2015</u>	<input type="checkbox"/> ACIDIZE <input type="checkbox"/> ALTER CASING <input type="checkbox"/> CASING REPAIR <input type="checkbox"/> CHANGE TO PREVIOUS PLANS <input type="checkbox"/> CHANGE TUBING <input type="checkbox"/> CHANGE WELL NAME <input type="checkbox"/> CHANGE WELL STATUS <input type="checkbox"/> COMMINGLE PRODUCING FORMATIONS <input type="checkbox"/> CONVERT WELL TYPE	<input type="checkbox"/> DEEPEN <input type="checkbox"/> FRACTURE TREAT <input type="checkbox"/> NEW CONSTRUCTION <input checked="" type="checkbox"/> OPERATOR CHANGE <input type="checkbox"/> PLUG AND ABANDON <input type="checkbox"/> PLUG BACK <input type="checkbox"/> PRODUCTION (START/RESUME) <input type="checkbox"/> RECLAMATION OF WELL SITE <input type="checkbox"/> RECOMPLETE - DIFFERENT FORMATION	<input type="checkbox"/> REPERFORATE CURRENT FORMATION <input type="checkbox"/> SIDETRACK TO REPAIR WELL <input type="checkbox"/> TEMPORARILY ABANDON <input type="checkbox"/> TUBING REPAIR <input type="checkbox"/> VENT OR FLARE <input type="checkbox"/> WATER DISPOSAL <input type="checkbox"/> WATER SHUT-OFF <input checked="" type="checkbox"/> OTHER: <u>Operator name change</u>

12. DESCRIBE PROPOSED OR COMPLETED OPERATIONS. Clearly show all pertinent details including dates, depths, volumes, etc.
Change of Operator name from Magnum NGLs Solution Mining, LLC to NGL Supply Terminal Solution Mining, LLC effective 2/17/2015

Operator current name:
Magnum NGLs Solution Mining, LLC, 3165 E Millrock Drive, Suite 330, Holladay, Utah 84121 801-993-7001

Operator new name and address:
NGL Supply Terminal Solution Mining, LLC, 6965 Union Park Avenue, Suite 270 Midvale, Utah 84047 801-255-9632

Wells are under State bond number B009096.

Existing lease. Memorandum of Natural Gas Liquid Storage Lease #ML-51573.A-OBA remains in effect.

See attached list of additional included wells (CW-5, CW-6, CW-7, CW-8, CW-9)

NAME (PLEASE PRINT) <u>Adam Richins</u>	TITLE <u>Safety, Compliance & Regulatory Manager</u>
SIGNATURE <u><i>Adam Richins</i></u>	DATE <u>4/20/2015</u>

(This space for State use only)

APPROVED

JUL 02 2015

DIV. OIL GAS & MINING
BY: Rachel Medina

List of Cavern Wells (Magnum NGLs/Sawt

Well Name	Section	Township	Range	API Number	Entity Number	Mineral Lease Type	Well Type
CW-5	23	15 S	7 W	43-027-50002	N/A	State	Gas Storage Well
CW-6	26	15 S	7 W	43-027-50003	N/A	State	Gas Storage Well
CW-7	23	15 S	7 W	43-027-50004	N/A	State	Gas Storage Well
CW-8	23	15 S	7 W	43-027-50005	N/A	State	Gas Storage Well
CW-9	26	15 S	7 W	43-027-50006	N/A	State	Gas Storage Well

ooth)

Well Status

Inactive

Active

Active

Spudded (Drilling commenced: Not yet completed)

New Permit (Not yet approved or drilled)

Delaware

PAGE 1

The First State

I, JEFFREY W. BULLOCK, SECRETARY OF STATE OF THE STATE OF DELAWARE, DO HEREBY CERTIFY THE ATTACHED IS A TRUE AND CORRECT COPY OF THE CERTIFICATE OF AMENDMENT OF "MAGNUM NGLS, LLC", CHANGING ITS NAME FROM "MAGNUM NGLS, LLC" TO "SAWTOOTH NGL CAVERNS, LLC", FILED IN THIS OFFICE ON THE EIGHTEENTH DAY OF MARCH, A.D. 2015, AT 12:21 O'CLOCK P.M.

5037140 8100

150374000




Jeffrey W. Bullock, Secretary of State
AUTHENTICATION: 2211843

DATE: 03-18-15

**STATE OF DELAWARE
CERTIFICATE OF AMENDMENT**

1. Name of Limited Liability Company: MAGNUM NGLS, LLC

2. The Certificate of Formation of the limited liability company is hereby amended as follows:

1. The name of the Limited Liability Company is
Sawtooth NGL Caverns, LLC.

IN WITNESS WHEREOF, the undersigned have executed this Certificate on
the 17th day of March, A.D. 2015.

By: 
Authorized Person(s)

Name: William G. Laughlin
Print or Type

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

Request to Transfer Application or Permit to Drill

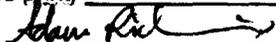
(This form should accompany a Sundry Notice, Form 9, requesting APD transfer)

Well name:	CW-5
API number:	430275002
Location:	Qtr-Qtr: SWSW Section: 23 Township: 15 S Range: 7 W
Company that filed original application:	Magnum NGLs Solution Mining, LLC
Date original permit was issued:	05/02/2013
Company that permit was issued to:	Magnum NGLs Solution Mining, LLC

Check one	Desired Action:
<input type="checkbox"/>	Transfer pending (unapproved) Application for Permit to Drill to new operator
	The undersigned as owner with legal rights to drill on the property, hereby verifies that the information as submitted in the pending Application for Permit to Drill, remains valid and does not require revision. The new owner of the application accepts and agrees to the information and procedures as stated in the application.
<input checked="" type="checkbox"/>	Transfer approved Application for Permit to Drill to new operator
	The undersigned as owner with legal rights to drill on the property as permitted, hereby verifies that the information as submitted in the previously approved application to drill, remains valid and does not require revision.

Following is a checklist of some items related to the application, which should be verified.	Yes	No
If located on private land, has the ownership changed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
If so, has the surface agreement been updated?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Have any wells been drilled in the vicinity of the proposed well which would affect the spacing or siting requirements for this location?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Have there been any unit or other agreements put in place that could affect the permitting or operation of this proposed well?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Have there been any changes to the access route including ownership or right-of-way, which could affect the proposed location?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Has the approved source of water for drilling changed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Have there been any physical changes to the surface location or access route which will require a change in plans from what was discussed at the onsite evaluation?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Is bonding still in place, which covers this proposed well? Bond No. <u>B009096</u>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Any desired or necessary changes to either a pending or approved Application for Permit to Drill that is being transferred, should be filed on a Sundry Notice, Form 9, or amended Application for Permit to Drill, Form 3, as appropriate, with necessary supporting information as required.

Name (please print) Adam Richins Title Safety, Compliance and Regulatory Manager
 Signature  Date 04/20/2015
 Representing (company name) NGL Supply Terminal Solution Mining, LLC

The person signing this form must have legal authority to represent the company or individual(s) to be listed as the new operator on the Application for Permit to Drill.

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

UIC FORM 5

TRANSFER OF AUTHORITY TO INJECT

Well Name and Number CW-5	API Number 4302750002
Location of Well Footage : 147 S 167 W County : Millard County QQ. Section. Township. Range: SWSW 23 15S 7W State : UTAH	Field or Unit Name Lease Designation and Number State ML-51573.A-OBA

EFFECTIVE DATE OF TRANSFER: 2/17/2015

CURRENT OPERATOR

Company: <u>Magnum NGLs Solution Mining. LLC</u>	Name: <u>Adam Richins</u>
Address: <u>3165 E Millrock Drive Suite 330</u>	Signature: <u><i>Adam Richins</i></u>
<u>city Holladay state UT zip 84121</u>	Title: <u>Safety. Compliance & Regulatory Manager</u>
Phone: <u>(801) 993-7001</u>	Date: <u>4-20-15</u>

Comments: Entity is the same. Name of operator is changing.

NEW OPERATOR

Company: <u>NGL Supply Terminal Solution Mining. LLC</u>	Name: <u>Adam Richins</u>
Address: <u>6965 Union Park Avenue Suite 270</u>	Signature: <u><i>Adam Richins</i></u>
<u>city Midvale state UT zip 84047</u>	Title: <u>Safety. Compliance & Regulatory Manager</u>
Phone: <u>(801) 255-9632</u>	Date: <u>4-20-15</u>

Comments: Magnum NGLs Solution Mining. LLC is changing name to NGL Supply Terminal Solution Mining. LLC

(This space for State use only)

Transfer approved by: *[Signature]*
Title: *Geologist*

Approval Date: 4/28/15

Comments:

RECEIVED

APR 2014

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

Request to Transfer Application or Permit to Drill

(This form should accompany a Sundry Notice, Form 9, requesting APD transfer)

Well name:	CW-6
API number:	430275003
Location:	Qtr-Qtr: NWNW Section: 26 Township 15 S Range: 7 W
Company that filed original application:	Magnum NGLs Solution Mining, LLC
Date original permit was issued:	05/02/2013
Company that permit was issued to:	Magnum NGLs Solution Mining, LLC

Check one	Desired Action:
<input type="checkbox"/>	Transfer pending (unapproved) Application for Permit to Drill to new operator
	The undersigned as owner with legal rights to drill on the property, hereby verifies that the information as submitted in the pending Application for Permit to Drill, remains valid and does not require revision. The new owner of the application accepts and agrees to the information and procedures as stated in the application.
<input checked="" type="checkbox"/>	Transfer approved Application for Permit to Drill to new operator
	The undersigned as owner with legal rights to drill on the property as permitted, hereby verifies that the information as submitted in the previously approved application to drill, remains valid and does not require revision.

Following is a checklist of some items related to the application, which should be verified.	Yes	No
If located on private land, has the ownership changed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
If so, has the surface agreement been updated?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Have any wells been drilled in the vicinity of the proposed well which would affect the spacing or siting requirements for this location?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Have there been any unit or other agreements put in place that could affect the permitting or operation of this proposed well?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Have there been any changes to the access route including ownership or right-of-way, which could affect the proposed location?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Has the approved source of water for drilling changed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Have there been any physical changes to the surface location or access route which will require a change in plans from what was discussed at the onsite evaluation?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Is bonding still in place, which covers this proposed well? Bond No. <u>B009096</u>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Any desired or necessary changes to either a pending or approved Application for Permit to Drill that is being transferred, should be filed on a Sundry Notice, Form 9, or amended Application for Permit to Drill, Form 3, as appropriate, with necessary supporting information as required.

Name (please print) Adam Richins Title Safety, Compliance and Regulatory Manager
Signature *Adam Richins* Date 04/20/2015
Representing (company name) NGL Supply Terminal Solution Mining, LLC

The person signing this form must have legal authority to represent the company or individual(s) to be listed as the new operator on the Application for Permit to Drill.

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

UIC FORM 5

TRANSFER OF AUTHORITY TO INJECT

Well Name and Number CW-6	API Number 4302750003
Location of Well Footage : 442 N 284 W County : Millard County QQ. Section. Township. Range: NWNW 26 15S 7W State : UTAH	Field or Unit Name Lease Designation and Number State ML-51573.A-OBA

EFFECTIVE DATE OF TRANSFER: 2/17/2015

CURRENT OPERATOR

Company: <u>Magnum NGLs Solution Mining. LLC</u>	Name: <u>Adam Richins</u>
Address: <u>3165 E Millrock Drive Suite 330</u>	Signature: <u><i>Adam Richins</i></u>
<u>city Holladay state UT zip 84121</u>	Title: <u>Safety, Compliance & Regulatory Manager</u>
Phone: <u>(801) 993-7001</u>	Date: <u>4-20-15</u>

Comments: Entity is the same. Name of operator is changing.

NEW OPERATOR

Company: <u>NGL Supply Terminal Solution Mining. LLC</u>	Name: <u>Adam Richins</u>
Address: <u>6965 Union Park Avenue Suite 270</u>	Signature: <u><i>Adam Richins</i></u>
<u>city Midvale state UT zip 84047</u>	Title: <u>Safety, Compliance & Regulatory Manager</u>
Phone: <u>(801) 255-9632</u>	Date: <u>4-20-15</u>

Comments: Magnum NGLs Solution Mining. LLC is changing name to NGL Supply Terminal Solution Mining. LLC

(This space for State use only)

Transfer approved by: EPA
Title: _____

Approval Date: _____

Comments:

RECEIVED
APR 22 2014
Div. of Oil, Gas & Mining

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

Request to Transfer Application or Permit to Drill

(This form should accompany a Sundry Notice, Form 9, requesting APD transfer)

Well name:	CW-7
API number:	430275004
Location:	Qtr-Qtr: SWSW Section: 23 Township: 15 S Range: 7 W
Company that filed original application:	Magnum NGLs Solution Mining, LLC
Date original permit was issued:	02/11/2014
Company that permit was issued to:	Magnum NGLs Solution Mining, LLC

Check one	Desired Action:
<input type="checkbox"/>	Transfer pending (unapproved) Application for Permit to Drill to new operator
	The undersigned as owner with legal rights to drill on the property, hereby verifies that the information as submitted in the pending Application for Permit to Drill, remains valid and does not require revision. The new owner of the application accepts and agrees to the information and procedures as stated in the application.
<input checked="" type="checkbox"/>	Transfer approved Application for Permit to Drill to new operator
	The undersigned as owner with legal rights to drill on the property as permitted, hereby verifies that the information as submitted in the previously approved application to drill, remains valid and does not require revision.

Following is a checklist of some items related to the application, which should be verified.	Yes	No
If located on private land, has the ownership changed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/> If so, has the surface agreement been updated?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Have any wells been drilled in the vicinity of the proposed well which would affect the spacing or siting requirements for this location?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Have there been any unit or other agreements put in place that could affect the permitting or operation of this proposed well?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Have there been any changes to the access route including ownership or right-of-way, which could affect the proposed location?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Has the approved source of water for drilling changed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Have there been any physical changes to the surface location or access route which will require a change in plans from what was discussed at the onsite evaluation?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Is bonding still in place, which covers this proposed well? Bond No. <u>B009096</u>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Any desired or necessary changes to either a pending or approved Application for Permit to Drill that is being transferred, should be filed on a Sundry Notice, Form 9, or amended Application for Permit to Drill, Form 3, as appropriate, with necessary supporting information as required.

Name (please print) Adam Richins Title Safety, Compliance and Regulatory Manager
 Signature  Date 04/20/2015
 Representing (company name) NGL Supply Terminal Solution Mining, LLC

The person signing this form must have legal authority to represent the company or individual(s) to be listed as the new operator on the Application for Permit to Drill.

STATE OF UTAH
 DEPARTMENT OF NATURAL RESOURCES
 DIVISION OF OIL, GAS AND MINING

UIC FORM 5

TRANSFER OF AUTHORITY TO INJECT

Well Name and Number CW-7		API Number 4302750004
Location of Well Footage : 852 S 91 W County : Millard County		Field or Unit Name
QQ. Section. Township. Range: SWSW 23 15S 7W	State : UTAH	Lease Designation and Number State ML-51573.A-OBA

EFFECTIVE DATE OF TRANSFER: 2/17/2015

CURRENT OPERATOR

Company: <u>Magnum NGLs Solution Mining, LLC</u>	Name: <u>Adam Richins</u>
Address: <u>3165 E Millrock Drive Suite 330</u>	Signature: <u><i>Adam Richins</i></u>
<u>city Holladay state UT zip 84121</u>	Title: <u>Safety, Compliance & Regulatory Manager</u>
Phone: <u>(801) 993-7001</u>	Date: <u>4-20-15</u>

Comments: Entity is the same. Name of operator is changing.

NEW OPERATOR

Company: <u>NGL Supply Terminal Solution Mining, LLC</u>	Name: <u>Adam Richins</u>
Address: <u>6965 Union Park Avenue Suite 270</u>	Signature: <u><i>Adam Richins</i></u>
<u>city Midvale state UT zip 84047</u>	Title: <u>Safety, Compliance & Regulatory Manager</u>
Phone: <u>(801) 255-9632</u>	Date: <u>4-20-15</u>

Comments: Magnum NGLs Solution Mining, LLC is changing name to NGL Supply Terminal Solution Mining, LLC

(This space for State use only)

Transfer approved by: EPA
 Title: _____

Approval Date: _____

Comments:

RECEIVED

APR 2014

Div. of Oil, Gas & Mining

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

Request to Transfer Application or Permit to Drill

(This form should accompany a Sundry Notice, Form 9, requesting APD transfer)

Well name:	CW-8
API number:	430275005
Location:	Qtr-Qtr: SWSW Section. 23 Township: 15 S Range: 7 W
Company that filed original application:	Magnum NGLs Solution Mining, LLC
Date original permit was issued:	11/25/2014
Company that permit was issued to:	Magnum NGLs Solution Mining, LLC

Check one	Desired Action:
<input type="checkbox"/>	Transfer pending (unapproved) Application for Permit to Drill to new operator
	The undersigned as owner with legal rights to drill on the property, hereby verifies that the information as submitted in the pending Application for Permit to Drill, remains valid and does not require revision. The new owner of the application accepts and agrees to the information and procedures as stated in the application.
<input checked="" type="checkbox"/>	Transfer approved Application for Permit to Drill to new operator
	The undersigned as owner with legal rights to drill on the property as permitted, hereby verifies that the information as submitted in the previously approved application to drill, remains valid and does not require revision.

Following is a checklist of some items related to the application, which should be verified.	Yes	No
If located on private land, has the ownership changed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
If so, has the surface agreement been updated?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Have any wells been drilled in the vicinity of the proposed well which would affect the spacing or siting requirements for this location?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Have there been any unit or other agreements put in place that could affect the permitting or operation of this proposed well?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Have there been any changes to the access route including ownership or right-of-way, which could affect the proposed location?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Has the approved source of water for drilling changed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Have there been any physical changes to the surface location or access route which will require a change in plans from what was discussed at the onsite evaluation?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Is bonding still in place, which covers this proposed well? Bond No. <u>B009096</u>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Any desired or necessary changes to either a pending or approved Application for Permit to Drill that is being transferred, should be filed on a Sundry Notice, Form 9, or amended Application for Permit to Drill, Form 3, as appropriate, with necessary supporting information as required.

Name (please print) Adam Richins Title Safety, Compliance and Regulatory Manager
Signature *Adam Richins* Date 04/20/2015
Representing (company name) NGL Supply Terminal Solution Mining, LLC

The person signing this form must have legal authority to represent the company or individual(s) to be listed as the new operator on the Application for Permit to Drill.

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

UIC FORM 5

TRANSFER OF AUTHORITY TO INJECT

Well Name and Number CW-8	API Number 4302750005
Location of Well Footage : 805 S 548 W County : Millard County QQ. Section. Township. Range: SWSW 23 15S 7W State : UTAH	Field or Unit Name Lease Designation and Number State ML-51573.A-OBA

EFFECTIVE DATE OF TRANSFER: 2/17/2015

CURRENT OPERATOR

Company: Magnum NGLs Solution Mining. LLC Name: Adam Richins
Address: 3165 E Millrock Drive Suite 330 Signature: *Adam Richins*
city Holladay state UT zip 84121 Title: Safety, Compliance & Regulatory Manager
Phone: (801) 993-7001 Date: 4-20-15
Comments: Entity is the same. Name of operator is changing.

NEW OPERATOR

Company: NGL Supply Terminal Solution Mining. LLC Name: Adam Richins
Address: 6965 Union Park Avenue Suite 270 Signature: *Adam Richins*
city Midvale state UT zip 84047 Title: Safety, Compliance & Regulatory Manager
Phone: (801) 255-9632 Date: 4-20-15
Comments: Magnum NGLs Solution Mining. LLC is changing name to NGL Supply Terminal Solution Mining. LLC

(This space for State use only)

Transfer approved by: EPA
Title: _____

Approval Date: _____

Comments:

RECEIVED
APR 22 2014

(5/2008)

Div. of Oil, Gas & Mining

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

AMENDED REPORT FORM 8
(highlight changes)

5. LEASE DESIGNATION AND SERIAL NUMBER:
51573-OBA

WELL COMPLETION OR RECOMPLETION REPORT AND LOG

1a. TYPE OF WELL: OIL WELL GAS WELL DRY OTHER **NGL Storage**

b. TYPE OF WORK: NEW WELL HORIZ. LATS. DEEP-EN RE-ENTRY DIFF. RESVR. OTHER _____

6. IF INDIAN, ALLOTTEE OR TRIBE NAME _____

7. UNIT or CA AGREEMENT NAME _____

8. WELL NAME and NUMBER:
CW-8

2. NAME OF OPERATOR:
NGL Supply Terminal Solution Mining LLC

9. API NUMBER:
4302750005

3. ADDRESS OF OPERATOR: **6965 Union Park Center** CITY **Midvale** STATE **UT** ZIP **84047** PHONE NUMBER: _____

10. FIELD AND POOL, OR WILDCAT _____

4. LOCATION OF WELL (FOOTAGES)
AT SURFACE: **805 FSL 548 FWL**
AT TOP PRODUCING INTERVAL REPORTED BELOW: **808 FSL 588 FWL**
AT TOTAL DEPTH: **805 FSL 576 FWL**

11. QTR/QTR, SECTION, TOWNSHIP, RANGE, MERIDIAN:
SWSW 23 15S 7W S

12. COUNTY **Millard** 13. STATE **UTAH**

14. DATE SPUDDED: **12/12/2014** 15. DATE T.D. REACHED: **3/23/2015** 16. DATE COMPLETED: **4/16/2015** ABANDONED READY TO PRODUCE 17. ELEVATIONS (DF, RKB, RT, GL): **4625**

18. TOTAL DEPTH: MD **5,000** TVD **5,000** 19. PLUG BACK T.D.: MD _____ TVD _____ 20. IF MULTIPLE COMPLETIONS, HOW MANY? * _____ 21. DEPTH BRIDGE MD _____ PLUG SET: TVD _____

22. TYPE ELECTRIC AND OTHER MECHANICAL LOGS RUN (Submit copy of each)
E-Logs, Caliper, CBL/CAST, Density Gamma & Gyro-Survey

23. WAS WELL CORED? NO YES (Submit analysis)
WAS DST RUN? NO YES (Submit report)
DIRECTIONAL SURVEY? NO YES (Submit copy)

24. CASING AND LINER RECORD (Report all strings set in well)

HOLE SIZE	SIZE/GRADE	WEIGHT (#/ft.)	TOP (MD)	BOTTOM (MD)	STAGE CEMENTER DEPTH	CEMENT TYPE & NO. OF SACKS	SLURRY VOLUME (BBL)	CEMENT TOP **	AMOUNT PULLED
40	36" X-52	282.4	0	159		A 730	157	0	
34	30" X-52	234.2	0	757		A 1,640	354	0	
30	24" X-56	186.2	0	949		G 4,400	924	0	
	X-56	245.6	949	3,036					
24	20" X-56	129.3	0	1,545		G 1,830	394	0	
	X-56	202.9	1,545	3,528					

25. TUBING RECORD

SIZE	DEPTH SET (MD)	PACKER SET (MD)	SIZE	DEPTH SET (MD)	PACKER SET (MD)	SIZE	DEPTH SET (MD)	PACKER SET (MD)
13 3/8	4,254		8 5/8	4,953				

26. PRODUCING INTERVALS **27. PERFORATION RECORD**

FORMATION NAME	TOP (MD)	BOTTOM (MD)	TOP (TVD)	BOTTOM (TVD)	INTERVAL (Top/Bot - MD)	SIZE	NO. HOLES	PERFORATION STATUS
(A) Miocene Salt	3,620	5,000	3,620	5,000	4,254 5,000	13 3/8	1	Open <input checked="" type="checkbox"/> Squeezed <input type="checkbox"/>
(B)					4,953 5,000	8 5/8	1	Open <input checked="" type="checkbox"/> Squeezed <input type="checkbox"/>
(C)								Open <input type="checkbox"/> Squeezed <input type="checkbox"/>
(D)								Open <input type="checkbox"/> Squeezed <input type="checkbox"/>

28. ACID, FRACTURE, TREATMENT, CEMENT SQUEEZE, ETC.

WAS WELL HYDRAULICALLY FRACTURED? YES NO IF YES -- DATE FRACTURED: _____

DEPTH INTERVAL	AMOUNT AND TYPE OF MATERIAL

29. ENCLOSED ATTACHMENTS: ELECTRICAL/MECHANICAL LOGS GEOLOGIC REPORT DST REPORT DIRECTIONAL SURVEY
 SUNDRY NOTICE FOR PLUGGING AND CEMENT VERIFICATION CORE ANALYSIS OTHER: _____

30. WELL STATUS: **Active**

31. INITIAL PRODUCTION

INTERVAL A (As shown in item #26)

DATE FIRST PRODUCED:		TEST DATE:		HOURS TESTED:		TEST PRODUCTION RATES: →	OIL - BBL:	GAS - MCF:	WATER - BBL:	PROD. METHOD:
CHOKE SIZE:	TBG. PRESS.	CSG. PRESS.	API GRAVITY	BTU - GAS	GAS/OIL RATIO	24 HR PRODUCTION RATES: →	OIL - BBL:	GAS - MCF:	WATER - BBL:	INTERVAL STATUS:

INTERVAL B (As shown in item #26)

DATE FIRST PRODUCED:		TEST DATE:		HOURS TESTED:		TEST PRODUCTION RATES: →	OIL - BBL:	GAS - MCF:	WATER - BBL:	PROD. METHOD:
CHOKE SIZE:	TBG. PRESS.	CSG. PRESS.	API GRAVITY	BTU - GAS	GAS/OIL RATIO	24 HR PRODUCTION RATES: →	OIL - BBL:	GAS - MCF:	WATER - BBL:	INTERVAL STATUS:

INTERVAL C (As shown in item #26)

DATE FIRST PRODUCED:		TEST DATE:		HOURS TESTED:		TEST PRODUCTION RATES: →	OIL - BBL:	GAS - MCF:	WATER - BBL:	PROD. METHOD:
CHOKE SIZE:	TBG. PRESS.	CSG. PRESS.	API GRAVITY	BTU - GAS	GAS/OIL RATIO	24 HR PRODUCTION RATES: →	OIL - BBL:	GAS - MCF:	WATER - BBL:	INTERVAL STATUS:

INTERVAL D (As shown in item #26)

DATE FIRST PRODUCED:		TEST DATE:		HOURS TESTED:		TEST PRODUCTION RATES: →	OIL - BBL:	GAS - MCF:	WATER - BBL:	PROD. METHOD:
CHOKE SIZE:	TBG. PRESS.	CSG. PRESS.	API GRAVITY	BTU - GAS	GAS/OIL RATIO	24 HR PRODUCTION RATES: →	OIL - BBL:	GAS - MCF:	WATER - BBL:	INTERVAL STATUS:

32. DISPOSITION OF GAS (Sold, Used for Fuel, Vented, Etc.)

33. SUMMARY OF POROUS ZONES (Include Aquifers):

Show all important zones of porosity and contents thereof: Cored intervals and all drill-stem tests, including depth interval tested, cushion used, time tool open, flowing and shut-in pressures and recoveries.

Formation	Top (MD)	Bottom (MD)	Descriptions, Contents, etc.	Name	Top (Measured Depth)
Unconfined Aquif	0	450	sand, clay and gravel	Quaternary sediments	0
Shallow Aquifer	450	700	Clay, Sand and occasional gravel	Miocene gypsum and clay	2,925
Deep Aquifer	700	1,450	Clay, sand and occasional gravel	Miocene salt	3,183
Basement Aquife	1,450	2,925	Clay, sand and occasional gravel		

34. FORMATION (Log) MARKERS:

35. ADDITIONAL REMARKS (Include plugging procedure)

Sheet attached: #24 Casing & Liner Record continued

36. I hereby certify that the foregoing and attached information is complete and correct as determined from all available records.

NAME (PLEASE PRINT) Thomas Eyermann TITLE Consultant
 SIGNATURE  DATE 5/30/15

This report must be submitted within 30 days of

- completing or plugging a new well
- drilling horizontal laterals from an existing well bore
- recompleting to a different producing formation
- reentering a previously plugged and abandoned well
- significantly deepening an existing well bore below the previous bottom-hole depth
- drilling hydrocarbon exploratory holes, such as core samples and stratigraphic tests

* ITEM 20: Show the number of completions if production is measured separately from two or more formations.

** ITEM 24: Cement Top - Show how reported top(s) of cement were determined (circulated (CIR), calculated (CAL), cement bond log (CBL), temperature survey (TS)).

Send to: Utah Division of Oil, Gas and Mining Phone: 801-538-5340
 1594 West North Temple, Suite 1210
 Box 145801 Fax: 801-359-3940
 Salt Lake City, Utah 84114-5801

Division of Oil, Gas and Mining

Well Completion Report API 43027500050000

24. Casing and Liner Record (Continued)

Hole Size	Size/Grade	Weight (#/ft.)	Top (MD)	Bottom (MD)	Stage Cements Depth	Cement Type & No. of Sacks	Slurry Volume (BBL)	Cement Top **	Amount Pulled
40	36" X-52	282.4	0	159		Class A 730 Sacks	157	0	
34	30" X-52	234.2	0	757		Class A 1640 sacks	354	0	
30	24" X-56	186.2	0	949		Class G 4400 sacks	924	0	
	24" X-56	245.6	949	3,036					
24	20" X-56	129.3	0	1,545		Class G 1830 sacks	394	0	
	20" X-56	202.9	1,545	3,528					
22	16" N-80	97	0	2,726		Class G 1430 sacks	309	0	
	16" N-80	109	2,726	3,619					
22	13 3/8" N-80	72	0	4,255					
12 1/4	8 5/8 N-80	36	0	3,943					
	8 5/8 N-80	44	3,943	4,953					

**Completion Report on NGL Supply Terminal Solution Mining,
LLC. Well CW-8**

Report ME-2015-04
FINAL Rev. 0

Prepared for:

NGL Supply Terminal Solution Mining, LLC
(fka) Magnum NGL Solution Mining LLC
Holladay, Utah

By:
Thomas Eyermann
Consultant

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Completion Report on NGL Supply Terminal Solution Mining, LLC. Well CW-8

Introduction

Magnum Development drilled Well CW-8 into the Delta salt deposit. The well will be solution mined to create a storage cavern for natural gas liquids. A schematic of the well is shown in Figure 1. The integrity of the casing, wellhead and wellbore in Well CW-8 was verified both during drilling and after completion of the well before initiating solution mining activities.

This report describes the:

- Overview of drilling activities,
- Various pressure tests conducted on the well during drilling,
- Summary of geology encountered, and
- Nitrogen/brine testing of the completed well system conducted in April 2015 before beginning solution mining.

Summary of Drilling Activities

The well was spudded on November 19, 2014 with installation of the 42" conductor pipe in a 48" inch hole. The casing was set at about 20 feet depth. The well was idle until December 12 as CW-7 was completed and the rig moved from CW-7 to CW-8.

Drilling of the 40" hole began on December 12. The 40" hole was drilled to 1610 feet and a 36" secondary butt-welded conductor pipe was set at about 153 feet on December 14, 2014. The 36" casing was cemented in place with 299 cubic feet of Type 1 cement with 2% calcium chloride to accelerate setting. The cement was allowed to cure for 25 hours before resuming drilling.

Drilling of the 17-1/2" pilot hole for the 30" casing started on December 16. The drill string was caught by sloughing sand on December 18 at a depth of about 576 feet. Numerous attempts were made to circulate out the fill using additional pumps and both direct and reverse circulation. The stuck pipe was left in the well over Christmas although circulation in the well was maintained throughout the period. The stuck tools were washed over and recovered. Drilling of the pilot hole resumed on January 4, 2015. The pilot hole was completed on January 6 at a depth of 770 feet. Century Geophysical logged the pilot hole with induction, resistivity, gamma and density tools.

The pilot hole was then reamed to 34" diameter to a depth of 770 feet from January 6 to January 9. The 30" casing was run into the well to 757 feet on January 9 and cemented in place

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with 1260 cubic feet of cement with calcium chloride. The cement was allowed to cure for 48 hours.

The 17-1/2" pilot hole for the 24" casing was started on January 14. The pilot hole was initially stopped on January 27 at 2930 feet. Well logging (Induction, Gamma, Neutron and Density) by Century Geophysical indicated that the pilot hole was still above the gypsum zone. Drilling resumed on January 27 and the pilot hole was deepened to 3200 feet on January 30. The well was circulated clean before logging. The lower section of the pilot hole was logged by Century Geophysical (Induction, Gamma, Neutron and Density) on January 31.

The pilot hole was then reamed to 28" from February 1 through February 13 to a depth of 3050 feet. The 24" casing was run into the well on February 14 set at 3,039 feet. The 24" casing was cemented into place on February 15 by Ridge Cementing. Cement was 925 barrels of Type 2/5 with 3% calcium chloride in the last 550 barrels. The cement was allowed to cure for 48 hours before resuming work in the well.

The casing was pressure tested on February 19 at 945 psi. There was a 5 psi loss over one hour. The shoe drilled out on February 20. Drilling continued with a 21-1/2" bit to a depth of 3,070 feet. Drilling then continued with a 12-1/4" bit to a depth of 3,800 feet. Jet West logged the open hole section of the log with gamma, neutron, density and sonic logs on February 27.

After logging, the pilot hole was opened to 24" for the 20" casing string. Underreaming was completed on March 5 at a depth of about 3,535 feet. The 20" casing was set on March 6 at a depth of 3,531 feet. The 20" casing was cemented by Ridge Cementing on March 7. A total of 394 barrels of Class G cement with 37.2% salt was pumped into the well. 61 barrels of cement were returned to surface.

The cement was allowed to cure for 72 hours before resuming work on the well. The casing was successfully tested before drilling out the cement. The casing seat was tested after drilling out the cement in the casing and 10 feet below the shoe on March 12. This test was also successful.

After testing the 20" casing seat, the well was underreamed to 22" for the final 16" casing. Underreaming was completed on March 15 at a depth of 3,630 feet. The 16" casing was run into the well on March 15 and 16 to a depth of 3,622 feet. The casing was cemented on March 16.

The cement was allowed to cure for 96 hours before additional well work began. The casing was successfully pressure tested. After drilling out the cement and shoe, the casing seat was pressure tested as described below.

Drilling of the well to final depth commenced on March 23 after testing the 16" casing seat. A 12-1/4" hole was drilled to 5,000 feet. The final depth was reached on April 2, 2015. The drill cuttings showed clean salt with minor gypsum from the 16" casing to total depth. Jet West then

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ran gamma, neutron, density, sonic and directional logs from total depth to the 16" casing shoe.

After the well logging was completed, the 12-1/4" hole was underreamed to 18-3/4" to a depth of 4,300 feet. This enlarged hole was to accommodate the 13-3/8" outer mining string. The underreaming was completed on April 11. The Upper section of the well was then underreamed to 22" to a depth of 3,900 feet to provide a larger volume for nitrogen interface logging. The drill string was run to total depth and the drilling mud was displaced with clean brine. Halliburton ran casing inspection and cement bond logs on April 15.

The 13-3/8" mining string was run to 4,250 feet on April 15 and 16. The 8-5/8" string was run to 4,956 feet on April 16. The wellhead was buttoned up on April 22nd. A schematic of the well is shown in Figure 1.

Deviation surveys were run from surface to 2,933 feet and from 3,090 to 4,978 feet. The total estimated deviation of the well is about 29.1 feet to the north relative to the surface location. The deviation survey data are given in Appendix A.

The rig was torn down and stacked from April 17 to April 22, 2015. CW-8 was prepared for the nitrogen/brine mechanical integrity test before beginning solution mining.

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Casing Tests during Drilling

30" Casing

Running of the 30" casing was completed on January 10, 2015. The casing was set at 754 ft below ground level in a 34" hole. The casing string consists of 0.75" wall thickness, grade X-56 pipe with Franks' Double Drive Shoulder (DDS) connections. Centralizers were set on every other joint of casing. The cementing was performed through the drill pipe (DP) set in a float shoe.

Cement Volume

The calculated volume of the cemented annulus was 1,053 cubic feet. A total of 1,987 cubic feet of cement mixed from "Super Sacks" of Quickcrete Brand Type I/II Portland cement with Halliburton HR-5 powdered cement retarder were used. The cement was pumped through the 5" DP and the float shoe. The approximate mix design/ratio was: 110-gallons water to one "Super Sack" (about 2,000-lbs.) Type I/II Portland cement, and 100 lb. of Halliburton HR-5 cement retarder. The cement weight varied from 15.4 to 16.8 pounds per gallon.

On January 12, the annulus was filled to surface with three super sacks of Type I/II cement placed through AQ drillpipe.

Casing Test January 13, 2015

The 30" casing was pressure tested on January 13. The test consisted of pressuring the casing to 530 psi surface pressure. The pressure was held for one hour. The surface pressure measured at the end of the 60 minute test was 525 psi with a 5 psi pressure loss. Thus, the casing and the BOP were installed within project specifications. The pressure chart is shown in Appendix B

24" Casing

Running of the 24" casing was completed on February 15, 2015. The casing was set at 3,039 ft in a 28" hole. The string consisted of 953 feet of 0.625" wall thickness X-60 pipe run above 2,086 feet of 1.0" wall thickness X-56 pipe. The casing has Franks' Double Drive Shoulder (DDS) connections. Centralizers were set on every other joint of casing. The cementing was performed through the drill pipe (DP) set in a float collar.

Cement Volume

The casing was cemented by Ridge Cementing through 5-1/2" drill pipe latched into a float collar. 925 barrels of Portland Type 2/5 cement were pumped into the well during cementing of the 24" diameter casing. This was approximately 113% of the calculated volume of the casing annulus of about 714 barrels. About 106 barrels of cement returned to surface. Cylinders of the cement were taken for strength testing. The job log is included in Appendix C.

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Casing Test February 19, 2015

Prior to performing the casing pressure test, the BOP flanges and casing were topped off with drilling mud and sealed off. The casing was then pressured up to 945 psi. The test was performed with a final pressure of 940 psi, or approximately 5 psi pressure loss over the tested one hour time interval. This equates to a pressure loss of approximately 0.5%. This is within the project specification of a specified maximum loss of 10% for the test. The pressures recorded during the test are shown in Appendix D.

20" Casing

The 20" casing (first salt casing) was set at 3531 feet on March 6, 2015. The string consisted of 1,545 feet of 0.625 wall X-56 pipe above 1,982 feet of 1" wall X-56 pipe. The pipe was fitted with Franks DDS connections. Centralizers were set on every other joint. Cementing was through drill pipe stabbed into a float collar one joint above the guide shoe. The casing shoe is approximately 350 feet below the top of salt.

