

PECOS DISTRICT DRILLING CONDITIONS OF APPROVAL

OPERATOR'S NAME:	COG OPERATING, LLC
LEASE NO.:	NMNM0000082
WELL NAME & NO.:	8H-LITTLE BEAR FEDERAL COM
SURFACE HOLE FOOTAGE:	696'/S & 2197'/E
BOTTOM HOLE FOOTAGE:	2440'/S & 2310'/W
LOCATION:	T-20S, R-34E, S-33. NMPM
COUNTY:	LEA, NM

Potash	☐ None	☐ Secretary	☒ R-111-P
Cave/Karst Potential	☒ Low	☐ Medium	☐ High
Variance	☐ None	☒ Flex Hose	☐ Other
Wellhead	☒ Conventional	☐ Multibowl	
Other	☐ 4 String Area	☒ Capitan Reef	☐ WIPP

A. Hydrogen Sulfide

1. Hydrogen Sulfide (H₂S) monitors shall be installed prior to drilling out the surface shoe. If H₂S is detected in concentrations greater than 100 ppm, the Hydrogen Sulfide area shall meet Onshore Order 6 requirements, which includes equipment and personnel/public protection items. If Hydrogen Sulfide is encountered, provide measured values and formations to the BLM.

B. CASING

1. The 13 3/8 inch surface casing shall be set at approximately 1855 feet (a minimum of 25 feet into the Rustler Anhydrite and above the salt) and cemented to the surface.
 - a. If cement does not circulate to the surface, the appropriate BLM office shall be notified and a temperature survey utilizing an electronic type temperature survey with surface log readout will be used or a cement bond log shall be run to verify the top of the cement. Temperature survey will be run a minimum of six hours after pumping cement and ideally between 8-10 hours after completing the cement job.
 - b. Wait on cement (WOC) time for a primary cement job will be a minimum of **24 hours in the Potash Area** or 500 pounds compressive strength, whichever is greater. (This is to include the lead cement)
 - c. Wait on cement (WOC) time for a remedial job will be a minimum of 4 hours after bringing cement to surface or 500 pounds compressive strength,

whichever is greater.

- d. If cement falls back, remedial cementing will be done prior to drilling out that string.

Intermediate casing must be kept fluid filled to meet BLM minimum collapse requirement.

2. The minimum required fill of cement behind the 9 5/8 inch intermediate casing is:

Operator has proposed a DV tool at a depth of 3840', the depth may be adjusted as long as the cement is changed proportionally. The DV tool may be cancelled if cement circulates to surface on the first stage.

- a. First stage to DV tool: Cement to circulate. If cement does not circulate off the DV tool, contact the appropriate BLM office before proceeding with second stage cement job.
- b. Second stage above DV tool:
 - Cement to surface. If cement does not circulate, contact the appropriate BLM office. **Wait on cement (WOC) time for a primary cement job is to include the lead cement slurry due to potash.**

❖ **Special Capitan Reef requirements.** If lost circulation (50% or greater) occurs below the Base of the Salt, the operator shall do the following:

- Switch to fresh water mud to protect the Capitan Reef and use fresh water mud until setting the intermediate casing. The appropriate BLM office is to be notified for a PET to witness the switch to fresh water.
- Daily drilling reports from the Base of the Salt to the setting of the intermediate casing are to be submitted to the BLM CFO engineering staff via e-mail by 0800 hours each morning. Any lost circulation encountered is to be recorded on these drilling reports. The daily drilling report should show mud volume per shift/tour. Failure to submit these reports will result in an Incidence of Non-Compliance being issued for failure to comply with the Conditions of Approval. If not already planned, the operator shall run a caliper survey for the intermediate well bore and submit to the appropriate BLM office.

3. The minimum required fill of cement behind the 5 1/2 inch production casing is:

- Cement to surface. Operator shall provide method of verification.

C. PRESSURE CONTROL

1. Variance approved to use flex line from BOP to choke manifold. Manufacturer's specification to be readily available. No external damage to flex line. Flex line to be installed as straight as possible (no hard bends).
2. Minimum working pressure of the blowout preventer (BOP) and related equipment (BOPE) required for drilling below the surface casing shoe shall be **3000 (3M)** psi
3. Minimum working pressure of the blowout preventer (BOP) and related equipment (BOPE) required for drilling below the **9 5/8** inch intermediate casing shoe shall be **5000 (5M)** psi.

D. SPECIAL REQUIREMENT(S)

Communitization Agreement

- The operator will submit a Communitization Agreement to the Carlsbad Field Office, 620 E Greene St. Carlsbad, New Mexico 88220, at least 90 days before the anticipated date of first production from a well subject to a spacing order issued by the New Mexico Oil Conservation Division. The Communitization Agreement will include the signatures of all working interest owners in all Federal and Indian leases subject to the Communitization Agreement (i.e., operating rights owners and lessees of record), or certification that the operator has obtained the written signatures of all such owners and will make those signatures available to the BLM immediately upon request.
- If the operator does not comply with this condition of approval, the BLM may take enforcement actions that include, but are not limited to, those specified in 43 CFR 3163.1.
- In addition, the well sign shall include the surface and bottom hole lease numbers. When the Communitization Agreement number is known, it shall also be on the sign.

Waste Minimization Plan (WMP)

In the interest of resource development, submission of additional well gas capture development plan information is deferred but may be required by the BLM Authorized Officer at a later date.

MHH 08072018

GENERAL REQUIREMENTS

The BLM is to be notified in advance for a representative to witness:

- a. Spudding well (minimum of 24 hours)
- b. Setting and/or Cementing of all casing strings (minimum of 4 hours)
- c. BOPE tests (minimum of 4 hours)

☒ Chaves and Roosevelt Counties
Call the Roswell Field Office, 2909 West Second St., Roswell NM 88201.
During office hours call (575) 627-0272.
After office hours call (575)

☒ Eddy County
Call the Carlsbad Field Office, 620 East Greene St., Carlsbad, NM 88220,
(575) 361-2822

☒ Lea County
Call the Hobbs Field Station, 414 West Taylor, Hobbs NM 88240, (575)
393-3612

1. Unless the production casing has been run and cemented or the well has been properly plugged, the drilling rig shall not be removed from over the hole without prior approval.
 - a. In the event the operator has proposed to drill multiple wells utilizing a skid/walking rig. Operator shall secure the wellbore on the current well, after installing and testing the wellhead, by installing a blind flange of like pressure rating to the wellhead and a pressure gauge that can be monitored while drilling is performed on the other well(s).
 - b. When the operator proposes to set surface casing with Spudder Rig
 - Notify the BLM when moving in and removing the Spudder Rig.
 - Notify the BLM when moving in the 2nd Rig. Rig to be moved in within 90 days of notification that Spudder Rig has left the location.
 - BOP/BOPE test to be conducted per Onshore Oil and Gas Order No. 2 as soon as 2nd Rig is rigged up on well.
2. Floor controls are required for 3M or Greater systems. These controls will be on the rig floor, unobstructed, readily accessible to the driller and will be operational at all times during drilling and/or completion activities