Cement Volume

The 20" casing was cemented on March 7, 2015 by Ridge Cementing. A total of 394 barrels of Class G Cement with 37.2% salt and 0.2% CAF-38 was pumped into the well during cementing of the 20" diameter casing. The calculated annular volume was about 332 barrels. The cement was mixed on-site and pumped through drill pipe stabbed into the float collar. Approximately 61 barrels of cement were returned to surface during the cementing job. Final cement tickets documenting cement volumes, mix ratios, pumping rates and properties are included in Appendix E.

Casing Test March 11, 2015

Boart Longyear completed the nipple up of the BOP and performed the casing/BOP pressure test on March 11, 2015. The test was performed for one hour with an initial pressure of 900 psi and a final shut-in pressure of 890 psi. This equates to a pressure loss of approximately 1.1%. This is within the project specification of a specified maximum loss of 10% for the 20" casing string. A copy of the pressure record is included in Appendix F.

Casing Seat Test March 13, 2015

After drilling out the cement shoe and cement and 10 feet of open hole, the casing seat was tested. The BOP was closed around drill pipe and the well was pressured to 900 psi. The pressure was held for one hour with a drop of about 25 psi, a fall of 2.8%, within the project allowance of 5%. A copy of the pressure record is included in Appendix G.

16" Casing

The 16" casing was set at 3,622 feet on March 16, 2015. This second salt casing is set approximately 440 feet below the top of salt and about 90 feet below the 20" casing shoe. The 16" casing consisted of 2,728 feet of 0.575" wall NT-80 casing above 894 feet of 0.656" wall P-

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110 casing. Both strings have buttress connections. Centralizers were set on every joint. Cementing was through drill pipe stabbed into a float collar one joint above the guide shoe.

Cement Volume

Ridge Cementing completed the cementing of the 16" diameter casing on March 16. The casing was cemented with 309 barrels Class G Cement with 37.2% salt and 0.2% CAF-38. The calculated annulus volume was approximately 240 barrels. The plug did not bump but held pressure. Approximately 10 barrels of slurry returned to the surface. A copy of the job log is included in Appendix H.

Casing Test March 20, 2015

A pressure test was performed of the BOP and 16" diameter casing before drilling out the float shoe on March 20. The test starting pressure was 1,100 psi. After 60 minutes the ending pressure was 1,085 psi. The pressure loss of 15 psi was 1.4% of the test pressure. A copy of the chart recorder is included in Appendix I.

Casing Seat Pressure Test March 22, 2015

A pressure test was performed of the 16" diameter casing seat on March 22. The test was conducted after the float collar and cement inside the casing were drilled out and the open hole had been advanced into the salt to a depth of 3,630 feet. The initial surface pressure for the test was 1,100 psi. The test was held for four hours. At the end of the test the final pressure was 1,080 psi, a decrease of 20 psi or 1.8%. A copy of the pressure recorder is included in Appendix J.

Geology

The geology of the well was explored by geophysical logs run in each section of the well and by a description of the drill cuttings. In general, the geology overlying the salt consists of clay and gravel-sand units from surface to about 2,925 where a gypsum layer was encountered. From 2,925 to 2,960 feet clay mixed with the gypsum continues in the drill cuttings. A gypsum unit extends from 2,960 feet to the top of salt at 3,183 feet (by gamma-neutron log.)

The salt body is primarily salt with minor gypsum. From 3,920 to about 3,955 feet, the salt cuttings resembled sand, but contained only about 5% insolubles. Below 3,955 feet, the zones that contain gypsum content are interspersed with clean salt. Appendix K contains the lithological description of the drill cuttings.

The gamma, neutron and density logs of the salt interval show numerous thin zones of dirty salt about 3,510 feet. Zones of high gamma counts and low neutron counts and reduced sonic speeds is located at about 4,125 to 4,145 feet and at 4,460 feet, similar to that seen in CW-5. The logs are included at the end of the report.

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Well Nitrogen/Brine MIT

Well Activities

Before starting solution mining, the completed well was tested for mechanical integrity using the brine-nitrogen method. The test was conducted about seven days after the rig was moved off location, about ten days after completion of drilling and three days after completing installation of the wellhead valves.

To prepare for the test, the wellhead valves were equipped with tapped blind flanges. The flanges were equipped with small valves and pressure gauges and transducers to allow monitoring of the pressures during the test. The test procedures and well data are included in Appendix L.

The temperature and interface logging for the test was conducted by Jet West. Cudd Energy Services provided the nitrogen injection. Intermountain Electric connected pressure monitoring recorders to the wellhead.

On April 27 Jet West rigged up the wireline tools and ran the baseline temperature log from surface to 3,994 feet in the well. The average temperature was 86° F. Figure 2 shows the temperature logs during the test sequence. The baseline density log was run from 5,004 to 3,300 feet. The log showed the bottom of both hanging strings and the weight change in the 8-5/8". The 16" casing shoe was not distinctly visible.

After the base logs were completed, Cudd Services rigged up the nitrogen pump and tank trucks. Nitrogen injection was started on April 27 at 11:00 AM. The nitrogen temperature was controlled at about 90° F to minimize the time required for temperature stabilization.

Jet West attempted to follow the nitrogen downhole with the density tool. However, due to the heavy walled 16" the other cemented strings the two strings of mining tubing in the well and the small annular space between the 16" and 13-3/8" strings into which the nitrogen was injected, the nitrogen/brine interface was not detected in the cased hole. The separate, one hour casing test was not performed.

After injecting 100,000 SCF (standard cubic feet) of nitrogen at 1220 hours, injection was suspended to look for the nitrogen interface in order to run a pressure test on the cased hole. The 100,000 SCF is less than the calculated volume of 115,000 SCF to the 16" casing seat. The nitrogen/brine interface was not found.

Following the attempted casing test interval, nitrogen injection resumed at 1300 hours. Once below the cemented casing tool, the nitrogen/brine interface was not clearly detectable with the density tool despite the larger annulus (22-1/4" borehole and 13-3/8" outer string) and less steel (the 16") in the wellbore.

Magnum NGL Well CW-8 MIT - April 2015

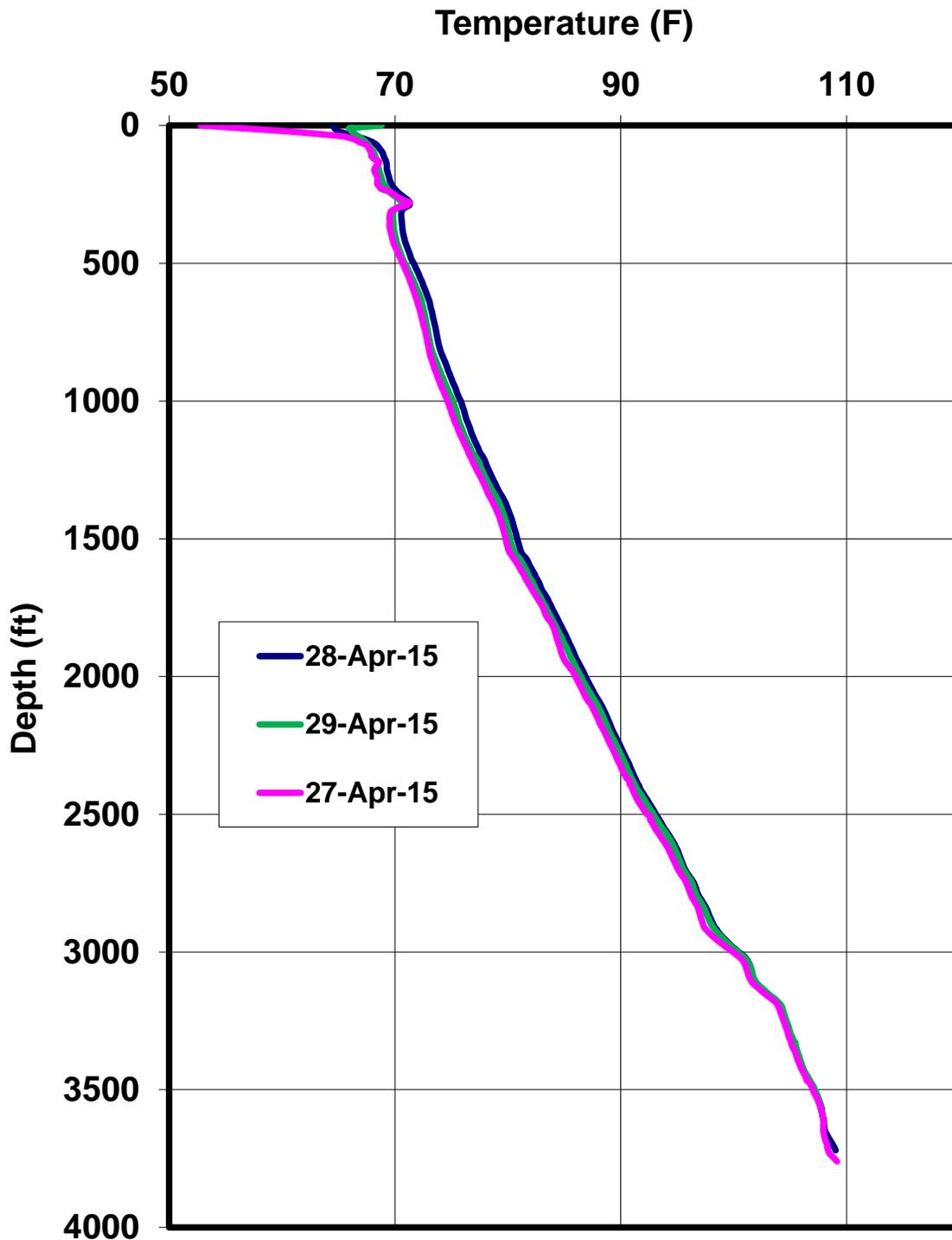


Figure 2 Temperatures during CW-8 MIT

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The nitrogen/brine interface was found at 3,758 feet with 160,000 SCF nitrogen in the well. The well pressure was reduced from 2620 psi to 2,577 psi by bleeding brine into the mud pit. The interface moved to 3,760 feet. The total nitrogen in the well was 160,000 SCF.

After logging the interface at about 1630 hours on April 27, the tools were removed from the well. The well was shut-in until the following morning. The pressure recording equipment remained installed and monitoring.

The well was left shut-in until about 1100 April 28, 2014 when the logging tools were rigged up and ran into the well. A temperature log was run on the trip into the well and the interface was logged afterwards. The interface was found at 3760.1 feet at 1330 hours. Table 1 lists the interfaces found during the MIT.

Table 1 Interfaces and Nitrogen Pressure during Well CW-6 MIT

Date/Time	As-logged Interface Depth – Feet	Surface Nitrogen Pressure – psig	Notes
04/27/15 1500	3,760	2,545	Established interface
04/28/15 1324	3,760.1	2,505	Start MIT
04/29/15 1307	3,760.1	2,491	Finish MIT

After completing the logging, the logging tools were removed from the well. The well was then shut-in until the morning of April 28.

About 1030 on April 28, the logging tools were run back into the well. The temperature of well was measured on the downward run and the interface was detected on the upward run. The interface was found at 3,760.1 feet at 1307 hours.

The surface pressures measured during the test are listed in Appendix M and shown in Figure 3. The temperature data from the base log and the two test logs are given in Appendix N and shown in Figure 2. Calibration papers for the surface pressure transducers are in Appendix O.

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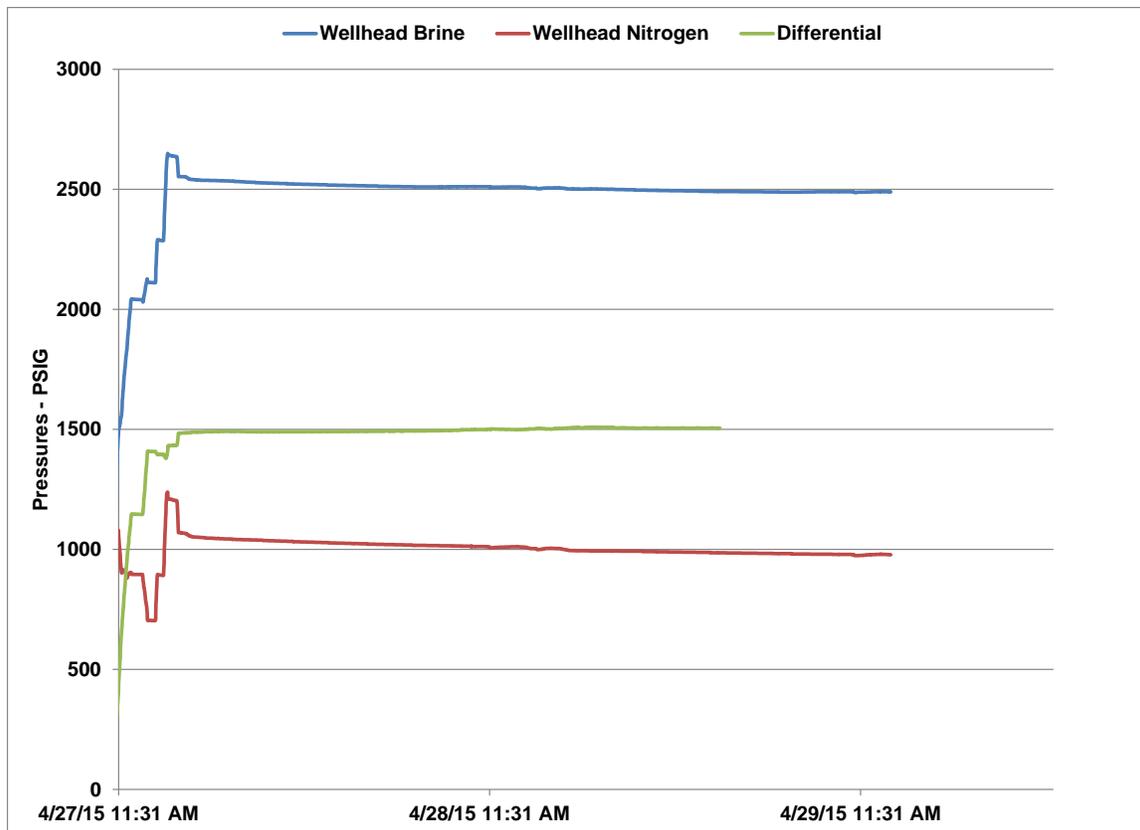


Figure 3 Surface Pressures during CW-8 MIT

Calculations

Using data collected during the test, a minimum detectable leak rate (MDLR) and a calculated nitrogen leak rate (CLR) can be calculated. Calculation of both leak rates requires knowing the pressure and temperature of the nitrogen as well as the depth to the brine/nitrogen interface at the start and end of the test.

Methodology

The purpose of performing this MIT is to determine if the cavern system has mechanical integrity and is, therefore, suitable for the storage of natural gas. The procedure involves continued injection of nitrogen into the storage well to a specified test pressure so that the nitrogen interface is below the production casing. The nitrogen interface depth can be affected by pressure and temperature changes caused by temperature equilibration, salt dissolution, and salt creep effects. In order to distinguish between these effects and nitrogen volume losses caused by leaks, the pressure and temperature changes must be considered. The following discussion and equations are borrowed from a report by Pavan Vajjha, Mark W. Meece, and Joe L. Ratigan, 2007, Mechanical Integrity Test Report Enterprise Products Operating L.P. Wilson Well No. 4, Boling Salt Dome, PB-ESS Report Prepared for Enterprise Products Operating L.P.

The nitrogen pressure, brine pressure, nitrogen temperature and nitrogen/brine interface depth are monitored during the test period. Evaluation of the test results involves calculating

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the volume of nitrogen to the interface at the start of the test and at the end of the test. Changes in calculated nitrogen volumes over the test period yield an apparent nitrogen volume change. The integrity of the well can be confirmed if the calculated nitrogen volume change is within the accuracy limits of the test method. The annual leak rate can be determined by linear extrapolation of the calculated change in nitrogen volume during the test period.

Nitrogen Mass Calculation

In addition to measured quantity of nitrogen, information of the well casing, tubular sizes and the diameter of the wellbore from the casing shoe to the interface allows the nitrogen volume in the annulus to be calculated. The following P - V - T gas equation is used to calculate the volume of nitrogen at standard temperature and pressure conditions in the wellbore during the test:

$$V_{N_2} = N_{scf} \times \sum_i^N \left[\frac{P_{WB\ i} \times 144 \times V_{WB\ i}}{Z_{AVE\ i} \times R \times T_{AVE\ i}} \right]$$

where:

V_{N_2} = volume of nitrogen measured in the wellbore over a specific depth interval " i " (SCF)

$P_{WB\ i}$ = average calculated wellbore pressure over a specific depth interval " i " (psia)

$V_{WB\ i}$ = volume of wellbore of a specific depth interval " i " (ft³)

$Z_{AVE\ i}$ = gas compressibility factor at a specific depth interval¹ " i " (dimensionless)

R = specific gas constant $\left[55.16 \text{ ft} \times \text{lb}_f / \text{lb mol} \times ^\circ\text{R} \right]$

$T_{AVE\ i}$ = average wellbore temperature for a specific depth interval " i " (°R)

N_{scf} = gas conversion for mass to volume at standard pressure and temperature conditions (13.8 scf_{N2} = 1 lb_{N2})

$i = 1, 2, \dots, N$, N = total number of depth intervals.

¹ Compressibility Factor (Z) research developed in NOWSCO Technical Manual, NOWSCO Services, 1980.

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The following recursive relationship is used to determine pressure at depth interval “*i*”:

$$P_i = P_{i-1} \left[1 + \frac{L}{R Z_{AVE\ i} T_{AVE\ i}} \right]$$

$$i = 1, 2, \dots N$$

where:

P_i = calculated pressure at a specific depth “*i*” (psia)

P_1 = measure wellhead pressure (psia)

L = distance between measurement *i* and measurement *i-1* (ft).

The volume calculation is performed for specific intervals (nominal ten feet) throughout the wellbore from the surface to the interface. The total annulus nitrogen volume is determined by summing the specific volume for each interval.

The results of the volume and mass calculations for the MIT are presented in Appendix N. Note that the surface measured volume of nitrogen may not be equal to the calculated volume of nitrogen in the wellbore. The accuracy of the metered nitrogen is based on the accuracy of the turbine and temperature measurement made during nitrogen injection. The calculated nitrogen volumes are based on downhole temperature logs, surface pressure recorders, calculated downhole pressures, nitrogen compressibility, known casing sizes and borehole dimensions measured by a caliper log prior to running the suspended mining strings. All measurements are subject to the accuracy of the instrumentation used at the time of the measurements.

Calculated Leak Rate

The calculated leak rate (CLR) is the slope of the nitrogen volume versus time data. A negative CLR indicates a calculated loss of nitrogen from the wellbore during the test period. A positive CLR indicates a calculated increase in nitrogen volume during the test period.

Minimum Detectable Leak Rate

The Minimum Detectable Leak Rate (MDLR) depends on the accuracy of the nitrogen volume calculations and the duration of the test. The accuracy of the nitrogen volume calculations depends *primarily* on the accuracy of the nitrogen pressure measurement, the wellbore temperature measurements, the interface depth measurement and the measurement of the size of the salt shaft below the casing.

The calculated apparent leak rate in this test relies on the measurement of pressure and temperature differences using the same measuring device at the start and end of the testing.

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Thus the accuracy in the calculated leak rate is dependent on the both level of random precision error in the temperature and pressure measurements as well as equipment biases for the temperature and pressure equipment.

Assuming normally distributed random precision error in both temperature and wellhead pressure, the accuracy of the calculated apparent leak rate can be calculated as the difference in the maximum and minimum gas volumes (at a single point in time such as the end of the MIT) where the maximum and minimum gas volumes are calculated with the temperature and wellhead pressure perturbed by ± 3 standard deviations of the random or precision error, divided by the duration of the test. The MDLR is estimated as:

$$\text{MDLR} = 3 \times \left[\frac{V_{N_2} P + \sigma_p, T - \sigma_T, D + \Delta D - V_{N_2} P - \sigma_p, T + \sigma_T, D - \Delta D}{\Delta t} \right]$$

where:

σ_p = standard deviation in pressure measurement bias

σ_T = standard deviation in temperature measurement bias

ΔD = accuracy of interface measurement

Δt = test duration.

This expression for MDLR is associated with a confidence interval >90 percent. The methods for estimating the standard deviation in the temperature and pressure measurement bias are described below.

Standard Deviation in Well Pressure Measurement Bias

The well pressure in this test should be a smooth function, the measuring device random precision error is exhibited as the scatter of the measured pressures about a smooth function in time. Figure 3 illustrates the measured wellhead pressures during the test period. For the pressure calculations, the pressures at the interface measured with the beginning and ending temperature logs were used. A smooth function that is a Fourier series with Fourier coefficients determined from a minimization of the sum-of-squared-error between the smooth function and the measured pressures can be fitted to the data. The Fourier series used to develop the smooth pressure (versus time) function for the well pressure is:

$$P_{wh} t = \bar{P} + \sum_{n=1}^{30} a_n \sin nt + b_n \cos nt$$

where \bar{P} , a_n , and b_n are fitting parameters. The standard deviation in the "lack of fit" to the smooth function is about 0.6398 psi. If the device random precision error is normally

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distributed, then the true pressures (to a confidence level of greater than about 90 percent) are within about ± 3 standard deviations of the pressures.

Standard Deviation in Temperature Measurement Bias

Similarly the temperature as a function of depth should be a smooth function, so the random error in the temperature measurement device can be calculated in a similar manner. Figure 2 illustrates the measured temperature in the well and cavern for the temperature logs run for the MIT. The temperature data is included in Appendix N. The average standard deviation in the lack of fit for the two temperature logs is 0.2920° F.

Interface Depth Measurement Accuracy

The resolution of the interface detection tool is determined from the logging tool used for the MIT. The resolution for the tool is believed to be ± 0.2 feet.

Salt Shaft Volume Accuracy

The salt shaft below the casing was developed during the drilling operation to a diameter of 22-1/4". A caliper log was run after all drilling and reaming operations were completed. The caliper log showed the wellbore to have a diameter of about 26-1/2" from the 16" casing to about 3,700 feet and about 27" from 3,700 feet to 3,800 feet. The caliper log was assumed to have an accuracy of 2% (about one-half inch).

Results and Discussion

The tests showed that the calculated leak rate (CLR) from CW-8 was a loss of 293 barrels per year at an average casing shoe pressure of 2,801 psi. The nitrogen-brine interface remained below the casing shoe and did not move during the test. This measurement of the CLR uses a linear fit to the nitrogen volume data at the start and at the end of the test. The minimum detectable leak rate (MDLR) was 522 barrels per year. The 2,801 psi pressure at the casing shoe is approximately 77% of the overlying lithostatic pressure.

At the time of this test and within the limitations of this test, Storage Well #CW-8 demonstrated mechanical integrity as the CLR was less than the MDLR of the test.

Appendix P contains the Mechanical Integrity Test data on the required State forms.

Appendix A Deviation Data

Measured Depth – Feet	True Depth - Feet	North Deviation - Feet	East Deviation - Feet	Distance - Feet	Azimuth - Degrees	Measured Depth - Feet
0.6	0.6	0.0	0.0	0.0	0.0	0.6
46.7	46.7	0.0	-0.1	0.1	259.0	46.7
96.7	96.7	0.0	-0.1	0.1	237.3	96.7
146.7	146.7	-0.1	-0.1	0.1	217.3	146.7
196.7	196.7	-0.1	-0.1	0.1	217.2	196.7
246.7	246.7	-0.1	0.0	0.1	210.5	246.7
296.7	296.7	-0.1	0.0	0.1	182.1	296.7
346.7	346.7	0.0	0.0	0.0	146.9	346.7
396.1	396.1	0.1	0.2	0.2	47.7	396.1
446.7	446.7	0.1	0.3	0.3	66.2	446.7
496.7	496.7	0.1	0.4	0.4	72.3	496.7
546.7	546.7	0.2	0.5	0.5	71.0	546.7
596.7	596.7	0.1	0.4	0.4	72.4	596.7
646.7	646.7	0.1	0.4	0.4	74.3	646.7
696.7	696.7	0.1	0.4	0.4	75.8	696.7
746.7	746.7	0.1	0.4	0.4	77.4	746.7
796.7	796.7	0.1	0.4	0.4	72.8	796.7
846.7	846.7	0.2	0.5	0.5	66.0	846.7
896.7	896.7	0.3	0.6	0.7	60.5	896.7
946.7	946.7	0.5	0.6	0.0	51.5	946.7
996.7	996.7	0.7	0.8	1.0	49.6	996.7
1046.7	1046.7	0.8	0.9	1.2	47.3	1046.7
1096.7	1096.7	0.9	1.0	1.4	47.9	1096.7
1146.7	1146.7	1.1	1.2	1.6	45.9	1146.7
1196.7	1196.7	1.2	1.4	1.8	49.8	1196.7
1246.7	1246.7	1.2	1.5	1.9	50.5	1246.7
1296.7	1296.7	1.3	1.8	2.2	53.8	1296.7
1346.7	1346.7	1.4	1.9	2.4	53.7	1346.7
1396.7	1396.7	1.4	2.3	2.7	57.6	1396.7
1446.7	1446.7	1.5	2.5	2.9	59.3	1446.7
1496.7	1496.7	1.6	2.8	3.2	60.3	1496.7
1546.7	1546.7	1.6	3.1	3.5	62.7	1546.7
1596.7	1596.7	1.7	3.4	3.8	63.9	1596.7
1646.7	1646.7	1.7	3.7	4.0	65.3	1646.7
1696.7	1696.7	1.7	4.1	4.4	67.4	1696.7
1746.7	1746.7	1.7	4.4	4.7	69.0	1746.7

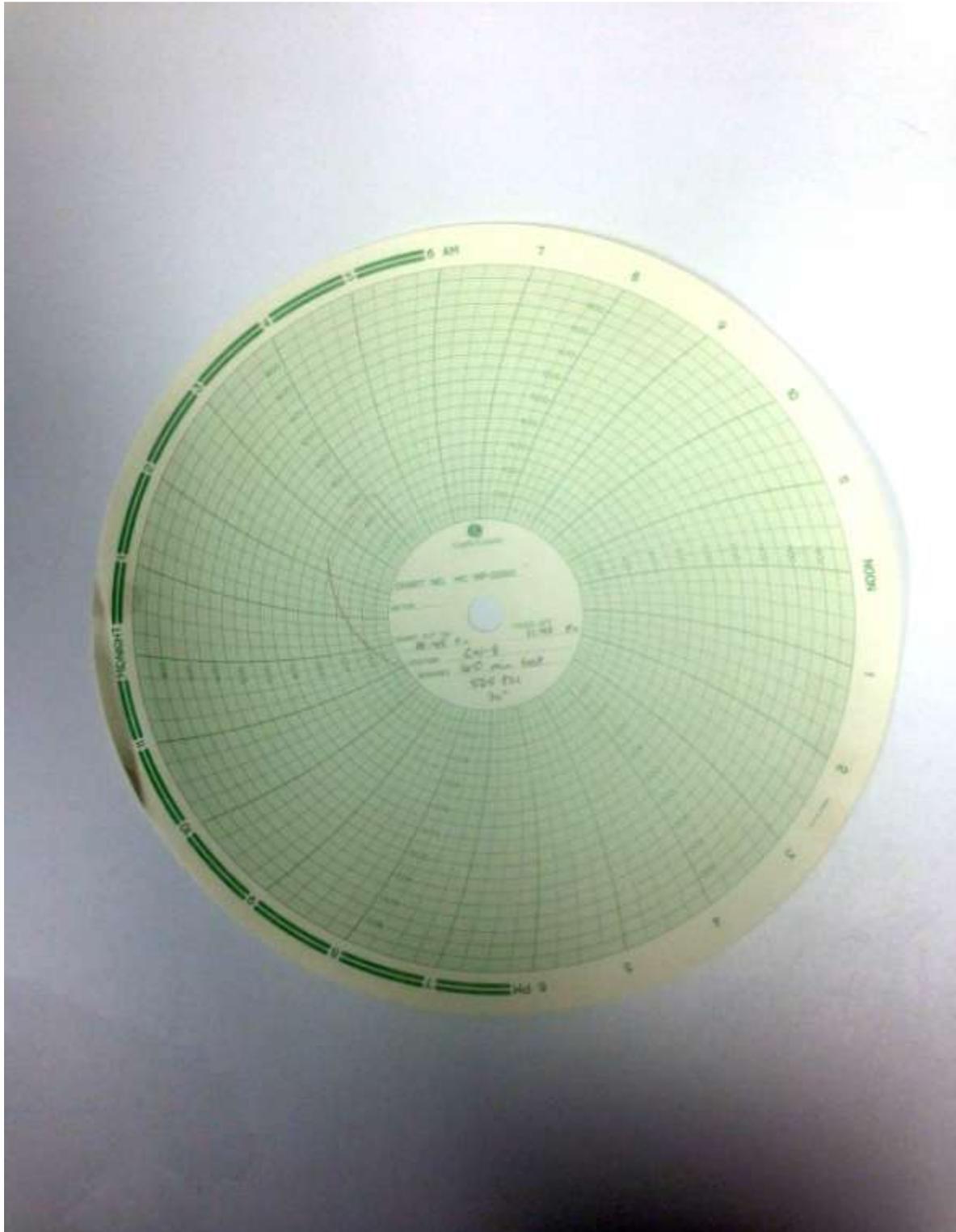
1736.7	1796.7	1.6	4.8	5.1	71.1	1736.7
1846.7	1846.7	1.6	5.2	5.5	72.9	1846.7
1896.7	1896.7	1.5	5.7	5.9	75.0	1896.7
1946.7	1946.7	1.5	6.2	6.4	76.7	1946.7
1996.7	1996.7	1.4	6.8	6.9	78.5	1996.7
2046.7	2046.7	1.3	7.3	7.4	80.0	2046.7
2096.7	2096.7	1.3	7.9	8.0	80.9	2096.7
2146.7	2146.7	1.3	8.6	8.7	81.5	2146.7
2196.7	2196.7	1.3	9.4	9.5	82.4	2196.7
2246.7	2246.6	1.1	10.3	10.4	83.9	2246.7
2296.7	2296.6	0.9	11.2	11.3	85.5	2296.7
2346.7	2346.6	0.5	12.3	12.3	87.5	2346.7
2396.7	2396.6	0.2	13.1	13.1	89.0	2396.7
2446.7	2446.6	0.0	14.0	14.0	90.0	2446.7
2496.7	2496.6	-0.2	15.1	15.1	90.6	2496.7
2546.7	2546.6	-0.4	16.5	16.5	91.4	2546.7
2596.7	2596.6	-0.7	18.0	18.0	92.3	2596.7
2646.7	2646.5	1.3	19.2	19.2	93.9	2646.7
2696.7	2696.5	-1.6	20.2	20.2	94.6	2696.7
2746.7	2746.5	-1.5	21.6	21.7	94.0	2746.7
2796.7	2796.5	-1.6	23.4	23.5	93.9	2796.7
2846.7	2846.4	-1.8	25.6	25.7	94.0	2846.7
2896.7	2896.4	2.7	27.1	27.3	95.7	2896.7
2946.7	2946.4	-2.9	28.2	28.4	95.9	2946.7
2938.4	2938.1	-2.9	28.2	28.4	95.9	2938.4
3090.0	3092.6	-3.1	28.8	29.0	105.0	3090.0
3110.0	3112.6	-3.2	29.5	29.6	105.0	3110.0
3130.0	3132.5	-3.4	30.1	30.3	103.5	3130.0
3150.0	3152.5	-3.3	31.0	31.1	97.4	3150.0
3170.0	3172.5	-3.4	31.6	31.8	97.7	3170.0
3190.0	3192.4	-3.6	32.1	32.3	99.5	3190.0
3210.0	3212.4	-3.7	32.7	33.0	99.8	3210.0
3230.0	3232.4	-3.8	33.5	33.7	99.1	3230.0
3250.0	3252.3	-3.8	34.2	34.4	98.5	3250.0
3270.0	3272.3	-3.8	34.9	35.1	97.7	3270.0
3290.0	3292.2	-3.8	35.6	35.9	97.2	3290.0
3310.0	3312.2	-3.9	36.3	36.6	96.8	3310.0
3330.0	3332.2	-3.9	37.0	37.2	96.3	3330.0
3350.0	3352.1	-3.9	37.7	37.9	95.7	3350.0
3370.0	3372.1	-3.8	38.4	38.5	95.3	3370.0
3390.0	3392.1	-3.8	39.0	39.2	94.8	3390.0

3410.0	3412.0	-3.8	39.6	39.8	94.3	3410.0
3430.0	3432.0	-3.7	40.2	40.4	93.8	3430.0
3450.0	3452.0	-3.7	40.8	41.0	93.4	3450.0
3470.0	3471.9	-3.6	41.4	41.5	92.9	3470.0
3490.0	3491.9	-3.5	42.0	42.1	92.5	3490.0
3510.0	3511.9	-3.4	42.5	42.7	92.0	3510.0
3530.0	3531.8	-3.3	43.1	43.2	91.6	3530.0
3550.0	3551.8	-3.2	43.6	43.7	91.2	3550.0
3570.0	3571.8	-3.1	44.2	44.3	90.7	3570.0
3590.0	3593.7	-3.0	44.8	44.9	90.3	3590.0
3610.0	3613.7	-2.9	45.3	45.4	89.8	3610.0
3630.0	3633.7	-2.7	45.8	45.8	89.4	3630.0
3650.0	3653.6	-2.6	46.2	46.3	89.0	3650.0
3670.0	3673.6	-2.4	46.7	46.8	88.4	3670.0
3690.0	3693.6	-2.2	47.2	47.2	87.9	3690.0
3710.0	3713.5	-2.0	47.6	47.7	87.3	3710.0
3730.0	3733.5	-1.8	48.0	48.1	86.8	3730.0
3750.0	3753.5	-1.6	48.4	48.5	86.4	3750.0
3770.0	3773.4	-1.5	48.8	48.9	86.0	3770.0
3790.0	3793.4	-1.4	49.2	49.2	85.9	3790.0
3618.0	3617.6	-3.0	28.7	28.8	104.0	3618.0
3638.0	3637.6	-2.8	29.0	29.2	84.9	3638.0
3658.0	3657.6	-2.7	29.5	29.6	80.2	3658.0
3678.0	3677.5	-2.5	30.0	30.1	76.8	3678.0
3698.0	3697.5	-2.3	30.4	30.5	75.1	3698.0
3718.0	3717.5	-2.2	30.8	30.9	73.8	3718.0
3738.0	3737.4	-2.0	31.2	31.3	73.0	3738.0
3758.0	3757.4	-1.8	31.6	31.7	72.1	3758.0
3778.0	3777.4	-1.7	32.0	32.0	71.5	3778.0
3798.0	3797.3	-1.5	32.4	32.4	70.7	3798.0
3818.0	3817.3	-1.3	32.7	32.7	70.3	3818.0
3838.0	3837.3	-1.1	33.0	33.0	69.4	3838.0
3858.0	3857.3	-1.0	33.3	33.3	68.8	3858.0
3878.0	3877.2	-0.7	33.6	33.6	67.8	3878.0
3898.0	3897.2	-0.6	33.8	33.8	67.1	3898.0
3918.0	3917.2	-0.4	34.0	34.0	66.2	3918.0
3938.0	3937.1	-0.2	34.2	34.2	65.3	3938.0
3958.0	3957.1	0.0	34.4	34.4	64.3	3958.0
3978.0	3977.1	0.2	34.5	34.5	63.4	3978.0
3998.0	3997.1	0.4	34.6	34.6	62.4	3998.0
4018.0	4017.0	0.6	34.7	34.7	61.5	4018.0

4038.0	4037.0	0.8	34.8	34.8	60.7	4038.0
4058.0	4057.0	0.9	34.8	34.8	59.7	4058.0
4078.0	4077.0	1.1	34.9	34.9	58.9	4078.0
4098.0	4096.9	1.3	34.9	34.9	57.9	4098.0
4118.0	4118.9	1.5	34.9	34.9	56.7	4118.0
4138.0	4138.9	1.6	34.9	34.9	55.7	4138.0
4158.0	4158.9	1.8	34.9	34.9	54.6	4158.0
4178.0	4178.8	2.0	34.8	34.9	53.4	4178.0
4198.0	4198.8	2.1	34.8	34.8	52.2	4198.0
4218.0	4218.8	2.3	34.7	34.8	51.2	4218.0
4238.0	4238.8	2.5	34.6	34.7	50.1	4238.0
4258.0	4258.7	2.6	34.6	34.6	48.9	4258.0
4278.0	4278.7	2.7	34.4	34.5	47.7	4278.0
4298.0	4298.7	2.9	34.4	34.5	46.6	4298.0
4318.0	4318.7	3.0	34.3	34.4	45.5	4318.0
4338.0	4338.6	3.2	34.1	34.3	44.1	4338.0
4358.0	4358.6	3.3	34.0	34.2	42.9	4358.0
4378.0	4378.6	3.5	33.9	34.1	41.7	4378.0
4398.0	4398.5	3.6	33.8	34.0	40.3	4398.0
4418.0	4418.5	3.7	33.6	33.8	38.8	4418.0
4438.0	4438.5	3.9	33.4	33.6	37.2	4438.0
4458.0	4458.5	4.0	33.3	33.5	36.0	4458.0
4478.0	4478.4	4.1	33.0	33.3	34.3	4478.0
4498.0	4498.4	4.3	32.8	33.1	32.7	4498.0
4518.0	4518.4	4.4	32.7	33.0	31.5	4518.0
4538.0	4538.4	4.5	32.5	32.8	30.1	4538.0
4558.0	4558.3	4.6	32.3	32.6	28.4	4558.0
4578.0	4578.3	4.6	32.1	32.4	27.0	4578.0
4598.0	4598.3	4.7	31.9	32.2	25.6	4598.0
4618.0	4618.3	4.7	31.6	32.0	23.9	4618.0
4638.0	4638.2	4.8	31.4	31.7	22.0	4638.0
4658.0	4658.2	4.9	31.1	31.5	19.9	4658.0
4678.0	4678.2	4.9	30.9	31.3	18.9	4678.0
4698.0	4698.2	4.8	30.8	31.2	18.7	4698.0
4718.0	4718.1	4.7	30.7	31.0	17.6	4718.0
4738.0	4738.1	4.7	30.4	30.8	16.1	4738.0
4758.0	4758.1	4.6	30.3	30.7	15.7	4758.0
4778.0	4778.0	4.5	30.3	30.6	15.6	4778.0
4798.0	4798.0	4.4	30.2	30.5	15.1	4798.0
4818.0	4818.0	4.3	30.2	30.5	14.8	4818.0
4838.0	4838.0	4.3	30.1	30.4	14.2	4838.0

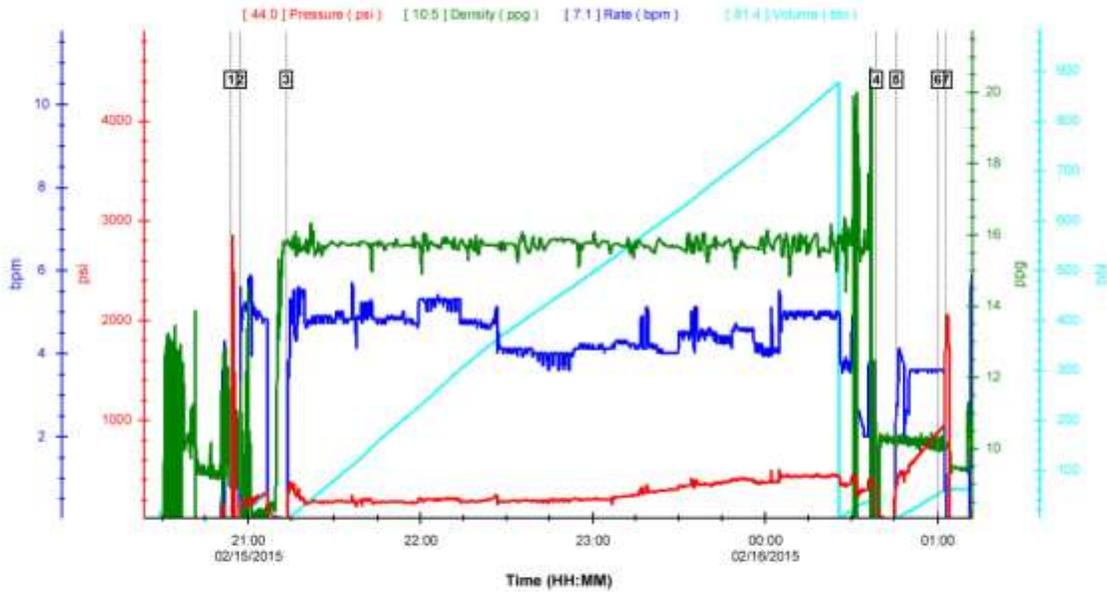
4858.0	4857.9	4.3	30.0	30.3	13.4	4858.0
4878.0	4877.9	4.3	29.8	30.1	12.2	4878.0
4898.0	4897.9	4.4	29.6	29.9	10.7	4898.0
4918.0	4917.9	4.4	29.5	29.8	9.5	4918.0
4938.0	4937.8	4.4	29.2	29.5	7.7	4938.0
4958.0	4957.8	4.4	29.0	29.3	5.8	4958.0
4978.0	4977.8	4.3	28.8	29.1	4.0	4978.0

Appendix B Pressure Recording for 30" Casing Test





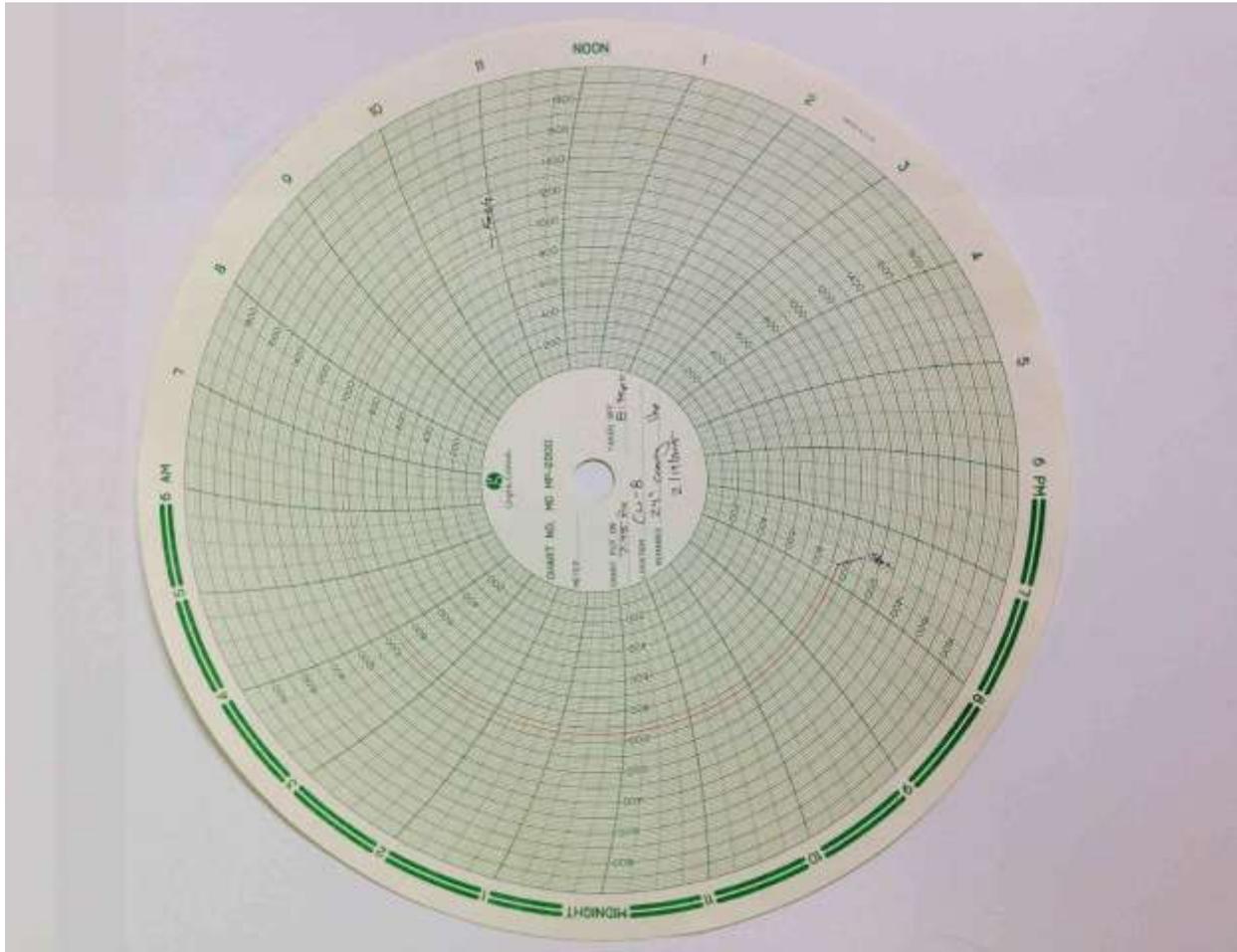
Sales Order Number: A5UT0076



- | | |
|-----------------------------|---------------------------|
| 1: 20:54:00 Pressure Test | 2: 20:57:14 H2O Ahead |
| 3: 21:13:19 Cement | 4: 00:38:46 Drop Top Plug |
| 5: 00:45:45 Displace | 6: 01:00:14 Land Plug |
| 7: 01:02:55 Cement In Place | |

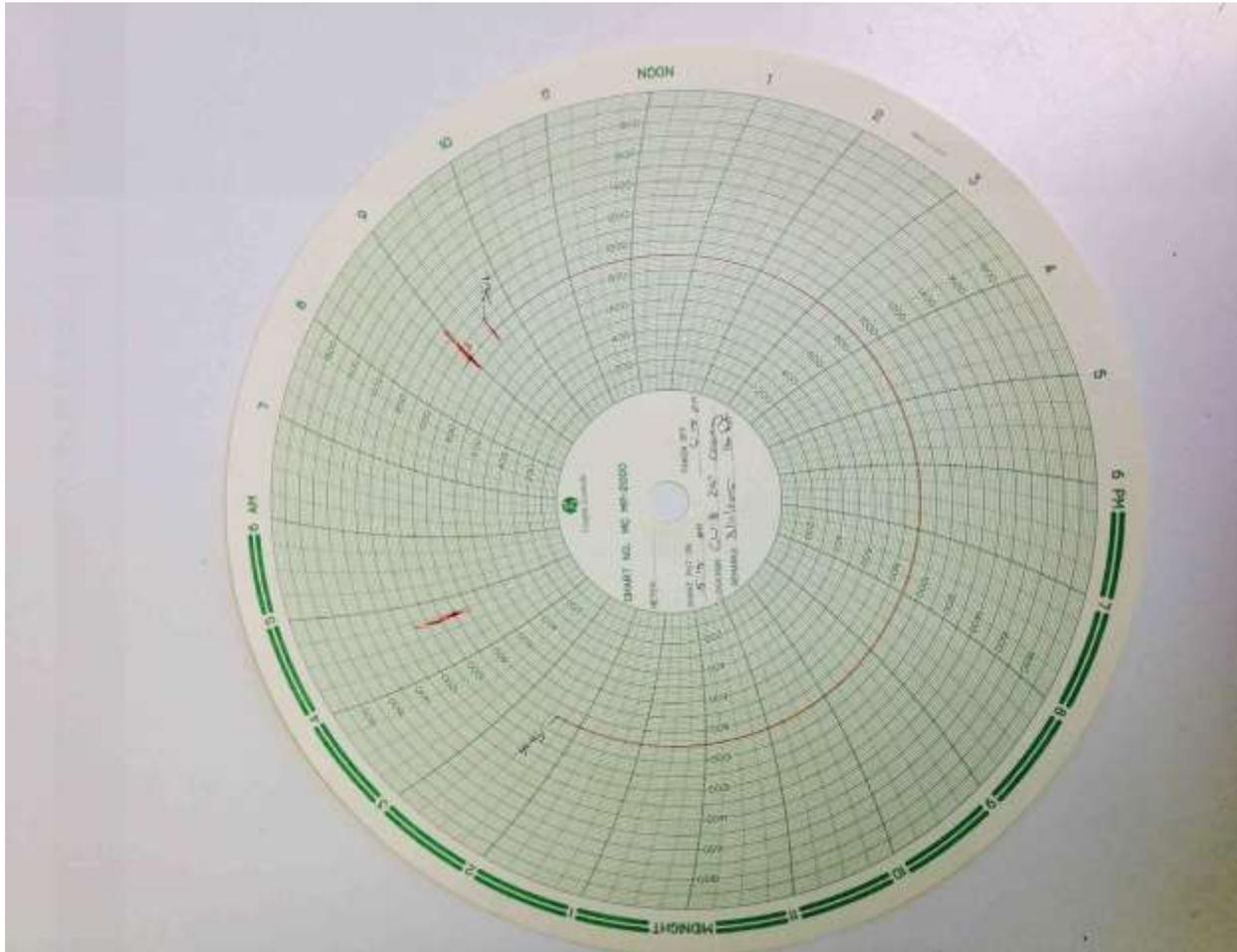
Customer: Boart Longear	Well: Magnum Caverns CW-8	Job Type: Intern.
Customer Rep: Allies, Ken	Supervisor: Owens, Scott	Job Date: 02/15/2015

Appendix D Pressure Recording for 24" Casing.

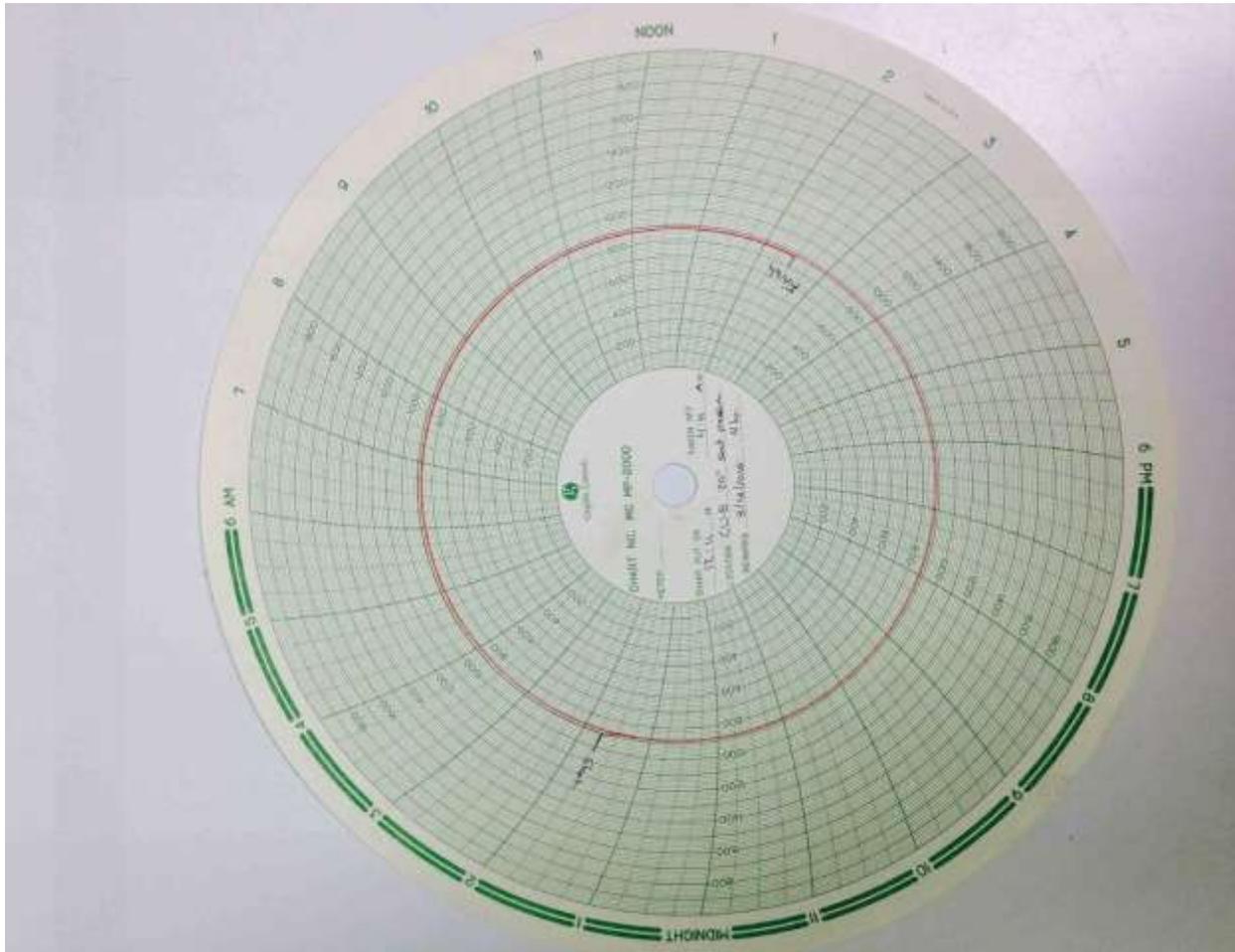


		JOB LOG			DATE
CLIENT	CONTACT	CONTACT PHONE	CONTACT ADDRESS	CONTACT CITY	03/07/15
PROJECT	STATE	CITY	WELL NAME	WELL NUMBER	
WELL TYPE	DEPT	WELL ID	WELL STATUS	WELL OPERATOR	
WELL LOCATION	WELL DEPTH	WELL DIRECTION	WELL DIAMETER	WELL CEMENT	
Magnum NGLs Solution Mining	Chris Ray	\$155,274.87		Matt Bulinski	
Gas Storage	Utah	Millard		Delta	
CW-8	Sec. 23 T155 R7W	43-027-50005		A5UT0078	
DATE	TIME	RATE (BPM)	VOLUME (BBL)	PRES (PSI)	REMARKS
03/07/15	11:00 AM				Arrive to Location
03/07/15	11:05 AM				Hazard Hunt on Location before spotting in trucks
03/07/15	11:20 AM				JSA on rigging up trucks and iron to rig
03/07/15	11:30 AM				Rig Up
03/07/15	12:15 PM				Rig Up Complete
03/07/15	12:16 PM				JSA with Company Man, Rig hands, and Ridge Cementing on Pump Schedule
03/07/15	12:54 PM				Start Job/Load Lines
03/07/15	12:56 PM	0.5	0.5	3410	3000psi Pressure Test, 8mins Held
03/07/15	1:07 PM	3.9	60	222	RX-1 Weighted Salt Mud Spacer
03/07/15	1:25 PM				Shutdown weigh up 16.3ppg Cement and verify with mud scales to truck
03/07/15	1:35 PM	4	394	330	1830sks Class G Premium/37.2% Salt Blend, 16.3ppg, 1.21yield, 4.74gal/sk
03/07/15	3:14 PM	1	1.5	150	Pump 1.5bbls H2O before shutting down to clear lines to floor of cement
03/07/15	3:17 PM				Shutdown, break cap to drop Dart Plug
03/07/15	3:22 PM				Drop Dart Plug
03/07/15	3:23 PM	4	56	1400	Displace 5.5bbls over calculated did not bump
03/07/15	3:41 PM				Check Floats/Held
					61bbls Cement Back To Surface
03/07/15	3:55 PM				JSA on washing up pump truck, rigging down iron and trucks
03/07/15	4:00 PM				Rig down
03/07/15	5:15 PM				Rig down complete
03/07/15	5:16 PM				Location walk around, clean up
03/07/15	5:25 PM				JSA on pre-tripping trucks and driving
03/07/15	5:30 PM				Leave Location

Appendix F Pressure Recording for 20" Casing Test

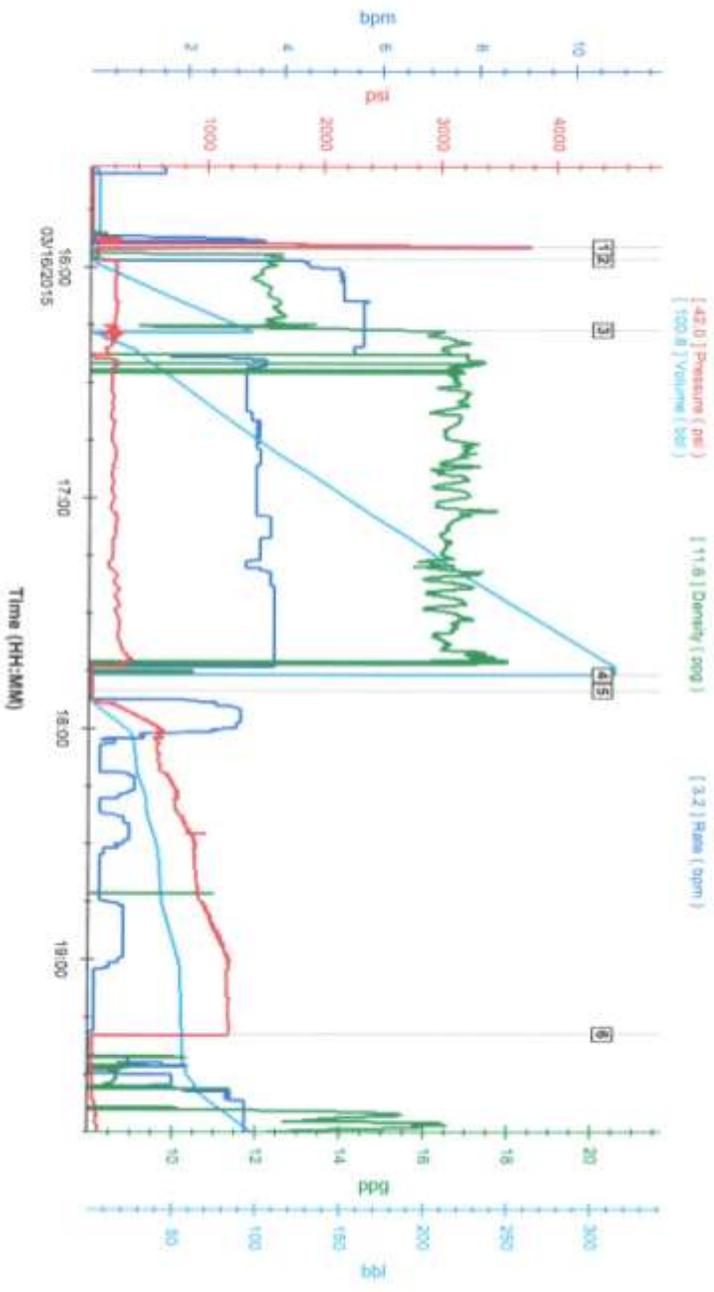


Appendix G Pressure Recording for 20" Casing Seat (Formation) Test





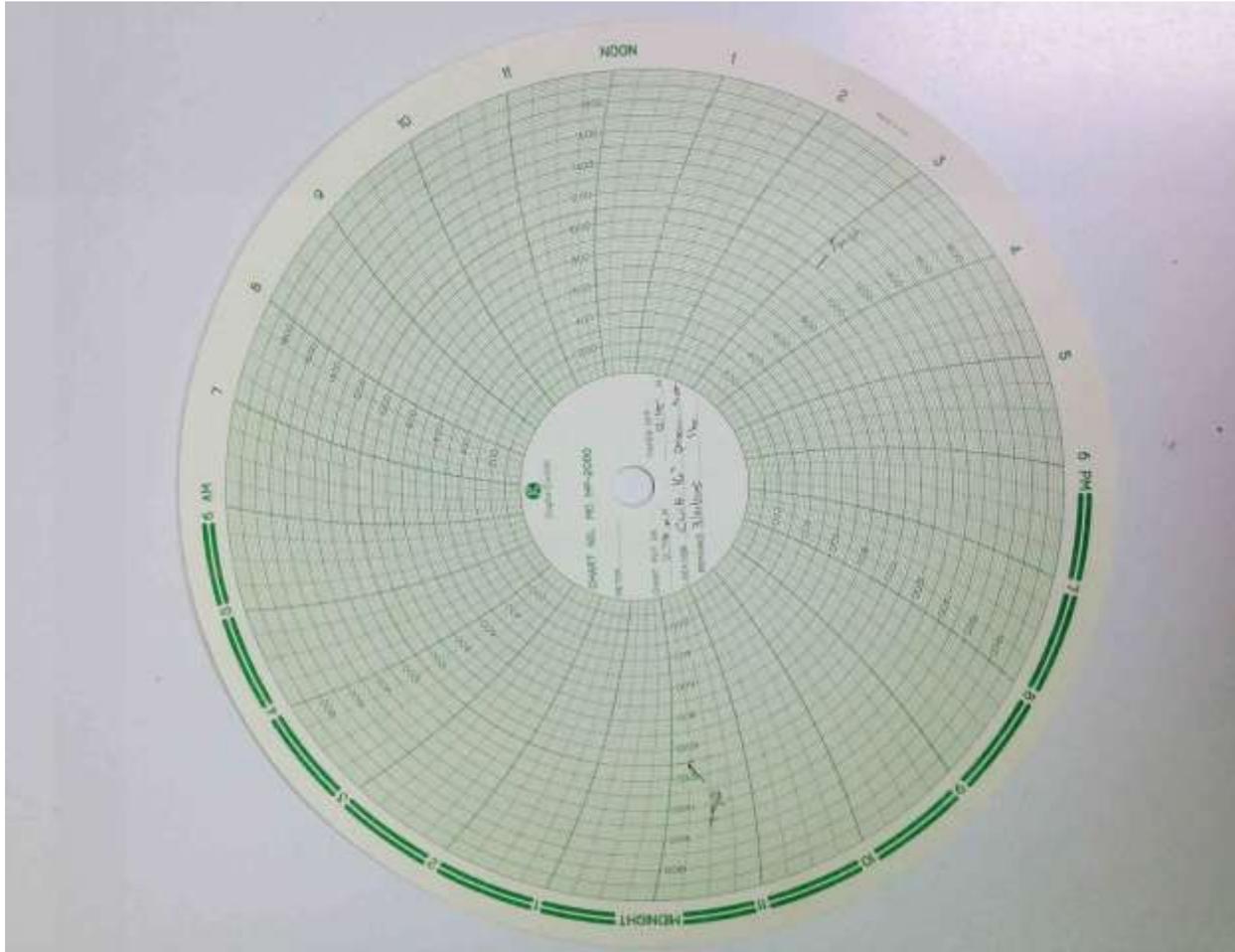
Sales Order Number: A5UT0079



- 1: 15:54:45 Pressure Test
- 2: 15:57:58 RX-1 Spacer
- 3: 16:16:23 Cement
- 4: 17:46:06 Drop Top Plug
- 5: 17:50:15 Displace
- 6: 19:19:31 Cement In Place

Customer: Boart Longear	Well: Magnum Caverns CW-8	Job Type: Production Casing
Customer Rep: Rey, Chris	Supervisor: Owens, Scott	Job Date: 03/18/2015

Appendix I Pressure Recording for 16" Casing Test



Appendix K Lithology of Drill Cuttings from Well CW-8

Sample No.	Depth (ft)	USCS Symbol	Description
1	25	SP	Sand (SP), grey, about 90% fine to coarse sand, 10% non-plastic fines.
2	30	CL	Clay (CL), brown, about 70% medium plastic fines, 30% fine to coarse sand.
3	35	CL	Clay (CL), brown, about 80% medium plastic fines, 20% fine to coarse sand.
4	40	CL	Clay (CL), brown, about 80% medium plastic fines, 20% fine to coarse sand.
5	45	ML	Silt (ML), brown, about 60% non-plastic fines, 20% fine to coarse sand, 20% medium plastic fines.
6	50	SM	Silty Sand (SM), brown, about 70% fine to medium sand, 20% non-plastic fines, 10% medium plastic fines.
7	55	SP	Sand (SP), grey, about 90% fine to coarse sand, 10% non-plastic fines.
8	60	SP/SM	Sand with Silt (SP/SM), grey, about 80% fine to coarse sand, 20% non-plastic fines.
9	65	SP/SM	Sand with Silt (SP/SM), brown, about 80% fine to coarse sand, 20% non-plastic fines.
10	70	ML	Silt (ML), dark brown, about 60% non-plastic fines, 20% fine to coarse sand, 20% medium plastic fines.
11	75	CL	Clay (CL), dark brown, about 80% medium plastic fines, 20% fine to coarse sand.
12	80	CL	Clay (CL), dark brown, about 70% medium plastic fines, 20% fine to coarse sand, 10% non-plastic fines.
13	85	CL	Clay (CL), dark brown, about 70% medium plastic fines, 20% fine to coarse sand, 10% non-plastic fines.
14	90	CL	Clay (CL), brown, about 70% medium plastic fines, 20% fine to coarse sand, 10% non-plastic fines.
15	95	CL	Clay (CL), brown, about 70% medium plastic fines, 20% fine to coarse sand, 10% non-plastic fines.
16	100	ML	Silt (ML), brown, about 60% non-plastic fines, 30% fine sand, 10% medium plastic fines.
17	105	ML	Silt (ML), brown, about 60% non-plastic fines, 30% fine sand, 10% medium plastic fines.
18	110	ML	Silt (ML), brown, about 50% non-plastic fines, 40% fine sand, 10% medium plastic fines.
19	115	ML	Silt (ML), brown, about 50% non-plastic fines, 40% fine sand, 10% medium plastic fines.
20	120	ML	Silt (ML), brown, about 60% non-plastic fines, 30% fine sand, 10% medium plastic fines.
21	125	ML	Silt (ML), brown, about 60% non-plastic fines, 30% fine sand, 10% medium plastic fines.
22	130	CL	Clay (CL), brown, about 60% medium plastic fines, 20% fine sand, 20% non-plastic fines.
23	135	CL	Clay (CL), brown, about 70% medium plastic fines, 20% non-plastic fines, 10% fine sand.
24	140	CL	Clay (CL), brown, about 70% medium plastic fines, 20% non-plastic fines, 10% fine sand.
25	145	CL	Clay (CL), brown, about 70% medium plastic fines, 20% non-plastic fines, 10% fine sand.
26	150	CL	Clay (CL), brown, about 70% medium plastic fines, 15% non-plastic fines, 15% fine sand.
27	155	ML	Silt (ML), brown, about 50% non-plastic fines, 30% fine gravel, 10% fine to coarse sand, 10% medium plastic fines.
28	160	CL	Clay (CL), grey, about 50% medium plastic fines, 30% fine gravel, 10% fine to coarse sand, 10% non-plastic fines.
29	165	CL	Clay (CL), grey, about 50% medium plastic fines, 30% fine gravel, 10% fine to coarse sand, 10% non-plastic fines.
30	170	CL	Clay (CL), grey, about 60% medium plastic fines, 20% fine gravel, 10% fine to coarse sand, 10% non-plastic fines.
31	175	CL	Clay (CL), grey, about 60% medium plastic fines, 20% fine gravel, 10% fine to coarse sand, 10% non-plastic fines.
32	180	CL	Clay (CL), grey, about 50% medium plastic fines, 30% fine gravel, 10% fine to coarse sand, 10% non-plastic fines.
33	185	CL	Clay (CL), grey, about 50% medium plastic fines, 20% fine gravel, 20% fine to coarse sand, 10% non-plastic fines.

34	190	CL	Clay (CL), grey, about 50% medium plastic fines, 20% fine gravel, 20% fine to coarse sand, 10% non-plastic fines.
35	195	CL	Clay (CL), grey, about 50% medium plastic fines, 20% fine gravel, 20% fine to coarse sand, 10% non-plastic fines.
36	200	CL	Clay (CL), brown, about 60% medium plastic fines, 20% fine to coarse sand, 10% fine gravel, 10% non-plastic fines.
37	205	CL	Clay (CL), brown, about 60% medium plastic fines, 20% fine to coarse sand, 10% fine gravel, 10% non-plastic fines.
38	210	CL	Clay (CL), brown, about 50% medium plastic fines, 20% fine gravel, 20% fine to coarse sand, 10% non-plastic fines.
39	215	CL	Clay (CL), brown, about 60% medium plastic fines, 20% fine to coarse sand, 10% fine gravel, 10% non-plastic fines.
40	220	CL	Clay (CL), brown, about 60% medium plastic fines, 20% fine to coarse sand, 10% fine gravel, 10% non-plastic fines.
41	225	CL	Clay (CL), brown, about 70% medium plastic fines, 10% fine gravel, 10% fine to coarse sand, 10% non-plastic fines.
42	230	CL	Clay (CL), brown, about 70% medium plastic fines, 10% fine gravel, 10% fine to coarse sand, 10% non-plastic fines.
43	235	CL	Clay (CL), brown, about 60% medium plastic fines, 20% fine to coarse sand, 10% fine gravel, 10% non-plastic fines.
44	240	CL	Clay (CL), brown, about 70% medium plastic fines, 10% fine gravel, 10% fine to coarse sand, 10% non-plastic fines.
45	245	CL	Clay (CL), brown, about 80% medium plastic fines, 10% fine to coarse sand, 10% non-plastic fines.
46	250	CL	Clay (CL), brown, about 60% medium plastic fines, 20% fine to coarse sand, 10% fine gravel, 10% non-plastic fines.
47	255	CL	Clay (CL), brown, about 60% medium plastic fines, 20% fine to coarse sand, 10% fine gravel, 10% non-plastic fines.
48	260	CL	Clay (CL), brown, about 70% medium plastic fines, 10% fine gravel, 10% fine to coarse sand, 10% non-plastic fines.
49	265	CL	Clay (CL), brown, about 70% medium plastic fines, 10% fine gravel, 10% fine to coarse sand, 10% non-plastic fines.
50	270	CL	Clay (CL), brown, about 80% medium plastic fines, 10% fine to coarse sand, 10% non-plastic fines.
51	275	CL	Clay (CL), brown, about 70% medium plastic fines, 20% fine to coarse sand, 10% non-plastic fines.
52	280	CL	Clay (CL), brown, about 70% medium plastic fines, 20% fine to coarse sand, 10% non-plastic fines.
53	285	CL	Clay (CL), brown, about 70% medium plastic fines, 20% fine to coarse sand, 10% non-plastic fines.
54	290	CL	Clay (CL), brown, about 70% medium plastic fines, 20% fine to coarse sand, 10% non-plastic fines.
55	295	CL	Clay (CL), brown, about 85% medium plastic fines, 10% fine to coarse sand, 5% non-plastic fines.
56	300	CL	Clay (CL), brown, about 80% medium plastic fines, 10% fine to coarse sand, 5% fine gravel, 5% non-plastic fines.
57	305	CL	Clay (CL), brown, about 70% medium plastic fines, 10% fine gravel, 10% fine to coarse sand, 10% non-plastic fines.
58	310	CL	Clay (CL), brown, about 90% medium plastic fines, 10% fine to coarse sand.
59	315	CL	Clay (CL), brown, about 90% medium plastic fines, 10% fine to coarse sand.
60	320	CL	Clay (CL), brown, about 70% medium plastic fines, 10% fine gravel, 10% fine to coarse sand, 10% non-plastic fines.
61	325	CL	Clay (CL), brown, about 70% medium plastic fines, 10% fine gravel, 10% fine to coarse sand, 10% non-plastic fines.
62	330	CL	Clay (CL), brown, about 90% medium plastic fines, 5% fine to coarse sand, 5% non-plastic fines.
63	335	CL	Sandy Clay (CL), brown, about 60% medium plastic fines, 30% fines to coarse sand, 10% fine gravel.
64	340	CL	Clay (CL), brown, about 80% medium plastic fines, 10% fine gravel, 10% fine to coarse sand.
65	345	CL	Clay (CL), brown, about 90% medium plastic fines, 10% fine to coarse sand.
66	350	CL	Clay (CL), brown, about 80% medium plastic fines, 10% fine gravel, 10% fine to coarse sand.
67	355	CL	Clay (CL), brown, about 80% medium plastic fines, 10% fine gravel, 10% fine to coarse sand.
68	360	CL	Clay (CL), brown, about 90% medium plastic fines, 10% fine to coarse sand.

69	365	CL	Clay (CL), brown, about 90% medium plastic fines, 10% fine to coarse sand.
70	370	CL	Clay (CL), brown, about 90% medium plastic fines, 10% fine to coarse sand.
71	375	CL	Clay (CL), brown, about 90% medium plastic fines, 10% fine to coarse sand.
72	380	CL	Clay (CL), brown, about 95% medium plastic fines, 5% fine sand.
73	385	CL	Clay (CL), brown, about 95% medium plastic fines, 5% fine sand.
74	390	CL	Clay (CL), brown, about 90% medium plastic fines, 10% fine to coarse sand.
75	395	CL	Clay (CL), brown, about 95% medium plastic fines, 5% fine sand.
76	400	CL	Clay (CL), brown, about 95% medium plastic fines, 5% fine sand.
77	405	CL	Clay (CL), brown, about 95% medium plastic fines, 5% fine to coarse sand.
78	410	CL	Sandy Clay (CL), brown, about 55% medium plastic fines, 45% fine to coarse sand.
79	415	CL	Sandy Clay (CL), brown, about 55% medium plastic fines, 45% fine to coarse sand.
80	420	CL	Sandy Clay (CL), brown, about 60% medium plastic fines, 30% fine to coarse sand, 10% fine gravel.
81	425	SC	Clayey Sand (SC), brown, about 60% fine to coarse sand, 30% medium plastic fines, 10% fine gravel.
82	430	CL	Sandy Clay (CL), brown, about 60% medium plastic fines, 40% fine to coarse sand.
83	435	SC	Clayey Sand (SC), brown, about 70% fine to coarse sand, 30% medium plastic fines.
84	440	CL	Clay (CL), about 70% medium plastic fines, 20% fine to medium sand, 10% non-plastic fines.
85	445	CL	Clay (CL), brown, about 80% medium plastic fines, 20% fine to coarse sand.
86	450	CL	Clay (CL), brown, about 90% medium plastic fines, 10% fine sand.
87	455	CL	Clay (CL), brown, about 80% medium plastic fines, 20% fine to coarse sand.
88	460	CL	Clay (CL), brown, about 80% medium plastic fines, 20% fine to coarse sand.
89	465	CL	Sandy Clay (CL), brown, about 60% medium plastic fines, 40% fine to coarse sand.
90	470	CL	Sandy Clay (CL), brown, about 70% medium plastic fines, 30% fine to coarse sand.
91	475	CL	Clay (CL), brown, about 90% medium plastic fines, 10% fine to medium sand.
92	480	CL	Clay (CL), brown, about 90% medium plastic fines, 10% fine to medium sand.
93	485	CL	Clay (CL), brown, about 80% medium plastic fines, 20% fine to coarse sand.
94	490	CL	Sandy Clay (CL), brown, about 70% medium plastic fines, 30% fine to coarse sand.
95	495	CL	Clay (CL), brown, about 85% medium plastic fines, 15% fine to medium sand.
96	500	CL	Clay (CL), brown, about 80% medium plastic fines, 20% fine to coarse sand.
97	505	CL	Clay (CL), brown, about 80% medium plastic fines, 20% fine to coarse sand.
98	510	CL	Clay (CL), brown, about 85% medium plastic fines, 15% fine to medium sand.
99	515	CL	Clay (CL), brown, about 80% medium plastic fines, 10% fine gravel, 10% fine to coarse sand.
100	520	CL	Clay (CL), brown, about 85% medium plastic fines, 15% fine to medium sand.
101	525	CL	Clay (CL), brown, about 80% medium plastic fines, 10% fine gravel, 10% fine to coarse sand.
102	530	CL	Clay (CL), brown, about 60% medium plastic fines, 20% fine gravel, 20% fine to coarse sand.
103	535	CL	Clay (CL), brown, about 60% medium plastic fines, 20% fine gravel, 20% fine to coarse sand.
104	540	CL	Clay (CL), brown, about 70% medium plastic fines, 20% fine to coarse sand, 10% fine gravel.
105	545	CL	Clay (CL), brown, about 90% medium plastic fines, 10% fine sand.
106	550	CL	Clay (CL), brown, about 95% medium plastic fines, 5% fine sand.
107	555	SP	Sand (SP), grey, about 95% fine to medium sand, 5% non-plastic fines.
108	560	SP	Sand (SP), grey, about 95% fine to medium sand, 5% non-plastic fines.
109	565	SP	Sand (SP), grey, about 95% fine to medium sand, 5% non-plastic fines.

110	570	SP	Sand (SP), grey, about 95% fine to medium sand, 5% non-plastic fines.
111	575	SP	Sand (SP), grey, about 95% fine to medium sand, 5% non-plastic fines.
112	580	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
113	585	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
114	590	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
115	595	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
116	600	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
117	605	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
118	610	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
119	615	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
120	620	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
121	625	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
122	630	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
123	635	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
124	640	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
125	645	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
126	650	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
127	655	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
128	660	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
129	665	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
130	670	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
131	675	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
132	680	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
133	685	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
134	690	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
135	695	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
136	700	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
137	705	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
138	710	SP-SM	Sand with Split(SP/SM), light brown/ grey, 80% fine to coarse sands, 20% on plastic fines
139	715	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
140	720	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
141	725	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
142	730	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
143	735	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
144	740	SP-SM	Sand with Split(SP/SM), light brown/ grey, 95% fine to coarse sands, 5% on plastic fines
145	745	SP-SM	Sand with Split(SP/SM), light brown/ grey, 95% fine to coarse sands, 5% on plastic fines
146	750	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
147	755	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
148	760	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
149	765	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
150	770	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.

151	775	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
152	780	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
153	785	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
154	790	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
155	795	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
156	800	CL	Clay (CL), light brown, 85% medium plastic fines, 15% fine to medium sand.
157	805	CL	Clay (CL), light brown, 85% medium plastic fines, 15% fine to medium sand.
158	810	SP-SM	Sand with Silt(SP/SM), light brown/ grey, 80% fine to coarse sands, 20% on plastic fines
159	815	SP-SM	Sand with Silt(SP/SM), light brown/ grey, 80% fine to coarse sands, 20% on plastic fines
160	820	SP-SM	Sand with Silt(SP/SM), light brown/ grey, 80% fine to coarse sands, 20% on plastic fines
161	825	SP-SM	Sand with Silt(SP/SM), light brown/ grey, 80% fine to coarse sands, 20% on plastic fines
162	830	ML	Silt (ML), brown, about 60% non-plastic fines, 30% fine sand, 10% medium plastic fines.
163	835	ML	Silt (ML), brown, about 60% non-plastic fines, 30% fine sand, 10% medium plastic fines.
164	840	ML	Silt (ML), brown, about 60% non-plastic fines, 30% fine sand, 10% medium plastic fines.
165	845	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
166	850	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
167	855	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
168	860	ML	Silt (ML), brown, about 80% non-plastic fines, 10% fine to coarse sand, 10% medium plastic fines.
169	865	ML	Silt (ML), brown, about 80% non-plastic fines, 10% fine to coarse sand, 10% medium plastic fines.
170	870	CL	Clay (CL), light brown, 80% medium plastic fines, 20% fine to medium sand.
171	875	CL	Clay (CL), light brown, 80% medium plastic fines, 20% fine to medium sand.
172	880	CL	Clay (CL), light brown, 80% medium plastic fines, 20% fine to medium sand.
173	885	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
174	890	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
175	895	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
176	900	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
177	905	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
178	910	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
179	915	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
180	920	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
181	925	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
182	930	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
183	935	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
184	940	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
185	945	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
186	950	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
187	955	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
188	960	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
189	965	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
190	970	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
191	975	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.

192	980	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
193	985	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
194	990	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
195	995	SP-SM	Sand with Silt(SP/SM), light brown/ grey, 90% fine to coarse sands, 10% on plastic fines
196	1000	SP-SM	Sand with Silt(SP/SM), light brown/ grey, 90% fine to coarse sands, 10% on plastic fines
197	1005	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
198	1010	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
199	1015	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
200	1020	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
201	1025	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
202	1030	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
203	1035	SP-SM	Sand with Silt(SP/SM), light brown/ grey, 90% fine to coarse sands, 10% on plastic fines
204	1040	SP-SM	Sand with Silt(SP/SM), light brown/ grey, 90% fine to coarse sands, 10% on plastic fines
205	1045	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
206	1050	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
207	1055	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
208	1060	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
209	1065	SP-SM	Sand with Silt(SP/SM), light brown/ grey, 90% fine to coarse sands, 10% on plastic fines
210	1070	SP-SM	Sand with Silt(SP/SM), light brown/ grey, 90% fine to coarse sands, 10% on plastic fines
211	1075	SP-SM	Sand with Silt(SP/SM), light brown/ grey, 90% fine to coarse sands, 10% on plastic fines
212	1080	SP-SM	Sand with Silt(SP/SM), light brown/ grey, 90% fine to coarse sands, 10% on plastic fines
213	1085	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
214	1090	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
215	1095	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
216	1100	SP-SM	Sand with Silt(SP/SM), light brown/ grey, 90% fine to coarse sands, 10% on plastic fines
217	1105	SP-SM	Sand with Silt(SP/SM), light brown/ grey, 90% fine to coarse sands, 10% on plastic fines
218	1110	SP-SM	Sand with Silt(SP/SM), light brown/ grey, 90% fine to coarse sands, 10% on plastic fines
219	1115	SP-SM	Sand with Silt(SP/SM), light brown/ grey, 90% fine to coarse sands, 10% on plastic fines
220	1120	SP-SM	Sand with Silt(SP/SM), light brown/ grey, 90% fine to coarse sands, 10% on plastic fines
221	1125	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
222	1130	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
223	1135	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
224	1140	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
225	1145	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
226	1150	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
227	1155	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
228	1160	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
229	1165	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
230	1170	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
231	1175	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
232	1180	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.

233	1185	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
234	1190	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
235	1195	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
236	1200	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
237	1205	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
238	1210	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
239	1215	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
240	1220	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
241	1225	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
242	1230	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
243	1235	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
244	1240	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
245	1245	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
246	1250	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
247	1255	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
248	1260	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
249	1265	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
250	1270	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
251	1275	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
252	1280	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
253	1285	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
254	1290	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
255	1295	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
256	1300	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
257	1305	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
258	1310	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
259	1315	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
260	1320	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
261	1325	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
262	1330	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
263	1335	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
264	1340	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
265	1345	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
266	1350	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
267	1355	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
268	1360	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
269	1365	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
270	1370	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
271	1375	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
272	1380	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
273	1385	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.

274	1390	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
275	1395	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
276	1400	ML	Silt (ML), light brown, about 80% non-plastic fines, 10% fine to coarse sand, 10% medium plastic fines.
277	1405	ML	Silt (ML), light brown, about 80% non-plastic fines, 10% fine to coarse sand, 10% medium plastic fines.
278	1410	SP-SM	Sand with Silt(SP/SM), light brown/ grey, 80% fine to coarse sands, 20% non-plastic fines
279	1415	SP-SM	Sand with Silt(SP/SM), light brown/ grey, 80% fine to coarse sands, 20% non-plastic fines
280	1420	ML	Silt (ML), light brown, about 80% non-plastic fines, 10% fine to coarse sand, 10% medium plastic fines.
281	1425	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
282	1430	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
283	1435	SP-SM	Sand with Silt(SP/SM), light brown/ grey, 80% fine to coarse sands, 20% non-plastic fines
284	1440	SP-SM	Sand with Silt(SP/SM), light brown/ grey, 80% fine to coarse sands, 20% non-plastic fines
285	1445	SP-SM	Sand with Silt(SP/SM), light brown/ grey, 80% fine to coarse sands, 20% non-plastic fines
286	1450	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
287	1455	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
288	1460	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
289	1465	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
290	1470	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
291	1475	SP-SM	Sand with Silt(SP/SM), light brown/ grey, 90% fine to coarse sands, 10% non-plastic fines
292	1480	SP-SM	Sand with Silt(SP/SM), light brown/ grey, 90% fine to coarse sands, 10% non-plastic fines
293	1485	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
294	1490	SP-SM	Sand with Silt(SP/SM), light brown/ grey, 90% fine to coarse sands, 10% non-plastic fines
295	1495	SP-SM	Sand with Silt(SP/SM), light brown/ grey, 90% fine to coarse sands, 10% non-plastic fines
296	1500	SP-SM	Sand with Silt(SP/SM), light brown/ grey, 90% fine to coarse sands, 10% non-plastic fines
297	1505	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
298	1510	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
299	1515	SP-SM	Sand with Silt(SP/SM), light brown/ grey, 80% fine to coarse sands, 20% on plastic fines
300	1520	SP-SM	Sand with Silt(SP/SM), light brown/ grey, 95% fine to coarse sands, 5% on plastic fines
301	1525	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
302	1530	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
303	1535	SP-SM	Sand with Silt(SP/SM), light brown/ grey, 95% fine to coarse sands, 5% on plastic fines
304	1540	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
305	1545	CL	Clay (CL), light brown, 85% medium plastic fines, 15% fine to medium sand.
306	1550	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
307	1555	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
308	1560	SP-SM	Sand with Silt(SP/SM), light brown/ grey, 90% fine to coarse sands, 10% non-plastic fines
309	1565	SP-SM	Sand with Silt(SP/SM), light brown/ grey, 90% fine to coarse sands, 10% non-plastic fines
310	1570	SP-SM	Sand with Silt(SP/SM), light brown/ grey, 95% fine to coarse sands, 5% on plastic fines
311	1575	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
312	1580	SP-SM	Sand with Silt(SP/SM), light brown/ grey, 95% fine to coarse sands, 5% on plastic fines
313	1585	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.

314	1590	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
315	1595	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
316	1600	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
317	1605	CL	Clay (CL), light brown, 85% medium plastic fines, 15% fine to medium sand.
318	1610	CL	Clay (CL), light brown, 85% medium plastic fines, 15% fine to medium sand.
319	1615	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
320	1620	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
321	1625	CL	Clay (CL), light brown, 85% medium plastic fines, 15% fine to medium sand.
322	1630	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
323	1635	CL	Clay (CL), light brown, 85% medium plastic fines, 15% fine to medium sand.
324	1640	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
325	1645	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
326	1650	CL	Clay (CL), light brown, 85% medium plastic fines, 15% fine to medium sand.
327	1655	CL	Clay (CL), light brown, 85% medium plastic fines, 15% fine to medium sand.
328	1660	CL	Clay (CL), light brown, 85% medium plastic fines, 15% fine to medium sand.
329	1665	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
330	1670	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
331	1675	CL	Clay (CL), light brown, 85% medium plastic fines, 15% fine to medium sand.
332	1680	CL	Clay (CL), light brown, 85% medium plastic fines, 15% fine to medium sand.
333	1685	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
334	1690	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
335	1695	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
336	1700	CL	Clay (CL), light brown, 85% medium plastic fines, 15% fine to medium sand.
337	1705	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
338	1710	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
339	1715	SP-SM	Sand with Split(SP/SM), light brown/ grey, 95% fine to coarse sands, 5% on plastic fines
340	1720	SP-SM	Sand with Split(SP/SM), light brown/ grey, 95% fine to coarse sands, 5% on plastic fines
341	1725	CL	Clay (CL), light brown, 85% medium plastic fines, 15% fine to medium sand.
342	1730	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
343	1735	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
344	1740	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
345	1745	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
346	1750	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
347	1755	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
348	1760	SP-SM	Sand with Split(SP/SM), light brown/ grey, 95% fine to coarse sands, 5% on plastic fines
349	1765	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
350	1770	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
351	1775	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
352	1780	SP-SM	Sand with Split(SP/SM), light brown/ grey, 95% fine to coarse sands, 5% on plastic fines
353	1785	CL	Clay (CL), light brown, 85% medium plastic fines, 15% fine to medium sand.
354	1790	CL	Clay (CL), light brown, 85% medium plastic fines, 15% fine to medium sand.

355	1795	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
356	1800	SP-SM	Sand with Split(SP/SM), light brown/ grey, 95% fine to coarse sands, 5% on plastic fines
357	1805	SP-SM	Sand with Split(SP/SM), light brown/ grey, 95% fine to coarse sands, 5% on plastic fines
358	1810	SP-SM	Sand with Split(SP/SM), light brown/ grey, 95% fine to coarse sands, 5% on plastic fines
359	1815	SP-SM	Sand with Split(SP/SM), light brown/ grey, 95% fine to coarse sands, 5% on plastic fines
360	1820	SP-SM	Sand with Split(SP/SM), light brown/ grey, 95% fine to coarse sands, 5% on plastic fines
361	1825	SP-SM	Sand with Split(SP/SM), light brown/ grey, 95% fine to coarse sands, 5% on plastic fines
362	1830	SP-SM	Sand with Split(SP/SM), light brown/ grey, 95% fine to coarse sands, 5% on plastic fines
363	1835	SP-SM	Sand with Split(SP/SM), light brown/ grey, 95% fine to coarse sands, 5% on plastic fines
364	1840	SP-SM	Sand with Split(SP/SM), light brown/ grey, 95% fine to coarse sands, 5% on plastic fines
365	1845	SP-SM	Sand with Split(SP/SM), light brown/ grey, 95% fine to coarse sands, 5% on plastic fines
366	1850	SP-SM	Sand with Split(SP/SM), light brown/ grey, 95% fine to coarse sands, 5% on plastic fines
367	1855	SP-SM	Sand with Split(SP/SM), light brown/ grey, 95% fine to coarse sands, 5% on plastic fines
368	1860	SP-SM	Sand with Split(SP/SM), light brown/ grey, 95% fine to coarse sands, 5% on plastic fines
369	1865	SP-SM	Sand with Split(SP/SM), light brown/ grey, 95% fine to coarse sands, 5% on plastic fines
370	1870	SP-SM	Sand with Split(SP/SM), light brown/ grey, 95% fine to coarse sands, 5% on plastic fines
371	1875	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
372	1880	CL	Clay (CL), light brown, 85% medium plastic fines, 15% fine to medium sand.
373	1885	CL	Clay (CL), light brown, 85% medium plastic fines, 15% fine to medium sand.
374	1890	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
375	1895	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
376	1900	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
377	1905	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
378	1910	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
379	1915	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
380	1920	SP-SM	Sand with Split(SP/SM), light brown/ grey, 95% fine to coarse sands, 5% on plastic fines
381	1925	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
382	1930	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
383	1935	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
384	1940	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
385	1945	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
386	1950	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
387	1955	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
388	1960	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
389	1965	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
390	1970	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
391	1975	CL	Clay (CL), light brown, 85% medium plastic fines, 15% fine to medium sand.
392	1980	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
393	1985	CL	Clay (CL), light brown, 85% medium plastic fines, 15% fine to medium sand.
394	1990	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
395	1995	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.

396	2000	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
397	2005	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
398	2010	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
399	2015	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
400	2020	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
401	2025	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
402	2030	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
403	2035	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
404	2040	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
405	2045	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
406	2050	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
407	2055	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
408	2060	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
409	2065	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
410	2070	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
411	2075	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
412	2080	SP-SM	Sand with Split(SP/SM), light brown/ grey, 95% fine to coarse sands, 5% on plastic fines
413	2085	SP-SM	Sand with Split(SP/SM), light brown/ grey, 95% fine to coarse sands, 5% on plastic fines
414	2090	SP-SM	Sand with Split(SP/SM), light brown/ grey, 95% fine to coarse sands, 5% on plastic fines
415	2095	CL	Clay (CL), light brown, 85% medium plastic fines, 15% fine to medium sand.
416	2100	SP-SM	Sand with Split(SP/SM), light brown/ grey, 95% fine to coarse sands, 5% on plastic fines
417	2105	SP-SM	Sand with Split(SP/SM), light brown/ grey, 95% fine to coarse sands, 5% on plastic fines
418	2110	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
419	2115	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
420	2120	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
421	2125	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
422	2130	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
423	2135	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
424	2140	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
425	2145	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
426	2150	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
427	2155	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
428	2160	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
429	2165	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
430	2170	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
431	2175	CL	Clay (CL), light brown, 85% medium plastic fines, 15% fine to medium sand.
432	2180	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
433	2185	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
434	2190	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
435	2195	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
436	2200	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.

437	2205	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
438	2210	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
439	2215	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
440	2220	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
441	2225	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
442	2230	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
443	2235	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
444	2240	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
445	2245	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
446	2250	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
447	2255	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
448	2260	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
449	2265	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
450	2270	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
451	2275	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
452	2280	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
453	2285	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
454	2290	CL	Clay (CL), light brown, 85% medium plastic fines, 15% fine to medium sand.
455	2295	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
456	2300	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
457	2305	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
458	2310	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
459	2315	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
460	2320	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
461	2325	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
462	2330	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
463	2335	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
464	2340	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
465	2345	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
466	2350	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
467	2355	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
468	2360	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
469	2365	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
470	2370	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
471	2375	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
472	2380	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
473	2385	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
474	2390	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
475	2395	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
476	2400	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
477	2405	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.

478	2410	CL	Clay (CL), light brown, 95% medium plastic fines, 5% fine to medium sand.
479	2415	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
480	2420	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
481	2425	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
482	2430	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
483	2435	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
484	2440	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
485	2445	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
486	2450	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
487	2455	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
488	2460	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
489	2465	CL	Clay (CL), light brown, 85% medium plastic fines, 15% fine to medium sand.
490	2470	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
491	2475	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
492	2480	CL	Clay (CL), light brown, 90% medium plastic fines, 10% fine to medium sand.
493	2485	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
494	2490	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
495	2495	CL	Clay (CL), Med/light brown, 90% medium plastic fines, 10% fine to medium sand.
496	2500	CL	Clay (CL), Med/light brown, 90% medium plastic fines, 10% fine to medium sand.
497	2505	CL	Clay (CL), Med/light brown, 90% medium plastic fines, 10% fine to medium sand.
498	2510	CL	Clay (CL), Med/light brown, 90% medium plastic fines, 10% fine to medium sand.
499	2515	CL	Clay (CL), Med/light brown, 90% medium plastic fines, 10% fine to medium sand.
500	2520	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
501	2525	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
502	2530	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
503	2535	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
504	2540	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
505	2545	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
506	2550	CL	Clay (CL), Med/light brown, 90% medium plastic fines, 10% fine to medium sand.
507	2555	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
508	2560	CL	Clay (CL), Med/light brown, 85% medium plastic fines, 15% fine to medium sand.
509	2565	CL	Clay (CL), Med/light brown, 90% medium plastic fines, 10% fine to medium sand.
510	2570	CL	Clay (CL), Med/light brown, 90% medium plastic fines, 10% fine to medium sand.
511	2575	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
512	2580	CL	Clay (CL), Med/light brown, 90% medium plastic fines, 10% fine to medium sand.
513	2585	CL	Clay (CL), Med/light brown, 90% medium plastic fines, 10% fine to medium sand.
514	2590	CL	Clay (CL), Med/light brown, 90% medium plastic fines, 10% fine to medium sand.
515	2595	CL	Clay (CL), Med/light brown, 90% medium plastic fines, 10% fine to medium sand.
516	2600	CL	Clay (CL), Med/light brown, 85% medium plastic fines, 15% fine to medium sand.
517	2605	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
518	2610	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.

519	2615	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
520	2620	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
521	2625	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
522	2630	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
523	2635	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
524	2640	CL	Clay (CL), Med/light brown, 90% medium plastic fines, 10% fine to medium sand.
525	2645	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
526	2650	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
527	2655	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
528	2660	SP-SM	Sand with Split(SP/SM), light brown/ grey, 90% fine to coarse sands, 10% on plastic fines
529	2665	CL	Clay (CL), Med/light brown, 90% medium plastic fines, 10% fine to medium sand.
530	2670	CL	Clay (CL), Med/light brown, 90% medium plastic fines, 10% fine to medium sand.
531	2675	CL	Clay (CL), Med/light brown, 90% medium plastic fines, 10% fine to medium sand.
532	2680	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
533	2685	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
534	2690	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
535	2695	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
536	2700	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
537	2705	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
538	2710	CL	Clay (CL), Med/light brown, 90% medium plastic fines, 10% fine to medium sand.
539	2715	CL	Clay (CL), Med/light brown, 90% medium plastic fines, 10% fine to medium sand.
540	2720	SP-SM	Sand with Split(SP/SM), light brown/ grey, 90% fine to coarse sands, 10% on plastic fines
541	2725	SP-SM	Sand with Split(SP/SM), light brown/ grey, 90% fine to coarse sands, 10% on plastic fines
542	2730	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
543	2735	CL	Clay (CL), Med/light brown, 90% medium plastic fines, 10% fine to medium sand.
544	2740	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
545	2745	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
546	2750	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
547	2755	CL	Clay (CL), Med/light brown, 90% medium plastic fines, 10% fine to medium sand.
548	2760	CL	Clay (CL), Med/light brown, 90% medium plastic fines, 10% fine to medium sand.
549	2765	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
550	2770	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
551	2775	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
552	2780	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
553	2785	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
554	2790	CL	Clay (CL), Med/light brown, 90% medium plastic fines, 10% fine to medium sand.
555	2795	CL	Clay (CL), Med/light brown, 90% medium plastic fines, 10% fine to medium sand.
556	2800	CL	Clay (CL), Med/light brown, 90% medium plastic fines, 10% fine to medium sand.
557	2805	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
558	2810	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
559	2815	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.

560	2820	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
561	2825	CL	Clay (CL), Med/light brown, 90% medium plastic fines, 10% fine to medium sand.
562	2830	CL	Clay (CL), Med/light brown, 90% medium plastic fines, 10% fine to medium sand.
563	2835	CL	Clay (CL), Med/light brown, 90% medium plastic fines, 10% fine to medium sand.
564	2840	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
565	2845	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
566	2850	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
567	2855	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
568	2860	CL	Clay (CL), Med/light brown, 95% medium plastic fines, 5% fine to medium sand.
569	2865	CL	Clay (CL), Med/light brown, 90% medium plastic fines, 10% fine to medium sand.
570	2870	CL	Clay (CL), Med/light brown, 90% medium plastic fines, 10% fine to medium sand.
571	2875	CL	Clay (CL), Med/light brown, 90% medium plastic fines, 10% fine to medium sand.
572	2880	CL	Clay (CL), Med/light brown, 90% medium plastic fines, 10% fine to medium sand.
573	2885	SP-SM	Sand with Split(SP/SM), light brown/ grey, 90% fine to coarse sands, 10% on plastic fines
574	2890	SP-SM	Sand with Split(SP/SM), light brown/ grey, 90% fine to coarse sands, 10% on plastic fines
575	2895	SP-SM	Sand with Split(SP/SM), light brown/ grey, 90% fine to coarse sands, 10% on plastic fines
576	2900	CL	Clay (CL), Med/light grey, 90% medium plastic fines, 10% fine to medium sand.
577	2905	CL	Clay (CL), Med/light grey, 90% medium plastic fines, 10% fine to medium sand.
578	2910	CL	Clay (CL), Med/light grey, 85% medium plastic fines, 15% fine to medium sand.
579	2915	CL	Clay (CL), Med/light gray, 85% medium plastic fines, 15% fine to medium sand.
580	2920	CL	Clay (CL), Med/light grey, 85% medium plastic fines, 15% fine to medium sand.
581	2925	GY/CL	Gypsum (GY), light grey/, 80% medium plastic fines, 20% fine to medium sand.
582	2930	GY/CL	Gypsum (GY), light grey/, 80% medium plastic fines, 20% fine to medium sand.
583	2935	GY/CL	Gypsum (GY), grey/, 80% medium plastic fines, 20% fine to medium sand.
584	2940	CL	Clay (CL), light brown/, 80% medium plastic fines, 20% fine to medium sand.
585	2945	CL	Clay (CL), light brown/, 80% medium plastic fines, 20% fine to medium sand.
586	2950	CL	Clay (CL), grey/, 80% medium plastic fines, 20% fine to medium sand.
587	2955	GY/CL	Gypsum (GY), grey/, 80% medium plastic fines, 20% fine to medium sand.
588	2960	GY/CL	Gypsum (GY), light grey/, 80% medium plastic fines, 20% fine to medium sand.
589	2965	GY	Gypsum (GY), grey/, 95% medium plastic fines, 5% fine to medium sand.
590	2970	GY	Gypsum (GY), light grey/, 90% medium plastic fines, 10% fine to medium sand.
591	2975	GY	Gypsum (GY), light grey/, 95% medium plastic% fine to medium sand.
592	2980	GY	Gypsum (GY), light grey/, 90% medium plastic fines, 10% fine to medium sand.
593	2985	GY	Gypsum (GY), light grey/, 95% medium plastic% fine to medium sand.
594	2990	GY	Gypsum (GY), light grey/, 90% medium plastic fines, 10% fine to medium sand.
595	2995	GY	Gypsum (GY), light grey/, 90% medium plastic fines, 10% fine to medium sand.
596	3000	GY	Gypsum (GY), light grey/, 90% medium plastic fines, 10% fine to medium sand.
597	3005	GY	Gypsum (GY), light grey/, 90% medium plastic fines, 10% fine to medium sand.
598	3010	GY	Gypsum (GY), light grey/, 90% medium plastic fines, 10% fine to medium sand.
599	3015	GY	Gypsum (GY), light grey/, 90% medium plastic fines, 10% fine to medium sand.
600	3020	GY	Gypsum (GY), light grey/, 90% medium plastic fines, 10% fine to medium sand.

601	3025	GY/CL	Gypsum (GY), grey/, 80% medium plastic fines, 20% fine to medium sand.
602	3030	GY/CL	Gypsum (GY), light grey/, 80% medium plastic fines, 20% fine to medium sand.
603	3035	CL	Clay (CL), grey/, 85% medium plastic fines, 15% fine to medium sand.
604	3040	CL	Clay (CL), grey/, 85% medium plastic fines, 15% fine to medium sand.
605	3045	GY	Gypsum (GY), grey/, 95% medium plastic% fine to medium sand.
606	3050	GY	Gypsum (GY), light grey/, 90% medium plastic fines, 10% fine to medium sand.
607	3055	GY	Gypsum (GY), light grey/, 95% medium plastic% fine to medium sand.
608	3060	GY	Gypsum (GY), light grey/, 90% medium plastic fines, 10% fine to medium sand.
609	3065	GY	Gypsum (GY), light grey/, 95% medium plastic% fine to medium sand.
610	3070	GY	Gypsum (GY), light grey/, 90% medium plastic fines, 10% fine to medium sand.
611	3075	GY	Gypsum (GY), light grey/, 90% medium plastic fines, 10% fine to medium sand.
612	3080	GY	Gypsum (GY), light grey/, 90% medium plastic fines, 10% fine to medium sand.
613	3085	GY	Gypsum (GY), light grey/, 90% medium plastic fines, 10% fine to medium sand.
614	3090	GY	Gypsum (GY), light grey/, 90% medium plastic fines, 10% fine to medium sand.
615	3095	GY	Gypsum (GY), light grey/, 90% medium plastic fines, 10% fine to medium sand.
616	3100	GY	Gypsum (GY), light grey/, 90% medium plastic fines, 10% fine to medium sand.
617	3105	GY	Gypsum (GY), light grey/, 90% medium plastic fines, 10% fine to medium sand.
618	3110	GY	Gypsum (GY), light grey/, 90% medium plastic fines, 10% fine to medium sand.
619	3115	GY	Gypsum (GY), light grey/, 90% medium plastic fines, 10% fine to medium sand.
620	3120	GY	Gypsum (GY), light grey/, 90% medium plastic fines, 10% fine to medium sand.
621	3125	GY	Gypsum (GY), light grey/, 90% medium plastic fines, 10% fine to medium sand.
622	3130	GY	Gypsum (GY), grey, 50% medium plastic fines, 40% cement, 10% fine to medium sand.
623	3135	GY	Gypsum (GY), grey, 50% medium plastic fines, 40% cement, 10% fine to medium sand.
624	3140	GY	Gypsum (GY), grey, 50% medium plastic fines, 40% cement, 10% fine to medium sand.
625	3145	GY	Gypsum (GY), grey, 50% medium plastic fines, 40% cement, 10% fine to medium sand.
626	3150	GY	Gypsum (GY), grey, 50% medium plastic fines, 40% cement, 10% fine to medium sand.
627	3155	CL	Clay (CL), grey/, 85% medium plastic fines, 15% fine to medium sand.
628	3160	CL	Clay (CL), grey/, 85% medium plastic fines, 15% fine to medium sand.
629	3165	GY/CL	Gypsum (GY), grey/, 85% medium plastic fines, 15% fine to medium sand.
630	3170	GY	Gypsum (GY), light grey/, 90% medium plastic fines, 10% fine to medium sand.
631	3175	GY	Gypsum (GY), light grey/, 90% medium plastic fines, 10% fine to medium sand.
632	3180	GY	Gypsum (GY), light grey/, 90% medium plastic fines, 10% fine to medium sand.
633	3185	GY	Gypsum (GY), grey, 50% medium plastic fines, 40% cement, 10% fine to medium sand.
634	3190	GY	Gypsum (GY), grey, 50% medium plastic fines, 40% cement, 10% fine to medium sand.
635	3195	GY	Gypsum (GY), grey, 50% medium plastic fines, 40% cement, 10% fine to medium sand.
636	3200	GY	Gypsum (GY), grey, 50% medium plastic fines, 40% cement, 10% fine to medium sand.
637	3205	SLT	Salt (SLT), clear, 80% salt, 20% gypsum.
638	3210	SLT	Salt (SLT), clear, 90% salt, 10% gypsum.
639	3215	SLT	Salt (SLT), clear, 90% salt, 10% gypsum.
640	3220	SLT	Salt (SLT), clear.
641	3225	SLT	Salt (SLT), clear.

642	3230	SLT	Salt (SLT), clear.
643	3235	GY	Gypsum (GY), grey, 50% medium plastic fines, 40% cement, 10% fine to medium sand.
644	3240	GY	Gypsum (GY), grey, 50% medium plastic fines, 40% cement, 10% fine to medium sand.
645	3245	SLT	Salt (SLT), clear.
646	3250	SLT	Salt (SLT), clear, 95% salt, 5% gypsum.
647	3255	SLT	Salt (SLT), clear.
648	3260	SLT	Salt (SLT), clear, 80% salt, 20% medium plastic fines.
649	3265	SLT	Salt (SLT), clear, 80% salt, 20% medium plastic fines.
650	3270	SLT	Salt (SLT), clear, 80% salt, 20% medium plastic fines.
651	3275	SLT	Salt (SLT), clear, 90% salt, 10% medium plastic fines.
652	3280	SLT	Salt (SLT), clear, 90% salt, 10% medium plastic fines.
653	3285	SLT	Salt (SLT), clear, 90% salt, 10% medium plastic fines.
654	3290	SLT	Salt (SLT), clear, 90% salt, 10% medium plastic fines.
655	3295	SLT	Salt (SLT), clear, 90% salt, 10% medium plastic fines.
656	3300	SLT	Salt (SLT), clear, 90% salt, 10% medium plastic fines.
657	3305	SLT	Salt (SLT), clear, 90% salt, 10% medium plastic fines.
658	3310	SLT	Salt (SLT), clear, 90% salt, 10% medium plastic fines.
659	3315	SLT	Salt (SLT), clear, 70% salt, 30% medium plastic fines.
660	3320	CL/SLT	Clay (CL) and Salt (SLT), light brown, 60% medium plastic fines, 40% salt.
661	3325	CL	Clay (CL), light brown, 90% medium plastic fines, 10% salt.
662	3330	SLT	Salt (SLT), clear, 95% salt, 5% medium plastic fines.
663	3335	SLT	Salt (SLT), clear, 95% salt, 5% medium plastic fines.
664	3340	SLT	Salt (SLT), clear, 95% salt, 5% medium plastic fines.
665	3345	SLT	Salt (SLT), clear, 95% salt, 5% medium plastic fines.
666	3350	SLT	Salt (SLT), clear, 80% salt, 20% medium plastic fines.
667	3355	SLT	Salt (SLT), clear, 90% salt, 10% medium plastic fines.
668	3360	SLT	Salt (SLT), clear, 90% salt, 10% medium plastic fines.
669	3365	SLT	Salt (SLT), clear, 80% salt, 20% medium plastic fines.
670	3370	CL	Clay (CL), light brown, 70% medium plastic fines, 30% salt.
671	3375	SLT	Salt (SLT), clear, 80% salt, 20% medium plastic fines.
672	3380	SLT	Salt (SLT), clear, 90% salt, 10% medium plastic fines.
673	3385	SLT	Salt (SLT), clear, 90% salt, 10% medium plastic fines.
674	3390	SLT	Salt (SLT), clear, 80% salt, 20% medium plastic fines.
675	3395	SLT	Salt (SLT), clear, 90% salt, 10% medium plastic fines.
676	3400	SLT	Salt (SLT), clear, 90% salt, 10% medium plastic fines.
677	3405	SLT	Salt (SLT), clear
678	3410	SLT	Salt (SLT), clear
679	3415	SLT	Salt (SLT), clear
680	3420	SLT	Salt (SLT), clear
681	3425	SLT	Salt (SLT), clear
682	3430	SLT	Salt (SLT), clear.
683	3435	SLT	Salt (SLT), clear.

684	3440	SLT	Salt (SLT), clear.
685	3445	SLT	Salt (SLT), clear.
686	3450	SLT	Salt (SLT), clear.
687	3455	SLT	Salt (SLT), clear.
688	3460	SLT	Salt (SLT), clear.
689	3465	SLT	Salt (SLT), clear.
690	3470	SLT	Salt (SLT), clear.
691	3475	SLT	Salt (SLT), clear.
692	3480	SLT	Salt (SLT), clear.
693	3485	SLT	Salt (SLT), clear.
694	3490	SLT	Salt (SLT), clear.
695	3495	SLT	Salt (SLT), clear.
696	3500	SLT	Salt (SLT), clear.
697	3505	SLT	Salt (SLT), clear.
698	3510	SLT	Salt (SLT), clear.
699	3515	SLT	Salt (SLT), clear.
700	3520	SLT	Salt (SLT), clear.
701	3525	SLT	Salt (SLT), clear.
702	3530	SLT	Salt (SLT), clear.
703	3535	SLT	Salt (SLT), clear.
704	3540	SLT	Salt (SLT), clear.
705	3545	SLT	Salt (SLT), clear.
706	3550	SLT	Salt (SLT), clear.
707	3555	SLT	Salt (SLT), clear.
708	3560	SLT	Salt (SLT), clear.
709	3565	SLT	Salt (SLT), clear.
710	3570	SLT	Salt (SLT), clear.
711	3575	SLT	Salt (SLT), clear.
712	3580	SLT	Salt (SLT), clear.
713	3585	SLT	Salt (SLT), clear.
714	3590	SLT	Salt (SLT), clear.
715	3595	SLT	Salt (SLT), clear.
716	3600	SLT	Salt (SLT), clear.
717	3605	SLT	Salt (SLT), clear.
718	3610	SLT	Salt (SLT), clear.
719	3615	SLT	Salt (SLT), clear.
720	3620	SLT	Salt (SLT), clear.
721	3625	SLT	Salt (SLT), clear.
722	3630	SLT	Salt (SLT), clear.
723	3635	SLT	Salt (SLT), clear.
724	3640	SLT	Salt (SLT), clear.
725	3645	SLT	Salt (SLT), clear.

726	3650	SLT	Salt (SLT), clear.
727	3655	SLT	Salt (SLT), clear.
728	3660	SLT	Salt (SLT), clear.
729	3665	SLT	Salt (SLT), clear.
730	3670	SLT	Salt (SLT), clear.
731	3675	SLT	Salt (SLT), clear.
732	3680	SLT	Salt (SLT), clear.
733	3685	SLT	Salt (SLT), clear.
734	3690	SLT	Salt (SLT), clear.
735	3695	SLT	Salt (SLT), clear.
736	3700	SLT	Salt (SLT), clear.
737	3705	SLT	Salt (SLT), clear.
738	3710	SLT	Salt (SLT), clear.
739	3715	SLT	Salt (SLT), clear.
740	3720	SLT	Salt (SLT), clear.
741	3725	SLT	Salt (SLT), clear.
742	3730	SLT	Salt (SLT), clear.
743	3735	SLT	Salt (SLT), clear.
744	3740	SLT	Salt (SLT), clear.
745	3745	SLT	Salt (SLT), clear.
746	3750	SLT	Salt (SLT), clear.
747	3755	SLT	Salt (SLT), clear.
748	3760	SLT	Salt (SLT), clear.
749	3765	SLT	Salt (SLT), clear.
750	3770	SLT	Salt (SLT), clear.
751	3775	SLT	Salt (SLT), clear.
752	3780	SLT	Salt (SLT), clear.
753	3785	SLT	Salt (SLT), clear.
754	3790	SLT	Salt (SLT), clear.
755	3795	SLT	Salt (SLT), clear.
756	3800	SLT	Salt (SLT), clear.
757	3805	SLT	Salt (SLT), clear.
758	3810	SLT	Salt (SLT), clear.
759	3815	SLT	Salt (SLT), clear.
760	3820	SLT	Salt (SLT), clear.
761	3825	SLT	Salt (SLT), clear.
762	3830	SLT	Salt (SLT), clear.
763	3835	SLT	Salt (SLT), clear.
764	3840	SLT	Salt (SLT), clear.
765	3845	SLT	Salt (SLT), clear.
766	3850	SLT	Salt (SLT), clear.
767	3855	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.

768	3860	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
769	3865	SLT	Salt (SLT), clear.
770	3870	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
771	3875	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
772	3880	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
773	3885	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
774	3890	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
775	3895	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
776	3900	SLT	Salt (SLT), clear.
777	3905	SLT	Salt (SLT), clear.
778	3910	SLT	Salt (SLT), clear.
779	3915	SLT	Salt (SLT), clear.
780	3920	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
781	3925	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
782	3930	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
783	3935	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
784	3940	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
785	3945	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
786	3950	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
787	3955	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
788	3960	SLT	Salt (SLT), clear.
789	3965	SLT	Salt (SLT), clear.
790	3970	SLT	Salt (SLT), clear.
791	3975	SLT	Salt (SLT), clear.
792	3980	SLT	Salt (SLT), clear.
793	3985	SLT	Salt (SLT), clear.
794	3990	SLT	Salt (SLT), clear.
795	3995	SLT	Salt (SLT), clear.
796	4000	SLT	Salt (SLT), clear.
797	4005	SLT	Salt (SLT), clear.
798	4010	SLT	Salt (SLT), clear.
799	4015	SLT	Salt (SLT), clear.
800	4020	SLT	Salt (SLT), clear.
801	4025	SLT	Salt (SLT), clear.
802	4030	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
803	4035	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
804	4040	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
805	4045	SLT	Salt (SLT), clear.
806	4050	SLT	Salt (SLT), clear.
807	4055	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
808	4060	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.

809	4065	SLT	Salt (SLT), clear.
810	4070	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
811	4075	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
812	4080	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
813	4085	SLT	Salt (SLT), clear.
814	4090	SLT	Salt (SLT), clear.
815	4095	SLT	Salt (SLT), clear.
816	4100	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
817	4105	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
818	4110	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
819	4115	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
820	4120	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
821	4125	SLT	Salt (SLT), clear.
822	4130	SLT	Salt (SLT), clear.
823	4135	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
824	4140	SLT	Salt (SLT), clear.
825	4145	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
826	4150	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
827	4155	SLT	Salt (SLT), clear.
828	4160	SLT	Salt (SLT), clear.
829	4165	SLT	Salt (SLT), clear.
830	4170	SLT	Salt (SLT), clear.
831	4175	SLT	Salt (SLT), clear.
832	4180	SLT	Salt (SLT), clear.
833	4185	SLT	Salt (SLT), clear.
834	4190	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
835	4195	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
836	4200	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
837	4205	SLT	Salt (SLT), clear.
838	4210	SLT	Salt (SLT), clear.
839	4215	SLT	Salt (SLT), clear.
840	4220	SLT	Salt (SLT), clear.
841	4225	SLT	Salt (SLT), clear.
842	4230	SLT	Salt (SLT), clear.
843	4235	SLT	Salt (SLT), clear.
844	4240	SLT	Salt (SLT), clear.
845	4245	SLT	Salt (SLT), clear.
846	4250	SLT	Salt (SLT), clear.
847	4255	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
848	4260	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
849	4265	SLT	Salt (SLT), 5% insoluble fine sand, clear.

850	4270	SLT	Salt (SLT), 5% insoluble fine sand, clear.
851	4275	SLT	Salt (SLT), clear.
852	4280	SLT	Salt (SLT), clear.
853	4285	SLT	Salt (SLT), clear.
854	4290	SLT	Salt (SLT), 5% insoluble fine sand, clear.
855	4295	SLT	Salt (SLT), 5% insoluble fine sand, clear.
856	4300	SLT	Salt (SLT), 5% insoluble fine sand, clear.
857	4305	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
858	4310	SLT	Salt (SLT), 5% insoluble fine sand, clear.
859	4315	SLT	Salt (SLT), 5% insoluble fine sand, clear.
860	4320	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
861	4325	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
862	4330	SLT	Salt (SLT), clear.
863	4335	SLT	Salt (SLT), clear.
864	4340	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
865	4345	SLT	Salt (SLT), clear.
866	4350	SLT	Salt (SLT), clear.
867	4355	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
868	4360	SLT	Salt (SLT), clear.
869	4365	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
870	4370	SLT	Salt (SLT), clear.
871	4375	SLT	Salt (SLT), clear.
872	4380	SLT	Salt (SLT), clear.
873	4385	SLT	Salt (SLT), clear.
874	4390	SLT	Salt (SLT), clear.
875	4395	SLT	Salt (SLT), clear.
876	4400	SLT	Salt (SLT), clear.
877	4405	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
878	4410	SLT	Salt (SLT), clear.
879	4415	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
880	4420	SLT	Salt (SLT), clear.
881	4425	SLT	Salt (SLT), clear.
882	4430	SLT	Salt (SLT), clear.
883	4435	SLT	Salt (SLT), 5% insoluble fine sand, clear.
884	4440	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
885	4445	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
886	4450	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
887	4455	SLT	Salt (SLT), clear.
888	4460	SLT	Salt (SLT), clear.
889	4465	SLT	Salt (SLT), clear.
890	4470	SLT	Salt (SLT), clear.

891	4475	SLT	Salt (SLT), clear.
892	4480	SLT	Salt (SLT), clear.
893	4485	SLT	Salt (SLT), clear.
894	4490	SLT	Salt (SLT), clear.
895	4495	SLT	Salt (SLT), clear.
896	4500	SLT	Salt (SLT), clear.
897	4505	SLT	Salt (SLT), clear.
898	4510	SLT	Salt (SLT), clear.
899	4515	SLT	Salt (SLT), clear.
900	4520	SLT	Salt (SLT), clear.
901	4525	SLT	Salt (SLT), clear.
902	4530	SLT	Salt (SLT), clear.
903	4535	SLT	Salt (SLT), clear.
904	4540	SLT	Salt (SLT), clear.
905	4545	SLT	Salt (SLT), clear.
906	4550	SLT	Salt (SLT), clear.
907	4555	SLT	Salt (SLT), clear.
908	4560	SLT	Salt (SLT), clear.
909	4565	SLT	Salt (SLT), clear.
910	4570	SLT	Salt (SLT), clear.
911	4575	SLT	Salt (SLT), clear.
912	4580	SLT	Salt (SLT), clear.
913	4585	SLT	Salt (SLT), clear.
914	4590	SLT	Salt (SLT), clear.
915	4595	SLT	Salt (SLT), clear.
916	4600	SLT	Salt (SLT), clear.
917	4605	SLT	Salt (SLT), clear.
918	4610	SLT	Salt (SLT), clear.
919	4615	SLT	Salt (SLT), clear.
920	4620	SLT	Salt (SLT), clear.
921	4625	SLT	Salt (SLT), clear.
922	4630	SLT	Salt (SLT), clear.
923	4635	SLT	Salt (SLT), clear.
924	4640	SLT	Salt (SLT), clear.
925	4645	SLT	Salt (SLT), clear.
926	4650	SLT	Salt (SLT), clear.
927	4655	SLT	Salt (SLT), clear.
928	4660	SLT	Salt (SLT), clear.
929	4665	SLT	Salt (SLT), clear.
930	4670	SLT	Salt (SLT), clear.
931	4675	SLT	Salt (SLT), clear.

932	4680	SLT	Salt (SLT), clear.
933	4685	SLT	Salt (SLT), clear.
934	4690	SLT	Salt (SLT), clear.
935	4695	SLT	Salt (SLT), clear.
936	4700	SLT	Salt (SLT), clear.
937	4705	SLT	Salt (SLT), clear.
938	4710	SLT	Salt (SLT), clear.
939	4715	SLT	Salt (SLT), clear.
940	4720	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
941	4725	SLT	Salt (SLT), clear.
942	4730	SLT	Salt (SLT), clear.
943	4735	SLT	Salt (SLT), clear.
944	4740	SLT	Salt (SLT), clear.
945	4745	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
946	4750	SLT	Salt (SLT), clear.
947	4755	SLT	Salt (SLT), clear.
948	4760	SLT	Salt (SLT), clear.
949	4765	SLT	Salt (SLT), clear.
950	4770	SLT	Salt (SLT), clear.
951	4775	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
952	4780	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
953	4785	SLT	Salt (SLT), clear.
954	4790	SLT	Salt (SLT), clear.
955	4795	SLT	Salt (SLT), clear.
956	4800	SLT	Salt (SLT), clear.
957	4805	SLT	Salt (SLT), clear.
958	4810	SLT	Salt (SLT), clear.
959	4815	SLT	Salt (SLT), clear.
960	4820	SLT	Salt (SLT), clear.
961	4825	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
962	4830	SLT	Salt (SLT), clear.
963	4835	SLT	Salt (SLT), clear.
964	4840	SLT	Salt (SLT), clear.
965	4845	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
966	4850	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
967	4855	SLT	Salt (SLT), clear.
968	4860	SLT	Salt (SLT), clear.
969	4865	SLT	Salt (SLT), clear.
970	4870	SLT	Salt (SLT), clear.
971	4875	SLT	Salt (SLT), clear.
972	4880	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.

973	4885	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
974	4890	SLT	Salt (SLT), clear.
975	4895	SLT	Salt (SLT), clear.
976	4900	SLT	Salt (SLT), clear.
977	4905	SLT	Salt (SLT), clear.
978	4910	SLT	Salt (SLT), less than 5% insoluble fine sand, clear.
979	4915	SLT	Salt (SLT), clear.
980	4920	SLT	Salt (SLT), clear.
981	4925	SLT	Salt (SLT), clear.
982	4930	SLT	Salt (SLT), clear.
983	4935	SLT	Salt (SLT), clear.
984	4940	SLT	Salt (SLT), clear.
985	4945	SLT	Salt (SLT), clear.
986	4950	SLT	Salt (SLT), clear.
987	4955	SLT	Salt (SLT), clear.
988	4960	SLT	Salt (SLT), clear.
989	4965	SLT	Salt (SLT), clear.
990	4970	SLT	Salt (SLT), clear.
991	4975	SLT	Salt (SLT), clear.
992	4980	SLT	Salt (SLT), clear.
993	4985	SLT	Salt (SLT), clear.
994	4990	SLT	Salt (SLT), clear.
995	4995	SLT	Salt (SLT), clear.
996	5000	SLT	Salt (SLT), clear.

Appendix L Test Procedure for CW-8 Nitrogen-Brine MIT PRE-STORAGE MECHANICAL INTEGRITY TEST PROCEDURE Magnum Well CW-8

INTRODUCTION

- 1.1. The purpose of the Mechanical Integrity Test (MIT) procedure is to test the mechanical integrity of the production casing and cement and to ensure that the wellbore below the casing shoe has integrity before beginning mining. In summary, the test procedure consists of the following basic steps.
- 1.2. Bleeding brine from the well to maintain the pressure at approximately 780 psi.
- 1.3. Monitoring and recording the cavern pressure for a period of time, minimum 24 hours, until the pressure is decreasing less than 10 psi per day.
- 1.4. Inject nitrogen to place the interface at about 3460 feet depth.
- 1.5. Measuring the position of the nitrogen/brine interface and temperature of the nitrogen column at the beginning and end of the test period,
- 1.6. Recording the brine and nitrogen wellhead pressures throughout the test period, a minimum of 24 hours,
- 1.7. Determining the calculated leak rate and the minimum detectable leak rate.

PREPARATION

- 1.1. Provide blind flanges and/or double valves to isolate the well during the test. Test flanges with connections that are required for wellhead valves.
- 1.2. Install pressure-monitoring equipment on both tubing strings and the cemented annulus connections to allow continuous monitoring of wellhead pressures.
 - 1.2.1. NOTE: Digital pressure recorders and temperature recorders (including logging tools) utilized for the mechanical integrity test shall be calibrated in accordance with manufacturer specifications.
 - 1.2.2. Calibration papers are to be on location, available for DWQ review.
- 1.3. Provide a connection to permit injecting brine into or withdrawing brine from the well.

BRINE INJECTION AND MONITORING

- 1.1. Not applicable – no cavern to pressurize.

NITROGEN INJECTION

- 1.1. Rig up wireline logging unit and install a lubricator on wellhead. Run base interface log (Gamma-Gamma Ray or other suitable log for detecting nitrogen/brine interface) and temperature log. Temperature log should be completed from surface to approximately the end of the 13-3/8" tubing. The base interface log should be completed from the end of the 13-3/8" tubing to 300 feet above the cemented casing shoe.

- 1.2. Rig up nitrogen pumping unit to inject into the product annulus. Start injecting nitrogen at a slow rate. Control the nitrogen injection temperature as close as possible to the average wellbore temperature measured by the base temperature log.
- 1.3. Monitor and record nitrogen and brine pressures and flow conditions during injection. The MIT Well Data Sheet lists the appropriate wellhead test pressures. Monitor the differential nitrogen-brine pressure to insure the brine string is not subjected to collapse pressure condition.
- 1.4. While injecting nitrogen, it will be necessary to bleed off brine to avoid overpressuring the well. After the interface reaches 2500 feet, regulate the brine flow to maintain the brine pressure specified in Step 2.0 of the Well Data Sheet.
- 1.5. Find the nitrogen/brine interface with the density tool and track the interface movement down the well by moving the tool down in 51 feet to 100 feet increments after the nitrogen is at 3000 feet. Continue tracking the interface until it reaches the desired depth. Record the nitrogen quantity injected for each interval.
- 1.6. When the interface is at about 3400 feet, stop nitrogen injection to run a casing test.
 - 1.6.1. An initial log is recorded of the interface in the cemented casing. Nitrogen and brine pressures are recorded. The wellhead and associated piping and connections are checked for leaks and any leaks are repaired.
 - 1.6.2. After a time interval determined by the test conditions, but not less than sixty minutes, a second interface log is recorded of the interface in the cemented casing. Nitrogen and brine pressure are recorded.
 - 1.6.3. If the nitrogen pressure has remained constant and the interface in the cemented casing has not moved, the cemented casing string is considered tight and nitrogen injection resumed.
 - 1.6.4. If the interface in the cemented casing moves up hole and the nitrogen pressure decreases the well head is again checked for leaks and the casing test is extended. This procedure is repeated until the casing is considered tight or a leak is identified.
- 1.7. Resume nitrogen injection and record the nitrogen volume, pressure and interface depth at each station. Continue tracking the interface until it reaches approximately the planned interface depth about 50 feet below the 16" casing.
- 1.8. Run a density log to verify the position of the nitrogen/brine interface relative to the 16" casing shoe. Determine total volume of nitrogen injected from original interface location to interface location for the MIT. See MIT Well Data Sheet for planned interface depth and estimated volumes.
- 1.9. Remove the logging tool from the well and close the logging valve.
- 1.10. Shut-in well for nitrogen temperature stabilization of at least 18 hours. During the temperature stabilization period, record nitrogen and brine wellhead pressures. Check all wellhead fittings and flanges with liquid soap or equivalent to insure there are no nitrogen leaks.
- 1.11. Determine the duration of the test using the appropriate test data and following calculation:

$$T = \frac{V \times R \times 365 \text{ days year} \times 24 \text{ hours day}}{100 \text{ bbls year}}$$

Where:

T = Duration of test, 13 hours, with a minimum of 24 hours

V = Unit annular volume of casing, bbls/ft - 0.2964 bbls per linear foot estimated. Actual volume will be determined during nitrogen injection below the casing by injecting known quantity of nitrogen over a measured length of the borehole.

R = Resolution of the interface tool, ft, 0.5 feet

There is an over-riding minimum test period of 24 hours.

TEST INITIALIZATION

- 1.1. After a minimum wait of at least 18 hours rig up wireline logging unit and install lubricator on wellhead. Run initial density and temperature logs. Temperature log should be completed from surface to approximately 100 feet below interface depth. The density log should be completed from 100 feet below to 200 feet above the interface location below the 16" casing.
- 1.2. Record nitrogen and brine wellhead pressures at least every five minutes during the test.

TEST FINALIZATION

- 1.1. After the planned test duration, a minimum of 24 hours, run the final density and temperature logs. Temperature log should be completed from surface to approximately 100 feet below proposed interface depth. The base density log should be completed from 100 feet below to 200 feet above the proposed interface location below the 16" casing.
- 1.2. Record nitrogen and brine wellhead pressures.
- 1.3. If results indicate the test period must be extended, repeat steps 6.1 and 6.2 as required.
- 1.4. If results indicate the MIT is successful, end test
- 1.5. If the test indicates the well is leaking, shut-in the well and continue to monitor nitrogen pressures and interface levels to more closely isolate leak location.

REPORT ON TEST RESULTS

- 1.1. Prepare a written report presenting test procedures, results and conclusions, along with a chronology of test activity, wellhead pressure records, and supporting calculations.
- 1.2. The Minimum Detectable Leak Rate (MDLR) will be calculated with the following formula:

$$\text{MDLR} = 3 \times \left[\frac{V_{N_2} P + \sigma_P, T - \sigma_T, D + \Delta D - V_{N_2} P - \sigma_P, T + \sigma_T, D - \Delta D}{\Delta t} \right]$$

where:

σ_P = standard deviation in pressure measurement bias

σ_T = standard deviation in temperature measurement bias

ΔD = accuracy of interface measurement

Δt = test duration.

The Calculated Nitrogen Leak Rate will be determined using the following methodology. In addition to measured quantities, knowledge of the well casing and tubular sizes and previous knowledge of the diameter of the wellbore from the casing shoe to the interface allows the nitrogen volume in the annulus to be calculated. The following P - V - T gas equation (which is an approximation to an integral over the axis of the annulus) is used to calculate the volume of nitrogen (at standard temperature and pressure conditions) in the wellbore at any time during the test:

$$V_{N_2} = N_{scf} \times \sum_i^N \left[\frac{P_{WB\ i} \times 144 \times V_{WB\ i}}{Z_{AVE\ i} \times R \times T_{AVE\ i}} \right]$$

where:

V_{N_2} = volume of nitrogen measured in the wellbore over a specific depth interval " i " (SCF)

$P_{WB\ i}$ = average calculated wellbore pressure over a specific depth interval " i " (psia)

$V_{WB\ i}$ = volume of wellbore of a specific depth interval " i " (ft³)²

$Z_{AVE\ i}$ = gas compressibility factor at a specific depth interval " i " (dimensionless)

R = specific gas constant $\left[55.16 \text{ ft} \times \text{lb}_f / \text{lb mol} \times ^\circ\text{R} \right]$

$T_{AVE\ i}$ = average wellbore temperature over a specific depth interval " i " ($^\circ\text{R}$)

N_{scf} = gas conversion for mass to volume at standard pressure and temperature conditions (13.8 scf_{N₂} = 1 lb_{N₂})

$i = 1, 2, \dots, N, N$ = total number of depth intervals.

² NOTE: Determined by wellbore geometry.

M.I.T. WELL DATA SHEET

1.0 WELL DESCRIPTION

- 1.1 Name Magnum CW-8
- 1.2 Operator Magnum NGL Solution Mining
- 1.3 Location Field Delta
- 1.4 Cemented Casing Size O.D. 16 inches
 - 1.4.1. Size I.D. 14.868 inches
 - 1.4.2. Depth 2396 feet, measured depth
 - 1.4.3. Weight 97 lbs/ft
 - 1.4.4. Size I.D. 14.688 inches
 - 1.4.5. Depth 2396 - 3410 feet, measured depth
 - 1.4.6. Weight 109 lbs/ft
- 1.5 Hanging String – Size 13-3/8 inches
 - 1.5.1 Depth 4,100 feet estimated
- 1.6 Hanging String – Size 8-5/8”
 - 1.6.1. Depth 4900 feet (estimated)
- 1.7 Total Depth 4950 feet (estimated)

2.0 TEST PRESSURES

- 2.1 Brine Specific Gravity in 8-5/8” (Estimated) 1.2
- 2.2 Desired Interface level at start 3460 feet
- 2.3 Test Gradient 0.75 psi/ft
 - 2.3.1 Casing Shoe Pressure 2558 psig
 - 2.3.2 Surface Brine Pressure 784 psig

3.0 ANNULUS VOLUME ESTIMATE

- 3.1 Total Volume to Casing Shoe 150 bbls (2396 feet*0.404 bbls/ft + 1014 feet*0.0375 bbls/ft)
- 3.2 Volume from Casing Shoe to Interface Depth 15 bbls (50 feet*0.2964 bbls/ft)

4.0 NITROGEN VOLUME

- 4.1. Nitrogen Volume to Casing Shoe 92,000 SCF
- 4.2. Nitrogen Volume below Casing Shoe 36,000 SCF
- 4.3. Total Nitrogen Volume Required 128,000 SCF

5.0 CAVERN COMPRESSIBILITY RESPONSE

- 5.1 Well Volume 744 bbls (estimated)
- 5.2 Well Compressibility, estimated 0.000801 bbls/psi
- 5.3 Wellhead Pressure with Brine (before test) 0 psi
- 5.4 Pressure increase due to nitrogen injection, over 260000 psi
- 5.5 Brine requirement -210 bbls (260,000 psi *0 000801 bbls/psi)

Appendix M Surface Pressures Recorded during Well CW-8 MIT

Date -Time	Nitrogen Pressure – PSIG	Brine Pressure – PSIG
4/27/15 11:00	178	162
4/27/15 11:12	1633	1452
4/27/15 11:24	1333	1025
4/27/15 11:36	1520	991
4/27/15 11:47	1652	914
4/27/15 11:59	1801	895
4/27/15 12:11	1948	900
4/27/15 12:23	2043	895
4/27/15 12:34	2042	895
4/27/15 12:46	2041	895
4/27/15 12:58	2040	895
4/27/15 13:10	2057	840
4/27/15 13:21	2127	733
4/27/15 13:33	2112	704
4/27/15 13:45	2111	703
4/27/15 13:57	2196	794
4/27/15 14:08	2289	893
4/27/15 14:20	2287	892
4/27/15 14:32	2475	1092
4/27/15 14:44	2642	1210
4/27/15 14:56	2640	1208
4/27/15 15:07	2638	1204
4/27/15 15:19	2615	1171
4/27/15 15:31	2553	1069
4/27/15 15:43	2553	1068
4/27/15 15:54	2551	1066
4/27/15 16:06	2542	1056
4/27/15 16:18	2541	1052
4/27/15 16:30	2539	1051
4/27/15 16:41	2539	1050
4/27/15 16:53	2538	1049
4/27/15 17:05	2538	1048
4/27/15 17:17	2538	1047
4/27/15 17:28	2537	1047

4/27/15 17:40	2537	1046
4/27/15 17:52	2537	1045
4/27/15 18:04	2536	1044
4/27/15 18:15	2536	1044
4/27/15 18:27	2535	1043
4/27/15 18:39	2535	1043
4/27/15 18:51	2534	1042
4/27/15 19:02	2533	1042
4/27/15 19:14	2533	1041
4/27/15 19:26	2532	1041
4/27/15 19:38	2531	1040
4/27/15 19:49	2530	1040
4/27/15 20:01	2530	1039
4/27/15 20:13	2529	1039
4/27/15 20:25	2528	1039
4/27/15 20:36	2528	1038
4/27/15 20:48	2527	1038
4/27/15 21:00	2527	1037
4/27/15 21:12	2526	1037
4/27/15 21:23	2526	1036
4/27/15 21:35	2525	1036
4/27/15 21:47	2525	1035
4/27/15 21:59	2524	1034
4/27/15 22:10	2524	1034
4/27/15 22:22	2524	1034
4/27/15 22:34	2523	1033
4/27/15 22:46	2523	1033
4/27/15 22:57	2522	1032
4/27/15 23:09	2522	1032
4/27/15 23:21	2521	1031
4/27/15 23:32	2521	1031
4/27/15 23:44	2521	1030
4/27/15 23:56	2520	1030
4/28/15 0:08	2520	1030
4/28/15 0:19	2520	1029
4/28/15 0:31	2519	1029
4/28/15 0:43	2519	1028
4/28/15 0:55	2519	1028
4/28/15 1:06	2518	1027
4/28/15 1:18	2518	1027
4/28/15 1:30	2518	1027

4/28/15 1:42	2517	1026
4/28/15 1:54	2517	1026
4/28/15 2:05	2517	1026
4/28/15 2:17	2516	1025
4/28/15 2:29	2516	1025
4/28/15 2:41	2516	1024
4/28/15 2:52	2516	1024
4/28/15 3:04	2515	1023
4/28/15 3:16	2515	1023
4/28/15 3:28	2515	1023
4/28/15 3:39	2514	1022
4/28/15 3:51	2514	1022
4/28/15 4:03	2514	1022
4/28/15 4:15	2514	1021
4/28/15 4:26	2513	1021
4/28/15 4:38	2513	1021
4/28/15 4:50	2513	1020
4/28/15 5:02	2512	1020
4/28/15 5:13	2512	1020
4/28/15 5:25	2512	1019
4/28/15 5:37	2512	1019
4/28/15 5:49	2511	1019
4/28/15 6:00	2511	1018
4/28/15 6:12	2511	1018
4/28/15 6:24	2511	1018
4/28/15 6:36	2510	1017
4/28/15 6:47	2510	1017
4/28/15 6:59	2510	1017
4/28/15 7:11	2510	1017
4/28/15 7:23	2510	1017
4/28/15 7:34	2510	1016
4/28/15 7:46	2510	1016
4/28/15 7:58	2510	1016
4/28/15 8:10	2510	1016
4/28/15 8:21	2510	1015
4/28/15 8:33	2510	1015
4/28/15 8:45	2510	1015
4/28/15 8:57	2510	1015
4/28/15 9:08	2511	1015
4/28/15 9:20	2511	1014
4/28/15 9:32	2511	1014

4/28/15 9:44	2511	1013
4/28/15 9:55	2511	1013
4/28/15 10:07	2511	1013
4/28/15 10:19	2511	1013
4/28/15 10:31	2512	1012
4/28/15 10:42	2511	1012
4/28/15 10:54	2511	1012
4/28/15 11:06	2511	1012
4/28/15 11:19	2511	1011
4/28/15 11:31	2510	1010
4/28/15 11:42	2509	1007
4/28/15 11:54	2509	1008
4/28/15 12:06	2509	1008
4/28/15 12:18	2509	1009
4/28/15 12:31	2509	1010
4/28/15 12:42	2510	1010
4/28/15 12:54	2510	1011
4/28/15 13:06	2510	1011
4/28/15 13:18	2510	1012
4/28/15 13:29	2510	1010
4/28/15 13:41	2509	1010
4/28/15 13:53	2508	1008
4/28/15 14:05	2506	1005
4/28/15 14:16	2505	1003
4/28/15 14:28	2505	1003
4/28/15 14:40	2503	999
4/28/15 14:52	2504	1000
4/28/15 15:03	2505	1002
4/28/15 15:15	2506	1004
4/28/15 15:27	2506	1005
4/28/15 15:39	2506	1004
4/28/15 15:50	2506	1003
4/28/15 16:02	2507	1003
4/28/15 16:14	2505	1001
4/28/15 16:26	2504	999
4/28/15 16:37	2502	996
4/28/15 16:49	2501	995
4/28/15 17:01	2501	995
4/28/15 17:13	2501	994
4/28/15 17:25	2501	994
4/28/15 17:36	2501	994

4/28/15 17:48	2501	994
4/28/15 18:00	2502	993
4/28/15 18:12	2502	993
4/28/15 18:23	2502	993
4/28/15 18:35	2501	993
4/28/15 18:47	2501	993
4/28/15 18:59	2501	993
4/28/15 19:10	2501	993
4/28/15 19:22	2501	993
4/28/15 19:34	2500	993
4/28/15 19:46	2499	993
4/28/15 19:57	2499	992
4/28/15 20:09	2499	992
4/28/15 20:21	2498	992
4/28/15 20:33	2498	992
4/28/15 20:44	2498	992
4/28/15 20:56	2497	992
4/28/15 21:08	2497	992
4/28/15 21:20	2497	992
4/28/15 21:31	2497	991
4/28/15 21:43	2496	991
4/28/15 21:55	2496	991
4/28/15 22:07	2496	991
4/28/15 22:18	2496	990
4/28/15 22:30	2495	990
4/28/15 22:42	2495	990
4/28/15 22:54	2495	990
4/28/15 23:05	2495	989
4/28/15 23:17	2494	989
4/28/15 23:29	2494	989
4/28/15 23:41	2494	989
4/28/15 23:52	2494	989
4/29/15 0:04	2494	988
4/29/15 0:16	2493	988
4/29/15 0:28	2493	988
4/29/15 0:39	2493	988
4/29/15 0:51	2493	988
4/29/15 1:03	2493	987
4/29/15 1:15	2492	987
4/29/15 1:26	2492	987
4/29/15 1:38	2492	987

4/29/15 1:50	2492	986
4/29/15 2:02	2491	986
4/29/15 2:13	2491	986
4/29/15 2:25	2491	986
4/29/15 2:37	2491	986
4/29/15 2:49	2491	986
4/29/15 3:01	2491	985
4/29/15 3:12	2491	985
4/29/15 3:24	2491	985
4/29/15 3:36	2491	985
4/29/15 3:48	2490	985
4/29/15 3:59	2490	984
4/29/15 4:11	2490	984
4/29/15 4:23	2490	984
4/29/15 4:35	2490	984
4/29/15 4:46	2490	984
4/29/15 4:58	2490	983
4/29/15 5:10	2490	983
4/29/15 5:22	2489	983
4/29/15 5:33	2489	983
4/29/15 5:45	2489	983
4/29/15 5:57	2489	982
4/29/15 6:09	2489	982
4/29/15 6:20	2488	982
4/29/15 6:32	2488	982
4/29/15 6:44	2488	982
4/29/15 6:56	2488	982
4/29/15 7:07	2488	981
4/29/15 7:19	2488	981
4/29/15 7:31	2488	981
4/29/15 7:43	2489	981
4/29/15 7:54	2489	981
4/29/15 8:06	2489	981
4/29/15 8:18	2489	980
4/29/15 8:30	2489	980
4/29/15 8:41	2490	980
4/29/15 8:53	2490	980
4/29/15 9:05	2490	980
4/29/15 9:17	2490	980
4/29/15 9:28	2490	980
4/29/15 9:40	2490	980

4/29/15 9:52	2490	979
4/29/15 10:04	2490	979
4/29/15 10:15	2490	979
4/29/15 10:27	2490	979
4/29/15 10:36	2490	979
4/29/15 10:40	2490	979
4/29/15 10:44	2490	979
4/29/15 10:48	2490	979
4/29/15 10:52	2490	979
4/29/15 10:56	2490	979
4/29/15 11:00	2490	978
4/29/15 11:03	2489	978
4/29/15 11:07	2487	974
4/29/15 11:11	2487	974
4/29/15 11:15	2487	974
4/29/15 11:19	2488	974
4/29/15 11:23	2488	974
4/29/15 11:27	2488	975
4/29/15 11:31	2488	975
4/29/15 11:35	2488	975
4/29/15 11:39	2488	975
4/29/15 11:43	2488	976
4/29/15 11:47	2488	976
4/29/15 11:50	2488	976
4/29/15 11:54	2489	977
4/29/15 11:58	2489	977
4/29/15 12:02	2489	977
4/29/15 12:06	2489	977
4/29/15 12:10	2489	978
4/29/15 12:14	2489	978
4/29/15 12:18	2490	978
4/29/15 12:22	2490	978
4/29/15 12:26	2490	978
4/29/15 12:30	2490	979
4/29/15 12:34	2490	979
4/29/15 12:37	2490	979
4/29/15 12:41	2490	979
4/29/15 12:45	2490	979
4/29/15 12:49	2491	980
4/29/15 12:53	2491	980
4/29/15 12:57	2490	979

4/29/15 13:01	2490	979
4/29/15 13:05	2490	979
4/29/15 13:09	2490	979
4/29/15 13:13	2490	979
4/29/15 13:17	2490	978
4/29/15 13:21	2490	978
4/29/15 13:25	2489	977

Appendix N Well Temperatures Measured during Well CW-8 MIT

Table N1 CW-8 Temperature Volume Data at Nitrogen Injection

Depth – Feet	Volume (ft3)		Temperature		Pressure		Nitrogen – SCF
	Incremental	Total	(°F)	(°R)	(psig)	(psia)	
0	0.0	0.0	52.8	512.8	2545.0	2559.7	0.0
10	2.3	2.3	56.4	516.4	2545.9	2560.6	397.2
20	2.3	4.6	60.2	520.2	2546.7	2561.4	394.1
30	2.3	6.9	62.9	522.9	2547.6	2562.3	391.5
40	2.3	9.2	65.5	525.5	2548.5	2563.1	389.3
50	2.3	11.5	66.4	526.4	2549.3	2564.0	388.0
60	2.3	13.8	66.8	526.8	2550.2	2564.8	387.5
70	2.3	16.1	67.5	527.5	2551.0	2565.7	387.2
80	2.3	18.4	67.6	527.6	2551.9	2566.5	387.0
90	2.3	20.7	67.8	527.8	2552.7	2567.4	387.0
100	2.3	23.0	67.9	527.9	2553.6	2568.2	387.0
110	2.3	25.3	67.9	527.9	2554.4	2569.1	387.1
120	2.3	27.6	68.1	528.1	2555.3	2569.9	387.1
130	2.3	29.9	68.6	528.6	2556.1	2570.8	386.9
140	2.3	32.2	68.5	528.5	2557.0	2571.6	386.9
150	2.3	34.5	68.3	528.3	2557.8	2572.5	387.1
160	2.3	36.8	68.2	528.2	2558.7	2573.3	387.4
170	2.3	39.1	68.2	528.2	2559.5	2574.2	387.5
180	2.3	41.4	68.4	528.4	2560.4	2575.0	387.5
190	2.3	43.7	68.5	528.5	2561.2	2575.9	387.6
200	2.3	46.0	68.4	528.4	2562.1	2576.7	387.6
210	2.3	48.3	68.4	528.4	2562.9	2577.6	387.8
220	2.3	50.6	68.5	528.5	2563.8	2578.4	387.8
230	2.3	52.9	68.8	528.8	2564.6	2579.3	387.8
240	2.3	55.2	69.6	529.6	2565.5	2580.1	387.5
250	2.3	57.5	69.9	529.9	2566.3	2581.0	387.1
260	2.3	59.8	70.3	530.3	2567.2	2581.8	387.0
270	2.3	62.1	70.7	530.7	2568.0	2582.7	386.7
280	2.3	64.4	71.3	531.3	2568.9	2583.5	386.4
290	2.3	66.7	71.1	531.1	2569.7	2584.4	386.4
300	2.3	69.0	70.1	530.1	2570.6	2585.2	387.0
310	2.3	71.3	69.7	529.7	2571.4	2586.1	387.7
320	2.3	73.6	69.6	529.6	2572.3	2586.9	388.0
330	2.3	75.9	69.5	529.5	2573.1	2587.8	388.2
340	2.3	78.2	69.5	529.5	2574.0	2588.6	388.3
350	2.3	80.5	69.5	529.5	2574.8	2589.5	388.4
360	2.3	82.8	69.5	529.5	2575.7	2590.4	388.5
370	2.3	85.1	69.5	529.5	2576.5	2591.2	388.7
380	2.3	87.4	69.6	529.6	2577.4	2592.1	388.8
390	2.3	89.7	69.7	529.7	2578.2	2592.9	388.8

400	2.3	92.0	69.7	529.7	2579.1	2593.8	388.9
410	2.3	94.3	69.8	529.8	2579.9	2594.6	389.0
420	2.3	96.6	69.8	529.8	2580.8	2595.5	389.0
430	2.3	98.9	69.9	529.9	2581.6	2596.3	389.1
440	2.3	101.2	70.0	530.0	2582.5	2597.2	389.1
450	2.3	103.5	70.1	530.1	2583.4	2598.0	389.1
460	2.3	105.8	70.2	530.2	2584.2	2598.9	389.2
470	2.3	108.1	70.3	530.3	2585.1	2599.7	389.2
480	2.3	110.4	70.5	530.5	2585.9	2600.6	389.2
490	2.3	112.7	70.6	530.6	2586.8	2601.5	389.2
500	2.3	115.0	70.7	530.7	2587.6	2602.3	389.2
510	2.3	117.3	70.8	530.8	2588.5	2603.2	389.3
520	2.3	119.6	70.9	530.9	2589.3	2604.0	389.3
530	2.3	121.9	71.0	531.0	2590.2	2604.9	389.3
540	2.3	124.2	71.1	531.1	2591.0	2605.7	389.3
550	2.3	126.5	71.2	531.2	2591.9	2606.6	389.4
560	2.3	128.8	71.3	531.3	2592.8	2607.4	389.4
570	2.3	131.1	71.4	531.4	2593.6	2608.3	389.4
580	2.3	133.4	71.5	531.5	2594.5	2609.1	389.5
590	2.3	135.7	71.6	531.6	2595.3	2610.0	389.5
600	2.3	138.0	71.7	531.7	2596.2	2610.9	389.6
610	2.3	140.3	71.7	531.7	2597.0	2611.7	389.6
620	2.3	142.6	71.8	531.8	2597.9	2612.6	389.6
630	2.3	144.9	71.9	531.9	2598.7	2613.4	389.7
640	2.3	147.2	72.0	532.0	2599.6	2614.3	389.7
650	2.3	149.5	72.0	532.0	2600.5	2615.1	389.8
660	2.3	151.8	72.1	532.1	2601.3	2616.0	389.8
670	2.3	154.1	72.2	532.2	2602.2	2616.8	389.9
680	2.3	156.4	72.3	532.3	2603.0	2617.7	390.0
690	2.3	158.7	72.3	532.3	2603.9	2618.6	390.0
700	2.3	161.0	72.4	532.4	2604.7	2619.4	390.1
710	2.3	163.3	72.4	532.4	2605.6	2620.3	390.1
720	2.3	165.6	72.5	532.5	2606.4	2621.1	390.2
730	2.3	167.9	72.6	532.6	2607.3	2622.0	390.3
740	2.3	170.2	72.6	532.6	2608.2	2622.8	390.3
750	2.3	172.5	72.7	532.7	2609.0	2623.7	390.4
760	2.3	174.8	72.7	532.7	2609.9	2624.6	390.4
770	2.3	177.1	72.8	532.8	2610.7	2625.4	390.5
780	2.3	179.4	72.8	532.8	2611.6	2626.3	390.6
790	2.3	181.7	72.9	532.9	2612.4	2627.1	390.7
800	2.3	184.0	72.9	532.9	2613.3	2628.0	390.7
810	2.3	186.3	73.0	533.0	2614.2	2628.8	390.8
820	2.3	188.6	73.0	533.0	2615.0	2629.7	390.9
830	2.3	190.9	73.1	533.1	2615.9	2630.6	391.0
840	2.3	193.2	73.2	533.2	2616.7	2631.4	391.0
850	2.3	195.5	73.2	533.2	2617.6	2632.3	391.1
860	2.3	197.8	73.3	533.3	2618.4	2633.1	391.1

870	2.3	200.1	73.4	533.4	2619.3	2634.0	391.2
880	2.3	202.4	73.5	533.5	2620.2	2634.8	391.2
890	2.3	204.7	73.6	533.6	2621.0	2635.7	391.3
900	2.3	207.0	73.7	533.7	2621.9	2636.6	391.3
910	2.3	209.3	73.7	533.7	2622.7	2637.4	391.3
920	2.3	211.6	73.8	533.8	2623.6	2638.3	391.4
930	2.3	213.9	73.9	533.9	2624.5	2639.1	391.4
940	2.3	216.2	74.0	534.0	2625.3	2640.0	391.4
950	2.3	218.5	74.1	534.1	2626.2	2640.9	391.5
960	2.3	220.8	74.3	534.3	2627.0	2641.7	391.5
970	2.3	223.1	74.4	534.4	2627.9	2642.6	391.5
980	2.3	225.4	74.5	534.5	2628.8	2643.4	391.5
990	2.3	227.7	74.5	534.5	2629.6	2644.3	391.6
1000	2.3	230.0	74.7	534.7	2630.5	2645.2	391.6
1010	2.3	232.3	74.8	534.8	2631.3	2646.0	391.6
1020	2.3	234.6	74.8	534.8	2632.2	2646.9	391.7
1030	2.3	236.9	74.9	534.9	2633.1	2647.7	391.7
1040	2.3	239.2	75.0	535.0	2633.9	2648.6	391.8
1050	2.3	241.5	75.1	535.1	2634.8	2649.5	391.8
1060	2.3	243.8	75.2	535.2	2635.6	2650.3	391.8
1070	2.3	246.1	75.2	535.2	2636.5	2651.2	391.9
1080	2.3	248.4	75.4	535.4	2637.4	2652.0	391.9
1090	2.3	250.7	75.5	535.5	2638.2	2652.9	391.9
1100	2.3	253.0	75.6	535.6	2639.1	2653.8	392.0
1110	2.3	255.3	75.6	535.6	2639.9	2654.6	392.0
1120	2.3	257.6	75.8	535.8	2640.8	2655.5	392.0
1130	2.3	259.9	75.9	535.9	2641.7	2656.3	392.1
1140	2.3	262.2	76.0	536.0	2642.5	2657.2	392.1
1150	2.3	264.5	76.1	536.1	2643.4	2658.1	392.1
1160	2.3	266.8	76.2	536.2	2644.2	2658.9	392.1
1170	2.3	269.1	76.3	536.3	2645.1	2659.8	392.1
1180	2.3	271.4	76.5	536.5	2646.0	2660.6	392.1
1190	2.3	273.7	76.5	536.5	2646.8	2661.5	392.2
1200	2.3	276.0	76.6	536.6	2647.7	2662.4	392.2
1210	2.3	278.3	76.8	536.8	2648.5	2663.2	392.2
1220	2.3	280.6	76.9	536.9	2649.4	2664.1	392.2
1230	2.3	282.9	77.0	537.0	2650.3	2664.9	392.2
1240	2.3	285.2	77.1	537.1	2651.1	2665.8	392.3
1250	2.3	287.5	77.2	537.2	2652.0	2666.7	392.3
1260	2.3	289.8	77.4	537.4	2652.8	2667.5	392.3
1270	2.3	292.1	77.5	537.5	2653.7	2668.4	392.3
1280	2.3	294.4	77.6	537.6	2654.6	2669.3	392.3
1290	2.3	296.7	77.7	537.7	2655.4	2670.1	392.3
1300	2.3	299.0	77.9	537.9	2656.3	2671.0	392.3
1310	2.3	301.3	78.0	538.0	2657.2	2671.8	392.3
1320	2.3	303.6	78.1	538.1	2658.0	2672.7	392.4
1330	2.3	305.9	78.2	538.2	2658.9	2673.6	392.4

1340	2.3	308.2	78.3	538.3	2659.7	2674.4	392.4
1350	2.3	310.5	78.4	538.4	2660.6	2675.3	392.4
1360	2.3	312.8	78.6	538.6	2661.5	2676.1	392.4
1370	2.3	315.1	78.7	538.7	2662.3	2677.0	392.4
1380	2.3	317.4	78.8	538.8	2663.2	2677.9	392.4
1390	2.3	319.7	78.9	538.9	2664.0	2678.7	392.4
1400	2.3	322.0	79.0	539.0	2664.9	2679.6	392.5
1410	2.3	324.3	79.1	539.1	2665.8	2680.4	392.5
1420	2.3	326.6	79.3	539.3	2666.6	2681.3	392.5
1430	2.3	328.9	79.3	539.3	2667.5	2682.2	392.5
1440	2.3	331.2	79.4	539.4	2668.4	2683.0	392.6
1450	2.3	333.5	79.5	539.5	2669.2	2683.9	392.7
1460	2.3	335.8	79.5	539.5	2670.1	2684.8	392.7
1470	2.3	338.1	79.6	539.6	2670.9	2685.6	392.8
1480	2.3	340.4	79.7	539.7	2671.8	2686.5	392.8
1490	2.3	342.7	79.7	539.7	2672.7	2687.3	392.9
1500	2.3	345.0	79.8	539.8	2673.5	2688.2	392.9
1510	2.3	347.3	79.8	539.8	2674.4	2689.1	393.0
1520	2.3	349.6	79.9	539.9	2675.3	2689.9	393.1
1530	2.3	351.9	80.0	540.0	2676.1	2690.8	393.1
1540	2.3	354.2	80.1	540.1	2677.0	2691.7	393.2
1550	2.3	356.5	80.2	540.2	2677.8	2692.5	393.2
1560	2.3	358.8	80.3	540.3	2678.7	2693.4	393.2
1570	2.3	361.1	80.5	540.5	2679.6	2694.2	393.2
1580	2.3	363.4	80.7	540.7	2680.4	2695.1	393.2
1590	2.3	365.7	80.8	540.8	2681.3	2696.0	393.1
1600	2.3	368.0	81.0	541.0	2682.2	2696.8	393.1
1610	2.3	370.3	81.1	541.1	2683.0	2697.7	393.1
1620	2.3	372.6	81.2	541.2	2683.9	2698.6	393.1
1630	2.3	374.9	81.4	541.4	2684.7	2699.4	393.1
1640	2.3	377.2	81.5	541.5	2685.6	2700.3	393.1
1650	2.3	379.5	81.7	541.7	2686.5	2701.2	393.1
1660	2.3	381.8	81.8	541.8	2687.3	2702.0	393.1
1670	2.3	384.1	81.9	541.9	2688.2	2702.9	393.1
1680	2.3	386.4	82.1	542.1	2689.1	2703.7	393.1
1690	2.3	388.7	82.2	542.2	2689.9	2704.6	393.1
1700	2.3	391.0	82.4	542.4	2690.8	2705.5	393.1
1710	2.3	393.3	82.5	542.5	2691.6	2706.3	393.1
1720	2.3	395.6	82.7	542.7	2692.5	2707.2	393.0
1730	2.3	397.9	82.8	542.8	2693.4	2708.1	393.0
1740	2.3	400.2	83.0	543.0	2694.2	2708.9	393.0
1750	2.3	402.5	83.1	543.1	2695.1	2709.8	393.0
1760	2.3	404.8	83.2	543.2	2696.0	2710.6	393.0
1770	2.3	407.1	83.3	543.3	2696.8	2711.5	393.1
1780	2.3	409.4	83.4	543.4	2697.7	2712.4	393.1
1790	2.3	411.7	83.6	543.6	2698.5	2713.2	393.1
1800	2.3	414.0	83.7	543.7	2699.4	2714.1	393.1

1810	2.3	416.3	83.9	543.9	2700.3	2715.0	393.0
1820	2.3	418.6	84.0	544.0	2701.1	2715.8	393.0
1830	2.3	420.9	84.1	544.1	2702.0	2716.7	393.1
1840	2.3	423.2	84.2	544.2	2702.9	2717.5	393.1
1850	2.3	425.5	84.2	544.2	2703.7	2718.4	393.2
1860	2.3	427.8	84.3	544.3	2704.6	2719.3	393.2
1870	2.3	430.1	84.4	544.4	2705.5	2720.1	393.3
1880	2.3	432.4	84.5	544.5	2706.3	2721.0	393.3
1890	2.3	434.7	84.6	544.6	2707.2	2721.9	393.4
1900	2.3	437.0	84.6	544.6	2708.0	2722.7	393.4
1910	2.3	439.3	84.7	544.7	2708.9	2723.6	393.4
1920	2.3	441.6	84.8	544.8	2709.8	2724.4	393.5
1930	2.3	443.9	84.9	544.9	2710.6	2725.3	393.5
1940	2.3	446.2	85.0	545.0	2711.5	2726.2	393.6
1950	2.3	448.5	85.2	545.2	2712.4	2727.0	393.5
1960	2.3	450.8	85.3	545.3	2713.2	2727.9	393.5
1970	2.3	453.1	85.5	545.5	2714.1	2728.8	393.5
1980	2.3	455.4	85.7	545.7	2715.0	2729.6	393.4
1990	2.3	457.7	85.9	545.9	2715.8	2730.5	393.4
2000	2.3	460.0	86.0	546.0	2716.7	2731.4	393.4
2010	2.3	462.3	86.1	546.1	2717.5	2732.2	393.4
2020	2.3	464.6	86.2	546.2	2718.4	2733.1	393.4
2030	2.3	466.9	86.4	546.4	2719.3	2734.0	393.4
2040	2.3	469.2	86.5	546.5	2720.1	2734.8	393.4
2050	2.3	471.5	86.6	546.6	2721.0	2735.7	393.5
2060	2.3	473.8	86.7	546.7	2721.9	2736.5	393.5
2070	2.3	476.1	86.8	546.8	2722.7	2737.4	393.5
2080	2.3	478.4	87.0	547.0	2723.6	2738.3	393.5
2090	2.3	480.7	87.1	547.1	2724.5	2739.1	393.5
2100	2.3	483.0	87.3	547.3	2725.3	2740.0	393.4
2110	2.3	485.3	87.5	547.5	2726.2	2740.9	393.4
2120	2.3	487.6	87.6	547.6	2727.0	2741.7	393.4
2130	2.3	489.9	87.7	547.7	2727.9	2742.6	393.4
2140	2.3	492.2	87.8	547.8	2728.8	2743.5	393.5
2150	2.3	494.5	87.9	547.9	2729.6	2744.3	393.5
2160	2.3	496.8	88.0	548.0	2730.5	2745.2	393.5
2170	2.3	499.1	88.1	548.1	2731.4	2746.0	393.5
2180	2.3	501.4	88.3	548.3	2732.2	2746.9	393.5
2190	2.3	503.7	88.4	548.4	2733.1	2747.8	393.5
2200	2.3	506.0	88.5	548.5	2734.0	2748.6	393.5
2210	2.3	508.3	88.7	548.7	2734.8	2749.5	393.5
2220	2.3	510.6	88.8	548.8	2735.7	2750.4	393.5
2230	2.3	512.9	88.9	548.9	2736.5	2751.2	393.6
2240	2.3	515.2	89.0	549.0	2737.4	2752.1	393.6
2250	2.3	517.5	89.1	549.1	2738.3	2753.0	393.6
2260	2.3	519.8	89.2	549.2	2739.1	2753.8	393.6
2270	2.3	522.1	89.4	549.4	2740.0	2754.7	393.6

2280	2.3	524.4	89.5	549.5	2740.9	2755.5	393.6
2290	2.3	526.7	89.6	549.6	2741.7	2756.4	393.6
2300	2.3	529.0	89.7	549.7	2742.6	2757.3	393.7
2310	2.3	531.3	89.8	549.8	2743.5	2758.1	393.7
2320	2.3	533.6	89.9	549.9	2744.3	2759.0	393.7
2330	2.3	535.9	90.0	550.0	2745.2	2759.9	393.7
2340	2.3	538.2	90.1	550.1	2746.0	2760.7	393.7
2350	2.3	540.5	90.2	550.2	2746.9	2761.6	393.8
2360	2.3	542.8	90.4	550.4	2747.8	2762.5	393.8
2370	2.3	545.1	90.5	550.5	2748.6	2763.3	393.8
2380	2.3	547.4	90.8	550.8	2749.5	2764.2	393.7
2390	2.3	549.7	90.8	550.8	2750.4	2765.1	393.7
2396	1.4	551.0	90.9	550.9	2750.9	2765.6	236.2
2410	2.8	553.9	91.0	551.0	2752.1	2766.8	481.7
2420	2.0	555.9	91.2	551.2	2753.0	2767.6	344.1
2430	2.0	557.9	91.3	551.3	2753.8	2768.5	344.1
2440	2.0	559.9	91.4	551.4	2754.7	2769.4	344.1
2450	2.0	561.9	91.5	551.5	2755.6	2770.2	344.1
2460	2.0	563.9	91.6	551.6	2756.4	2771.1	344.1
2470	2.0	565.9	91.8	551.8	2757.3	2772.0	344.1
2480	2.0	567.9	92.0	552.0	2758.1	2772.8	344.1
2490	2.0	569.9	92.1	552.1	2759.0	2773.7	344.1
2500	2.0	571.9	92.3	552.3	2759.9	2774.6	344.1
2510	2.0	574.0	92.7	552.7	2760.7	2775.4	344.0
2520	2.0	576.0	92.6	552.6	2761.6	2776.3	344.0
2530	2.0	578.0	92.8	552.8	2762.5	2777.2	344.0
2540	2.0	580.0	92.9	552.9	2763.3	2778.0	344.0
2550	2.0	582.0	93.0	553.0	2764.2	2778.9	344.0
2560	2.0	584.0	93.2	553.2	2765.1	2779.7	344.0
2570	2.0	586.0	93.4	553.4	2765.9	2780.6	344.0
2580	2.0	588.0	93.5	553.5	2766.8	2781.5	343.9
2590	2.0	590.0	93.7	553.7	2767.7	2782.3	343.9
2600	2.0	592.0	93.9	553.9	2768.5	2783.2	343.9
2610	2.0	594.0	94.0	554.0	2769.4	2784.1	343.9
2620	2.0	596.1	94.2	554.2	2770.2	2784.9	343.9
2630	2.0	598.1	94.3	554.3	2771.1	2785.8	343.9
2640	2.0	600.1	94.4	554.4	2772.0	2786.7	343.9
2650	2.0	602.1	94.5	554.5	2772.8	2787.5	343.9
2660	2.0	604.1	94.6	554.6	2773.7	2788.4	343.9
2670	2.0	606.1	94.7	554.7	2774.6	2789.2	343.9
2680	2.0	608.1	94.8	554.8	2775.4	2790.1	343.9
2690	2.0	610.1	94.9	554.9	2776.3	2791.0	344.0
2700	2.0	612.1	95.1	555.1	2777.2	2791.8	344.0
2710	2.0	614.1	95.2	555.2	2778.0	2792.7	344.0
2720	2.0	616.2	95.4	555.4	2778.9	2793.6	344.0
2730	2.0	618.2	95.5	555.5	2779.7	2794.4	343.9
2740	2.0	620.2	95.7	555.7	2780.6	2795.3	343.9

2750	2.0	622.2	95.8	555.8	2781.5	2796.2	343.9
2760	2.0	624.2	95.9	555.9	2782.3	2797.0	343.9
2770	2.0	626.2	96.0	556.0	2783.2	2797.9	344.0
2780	2.0	628.2	96.1	556.1	2784.1	2798.7	344.0
2790	2.0	630.2	96.2	556.2	2784.9	2799.6	344.0
2800	2.0	632.2	96.3	556.3	2785.8	2800.5	344.0
2810	2.0	634.2	96.4	556.4	2786.7	2801.3	344.0
2820	2.0	636.3	96.6	556.6	2787.5	2802.2	344.0
2830	2.0	638.3	96.7	556.7	2788.4	2803.1	344.0
2840	2.0	640.3	96.9	556.9	2789.3	2803.9	344.0
2850	2.0	642.3	96.9	556.9	2790.1	2804.8	344.1
2860	2.0	644.3	97.0	557.0	2791.0	2805.7	344.1
2870	2.0	646.3	97.0	557.0	2791.8	2806.5	344.1
2880	2.0	648.3	97.1	557.1	2792.7	2807.4	344.2
2890	2.0	650.3	97.2	557.2	2793.6	2808.3	344.2
2900	2.0	652.3	97.3	557.3	2794.4	2809.1	344.3
2910	2.0	654.3	97.4	557.4	2795.3	2810.0	344.3
2920	2.0	656.3	97.6	557.6	2796.2	2810.9	344.3
2930	2.0	658.4	97.8	557.8	2797.0	2811.7	344.2
2940	2.0	660.4	98.1	558.1	2797.9	2812.6	344.2
2950	2.0	662.4	98.3	558.3	2798.8	2813.4	344.1
2960	2.0	664.4	98.6	558.6	2799.6	2814.3	344.0
2970	2.0	666.4	99.0	559.0	2800.5	2815.2	343.8
2980	2.0	668.4	99.3	559.3	2801.4	2816.0	343.7
2990	2.0	670.4	99.6	559.6	2802.2	2816.9	343.6
3000	2.0	672.4	99.9	559.9	2803.1	2817.8	343.4
3010	2.0	674.4	100.3	560.3	2803.9	2818.6	343.3
3020	2.0	676.4	100.6	560.6	2804.8	2819.5	343.2
3030	2.0	678.5	100.8	560.8	2805.7	2820.3	343.1
3040	2.0	680.5	100.9	560.9	2806.5	2821.2	343.0
3050	2.0	682.5	101.0	561.0	2807.4	2822.1	343.0
3060	2.0	684.5	101.1	561.1	2808.3	2822.9	343.1
3070	2.0	686.5	101.2	561.2	2809.1	2823.8	343.1
3080	2.0	688.5	101.3	561.3	2810.0	2824.7	343.1
3090	2.0	690.5	101.4	561.4	2810.8	2825.5	343.2
3100	2.0	692.5	101.5	561.5	2811.7	2826.4	343.2
3110	2.0	694.5	101.6	561.6	2812.6	2827.2	343.2
3120	2.0	696.5	101.9	561.9	2813.4	2828.1	343.2
3130	2.0	698.6	102.1	562.1	2814.3	2829.0	343.1
3140	2.0	700.6	102.4	562.4	2815.1	2829.8	343.0
3150	2.0	702.6	102.7	562.7	2816.0	2830.7	342.9
3160	2.0	704.6	103.0	563.0	2816.9	2831.6	342.7
3170	2.0	706.6	103.3	563.3	2817.7	2832.4	342.6
3180	2.0	708.6	103.6	563.6	2818.6	2833.3	342.5
3190	2.0	710.6	103.8	563.8	2819.5	2834.1	342.4
3200	2.0	712.6	104.0	564.0	2820.3	2835.0	342.4
3210	2.0	714.6	104.1	564.1	2821.2	2835.9	342.4

3220	2.0	716.6	104.2	564.2	2822.0	2836.7	342.4
3230	2.0	718.6	104.2	564.2	2822.9	2837.6	342.5
3240	2.0	720.7	104.3	564.3	2823.8	2838.4	342.5
3250	2.0	722.7	104.4	564.4	2824.6	2839.3	342.5
3260	2.0	724.7	104.5	564.5	2825.5	2840.2	342.6
3270	2.0	726.7	104.6	564.6	2826.3	2841.0	342.6
3280	2.0	728.7	104.7	564.7	2827.2	2841.9	342.6
3290	2.0	730.7	104.8	564.8	2828.1	2842.7	342.6
3300	2.0	732.7	104.8	564.8	2828.9	2843.6	342.7
3310	2.0	734.7	104.9	564.9	2829.8	2844.5	342.7
3320	2.0	736.7	105.0	565.0	2830.6	2845.3	342.8
3330	2.0	738.7	105.1	565.1	2831.5	2846.2	342.8
3340	2.0	740.8	105.2	565.2	2832.4	2847.0	342.8
3350	2.0	742.8	105.3	565.3	2833.2	2847.9	342.9
3360	2.0	744.8	105.4	565.4	2834.1	2848.8	342.9
3370	2.0	746.8	105.5	565.5	2834.9	2849.6	342.9
3380	2.0	748.8	105.6	565.6	2835.8	2850.5	342.9
3390	2.0	750.8	105.7	565.7	2836.7	2851.3	342.9
3400	2.0	752.8	105.8	565.8	2837.5	2852.2	343.0
3410	2.0	754.8	105.9	565.9	2838.4	2853.1	343.0
3420	2.0	756.8	106.0	566.0	2839.3	2853.9	343.0
3430	2.0	758.8	106.1	566.1	2840.1	2854.8	343.0
3440	2.0	760.9	106.2	566.2	2841.0	2855.7	343.0
3450	2.0	762.9	106.3	566.3	2841.8	2856.5	343.0
3460	2.0	764.9	106.5	566.5	2842.7	2857.4	343.0
3470	2.0	766.9	106.7	566.7	2843.6	2858.2	343.0
3480	2.0	768.9	106.8	566.8	2844.4	2859.1	343.0
3490	2.0	770.9	106.9	566.9	2845.3	2860.0	343.0
3500	2.0	772.9	107.0	567.0	2846.1	2860.8	343.0
3510	2.0	774.9	107.1	567.1	2847.0	2861.7	343.0
3520	2.0	776.9	107.2	567.2	2847.9	2862.5	343.0
3530	2.0	778.9	107.4	567.4	2848.7	2863.4	343.1
3540	2.0	780.9	107.5	567.5	2849.6	2864.3	343.1
3550	2.0	783.0	107.6	567.6	2850.5	2865.1	343.1
3560	2.0	785.0	107.7	567.7	2851.3	2866.0	343.1
3570	2.0	787.0	107.8	567.8	2852.2	2866.9	343.1
3580	2.0	789.0	107.8	567.8	2853.0	2867.7	343.2
3590	2.0	791.0	107.9	567.9	2853.9	2868.6	343.2
3600	2.0	793.0	107.9	567.9	2854.8	2869.4	343.3
3610	2.0	795.0	107.9	567.9	2855.6	2870.3	343.3
3622	2.4	797.4	108.0	568.0	2856.7	2871.3	412.1
3630	22.8	820.2	107.9	567.9	2857.4	2872.0	3897.2
3640	28.5	848.7	107.9	567.9	2858.2	2872.9	4872.8
3650	28.5	877.2	108.0	568.0	2859.1	2873.8	4874.0
3660	28.5	905.7	108.0	568.0	2859.9	2874.6	4875.1
3670	28.5	934.2	108.0	568.0	2860.8	2875.5	4876.0
3680	28.5	962.7	108.1	568.1	2861.7	2876.3	4876.7

3690	28.5	991.2	108.2	568.2	2862.5	2877.2	4877.2
3700	28.5	1019.7	108.3	568.3	2863.4	2878.1	4877.6
3710	28.5	1048.2	108.3	568.3	2864.3	2878.9	4878.3
3720	28.5	1076.7	108.4	568.4	2865.1	2879.8	4879.1
3730	30.0	1106.7	108.5	568.5	2866.0	2880.7	5136.4
3740	30.0	1136.7	108.7	568.7	2866.9	2881.5	5136.2
3750	30.0	1166.7	108.9	568.9	2867.7	2882.4	5135.2
3759.65	29.0	1195.7	109.1	569.1	2868.6	2883.2	4954.4
Total Nitrogen							204049.0

Table N2 CW-8 Temperature Volume Data at Start MIT

Depth – Feet	Volume (ft3)		Temperature		Pressure		Nitrogen – SCF
	Incremental	Total	(°F)	(°R)	(psig)	psia)	
0	0.0	0.0	64.6	524.6	2505.0	2519.7	0.0
10	2.3	2.3	64.7	524.7	2505.8	2520.5	383.2
20	2.3	4.6	64.9	524.9	2506.7	2521.4	383.2
30	2.3	6.9	65.7	525.7	2507.5	2522.2	382.9
40	2.3	9.2	66.6	526.6	2508.4	2523.0	382.3
50	2.3	11.5	67.4	527.4	2509.2	2523.9	381.7
60	2.3	13.8	68.0	528.0	2510.0	2524.7	381.2
70	2.3	16.1	68.4	528.4	2510.9	2525.6	381.0
80	2.3	18.4	68.6	528.6	2511.7	2526.4	380.8
90	2.3	20.7	68.8	528.8	2512.5	2527.2	380.8
100	2.3	23.0	68.9	528.9	2513.4	2528.1	380.8
110	2.3	25.3	69.0	529.0	2514.2	2528.9	380.8
120	2.3	27.6	69.1	529.1	2515.1	2529.7	380.8
130	2.3	29.9	69.2	529.2	2515.9	2530.6	380.8
140	2.3	32.2	69.3	529.3	2516.7	2531.4	380.9
150	2.3	34.5	69.3	529.3	2517.6	2532.2	381.0
160	2.3	36.8	69.3	529.3	2518.4	2533.1	381.1
170	2.3	39.1	69.3	529.3	2519.2	2533.9	381.2
180	2.3	41.4	69.4	529.4	2520.1	2534.8	381.2
190	2.3	43.7	69.5	529.5	2520.9	2535.6	381.3
200	2.3	46.0	69.5	529.5	2521.7	2536.4	381.3
210	2.3	48.3	69.6	529.6	2522.6	2537.3	381.4
220	2.3	50.6	69.8	529.8	2523.4	2538.1	381.4
230	2.3	52.9	70.0	530.0	2524.3	2538.9	381.4
240	2.3	55.2	70.2	530.2	2525.1	2539.8	381.3
250	2.3	57.5	70.5	530.5	2525.9	2540.6	381.2
260	2.3	59.8	70.8	530.8	2526.8	2541.4	381.1
270	2.3	62.1	71.1	531.1	2527.6	2542.3	380.9
280	2.3	64.4	71.3	531.3	2528.4	2543.1	380.8
290	2.3	66.7	71.3	531.3	2529.3	2544.0	380.9
300	2.3	69.0	70.8	530.8	2530.1	2544.8	381.2
310	2.3	71.3	70.6	530.6	2531.0	2545.6	381.6
320	2.3	73.6	70.6	530.6	2531.8	2546.5	381.8
330	2.3	75.9	70.6	530.6	2532.6	2547.3	381.9
340	2.3	78.2	70.6	530.6	2533.5	2548.1	382.1
350	2.3	80.5	70.6	530.6	2534.3	2549.0	382.2
360	2.3	82.8	70.6	530.6	2535.1	2549.8	382.2
370	2.3	85.1	70.6	530.6	2536.0	2550.7	382.3
380	2.3	87.4	70.7	530.7	2536.8	2551.5	382.4
390	2.3	89.7	70.7	530.7	2537.7	2552.3	382.5
400	2.3	92.0	70.8	530.8	2538.5	2553.2	382.6
410	2.3	94.3	70.8	530.8	2539.3	2554.0	382.7

420	2.3	96.6	70.9	530.9	2540.2	2554.9	382.7
430	2.3	98.9	71.0	531.0	2541.0	2555.7	382.8
440	2.3	101.2	71.1	531.1	2541.9	2556.5	382.8
450	2.3	103.5	71.1	531.1	2542.7	2557.4	382.9
460	2.3	105.8	71.2	531.2	2543.5	2558.2	382.9
470	2.3	108.1	71.3	531.3	2544.4	2559.1	382.9
480	2.3	110.4	71.4	531.4	2545.2	2559.9	383.0
490	2.3	112.7	71.5	531.5	2546.1	2560.7	383.0
500	2.3	115.0	71.6	531.6	2546.9	2561.6	383.0
510	2.3	117.3	71.8	531.8	2547.7	2562.4	383.0
520	2.3	119.6	71.9	531.9	2548.6	2563.3	383.0
530	2.3	121.9	72.0	532.0	2549.4	2564.1	383.1
540	2.3	124.2	72.1	532.1	2550.3	2564.9	383.1
550	2.3	126.5	72.2	532.2	2551.1	2565.8	383.1
560	2.3	128.8	72.3	532.3	2551.9	2566.6	383.1
570	2.3	131.1	72.4	532.4	2552.8	2567.5	383.2
580	2.3	133.4	72.5	532.5	2553.6	2568.3	383.2
590	2.3	135.7	72.6	532.6	2554.5	2569.2	383.2
600	2.3	138.0	72.7	532.7	2555.3	2570.0	383.3
610	2.3	140.3	72.8	532.8	2556.2	2570.8	383.3
620	2.3	142.6	72.9	532.9	2557.0	2571.7	383.3
630	2.3	144.9	73.0	533.0	2557.8	2572.5	383.4
640	2.3	147.2	73.1	533.1	2558.7	2573.4	383.4
650	2.3	149.5	73.1	533.1	2559.5	2574.2	383.5
660	2.3	151.8	73.2	533.2	2560.4	2575.0	383.5
670	2.3	154.1	73.2	533.2	2561.2	2575.9	383.6
680	2.3	156.4	73.3	533.3	2562.0	2576.7	383.7
690	2.3	158.7	73.3	533.3	2562.9	2577.6	383.7
700	2.3	161.0	73.4	533.4	2563.7	2578.4	383.8
710	2.3	163.3	73.4	533.4	2564.6	2579.3	383.9
720	2.3	165.6	73.5	533.5	2565.4	2580.1	383.9
730	2.3	167.9	73.6	533.6	2566.3	2580.9	384.0
740	2.3	170.2	73.6	533.6	2567.1	2581.8	384.1
750	2.3	172.5	73.7	533.7	2567.9	2582.6	384.2
760	2.3	174.8	73.7	533.7	2568.8	2583.5	384.2
770	2.3	177.1	73.8	533.8	2569.6	2584.3	384.3
780	2.3	179.4	73.8	533.8	2570.5	2585.2	384.4
790	2.3	181.7	73.9	533.9	2571.3	2586.0	384.4
800	2.3	184.0	73.9	533.9	2572.2	2586.8	384.5
810	2.3	186.3	74.0	534.0	2573.0	2587.7	384.6
820	2.3	188.6	74.1	534.1	2573.9	2588.5	384.6
830	2.3	190.9	74.1	534.1	2574.7	2589.4	384.7
840	2.3	193.2	74.3	534.3	2575.5	2590.2	384.7
850	2.3	195.5	74.3	534.3	2576.4	2591.1	384.7
860	2.3	197.8	74.5	534.5	2577.2	2591.9	384.8
870	2.3	200.1	74.6	534.6	2578.1	2592.8	384.8
880	2.3	202.4	74.6	534.6	2578.9	2593.6	384.8

890	2.3	204.7	74.7	534.7	2579.8	2594.4	384.9
900	2.3	207.0	74.8	534.8	2580.6	2595.3	384.9
910	2.3	209.3	74.9	534.9	2581.5	2596.1	384.9
920	2.3	211.6	75.0	535.0	2582.3	2597.0	385.0
930	2.3	213.9	75.1	535.1	2583.1	2597.8	385.0
940	2.3	216.2	75.2	535.2	2584.0	2598.7	385.0
950	2.3	218.5	75.3	535.3	2584.8	2599.5	385.1
960	2.3	220.8	75.4	535.4	2585.7	2600.4	385.1
970	2.3	223.1	75.5	535.5	2586.5	2601.2	385.1
980	2.3	225.4	75.6	535.6	2587.4	2602.0	385.2
990	2.3	227.7	75.7	535.7	2588.2	2602.9	385.2
1000	2.3	230.0	75.8	535.8	2589.1	2603.7	385.2
1010	2.3	232.3	75.9	535.9	2589.9	2604.6	385.2
1020	2.3	234.6	76.0	536.0	2590.8	2605.4	385.3
1030	2.3	236.9	76.1	536.1	2591.6	2606.3	385.3
1040	2.3	239.2	76.2	536.2	2592.4	2607.1	385.4
1050	2.3	241.5	76.2	536.2	2593.3	2608.0	385.4
1060	2.3	243.8	76.3	536.3	2594.1	2608.8	385.5
1070	2.3	246.1	76.4	536.4	2595.0	2609.7	385.5
1080	2.3	248.4	76.5	536.5	2595.8	2610.5	385.6
1090	2.3	250.7	76.6	536.6	2596.7	2611.4	385.6
1100	2.3	253.0	76.6	536.6	2597.5	2612.2	385.6
1110	2.3	255.3	76.7	536.7	2598.4	2613.0	385.7
1120	2.3	257.6	76.8	536.8	2599.2	2613.9	385.7
1130	2.3	259.9	76.9	536.9	2600.1	2614.7	385.7
1140	2.3	262.2	77.0	537.0	2600.9	2615.6	385.8
1150	2.3	264.5	77.1	537.1	2601.8	2616.4	385.8
1160	2.3	266.8	77.3	537.3	2602.6	2617.3	385.8
1170	2.3	269.1	77.4	537.4	2603.4	2618.1	385.8
1180	2.3	271.4	77.5	537.5	2604.3	2619.0	385.9
1190	2.3	273.7	77.6	537.6	2605.1	2619.8	385.9
1200	2.3	276.0	77.7	537.7	2606.0	2620.7	385.9
1210	2.3	278.3	77.9	537.9	2606.8	2621.5	385.9
1220	2.3	280.6	78.0	538.0	2607.7	2622.4	385.9
1230	2.3	282.9	78.1	538.1	2608.5	2623.2	385.9
1240	2.3	285.2	78.2	538.2	2609.4	2624.1	385.9
1250	2.3	287.5	78.3	538.3	2610.2	2624.9	386.0
1260	2.3	289.8	78.4	538.4	2611.1	2625.8	386.0
1270	2.3	292.1	78.5	538.5	2611.9	2626.6	386.0
1280	2.3	294.4	78.6	538.6	2612.8	2627.4	386.0
1290	2.3	296.7	78.8	538.8	2613.6	2628.3	386.0
1300	2.3	299.0	78.9	538.9	2614.5	2629.1	386.0
1310	2.3	301.3	79.0	539.0	2615.3	2630.0	386.1
1320	2.3	303.6	79.1	539.1	2616.2	2630.8	386.1
1330	2.3	305.9	79.2	539.2	2617.0	2631.7	386.1
1340	2.3	308.2	79.4	539.4	2617.9	2632.5	386.1
1350	2.3	310.5	79.5	539.5	2618.7	2633.4	386.1

1360	2.3	312.8	79.7	539.7	2619.5	2634.2	386.1
1370	2.3	315.1	79.8	539.8	2620.4	2635.1	386.1
1380	2.3	317.4	79.9	539.9	2621.2	2635.9	386.1
1390	2.3	319.7	80.0	540.0	2622.1	2636.8	386.1
1400	2.3	322.0	80.1	540.1	2622.9	2637.6	386.2
1410	2.3	324.3	80.2	540.2	2623.8	2638.5	386.2
1420	2.3	326.6	80.3	540.3	2624.6	2639.3	386.2
1430	2.3	328.9	80.3	540.3	2625.5	2640.2	386.3
1440	2.3	331.2	80.4	540.4	2626.3	2641.0	386.3
1450	2.3	333.5	80.5	540.5	2627.2	2641.9	386.4
1460	2.3	335.8	80.6	540.6	2628.0	2642.7	386.4
1470	2.3	338.1	80.6	540.6	2628.9	2643.6	386.5
1480	2.3	340.4	80.7	540.7	2629.7	2644.4	386.5
1490	2.3	342.7	80.8	540.8	2630.6	2645.2	386.6
1500	2.3	345.0	80.8	540.8	2631.4	2646.1	386.6
1510	2.3	347.3	80.9	540.9	2632.3	2646.9	386.7
1520	2.3	349.6	81.0	541.0	2633.1	2647.8	386.8
1530	2.3	351.9	81.0	541.0	2634.0	2648.6	386.8
1540	2.3	354.2	81.1	541.1	2634.8	2649.5	386.9
1550	2.3	356.5	81.2	541.2	2635.7	2650.3	386.9
1560	2.3	358.8	81.3	541.3	2636.5	2651.2	386.9
1570	2.3	361.1	81.6	541.6	2637.4	2652.0	386.9
1580	2.3	363.4	81.7	541.7	2638.2	2652.9	386.8
1590	2.3	365.7	81.8	541.8	2639.1	2653.7	386.8
1600	2.3	368.0	82.0	542.0	2639.9	2654.6	386.9
1610	2.3	370.3	82.1	542.1	2640.8	2655.4	386.9
1620	2.3	372.6	82.2	542.2	2641.6	2656.3	386.8
1630	2.3	374.9	82.4	542.4	2642.5	2657.1	386.9
1640	2.3	377.2	82.5	542.5	2643.3	2658.0	386.9
1650	2.3	379.5	82.6	542.6	2644.2	2658.8	386.9
1660	2.3	381.8	82.8	542.8	2645.0	2659.7	386.9
1670	2.3	384.1	82.9	542.9	2645.9	2660.5	386.9
1680	2.3	386.4	83.0	543.0	2646.7	2661.4	386.9
1690	2.3	388.7	83.1	543.1	2647.6	2662.2	386.9
1700	2.3	391.0	83.3	543.3	2648.4	2663.1	386.9
1710	2.3	393.3	83.4	543.4	2649.2	2663.9	386.9
1720	2.3	395.6	83.5	543.5	2650.1	2664.8	386.9
1730	2.3	397.9	83.6	543.6	2650.9	2665.6	386.9
1740	2.3	400.2	83.8	543.8	2651.8	2666.5	386.9
1750	2.3	402.5	83.9	543.9	2652.6	2667.3	386.9
1760	2.3	404.8	84.0	544.0	2653.5	2668.2	386.9
1770	2.3	407.1	84.1	544.1	2654.3	2669.0	387.0
1780	2.3	409.4	84.3	544.3	2655.2	2669.9	387.0
1790	2.3	411.7	84.4	544.4	2656.0	2670.7	387.0
1800	2.3	414.0	84.5	544.5	2656.9	2671.6	387.0
1810	2.3	416.3	84.6	544.6	2657.7	2672.4	387.0
1820	2.3	418.6	84.8	544.8	2658.6	2673.3	387.0

1830	2.3	420.9	84.9	544.9	2659.4	2674.1	387.0
1840	2.3	423.2	85.0	545.0	2660.3	2675.0	387.0
1850	2.3	425.5	85.1	545.1	2661.1	2675.8	387.0
1860	2.3	427.8	85.2	545.2	2662.0	2676.7	387.0
1870	2.3	430.1	85.3	545.3	2662.8	2677.5	387.1
1880	2.3	432.4	85.4	545.4	2663.7	2678.4	387.1
1890	2.3	434.7	85.6	545.6	2664.5	2679.2	387.1
1900	2.3	437.0	85.7	545.7	2665.4	2680.1	387.1
1910	2.3	439.3	85.8	545.8	2666.2	2680.9	387.1
1920	2.3	441.6	85.9	545.9	2667.1	2681.8	387.2
1930	2.3	443.9	86.0	546.0	2667.9	2682.6	387.2
1940	2.3	446.2	86.1	546.1	2668.8	2683.5	387.2
1950	2.3	448.5	86.3	546.3	2669.6	2684.3	387.2
1960	2.3	450.8	86.4	546.4	2670.5	2685.2	387.2
1970	2.3	453.1	86.5	546.5	2671.3	2686.0	387.2
1980	2.3	455.4	86.6	546.6	2672.2	2686.9	387.2
1990	2.3	457.7	86.8	546.8	2673.0	2687.7	387.2
2000	2.3	460.0	86.9	546.9	2673.9	2688.6	387.3
2010	2.3	462.3	87.0	547.0	2674.7	2689.4	387.3
2020	2.3	464.6	87.1	547.1	2675.6	2690.3	387.3
2030	2.3	466.9	87.2	547.2	2676.4	2691.1	387.3
2040	2.3	469.2	87.4	547.4	2677.3	2692.0	387.3
2050	2.3	471.5	87.5	547.5	2678.1	2692.8	387.3
2060	2.3	473.8	87.6	547.6	2679.0	2693.7	387.3
2070	2.3	476.1	87.8	547.8	2679.8	2694.5	387.3
2080	2.3	478.4	87.9	547.9	2680.7	2695.4	387.3
2090	2.3	480.7	88.1	548.1	2681.5	2696.2	387.3
2100	2.3	483.0	88.2	548.2	2682.4	2697.1	387.2
2110	2.3	485.3	88.4	548.4	2683.2	2697.9	387.3
2120	2.3	487.6	88.5	548.5	2684.1	2698.8	387.3
2130	2.3	489.9	88.6	548.6	2684.9	2699.6	387.3
2140	2.3	492.2	88.7	548.7	2685.8	2700.5	387.3
2150	2.3	494.5	88.8	548.8	2686.6	2701.3	387.3
2160	2.3	496.8	88.9	548.9	2687.5	2702.2	387.3
2170	2.3	499.1	89.0	549.0	2688.3	2703.0	387.4
2180	2.3	501.4	89.1	549.1	2689.2	2703.9	387.4
2190	2.3	503.7	89.2	549.2	2690.0	2704.7	387.4
2200	2.3	506.0	89.3	549.3	2690.9	2705.6	387.4
2210	2.3	508.3	89.4	549.4	2691.7	2706.4	387.5
2220	2.3	510.6	89.6	549.6	2692.6	2707.3	387.5
2230	2.3	512.9	89.7	549.7	2693.4	2708.1	387.5
2240	2.3	515.2	89.8	549.8	2694.3	2709.0	387.5
2250	2.3	517.5	89.9	549.9	2695.1	2709.8	387.5
2260	2.3	519.8	90.1	550.1	2696.0	2710.7	387.5
2270	2.3	522.1	90.2	550.2	2696.8	2711.5	387.5
2280	2.3	524.4	90.3	550.3	2697.7	2712.4	387.5
2290	2.3	526.7	90.4	550.4	2698.5	2713.2	387.6

2300	2.3	529.0	90.5	550.5	2699.4	2714.1	387.6
2310	2.3	531.3	90.6	550.6	2700.2	2714.9	387.6
2320	2.3	533.6	90.7	550.7	2701.1	2715.8	387.6
2330	2.3	535.9	90.9	550.9	2701.9	2716.6	387.6
2340	2.3	538.2	91.0	551.0	2702.8	2717.5	387.6
2350	2.3	540.5	91.1	551.1	2703.7	2718.3	387.7
2360	2.3	542.8	91.2	551.2	2704.5	2719.2	387.7
2370	2.3	545.1	91.3	551.3	2705.4	2720.0	387.7
2380	2.3	547.4	91.4	551.4	2706.2	2720.9	387.7
2390	2.3	549.7	91.5	551.5	2707.1	2721.7	387.7
2396	1.4	551.0	91.6	551.6	2707.6	2722.2	232.6
2410	2.8	553.9	91.7	551.7	2708.8	2723.4	474.4
2420	2.0	555.9	91.9	551.9	2709.6	2724.3	338.8
2430	2.0	557.9	92.1	552.1	2710.5	2725.1	338.8
2440	2.0	559.9	92.2	552.2	2711.3	2726.0	338.8
2450	2.0	561.9	92.4	552.4	2712.2	2726.8	338.8
2460	2.0	563.9	92.5	552.5	2713.0	2727.7	338.8
2470	2.0	565.9	92.7	552.7	2713.9	2728.5	338.8
2480	2.0	567.9	92.8	552.8	2714.7	2729.4	338.8
2490	2.0	569.9	93.0	553.0	2715.6	2730.2	338.7
2500	2.0	571.9	93.1	553.1	2716.4	2731.1	338.7
2510	2.0	574.0	93.3	553.3	2717.3	2731.9	338.7
2520	2.0	576.0	93.4	553.4	2718.1	2732.8	338.7
2530	2.0	578.0	93.6	553.6	2719.0	2733.6	338.7
2540	2.0	580.0	93.7	553.7	2719.8	2734.5	338.7
2550	2.0	582.0	93.8	553.8	2720.7	2735.3	338.7
2560	2.0	584.0	94.0	554.0	2721.5	2736.2	338.7
2570	2.0	586.0	94.2	554.2	2722.4	2737.1	338.7
2580	2.0	588.0	94.3	554.3	2723.2	2737.9	338.6
2590	2.0	590.0	94.5	554.5	2724.1	2738.8	338.6
2600	2.0	592.0	94.6	554.6	2724.9	2739.6	338.6
2610	2.0	594.0	94.8	554.8	2725.8	2740.5	338.6
2620	2.0	596.1	94.9	554.9	2726.6	2741.3	338.6
2630	2.0	598.1	95.0	555.0	2727.5	2742.2	338.6
2640	2.0	600.1	95.1	555.1	2728.3	2743.0	338.6
2650	2.0	602.1	95.2	555.2	2729.2	2743.9	338.7
2660	2.0	604.1	95.3	555.3	2730.0	2744.7	338.7
2670	2.0	606.1	95.4	555.4	2730.9	2745.6	338.7
2680	2.0	608.1	95.5	555.5	2731.7	2746.4	338.7
2690	2.0	610.1	95.6	555.6	2732.6	2747.3	338.8
2700	2.0	612.1	95.7	555.7	2733.4	2748.1	338.8
2710	2.0	614.1	95.8	555.8	2734.3	2749.0	338.8
2720	2.0	616.2	96.0	556.0	2735.1	2749.8	338.8
2730	2.0	618.2	96.2	556.2	2736.0	2750.7	338.8
2740	2.0	620.2	96.3	556.3	2736.8	2751.5	338.7
2750	2.0	622.2	96.5	556.5	2737.7	2752.4	338.7
2760	2.0	624.2	96.6	556.6	2738.5	2753.2	338.7

2770	2.0	626.2	96.7	556.7	2739.4	2754.1	338.8
2780	2.0	628.2	96.7	556.7	2740.2	2754.9	338.8
2790	2.0	630.2	96.8	556.8	2741.1	2755.8	338.8
2800	2.0	632.2	97.0	557.0	2741.9	2756.6	338.8
2810	2.0	634.2	97.1	557.1	2742.8	2757.5	338.8
2820	2.0	636.3	97.3	557.3	2743.6	2758.3	338.8
2830	2.0	638.3	97.4	557.4	2744.5	2759.2	338.8
2840	2.0	640.3	97.6	557.6	2745.3	2760.0	338.8
2850	2.0	642.3	97.7	557.7	2746.2	2760.9	338.8
2860	2.0	644.3	97.8	557.8	2747.0	2761.7	338.8
2870	2.0	646.3	97.9	557.9	2747.9	2762.6	338.9
2880	2.0	648.3	98.0	558.0	2748.7	2763.4	338.9
2890	2.0	650.3	98.1	558.1	2749.6	2764.3	338.9
2900	2.0	652.3	98.2	558.2	2750.5	2765.1	338.9
2910	2.0	654.3	98.3	558.3	2751.3	2766.0	338.9
2920	2.0	656.3	98.5	558.5	2752.2	2766.8	338.9
2930	2.0	658.4	98.7	558.7	2753.0	2767.7	338.9
2940	2.0	660.4	98.9	558.9	2753.9	2768.5	338.8
2950	2.0	662.4	99.1	559.1	2754.7	2769.4	338.8
2960	2.0	664.4	99.4	559.4	2755.6	2770.2	338.7
2970	2.0	666.4	99.6	559.6	2756.4	2771.1	338.6
2980	2.0	668.4	99.9	559.9	2757.3	2771.9	338.5
2990	2.0	670.4	100.1	560.1	2758.1	2772.8	338.4
3000	2.0	672.4	100.4	560.4	2759.0	2773.6	338.3
3010	2.0	674.4	100.8	560.8	2759.8	2774.5	338.2
3020	2.0	676.4	101.0	561.0	2760.7	2775.3	338.1
3030	2.0	678.5	101.2	561.2	2761.5	2776.2	338.1
3040	2.0	680.5	101.4	561.4	2762.4	2777.0	338.0
3050	2.0	682.5	101.5	561.5	2763.2	2777.9	338.0
3060	2.0	684.5	101.5	561.5	2764.1	2778.7	338.1
3070	2.0	686.5	101.6	561.6	2764.9	2779.6	338.1
3080	2.0	688.5	101.6	561.6	2765.8	2780.4	338.2
3090	2.0	690.5	101.7	561.7	2766.6	2781.3	338.2
3100	2.0	692.5	101.8	561.8	2767.5	2782.1	338.3
3110	2.0	694.5	101.9	561.9	2768.3	2783.0	338.3
3120	2.0	696.5	102.2	562.2	2769.2	2783.8	338.2
3130	2.0	698.6	102.4	562.4	2770.0	2784.7	338.2
3140	2.0	700.6	102.7	562.7	2770.9	2785.5	338.1
3150	2.0	702.6	102.9	562.9	2771.7	2786.4	338.0
3160	2.0	704.6	103.2	563.2	2772.6	2787.2	337.9
3170	2.0	706.6	103.5	563.5	2773.4	2788.1	337.8
3180	2.0	708.6	103.8	563.8	2774.2	2788.9	337.7
3190	2.0	710.6	104.0	564.0	2775.1	2789.8	337.6
3200	2.0	712.6	104.1	564.1	2775.9	2790.6	337.6
3210	2.0	714.6	104.2	564.2	2776.8	2791.5	337.6
3220	2.0	716.6	104.3	564.3	2777.6	2792.3	337.6
3230	2.0	718.6	104.4	564.4	2778.5	2793.2	337.7

3240	2.0	720.7	104.5	564.5	2779.3	2794.0	337.7
3250	2.0	722.7	104.5	564.5	2780.2	2794.9	337.7
3260	2.0	724.7	104.6	564.6	2781.0	2795.7	337.8
3270	2.0	726.7	104.7	564.7	2781.9	2796.6	337.8
3280	2.0	728.7	104.8	564.8	2782.7	2797.4	337.8
3290	2.0	730.7	104.9	564.9	2783.6	2798.3	337.9
3300	2.0	732.7	104.9	564.9	2784.4	2799.1	337.9
3310	2.0	734.7	105.1	565.1	2785.3	2800.0	337.9
3320	2.0	736.7	105.2	565.2	2786.1	2800.8	337.9
3330	2.0	738.7	105.3	565.3	2787.0	2801.7	338.0
3340	2.0	740.8	105.4	565.4	2787.8	2802.5	338.0
3350	2.0	742.8	105.5	565.5	2788.7	2803.4	338.0
3360	2.0	744.8	105.5	565.5	2789.5	2804.2	338.0
3370	2.0	746.8	105.6	565.6	2790.4	2805.0	338.1
3380	2.0	748.8	105.7	565.7	2791.2	2805.9	338.1
3390	2.0	750.8	105.8	565.8	2792.1	2806.7	338.2
3400	2.0	752.8	105.9	565.9	2792.9	2807.6	338.2
3410	2.0	754.8	105.9	565.9	2793.8	2808.4	338.2
3420	2.0	756.8	106.0	566.0	2794.6	2809.3	338.3
3430	2.0	758.8	106.1	566.1	2795.5	2810.1	338.3
3440	2.0	760.9	106.3	566.3	2796.3	2811.0	338.3
3450	2.0	762.9	106.4	566.4	2797.2	2811.8	338.3
3460	2.0	764.9	106.6	566.6	2798.0	2812.7	338.3
3470	2.0	766.9	106.7	566.7	2798.9	2813.5	338.2
3480	2.0	768.9	106.9	566.9	2799.7	2814.4	338.2
3490	2.0	770.9	107.0	567.0	2800.6	2815.2	338.2
3500	2.0	772.9	107.1	567.1	2801.4	2816.1	338.2
3510	2.0	774.9	107.2	567.2	2802.3	2816.9	338.3
3520	2.0	776.9	107.3	567.3	2803.1	2817.8	338.3
3530	2.0	778.9	107.4	567.4	2804.0	2818.6	338.3
3540	2.0	780.9	107.5	567.5	2804.8	2819.5	338.3
3550	2.0	783.0	107.6	567.6	2805.7	2820.3	338.4
3560	2.0	785.0	107.7	567.7	2806.5	2821.2	338.4
3570	2.0	787.0	107.7	567.7	2807.4	2822.0	338.4
3580	2.0	789.0	107.8	567.8	2808.2	2822.9	338.5
3590	2.0	791.0	107.9	567.9	2809.1	2823.7	338.5
3600	2.0	793.0	107.9	567.9	2809.9	2824.6	338.6
3610	2.0	795.0	108.0	568.0	2810.8	2825.4	338.6
3622	2.4	797.4	108.0	568.0	2811.8	2826.5	406.4
3630	22.8	820.2	108.0	568.0	2812.5	2827.1	3843.4
3640	28.5	848.7	108.0	568.0	2813.3	2828.0	4805.2
3650	28.5	877.2	108.1	568.1	2814.2	2828.8	4806.1
3660	28.5	905.7	108.2	568.2	2815.0	2829.7	4806.5
3670	28.5	934.2	108.4	568.4	2815.9	2830.6	4806.6
3680	28.5	962.7	108.5	568.5	2816.7	2831.4	4806.5
3690	28.5	991.2	108.7	568.7	2817.6	2832.3	4806.3
3700	28.5	1019.7	108.8	568.8	2818.4	2833.1	4806.1

3710	28.5	1048.2	108.9	568.9	2819.3	2834.0	4806.1
3720	28.5	1076.7	109.0	569.0	2820.1	2834.8	4806.2
3730	30.0	1106.7	109.1	569.1	2821.0	2835.7	5059.5
3740	30.0	1136.7	109.2	569.2	2821.8	2836.5	5059.9
3750	30.0	1166.7	109.3	569.3	2822.7	2837.4	5060.6
3760.1	30.3	1197.0	109.3	569.3	2823.5	2838.2	5111.9
Total Nitrogen			86.8				201166.7

Table N3 CW-8 Temperature Volume Data at End MIT

Depth – Feet	Volume (ft3)		Temperature		Pressure		Nitrogen – SCF
	Incremental	Total	(°F)	(°R)	(psig)	psia)	
0	0.0	0.0	68.8	528.8	2491.0	2505.7	0.0
10	2.3	2.3	65.9	525.9	2491.8	2506.5	379.0
20	2.3	4.6	66.2	526.2	2492.7	2507.3	380.2
30	2.3	6.9	66.4	526.4	2493.5	2508.2	380.2
40	2.3	9.2	66.8	526.8	2494.3	2509.0	380.0
50	2.3	11.5	67.1	527.1	2495.2	2509.8	379.8
60	2.3	13.8	67.4	527.4	2496.0	2510.7	379.7
70	2.3	16.1	67.6	527.6	2496.8	2511.5	379.6
80	2.3	18.4	67.8	527.8	2497.7	2512.3	379.5
90	2.3	20.7	68.0	528.0	2498.5	2513.2	379.5
100	2.3	23.0	68.2	528.2	2499.3	2514.0	379.5
110	2.3	25.3	68.2	528.2	2500.2	2514.8	379.5
120	2.3	27.6	68.3	528.3	2501.0	2515.7	379.5
130	2.3	29.9	68.4	528.4	2501.8	2516.5	379.6
140	2.3	32.2	68.5	528.5	2502.7	2517.3	379.6
150	2.3	34.5	68.5	528.5	2503.5	2518.2	379.7
160	2.3	36.8	68.6	528.6	2504.3	2519.0	379.8
170	2.3	39.1	68.6	528.6	2505.2	2519.8	379.9
180	2.3	41.4	68.7	528.7	2506.0	2520.7	379.9
190	2.3	43.7	68.8	528.8	2506.8	2521.5	379.9
200	2.3	46.0	68.9	528.9	2507.7	2522.3	380.0
210	2.3	48.3	69.0	529.0	2508.5	2523.2	380.0
220	2.3	50.6	69.1	529.1	2509.3	2524.0	380.0
230	2.3	52.9	69.3	529.3	2510.2	2524.9	380.0
240	2.3	55.2	69.5	529.5	2511.0	2525.7	380.0
250	2.3	57.5	69.7	529.7	2511.8	2526.5	379.9
260	2.3	59.8	70.1	530.1	2512.7	2527.4	379.8
270	2.3	62.1	70.4	530.4	2513.5	2528.2	379.6
280	2.3	64.4	70.6	530.6	2514.3	2529.0	379.5
290	2.3	66.7	70.6	530.6	2515.2	2529.9	379.6
300	2.3	69.0	70.1	530.1	2516.0	2530.7	379.9
310	2.3	71.3	69.9	529.9	2516.8	2531.5	380.3
320	2.3	73.6	69.8	529.8	2517.7	2532.4	380.5
330	2.3	75.9	69.8	529.8	2518.5	2533.2	380.6
340	2.3	78.2	69.8	529.8	2519.3	2534.0	380.8
350	2.3	80.5	69.9	529.9	2520.2	2534.9	380.9
360	2.3	82.8	69.9	529.9	2521.0	2535.7	381.0
370	2.3	85.1	69.9	529.9	2521.9	2536.5	381.1
380	2.3	87.4	69.9	529.9	2522.7	2537.4	381.1
390	2.3	89.7	70.0	530.0	2523.5	2538.2	381.2
400	2.3	92.0	70.0	530.0	2524.4	2539.0	381.3
410	2.3	94.3	70.1	530.1	2525.2	2539.9	381.4

420	2.3	96.6	70.1	530.1	2526.0	2540.7	381.4
430	2.3	98.9	70.2	530.2	2526.9	2541.6	381.5
440	2.3	101.2	70.3	530.3	2527.7	2542.4	381.5
450	2.3	103.5	70.4	530.4	2528.6	2543.2	381.6
460	2.3	105.8	70.5	530.5	2529.4	2544.1	381.6
470	2.3	108.1	70.6	530.6	2530.2	2544.9	381.7
480	2.3	110.4	70.6	530.6	2531.1	2545.7	381.7
490	2.3	112.7	70.7	530.7	2531.9	2546.6	381.7
500	2.3	115.0	70.9	530.9	2532.7	2547.4	381.8
510	2.3	117.3	71.0	531.0	2533.6	2548.3	381.8
520	2.3	119.6	71.1	531.1	2534.4	2549.1	381.8
530	2.3	121.9	71.2	531.2	2535.3	2549.9	381.8
540	2.3	124.2	71.3	531.3	2536.1	2550.8	381.8
550	2.3	126.5	71.5	531.5	2536.9	2551.6	381.8
560	2.3	128.8	71.6	531.6	2537.8	2552.4	381.8
570	2.3	131.1	71.7	531.7	2538.6	2553.3	381.9
580	2.3	133.4	71.8	531.8	2539.4	2554.1	381.9
590	2.3	135.7	71.9	531.9	2540.3	2555.0	381.9
600	2.3	138.0	72.0	532.0	2541.1	2555.8	381.9
610	2.3	140.3	72.1	532.1	2542.0	2556.6	382.0
620	2.3	142.6	72.2	532.2	2542.8	2557.5	382.0
630	2.3	144.9	72.3	532.3	2543.6	2558.3	382.0
640	2.3	147.2	72.4	532.4	2544.5	2559.2	382.1
650	2.3	149.5	72.4	532.4	2545.3	2560.0	382.1
660	2.3	151.8	72.5	532.5	2546.2	2560.8	382.2
670	2.3	154.1	72.5	532.5	2547.0	2561.7	382.3
680	2.3	156.4	72.6	532.6	2547.8	2562.5	382.3
690	2.3	158.7	72.7	532.7	2548.7	2563.4	382.4
700	2.3	161.0	72.7	532.7	2549.5	2564.2	382.5
710	2.3	163.3	72.8	532.8	2550.3	2565.0	382.5
720	2.3	165.6	72.8	532.8	2551.2	2565.9	382.6
730	2.3	167.9	72.8	532.8	2552.0	2566.7	382.7
740	2.3	170.2	72.9	532.9	2552.9	2567.5	382.8
750	2.3	172.5	72.9	532.9	2553.7	2568.4	382.9
760	2.3	174.8	73.0	533.0	2554.5	2569.2	382.9
770	2.3	177.1	73.0	533.0	2555.4	2570.1	383.0
780	2.3	179.4	73.1	533.1	2556.2	2570.9	383.1
790	2.3	181.7	73.1	533.1	2557.1	2571.8	383.2
800	2.3	184.0	73.2	533.2	2557.9	2572.6	383.2
810	2.3	186.3	73.2	533.2	2558.8	2573.4	383.3
820	2.3	188.6	73.3	533.3	2559.6	2574.3	383.3
830	2.3	190.9	73.4	533.4	2560.4	2575.1	383.4
840	2.3	193.2	73.5	533.5	2561.3	2576.0	383.4
850	2.3	195.5	73.6	533.6	2562.1	2576.8	383.5
860	2.3	197.8	73.7	533.7	2563.0	2577.6	383.5
870	2.3	200.1	73.8	533.8	2563.8	2578.5	383.5
880	2.3	202.4	73.9	533.9	2564.6	2579.3	383.6

890	2.3	204.7	74.0	534.0	2565.5	2580.2	383.6
900	2.3	207.0	74.1	534.1	2566.3	2581.0	383.6
910	2.3	209.3	74.2	534.2	2567.2	2581.9	383.6
920	2.3	211.6	74.3	534.3	2568.0	2582.7	383.7
930	2.3	213.9	74.4	534.4	2568.9	2583.5	383.7
940	2.3	216.2	74.5	534.5	2569.7	2584.4	383.7
950	2.3	218.5	74.6	534.6	2570.5	2585.2	383.8
960	2.3	220.8	74.7	534.7	2571.4	2586.1	383.8
970	2.3	223.1	74.8	534.8	2572.2	2586.9	383.8
980	2.3	225.4	74.9	534.9	2573.1	2587.7	383.8
990	2.3	227.7	75.0	535.0	2573.9	2588.6	383.9
1000	2.3	230.0	75.1	535.1	2574.8	2589.4	383.9
1010	2.3	232.3	75.2	535.2	2575.6	2590.3	383.9
1020	2.3	234.6	75.3	535.3	2576.4	2591.1	383.9
1030	2.3	236.9	75.4	535.4	2577.3	2592.0	384.0
1040	2.3	239.2	75.5	535.5	2578.1	2592.8	384.0
1050	2.3	241.5	75.5	535.5	2579.0	2593.6	384.1
1060	2.3	243.8	75.6	535.6	2579.8	2594.5	384.2
1070	2.3	246.1	75.6	535.6	2580.7	2595.3	384.2
1080	2.3	248.4	75.7	535.7	2581.5	2596.2	384.3
1090	2.3	250.7	75.8	535.8	2582.3	2597.0	384.3
1100	2.3	253.0	75.9	535.9	2583.2	2597.9	384.3
1110	2.3	255.3	76.0	536.0	2584.0	2598.7	384.4
1120	2.3	257.6	76.1	536.1	2584.9	2599.6	384.4
1130	2.3	259.9	76.2	536.2	2585.7	2600.4	384.4
1140	2.3	262.2	76.3	536.3	2586.6	2601.2	384.5
1150	2.3	264.5	76.4	536.4	2587.4	2602.1	384.5
1160	2.3	266.8	76.6	536.6	2588.2	2602.9	384.5
1170	2.3	269.1	76.7	536.7	2589.1	2603.8	384.5
1180	2.3	271.4	76.8	536.8	2589.9	2604.6	384.5
1190	2.3	273.7	76.9	536.9	2590.8	2605.5	384.6
1200	2.3	276.0	77.1	537.1	2591.6	2606.3	384.5
1210	2.3	278.3	77.3	537.3	2592.5	2607.1	384.5
1220	2.3	280.6	77.4	537.4	2593.3	2608.0	384.5
1230	2.3	282.9	77.5	537.5	2594.2	2608.8	384.5
1240	2.3	285.2	77.6	537.6	2595.0	2609.7	384.5
1250	2.3	287.5	77.7	537.7	2595.8	2610.5	384.6
1260	2.3	289.8	77.8	537.8	2596.7	2611.4	384.6
1270	2.3	292.1	77.9	537.9	2597.5	2612.2	384.6
1280	2.3	294.4	78.0	538.0	2598.4	2613.1	384.6
1290	2.3	296.7	78.2	538.2	2599.2	2613.9	384.6
1300	2.3	299.0	78.3	538.3	2600.1	2614.7	384.6
1310	2.3	301.3	78.4	538.4	2600.9	2615.6	384.7
1320	2.3	303.6	78.5	538.5	2601.8	2616.4	384.7
1330	2.3	305.9	78.7	538.7	2602.6	2617.3	384.7
1340	2.3	308.2	78.8	538.8	2603.4	2618.1	384.7
1350	2.3	310.5	79.0	539.0	2604.3	2619.0	384.6

1360	2.3	312.8	79.1	539.1	2605.1	2619.8	384.6
1370	2.3	315.1	79.3	539.3	2606.0	2620.7	384.6
1380	2.3	317.4	79.4	539.4	2606.8	2621.5	384.7
1390	2.3	319.7	79.4	539.4	2607.7	2622.3	384.7
1400	2.3	322.0	79.5	539.5	2608.5	2623.2	384.7
1410	2.3	324.3	79.6	539.6	2609.4	2624.0	384.8
1420	2.3	326.6	79.7	539.7	2610.2	2624.9	384.8
1430	2.3	328.9	79.8	539.8	2611.0	2625.7	384.9
1440	2.3	331.2	79.8	539.8	2611.9	2626.6	384.9
1450	2.3	333.5	79.9	539.9	2612.7	2627.4	385.0
1460	2.3	335.8	80.0	540.0	2613.6	2628.3	385.0
1470	2.3	338.1	80.0	540.0	2614.4	2629.1	385.1
1480	2.3	340.4	80.1	540.1	2615.3	2629.9	385.2
1490	2.3	342.7	80.1	540.1	2616.1	2630.8	385.2
1500	2.3	345.0	80.2	540.2	2617.0	2631.6	385.3
1510	2.3	347.3	80.3	540.3	2617.8	2632.5	385.3
1520	2.3	349.6	80.3	540.3	2618.7	2633.3	385.4
1530	2.3	351.9	80.4	540.4	2619.5	2634.2	385.5
1540	2.3	354.2	80.5	540.5	2620.3	2635.0	385.5
1550	2.3	356.5	80.6	540.6	2621.2	2635.9	385.5
1560	2.3	358.8	80.7	540.7	2622.0	2636.7	385.6
1570	2.3	361.1	81.0	541.0	2622.9	2637.6	385.5
1580	2.3	363.4	81.2	541.2	2623.7	2638.4	385.4
1590	2.3	365.7	81.3	541.3	2624.6	2639.3	385.4
1600	2.3	368.0	81.4	541.4	2625.4	2640.1	385.4
1610	2.3	370.3	81.6	541.6	2626.3	2640.9	385.4
1620	2.3	372.6	81.7	541.7	2627.1	2641.8	385.4
1630	2.3	374.9	81.8	541.8	2628.0	2642.6	385.4
1640	2.3	377.2	81.9	541.9	2628.8	2643.5	385.4
1650	2.3	379.5	82.1	542.1	2629.6	2644.3	385.5
1660	2.3	381.8	82.2	542.2	2630.5	2645.2	385.4
1670	2.3	384.1	82.3	542.3	2631.3	2646.0	385.4
1680	2.3	386.4	82.4	542.4	2632.2	2646.9	385.5
1690	2.3	388.7	82.6	542.6	2633.0	2647.7	385.5
1700	2.3	391.0	82.7	542.7	2633.9	2648.6	385.5
1710	2.3	393.3	82.9	542.9	2634.7	2649.4	385.5
1720	2.3	395.6	83.0	543.0	2635.6	2650.3	385.5
1730	2.3	397.9	83.1	543.1	2636.4	2651.1	385.5
1740	2.3	400.2	83.3	543.3	2637.3	2651.9	385.5
1750	2.3	402.5	83.4	543.4	2638.1	2652.8	385.5
1760	2.3	404.8	83.5	543.5	2639.0	2653.6	385.5
1770	2.3	407.1	83.6	543.6	2639.8	2654.5	385.5
1780	2.3	409.4	83.8	543.8	2640.6	2655.3	385.5
1790	2.3	411.7	83.9	543.9	2641.5	2656.2	385.5
1800	2.3	414.0	84.0	544.0	2642.3	2657.0	385.5
1810	2.3	416.3	84.1	544.1	2643.2	2657.9	385.5
1820	2.3	418.6	84.3	544.3	2644.0	2658.7	385.5

1830	2.3	420.9	84.4	544.4	2644.9	2659.6	385.5
1840	2.3	423.2	84.5	544.5	2645.7	2660.4	385.5
1850	2.3	425.5	84.7	544.7	2646.6	2661.3	385.5
1860	2.3	427.8	84.8	544.8	2647.4	2662.1	385.6
1870	2.3	430.1	84.9	544.9	2648.3	2662.9	385.6
1880	2.3	432.4	85.0	545.0	2649.1	2663.8	385.6
1890	2.3	434.7	85.1	545.1	2650.0	2664.6	385.6
1900	2.3	437.0	85.3	545.3	2650.8	2665.5	385.6
1910	2.3	439.3	85.4	545.4	2651.7	2666.3	385.6
1920	2.3	441.6	85.5	545.5	2652.5	2667.2	385.6
1930	2.3	443.9	85.5	545.5	2653.3	2668.0	385.7
1940	2.3	446.2	85.7	545.7	2654.2	2668.9	385.7
1950	2.3	448.5	85.8	545.8	2655.0	2669.7	385.7
1960	2.3	450.8	85.9	545.9	2655.9	2670.6	385.7
1970	2.3	453.1	86.1	546.1	2656.7	2671.4	385.7
1980	2.3	455.4	86.2	546.2	2657.6	2672.3	385.7
1990	2.3	457.7	86.3	546.3	2658.4	2673.1	385.7
2000	2.3	460.0	86.5	546.5	2659.3	2674.0	385.7
2010	2.3	462.3	86.6	546.6	2660.1	2674.8	385.7
2020	2.3	464.6	86.7	546.7	2661.0	2675.6	385.7
2030	2.3	466.9	86.8	546.8	2661.8	2676.5	385.7
2040	2.3	469.2	87.0	547.0	2662.7	2677.3	385.7
2050	2.3	471.5	87.1	547.1	2663.5	2678.2	385.7
2060	2.3	473.8	87.3	547.3	2664.4	2679.0	385.7
2070	2.3	476.1	87.4	547.4	2665.2	2679.9	385.7
2080	2.3	478.4	87.6	547.6	2666.0	2680.7	385.7
2090	2.3	480.7	87.7	547.7	2666.9	2681.6	385.7
2100	2.3	483.0	87.9	547.9	2667.7	2682.4	385.7
2110	2.3	485.3	88.0	548.0	2668.6	2683.3	385.7
2120	2.3	487.6	88.1	548.1	2669.4	2684.1	385.7
2130	2.3	489.9	88.2	548.2	2670.3	2685.0	385.7
2140	2.3	492.2	88.4	548.4	2671.1	2685.8	385.7
2150	2.3	494.5	88.5	548.5	2672.0	2686.7	385.7
2160	2.3	496.8	88.6	548.6	2672.8	2687.5	385.7
2170	2.3	499.1	88.7	548.7	2673.7	2688.3	385.8
2180	2.3	501.4	88.8	548.8	2674.5	2689.2	385.8
2190	2.3	503.7	88.9	548.9	2675.4	2690.0	385.8
2200	2.3	506.0	89.0	549.0	2676.2	2690.9	385.8
2210	2.3	508.3	89.1	549.1	2677.1	2691.7	385.9
2220	2.3	510.6	89.3	549.3	2677.9	2692.6	385.9
2230	2.3	512.9	89.4	549.4	2678.7	2693.4	385.9
2240	2.3	515.2	89.5	549.5	2679.6	2694.3	385.9
2250	2.3	517.5	89.6	549.6	2680.4	2695.1	385.9
2260	2.3	519.8	89.7	549.7	2681.3	2696.0	385.9
2270	2.3	522.1	89.9	549.9	2682.1	2696.8	385.9
2280	2.3	524.4	90.0	550.0	2683.0	2697.7	385.9
2290	2.3	526.7	90.1	550.1	2683.8	2698.5	385.9

2300	2.3	529.0	90.2	550.2	2684.7	2699.4	386.0
2310	2.3	531.3	90.3	550.3	2685.5	2700.2	386.0
2320	2.3	533.6	90.4	550.4	2686.4	2701.0	386.0
2330	2.3	535.9	90.5	550.5	2687.2	2701.9	386.0
2340	2.3	538.2	90.6	550.6	2688.1	2702.7	386.0
2350	2.3	540.5	90.8	550.8	2688.9	2703.6	386.0
2360	2.3	542.8	90.9	550.9	2689.8	2704.4	386.1
2370	2.3	545.1	91.0	551.0	2690.6	2705.3	386.1
2380	2.3	547.4	91.1	551.1	2691.5	2706.1	386.1
2390	2.3	549.7	91.2	551.2	2692.3	2707.0	386.1
2400	2.3	552.0	91.4	551.4	2693.1	2707.8	386.1
2410	2.0	554.0	91.5	551.5	2694.0	2708.7	337.4
2420	2.0	556.0	91.6	551.6	2694.8	2709.5	337.4
2430	2.0	558.0	91.8	551.8	2695.7	2710.4	337.4
2440	2.0	560.0	92.0	552.0	2696.5	2711.2	337.4
2450	2.0	562.0	92.1	552.1	2697.4	2712.1	337.3
2460	2.0	564.0	92.3	552.3	2698.2	2712.9	337.3
2470	2.0	566.0	92.4	552.4	2699.1	2713.8	337.3
2480	2.0	568.0	92.6	552.6	2699.9	2714.6	337.3
2490	2.0	570.0	92.7	552.7	2700.8	2715.5	337.3
2500	2.0	572.1	92.9	552.9	2701.6	2716.3	337.3
2510	2.0	574.1	93.0	553.0	2702.5	2717.1	337.3
2520	2.0	576.1	93.2	553.2	2703.3	2718.0	337.3
2530	2.0	578.1	93.3	553.3	2704.2	2718.8	337.2
2540	2.0	580.1	93.5	553.5	2705.0	2719.7	337.2
2550	2.0	582.1	93.7	553.7	2705.9	2720.5	337.2
2560	2.0	584.1	93.8	553.8	2706.7	2721.4	337.2
2570	2.0	586.1	94.0	554.0	2707.6	2722.2	337.1
2580	2.0	588.1	94.2	554.2	2708.4	2723.1	337.1
2590	2.0	590.1	94.3	554.3	2709.2	2723.9	337.1
2600	2.0	592.2	94.5	554.5	2710.1	2724.8	337.1
2610	2.0	594.2	94.6	554.6	2710.9	2725.6	337.1
2620	2.0	596.2	94.7	554.7	2711.8	2726.5	337.1
2630	2.0	598.2	94.8	554.8	2712.6	2727.3	337.1
2640	2.0	600.2	94.9	554.9	2713.5	2728.2	337.1
2650	2.0	602.2	95.0	555.0	2714.3	2729.0	337.2
2660	2.0	604.2	95.1	555.1	2715.2	2729.9	337.2
2670	2.0	606.2	95.2	555.2	2716.0	2730.7	337.2
2680	2.0	608.2	95.3	555.3	2716.9	2731.5	337.2
2690	2.0	610.2	95.4	555.4	2717.7	2732.4	337.2
2700	2.0	612.3	95.5	555.5	2718.6	2733.2	337.3
2710	2.0	614.3	95.7	555.7	2719.4	2734.1	337.3
2720	2.0	616.3	95.8	555.8	2720.3	2734.9	337.3
2730	2.0	618.3	96.0	556.0	2721.1	2735.8	337.2
2740	2.0	620.3	96.2	556.2	2722.0	2736.6	337.2
2750	2.0	622.3	96.3	556.3	2722.8	2737.5	337.2
2760	2.0	624.3	96.4	556.4	2723.6	2738.3	337.2

2770	2.0	626.3	96.5	556.5	2724.5	2739.2	337.3
2780	2.0	628.3	96.6	556.6	2725.3	2740.0	337.3
2790	2.0	630.3	96.7	556.7	2726.2	2740.9	337.3
2800	2.0	632.3	96.8	556.8	2727.0	2741.7	337.4
2810	2.0	634.4	96.9	556.9	2727.9	2742.6	337.4
2820	2.0	636.4	97.1	557.1	2728.7	2743.4	337.3
2830	2.0	638.4	97.2	557.2	2729.6	2744.3	337.3
2840	2.0	640.4	97.4	557.4	2730.4	2745.1	337.3
2850	2.0	642.4	97.5	557.5	2731.3	2746.0	337.3
2860	2.0	644.4	97.6	557.6	2732.1	2746.8	337.3
2870	2.0	646.4	97.7	557.7	2733.0	2747.6	337.4
2880	2.0	648.4	97.8	557.8	2733.8	2748.5	337.4
2890	2.0	650.4	97.9	557.9	2734.7	2749.3	337.4
2900	2.0	652.4	98.0	558.0	2735.5	2750.2	337.4
2910	2.0	654.5	98.2	558.2	2736.4	2751.0	337.4
2920	2.0	656.5	98.4	558.4	2737.2	2751.9	337.4
2930	2.0	658.5	98.6	558.6	2738.1	2752.7	337.3
2940	2.0	660.5	98.8	558.8	2738.9	2753.6	337.3
2950	2.0	662.5	99.0	559.0	2739.7	2754.4	337.2
2960	2.0	664.5	99.3	559.3	2740.6	2755.3	337.2
2970	2.0	666.5	99.5	559.5	2741.4	2756.1	337.1
2980	2.0	668.5	99.8	559.8	2742.3	2757.0	337.0
2990	2.0	670.5	100.1	560.1	2743.1	2757.8	336.9
3000	2.0	672.5	100.4	560.4	2744.0	2758.7	336.8
3010	2.0	674.6	100.7	560.7	2744.8	2759.5	336.7
3020	2.0	676.6	101.0	561.0	2745.7	2760.3	336.6
3030	2.0	678.6	101.2	561.2	2746.5	2761.2	336.5
3040	2.0	680.6	101.3	561.3	2747.4	2762.0	336.4
3050	2.0	682.6	101.5	561.5	2748.2	2762.9	336.4
3060	2.0	684.6	101.6	561.6	2749.0	2763.7	336.4
3070	2.0	686.6	101.6	561.6	2749.9	2764.6	336.5
3080	2.0	688.6	101.7	561.7	2750.7	2765.4	336.5
3090	2.0	690.6	101.7	561.7	2751.6	2766.3	336.6
3100	2.0	692.6	101.8	561.8	2752.4	2767.1	336.6
3110	2.0	694.6	102.0	562.0	2753.3	2768.0	336.6
3120	2.0	696.7	102.2	562.2	2754.1	2768.8	336.6
3130	2.0	698.7	102.5	562.5	2755.0	2769.6	336.5
3140	2.0	700.7	102.8	562.8	2755.8	2770.5	336.4
3150	2.0	702.7	103.0	563.0	2756.7	2771.3	336.3
3160	2.0	704.7	103.3	563.3	2757.5	2772.2	336.2
3170	2.0	706.7	103.7	563.7	2758.3	2773.0	336.1
3180	2.0	708.7	103.9	563.9	2759.2	2773.9	336.0
3190	2.0	710.7	104.1	564.1	2760.0	2774.7	335.9
3200	2.0	712.7	104.3	564.3	2760.9	2775.6	335.9
3210	2.0	714.7	104.4	564.4	2761.7	2776.4	335.9
3220	2.0	716.8	104.4	564.4	2762.6	2777.2	335.9
3230	2.0	718.8	104.5	564.5	2763.4	2778.1	336.0

3240	2.0	720.8	104.6	564.6	2764.3	2778.9	336.0
3250	2.0	722.8	104.7	564.7	2765.1	2779.8	336.0
3260	2.0	724.8	104.8	564.8	2765.9	2780.6	336.1
3270	2.0	726.8	104.9	564.9	2766.8	2781.5	336.1
3280	2.0	728.8	104.9	564.9	2767.6	2782.3	336.1
3290	2.0	730.8	105.0	565.0	2768.5	2783.2	336.2
3300	2.0	732.8	105.1	565.1	2769.3	2784.0	336.2
3310	2.0	734.8	105.2	565.2	2770.2	2784.8	336.2
3320	2.0	736.9	105.3	565.3	2771.0	2785.7	336.2
3330	2.0	738.9	105.5	565.5	2771.9	2786.5	336.2
3340	2.0	740.9	105.5	565.5	2772.7	2787.4	336.3
3350	2.0	742.9	105.6	565.6	2773.5	2788.2	336.3
3360	2.0	744.9	105.6	565.6	2774.4	2789.1	336.4
3370	2.0	746.9	105.7	565.7	2775.2	2789.9	336.4
3380	2.0	748.9	105.8	565.8	2776.1	2790.8	336.4
3390	2.0	750.9	105.9	565.9	2776.9	2791.6	336.5
3400	2.0	752.9	106.0	566.0	2777.8	2792.4	336.5
3410	2.0	754.9	106.1	566.1	2778.6	2793.3	336.5
3420	2.0	756.9	106.2	566.2	2779.5	2794.1	336.6
3430	2.0	759.0	106.3	566.3	2780.3	2795.0	336.6
3440	2.0	761.0	106.4	566.4	2781.2	2795.8	336.6
3450	2.0	763.0	106.5	566.5	2782.0	2796.7	336.6
3460	2.0	765.0	106.7	566.7	2782.8	2797.5	336.6
3470	2.0	767.0	106.8	566.8	2783.7	2798.4	336.6
3480	2.0	769.0	107.0	567.0	2784.5	2799.2	336.6
3490	2.0	771.0	107.1	567.1	2785.4	2800.1	336.6
3500	2.0	773.0	107.2	567.2	2786.2	2800.9	336.6
3510	2.0	775.0	107.3	567.3	2787.1	2801.7	336.6
3520	2.0	777.0	107.4	567.4	2787.9	2802.6	336.6
3530	2.0	779.1	107.5	567.5	2788.8	2803.4	336.6
3540	2.0	781.1	107.6	567.6	2789.6	2804.3	336.7
3550	2.0	783.1	107.7	567.7	2790.5	2805.1	336.7
3560	2.0	785.1	107.8	567.8	2791.3	2806.0	336.7
3570	2.0	787.1	107.9	567.9	2792.1	2806.8	336.8
3580	2.0	789.1	107.9	567.9	2793.0	2807.7	336.8
3590	2.0	791.1	108.0	568.0	2793.8	2808.5	336.9
3600	2.0	793.1	108.0	568.0	2794.7	2809.4	336.9
3610	2.0	795.1	108.1	568.1	2795.5	2810.2	336.9
3622	2.4	797.5	108.2	568.2	2796.5	2811.2	404.4
3630	22.8	820.3	108.2	568.2	2797.2	2811.9	3824.0
3640	28.5	848.8	108.2	568.2	2798.1	2812.7	4780.7
3650	28.5	877.3	108.3	568.3	2798.9	2813.6	4781.4
3660	28.5	905.8	108.4	568.4	2799.8	2814.4	4781.7
3670	28.5	934.3	108.6	568.6	2800.6	2815.3	4781.7
3680	28.5	962.8	108.7	568.7	2801.5	2816.1	4781.6
3690	28.5	991.3	108.8	568.8	2802.3	2817.0	4781.6
3700	28.5	1019.8	109.0	569.0	2803.1	2817.8	4781.6

3710	28.5	1048.3	109.1	569.1	2804.0	2818.7	4781.8
3720	28.5	1076.8	109.2	569.2	2804.8	2819.5	4781.9
3730	30.0	1106.8	109.3	569.3	2805.7	2820.4	5033.9
3740	30.0	1136.8	109.4	569.4	2806.5	2821.2	5034.4
3750	30.0	1166.8	109.4	569.4	2807.4	2822.1	5035.0
3760.1	30.3	1197.1	109.5	569.5	2808.2	2822.9	5086.1
Total Nitrogen			86.4				200306.4

Appendix O Pressure Transducer Calibration Papers



1010 West Bagley Road
 Berea, OH 44017
 Phone: 440-243-0888
 Fax: 440-243-3472

PRESSURE TRANSDUCER CALIBRATION RECORD

Traceable to N.I.S.T.

CUSTOMER: Intermountain Electronics
 1511 South Highway 6
 Price, UT 84501

Purchase Order 6092242
Sales Order No. RMA#: 21031*001
Cal Date 04-22-15
Cal Due Date
Serial # N75291

Item: 621-3000-1-1-8-6-ORF	Accuracy (BFSL) ± 0.25 %
-----------------------------------	---------------------------------

CALIBRATION STANDARD: Agilent 34401A			
	S/N	CAL. DATE	CAL. DUE DATE
	US36134775	08-01-14	08-01-15
CALIBRATION STANDARD: Fluke RPM4			
	S/N	CAL. DATE	CAL. DUE DATE
	1623	12-21-14	12-21-15

Note: The aforementioned calibration standard is at least four times as accurate as the instrument being tested.

Power Supply: 24 VDC

STANDARD	OUTPUT	STANDARD	OUTPUT
0 PSI	4.001 mA	2400 PSI	16.822 mA
600	7.220	1800	13.627
1200	10.428	1200	10.423
1800	13.629	600	7.217
2400	16.824	0	3.996
3000	20.011		

Certified Correct By:

Brian Salol

Verified By:

Beck Ben

Lab Temperature: 70°F ±7°F	Lab Humidity: 20% to 70% R.H.
----------------------------	-------------------------------

PTCR0504



1010 West Bagley Road
 Berea, OH 44017
 Phone: 440-243-0888
 Fax: 440-243-3472

PRESSURE TRANSDUCER CALIBRATION RECORD

Traceable to N.I.S.T.

CUSTOMER: Intermountain Electronics
 1511 South Highway 6
 Price, UT 84501

Purchase Order 6092242
Sales Order No. RMA#: 21031*001
Cal Date 04-22-15
Cal Due Date
Serial # N75292

Item: 621-3000-1-1-8-6-ORF	Accuracy (BFSL) ± 0.25 %
-----------------------------------	---------------------------------

CALIBRATION STANDARD: Agilent 34401A			
	S/N	CAL. DATE	CAL. DUE DATE
	U536134775	08-01-14	08-01-15
CALIBRATION STANDARD: Fluke RPM4			
	S/N	CAL. DATE	CAL. DUE DATE
	1623	12-21-14	12-21-15

Note: The aforementioned calibration standard is at least four times as accurate as the instrument being tested.

Power Supply: 24 VDC

STANDARD	OUTPUT	STANDARD	OUTPUT
0 PSI	3.987 mA	2400 PSI	16.792 mA
600	7.192	1800	13.591
1200	10.393	1200	10.391
1800	13.593	600	7.190
2400	16.793	0	3.983
3000	19.992		

Certified Correct By:

Brian Lalor

Verified By:

Brian Lalor

Lab Temperature: 70°F ±7°F	Lab Humidity: 20% to 70% R.H.
----------------------------	-------------------------------

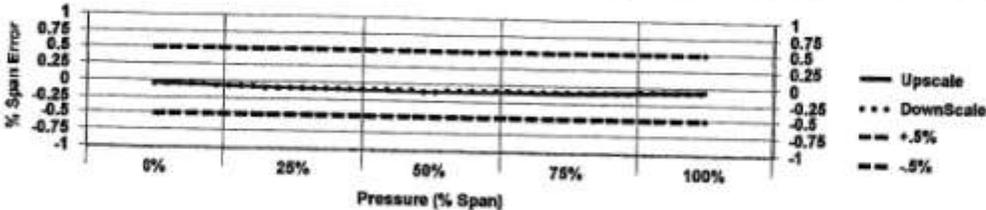
PTCR0504

CERTIFICATE OF CALIBRATION



OMEGA ENGINEERING INC.
1 OMEGA DRIVE
STAMFORD CT 06907, USA
(203) 359-1600

Serial Number: 4040195	Date: 041314
Accuracy Class: .5%	Cert. I.D. #:
Temperature Range: -20°C/+85°C	Calibration Standard I.D. #: PPCK P10 113
Pressure Range: 3000 PSI G	Calibration Station I.D. #: 34401A A2-0001
Output Type: 4 - 20 mA	



Pressure	Output	Accuracy (% Span)	Linearity (%Span)
PSI	mA		(BPSL)
-000.03	3.9936	-0.04%	0.04%
0750.05	7.9950	-0.10%	-0.02%
1499.98	11.9805	-0.12%	-0.04%
2250.02	15.9823	-0.11%	-0.03%
3000.00	19.9887	-0.07%	0.01%
2249.97	15.9835	-0.10%	-0.02%
1500.00	11.9825	-0.11%	-0.03%
0750.01	7.9836	-0.10%	-0.02%
0000.00	3.9933	-0.04%	0.04%

**Environmental
Conditions**

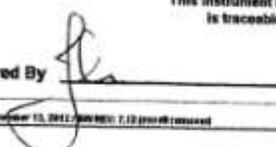
Temperature

72 +/- 3 Degrees F

Relative Humidity

0-80%

This instrument has been calibrated in a system with standards whose accuracy is traceable to the National Institute of Standards Technology (NIST).

Approved By: 

Date: 4-16-2014

REV DATE: November 13, 2011; REV 01: 7.12 (not released)

CERTIFICATE OF CALIBRATION			
Ω OMEGA®		OMEGA ENGINEERING INC. 1 OMEGA DRIVE STAMFORD CT 06907, USA (203) 359-1660	
Serial Number: 4023495	Accuracy Class: .5%	Date: 021314	Cert. I.D. #:
Temperature Range: -20°C/+85°C	Pressure Range: 3000 PSI G	Calibration Standard I.D. # PPCK P10 113	Calibration Station I.D. # 34401A A2-0001
Output Type: 4 - 20 mA			

Pressure	Output	Accuracy (% Span)	Linearity (%Span)
PSI	mA		(BFSL)
-0000.01	3.9939	-0.04%	-0.12%
0750.00	8.0075	0.05%	-0.03%
1500.00	12.0231	0.14%	0.06%
2249.98	16.0293	0.18%	0.10%
3000.05	20.0233	0.14%	0.06%
2249.95	16.0320	0.20%	0.12%
1500.01	12.0181	0.11%	0.03%
0750.02	8.0040	0.02%	-0.06%
0000.00	3.9964	-0.02%	-0.10%

Environmental Conditions
Temperature
72 +/- 3 Degrees F
Relative Humidity
0-60%

This instrument has been calibrated in a system with standards whose accuracy is traceable to the National Institute of Standards Technology (NIST).

Approved By: *[Signature]* Date: 2-14-2014

REV DATE: November 13, 2012 / NUMBER: 7.12 (void reserved)

Appendix P State UIC Forms



Nitrogen / Brine Interface Test Final Report

Guideline #:

UIC-3-17

(February 2014)

Narrative

Submit to the Utah Division of Water Quality the final report of the nitrogen / brine interface test following the format below. This final report template is taken, with permission, from the Kansas Underground Hydrocarbon Storage Unit.

Test Results	
Show formula and calculation for MDLR: $MDLR = V * R * 365 / T$ $MDLR = 3.0 * 0.5 * 365 / 1 = 547.5 \text{ Bbl./Year Nitrogen}$	Compare MDLR and NLR: The NLR is less than the MDLR. The MDLR is less than the required 1000 bbl./year detectable leak rate. The test is good
Show formula and calculation for nitrogen leak rate (NLR): $NLR = 1/T * (VS - (VF * PF * RF / PS * RS)) * 365$ $NLR = 1/1 * (213.2 - (213.2 * 2491. * 546.4) / 2505 * 546.8) * 365$ $NLR = 455.0 \text{ bbl./year nitrogen}$	
Explain any interface movement during the test: During the temperature stabilization period the interface remained stationary. During the test the interface remained stationary. The decrease in both the nitrogen and brine pressure resulted from continuing small equilibrium effects as undersaturated brine displaced from the 16" annulus continued to dissolve salt.	
Discuss the relationship of pressure trends to cavern integrity: The differential pressure trend taken in combination with the small temperature decrease during the test indicate the well is tight.	

Discuss temperature stability and any accompanying effect on the MIT:
Temperature stabilization is a long process in the well due to drilling have been completed less than 2 weeks before the test. The borehole skin is still cool as the result of the drilling process.

Discuss pressure changes in adjacent caverns. Attach a chart or a graph.
No adjacent caverns showed a response.

Summarize test results:
The test showed the well to have a detectable leak rate (MDLR) of about 547 barrels/year. The apparent leak rate as measured during the test at about 455 barrels per year is below the MDLR. The well has no measurable leak rate.

Submit field procedure report (UIC-3- 16)

Submit all logs.

Submit supporting data, including graphs for stabilization, temperatures, pressures, injection, etc. Submit appropriate charts.

Submit calibration charts for gauges and meters.

References

Kansas Department of Health and Environment, Bureau of Water, Geology Section, Underground Hydrocarbon Storage Unit <http://www.kdheks.gov/uhs/>

Bérest P, Brouard B, Durup G. 2001. Tightness tests in salt-cavern wells. Oil & Gas Science and Technology. 56:451-469.

Appendix Q Density Logs from MIT

STATE OF UTAH DEPARTMENT OF NATURAL RESOURCES DIVISION OF OIL, GAS, AND MINING	FORM 9
5. LEASE DESIGNATION AND SERIAL NUMBER: 51573-OBA	
SUNDRY NOTICES AND REPORTS ON WELLS	
Do not use this form for proposals to drill new wells, significantly deepen existing wells below current bottom-hole depth, reenter plugged wells, or to drill horizontal laterals. Use APPLICATION FOR PERMIT TO DRILL form for such proposals.	
6. IF INDIAN, ALLOTTEE OR TRIBE NAME:	
7. UNIT or CA AGREEMENT NAME:	
1. TYPE OF WELL Gas Storage Well	8. WELL NAME and NUMBER: CW-8
2. NAME OF OPERATOR: NGL SUPPLY TERMINAL SOLUTION MINING, LLC	9. API NUMBER: 43027500050000
3. ADDRESS OF OPERATOR: 6965 Union Park Avenue, Suite 270 , Midvale, UT, 84047	PHONE NUMBER: 801 255-9632 Ext
9. FIELD and POOL or WILDCAT: DELTA SALT CAVERN STORAGE	
4. LOCATION OF WELL FOOTAGES AT SURFACE: 0805 FSL 0548 FWL QTR/QTR, SECTION, TOWNSHIP, RANGE, MERIDIAN: Qtr/Qtr: SWSW Section: 23 Township: 15.0S Range: 07.0W Meridian: S	
COUNTY: MILLARD	
STATE: UTAH	

11. CHECK APPROPRIATE BOXES TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

TYPE OF SUBMISSION	TYPE OF ACTION		
<input checked="" type="checkbox"/> NOTICE OF INTENT Approximate date work will start: 6/1/2016	<input type="checkbox"/> ACIDIZE	<input type="checkbox"/> ALTER CASING	<input checked="" type="checkbox"/> CASING REPAIR
<input type="checkbox"/> SUBSEQUENT REPORT Date of Work Completion:	<input type="checkbox"/> CHANGE TO PREVIOUS PLANS	<input type="checkbox"/> CHANGE TUBING	<input type="checkbox"/> CHANGE WELL NAME
<input type="checkbox"/> SPUD REPORT Date of Spud:	<input type="checkbox"/> CHANGE WELL STATUS	<input type="checkbox"/> COMMINGLE PRODUCING FORMATIONS	<input type="checkbox"/> CONVERT WELL TYPE
<input type="checkbox"/> DRILLING REPORT Report Date:	<input type="checkbox"/> DEEPEN	<input type="checkbox"/> FRACTURE TREAT	<input type="checkbox"/> NEW CONSTRUCTION
	<input type="checkbox"/> OPERATOR CHANGE	<input type="checkbox"/> PLUG AND ABANDON	<input type="checkbox"/> PLUG BACK
	<input type="checkbox"/> PRODUCTION START OR RESUME	<input type="checkbox"/> RECLAMATION OF WELL SITE	<input type="checkbox"/> RECOMPLETE DIFFERENT FORMATION
	<input type="checkbox"/> REPERFORATE CURRENT FORMATION	<input type="checkbox"/> SIDETRACK TO REPAIR WELL	<input type="checkbox"/> TEMPORARY ABANDON
	<input type="checkbox"/> TUBING REPAIR	<input type="checkbox"/> VENT OR FLARE	<input type="checkbox"/> WATER DISPOSAL
	<input type="checkbox"/> WATER SHUTOFF	<input type="checkbox"/> SI TA STATUS EXTENSION	<input type="checkbox"/> APD EXTENSION
	<input type="checkbox"/> WILDCAT WELL DETERMINATION	<input type="checkbox"/> OTHER	OTHER: <input style="width: 100px;" type="text"/>

12. DESCRIBE PROPOSED OR COMPLETED OPERATIONS. Clearly show all pertinent details including dates, depths, volumes, etc.

Workover to remove, inspect, and reinstall 8 5/8 inch casing in cavern well CW-8 to address obstructed and/or damaged casing. Proposed workover procedures attached.

Approved by the
June 01, 2016
Oil, Gas and Mining

Date: _____
By: D. K. Quist

NAME (PLEASE PRINT) Adam Richins	PHONE NUMBER 801 255-9632	TITLE Compliance Manager
SIGNATURE N/A	DATE 5/31/2016	

Workover Sawtooth Well CW-8

1. Remove product from well. (Sawtooth)
2. Disconnect surface piping (Sawtooth)
3. Move in rig
4. Run 2" or larger line (1,000 psi rating) from 16" x 13-3/8" spool to mud pit
5. Remove top spool wellhead
6. Install annular preventer
7. Pull 4,450 feet 8-5/8" casing (32 lb/ft, BT&C, range 3). This has been shot in a collar, but 200 feet may still be attached below the cut and may be bent inside 13-3/8".
8. If 8-5/8" pulls hard, run log inside 13-3/8" to determine if it is bent. (Others) If bent, will need to mechanically cut.
9. Remove 8-5/8" spool piece on wellhead
10. Install Annular Preventer (2,000 psi)
11. Pull 4,386 feet 13-3/8" casing (72 lb/ft, BTC, range 3) This may also be bent
12. Clean and inspect 8-5/8" and 13-3/8" threads (Other)
13. Run sonar survey of entire cavern including floor and roof (Others)
14. Run 4200 feet 13-3/8" back into well
15. Nipple down BOP on 13-3/8" spool
16. Nipple up 8-5/8" casing spool
17. Test 13-3/8" hanger seals (other)
18. Run 4,500 feet of 8-5/8"
19. Run wireline log to confirm depth before landing 8-5/8" hanger (Other)
20. Nipple up top spool
21. Test 8-5/8" hanger seals (Other)
22. Complete buttoning up wellhead
23. Rig down
24. Button up well (Others)

Notes:

- 1> There is product. There may be small amounts of butane trapped in well, but not to the extent of CW-5
- 2> Depths of strings to be run will be determined from sonar survey and may vary +/- 100 feet
- 3> Services marked (Other) will be provided by owner, Remaining services to be arranged form by rig.

STATE OF UTAH DEPARTMENT OF NATURAL RESOURCES DIVISION OF OIL, GAS, AND MINING	FORM 9
5.LEASE DESIGNATION AND SERIAL NUMBER: 51573-OBA	
6. IF INDIAN, ALLOTTEE OR TRIBE NAME:	
7.UNIT or CA AGREEMENT NAME:	
1. TYPE OF WELL Gas Storage Well	
8. WELL NAME and NUMBER: CW-8	
2. NAME OF OPERATOR: NGL SUPPLY TERMINAL SOLUTION MINING, LLC	
9. API NUMBER: 43027500050000	
3. ADDRESS OF OPERATOR: 6965 Union Park Avenue, Suite 270 , Midvale, UT, 84047	
PHONE NUMBER: 801 255-9632 Ext	
9. FIELD and POOL or WILDCAT: DELTA SALT CAVERN STORAGE	
4. LOCATION OF WELL FOOTAGES AT SURFACE: 0805 FSL 0548 FWL QTR/QTR, SECTION, TOWNSHIP, RANGE, MERIDIAN: Qtr/Qtr: SWSW Section: 23 Township: 15.0S Range: 07.0W Meridian: S	
COUNTY: MILLARD	
STATE: UTAH	

11. CHECK APPROPRIATE BOXES TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

TYPE OF SUBMISSION	TYPE OF ACTION		
<input type="checkbox"/> NOTICE OF INTENT Approximate date work will start:	<input type="checkbox"/> ACIDIZE	<input type="checkbox"/> ALTER CASING	<input type="checkbox"/> CASING REPAIR
<input checked="" type="checkbox"/> SUBSEQUENT REPORT Date of Work Completion: 6/18/2016	<input type="checkbox"/> CHANGE TO PREVIOUS PLANS	<input type="checkbox"/> CHANGE TUBING	<input type="checkbox"/> CHANGE WELL NAME
<input type="checkbox"/> SPUD REPORT Date of Spud:	<input type="checkbox"/> CHANGE WELL STATUS	<input type="checkbox"/> COMMINGLE PRODUCING FORMATIONS	<input type="checkbox"/> CONVERT WELL TYPE
<input type="checkbox"/> DRILLING REPORT Report Date:	<input type="checkbox"/> DEEPEN	<input type="checkbox"/> FRACTURE TREAT	<input type="checkbox"/> NEW CONSTRUCTION
	<input type="checkbox"/> OPERATOR CHANGE	<input type="checkbox"/> PLUG AND ABANDON	<input type="checkbox"/> PLUG BACK
	<input type="checkbox"/> PRODUCTION START OR RESUME	<input type="checkbox"/> RECLAMATION OF WELL SITE	<input type="checkbox"/> RECOMPLETE DIFFERENT FORMATION
	<input type="checkbox"/> REPERFORATE CURRENT FORMATION	<input type="checkbox"/> SIDETRACK TO REPAIR WELL	<input type="checkbox"/> TEMPORARY ABANDON
	<input checked="" type="checkbox"/> TUBING REPAIR	<input type="checkbox"/> VENT OR FLARE	<input type="checkbox"/> WATER DISPOSAL
	<input type="checkbox"/> WATER SHUTOFF	<input type="checkbox"/> SI TA STATUS EXTENSION	<input type="checkbox"/> APD EXTENSION
	<input type="checkbox"/> WILDCAT WELL DETERMINATION	<input type="checkbox"/> OTHER	OTHER: <input style="width: 100px;" type="text"/>

12. DESCRIBE PROPOSED OR COMPLETED OPERATIONS. Clearly show all pertinent details including dates, depths, volumes, etc.

Removal of 13 3/8 and 8 5/8 tubing to address obstruction/damage to 8 5/8 tubing preventing brine flow.

Accepted by the
Utah Division of
Oil, Gas and Mining
FOR RECORD ONLY
 July 20, 2016

NAME (PLEASE PRINT) Adam Richins	PHONE NUMBER 801 255-9632	TITLE Compliance Manager
SIGNATURE N/A	DATE 7/19/2016	



Thomas Eyermann, Consultant

June 30, 2016

To: J. Morris, A. Richins
From: T. Eyermann
Subject: Workover of CW-8

Background

In early May, CW-8 suddenly stopped flowing brine while in storage operation. Jet West ran a density log on May 11, 2016 to determine the condition of the casing. The density tool started dragging on the 8-5/8" casing wall at about 4,000 feet depth and sat down at about 4,350 feet. This depth was above the bottom of the 13-3/8" which was set at 4,386 feet. The 8-5/8" collar at 4,340 feet was shot with two 2" split shots. This enabled brine injection to continue so that the cavern could be emptied in preparation for a workover to repair the well.

Workover

The cavern was emptied about May 27 with minor amounts of butane being removed from the well after that date. The rig arrived on location June 1 with one crew. Rigging up with an annular BOP set on the 8-5/8" spool was completed on June 3. The 8-5/8" inch was easily pulled up from the wellhead. The hanger joint and next joint of 8-5/8" tubing were laid down. The next joint of 8-5/8" was pulled out about seven feet and would not come up further. The string was worked up and down with up to 120,000 pounds excess pull. Set the casing down in the slips and made preparations to cut the 8-5/8" with a mechanical cutter on the drill pipe.

The cutter set down at about 3,802 feet. The tool string was rotated down to 3,908 feet and would not pass. The cutter was tripped out of the well without having been used. Once the drill string was out of the hole, Jet West rigged up a free point tool and ran down to 3,800 feet. The rig pulled on the casing to stretch it for the free point, but the casing string pulled free. After rigging down Jet West, the 8-5/8" string was pulled from the well with no incidents.

The 8-5/8" string was out of the well on June 8. Jet West ran a caliper log in the 13-3/8" string, set at 4,386 feet and in place on March 26, 2016. The caliper tool found the bottom of the 13-3/8" string at 3,776 feet with no apparent damage. Jet West was rigged down.

The BOP and 8-5/8" spool piece were removed from the well and 13-3/8" handling tools were rigged up. The 13-3/8" hanger was easily lifted and laid down. The next joint broke with difficulty. The ninth joint would not break. Higher torque tongs were obtained from Boart Longyear and these did not break the connection. While waiting on additional tools, Sonarwire ran a sonar survey in the well from the 16" casing shoe to total depth. The cavern was basically unchanged from the November 2015 survey.

A blade cutter was obtained from B&L Casing. The ninth joint was successfully cut. The 11th joint was crushed by tongs but finally broke. After the 14th joint was pulled from the well, the remainder of the 13-3/8" casing was easily broken and pulled from the well. There was no apparent damage to the last joint of 13-3/8" casing pulled from the well that would indicate why 600 feet had fallen off.

Immediately after pulling all the 13-3/8" casing, the string was run back into the well. The joints that were in good shape but had been tight at the top of the string were placed at the bottom of the new string. New joints to replace lost and damaged joints were placed at the top of the string. The 13-3/8" was set at 4,292 by tally (Table 1) and 4,299 by wireline. The 8-5/8 wellhead spool was set in place and torqued. The seals were energized and tested to 3000 psi with no pressure loss.

The 8-5/8" was then run back in the well with new joints at the top. There are two 1" holes cut ten feet above the end of the bottom joint of pipe. The upper spool was torqued in place. The seals on the 8-5/8" were energized and successfully tested to 3000 psi. The 8-5/8" was set at 4,515 by tally (Table 2) and 4,514 by wireline, approximately 30 feet above the cavern floor.

Table 1 CW-8 13-3/8" Casing Tally

PIPE #	PIPE LENGTH	TOTAL PIPE LENGTH	PIPE #	PIPE LENGTH	TOTAL PIPE LENGTH	PIPE #	PIPE LENGTH	TOTAL PIPE LENGTH	PIPE #	PIPE LENGTH	TOTAL PIPE LENGTH
1	40.85	40.85	31	41.21	1,267.25	61	41.10	2,494.99	91	43.92	3,732.89
2	42.63	83.48	32	40.84	1,308.09	62	40.45	2,535.44	92	43.90	3,776.79
3	41.14	124.62	33	40.83	1,348.92	63	40.57	2,576.01	93	43.55	3,820.34
4	40.81	165.43	34	42.10	1,391.02	64	41.13	2,617.14	94	42.21	3,862.55
5	42.70	208.13	35	41.17	1,432.19	65	41.15	2,658.29	95	42.73	3,905.28
6	42.49	250.62	36	41.35	1,473.54	66	41.16	2,699.45	96	41.33	3,946.61
7	41.22	291.84	37	41.49	1,515.03	67	41.12	2,740.57	97	43.90	3,990.51
8	39.52	331.36	38	39.76	1,554.79	68	40.67	2,781.24	98	43.89	4,034.40
9	41.20	372.56	39	41.14	1,595.93	69	41.15	2,822.39	99	43.90	4,078.30
10	40.08	412.64	40	40.57	1,636.50	70	40.54	2,862.93	100	43.94	4,122.24
11	40.82	453.46	41	43.90	1,680.40	71	40.65	2,903.58	101	42.20	4,164.44
12	39.55	493.01	42	41.12	1,721.52	72	40.31	2,943.89	102	39.35	4,203.79
13	41.19	534.20	43	41.13	1,762.65	73	40.59	2,984.48	103	38.53	4,242.32
14	39.85	574.05	44	40.79	1,803.44	74	40.70	3,025.18	104	40.72	4,283.04
15	39.86	613.91	45	40.84	1,844.28	75	40.82	3,066.00			4,283.04
16	38.86	652.77	46	39.85	1,884.13	76	40.15	3,106.15	hanger	9.20	4,292.24
17	39.91	692.68	47	41.15	1,925.28	77	39.80	3,145.95	107		4,292.24
18	40.81	733.49	48	41.13	1,966.41	78	40.35	3,186.30	108		4,292.24
19	40.22	773.71	49	41.17	2,007.58	79	39.23	3,225.53	109		4,292.24
20	40.80	814.51	50	41.14	2,048.72	80	41.08	3,266.61	110		4,292.24
21	40.93	855.44	51	40.58	2,089.30	81	41.15	3,307.76	111		4,292.24

2	40.10	895.54	52	40.70	2,130.00	82	38.75	3,346.51	112		4,292.24
23	41.65	937.19	53	40.71	2,170.71	83	41.10	3,387.61	113		4,292.24
24	42.39	979.58	54	40.80	2,211.51	84	41.12	3,428.73	114		4,292.24
25	40.78	1,020.36	55	41.18	2,252.69	85	43.92	3,472.65	115		4,292.24
26	41.23	1,061.59	56	41.17	2,293.86	86	43.90	3,516.55	116		4,292.24
27	41.18	1,102.77	57	38.13	2,331.99	87	42.75	3,559.30	117		4,292.24
28	41.29	1,144.06	58	40.55	2,372.54	88	43.82	3,603.12	118		4,292.24
29	41.15	1,185.21	59	40.55	2,413.09	89	42.17	3,645.29	119		4,292.24
30	40.83	1,226.04	60	40.80	2,453.89	90	43.68	3,688.97	120		4,292.24

Table 2 CW-8 8-5/8" Casing Tally

PIPE #	PIPE LENGTH	TOTAL PIPE LENGTH	PIPE #	PIPE LENGTH	TOTAL PIPE LENGTH	PIPE #	PIPE LENGTH	TOTAL PIPE LENGTH	PIPE #	PIPE LENGTH	TOTAL PIPE LENGTH
1	27.15	27.15	31	45.30	1,353.84	61	44.77	2,669.99	91	45.31	3,977.34
2	45.48	72.63	32	39.48	1,393.32	62	45.71	2,715.70	92	45.45	4,022.79
3	42.20	114.83	33	42.10	1,435.42	63	45.29	2,760.99	93	44.29	4,067.08
4	42.15	156.98	34	45.80	1,481.22	64	42.27	2,803.26	94	44.32	4,111.40
5	42.14	199.12	35	44.75	1,525.97	65	42.33	2,845.59	95	45.24	4,156.64
6	42.18	241.30	36	42.02	1,567.99	66	45.44	2,891.03	96	40.22	4,196.86
7	44.91	286.21	37	42.38	1,610.37	67	45.05	2,936.08	97	44.20	4,241.06
8	44.83	331.04	38	42.07	1,652.44	68	45.12	2,981.20	98	44.20	4,285.26
9	45.03	376.07	39	43.49	1,695.93	69	43.53	3,024.73	99	44.19	4,329.45
10	41.58	417.65	40	45.50	1,741.43	70	44.74	3,069.47	100	44.20	4,373.65
11	45.38	463.03	41	45.74	1,787.17	71	45.32	3,114.79	101	44.19	4,417.84
12	45.34	508.37	42	41.51	1,828.68	72	41.89	3,156.68	102	44.20	4,462.04
13	45.67	554.04	43	39.20	1,867.88	73	45.34	3,202.02	103	44.20	4,506.24
14	41.61	595.65	44	45.16	1,913.04	74	45.34	3,247.36	hanger	9.32	4,515.56
15	45.40	641.05	45	45.07	1,958.11	75	42.75	3,290.11			4,515.56
16	45.11	686.16	46	45.56	2,003.67	76	44.45	3,334.56			4,515.56
17	41.61	727.77	47	45.68	2,049.35	77	44.61	3,379.17	107		4,515.56
18	45.03	772.80	48	44.80	2,094.15	78	37.98	3,417.15	108		4,515.56
19	44.97	817.77	49	44.55	2,138.70	79	40.23	3,457.38	109		4,515.56
20	44.88	862.65	50	44.57	2,183.27	80	37.28	3,494.66	110		4,515.56

21	44.63	907.28	51	45.14	2,228.41	81	45.43	3,540.09	111	4,515.56
22	45.20	952.48	52	45.46	2,273.87	82	44.41	3,584.50	112	4,515.56
23	45.18	997.66	53	42.36	2,316.23	83	45.56	3,630.06	113	4,515.56
24	44.66	1,042.32	54	45.63	2,361.86	84	40.23	3,670.29	114	4,515.56
25	42.17	1,084.49	55	45.70	2,407.56	85	42.22	3,712.51	115	4,515.56
26	45.64	1,130.13	56	42.32	2,449.88	86	45.39	3,757.90	116	4,515.56
27	45.47	1,175.60	57	41.88	2,491.76	87	45.37	3,803.27	117	4,515.56
28	45.67	1,221.27	58	43.97	2,535.73	88	45.39	3,848.66	118	4,515.56
29	45.42	1,266.69	59	43.85	2,579.58	89	44.93	3,893.59	119	4,515.56
30	41.85	1,308.54	60	45.64	2,625.22	90	38.44	3,932.03	120	4,515.56

STATE OF UTAH DEPARTMENT OF NATURAL RESOURCES DIVISION OF OIL, GAS, AND MINING	FORM 9
5. LEASE DESIGNATION AND SERIAL NUMBER: 51573-OBA	
SUNDRY NOTICES AND REPORTS ON WELLS	
Do not use this form for proposals to drill new wells, significantly deepen existing wells below current bottom-hole depth, reenter plugged wells, or to drill horizontal laterals. Use APPLICATION FOR PERMIT TO DRILL form for such proposals.	
6. IF INDIAN, ALLOTTEE OR TRIBE NAME:	
7. UNIT or CA AGREEMENT NAME:	
1. TYPE OF WELL Gas Storage Well	8. WELL NAME and NUMBER: CW-8
2. NAME OF OPERATOR: NGL SUPPLY TERMINAL SOLUTION MINING, LLC	9. API NUMBER: 43027500050000
3. ADDRESS OF OPERATOR: 6965 Union Park Avenue, Suite 270 , Midvale, UT, 84047	PHONE NUMBER: 801 255-9632 Ext
9. FIELD and POOL or WILDCAT: DELTA SALT CAVERN STORAGE	
4. LOCATION OF WELL FOOTAGES AT SURFACE: 0805 FSL 0548 FWL QTR/QTR, SECTION, TOWNSHIP, RANGE, MERIDIAN: Qtr/Qtr: SWSW Section: 23 Township: 15.0S Range: 07.0W Meridian: S	COUNTY: MILLARD
STATE: UTAH	

11. CHECK APPROPRIATE BOXES TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

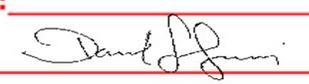
TYPE OF SUBMISSION	TYPE OF ACTION		
<input checked="" type="checkbox"/> NOTICE OF INTENT Approximate date work will start: 9/26/2016	<input type="checkbox"/> ACIDIZE <input type="checkbox"/> CHANGE TO PREVIOUS PLANS <input type="checkbox"/> CHANGE WELL STATUS <input type="checkbox"/> DEEPEN <input type="checkbox"/> OPERATOR CHANGE <input type="checkbox"/> PRODUCTION START OR RESUME <input type="checkbox"/> REPERFORATE CURRENT FORMATION <input type="checkbox"/> TUBING REPAIR <input type="checkbox"/> WATER SHUTOFF <input type="checkbox"/> WILDCAT WELL DETERMINATION	<input type="checkbox"/> ALTER CASING <input type="checkbox"/> CHANGE TUBING <input type="checkbox"/> COMMINGLE PRODUCING FORMATIONS <input type="checkbox"/> FRACTURE TREAT <input type="checkbox"/> PLUG AND ABANDON <input type="checkbox"/> RECLAMATION OF WELL SITE <input type="checkbox"/> SIDETRACK TO REPAIR WELL <input type="checkbox"/> VENT OR FLARE <input type="checkbox"/> SI TA STATUS EXTENSION <input checked="" type="checkbox"/> OTHER	<input type="checkbox"/> CASING REPAIR <input type="checkbox"/> CHANGE WELL NAME <input type="checkbox"/> CONVERT WELL TYPE <input type="checkbox"/> NEW CONSTRUCTION <input type="checkbox"/> PLUG BACK <input type="checkbox"/> RECOMPLETE DIFFERENT FORMATION <input type="checkbox"/> TEMPORARY ABANDON <input type="checkbox"/> WATER DISPOSAL <input type="checkbox"/> APD EXTENSION OTHER: <input type="text" value="Drilling Mud Pit Closure"/>
<input type="checkbox"/> SUBSEQUENT REPORT Date of Work Completion:			
<input type="checkbox"/> SPUD REPORT Date of Spud:			
<input type="checkbox"/> DRILLING REPORT Report Date:			

12. DESCRIBE PROPOSED OR COMPLETED OPERATIONS. Clearly show all pertinent details including dates, depths, volumes, etc.

Closure of Mud Pit from drilling operations. Pit will be emptied of any water, liner will be perforated and/or shredded, and pit will be filled with native soil to previous grade.

Approved by the
October 27, 2016
 Oil, Gas and Mining

Date: _____

By: 

NAME (PLEASE PRINT) Adam Richins	PHONE NUMBER 801 255-9632	TITLE Compliance Manager
SIGNATURE N/A	DATE 9/23/2016	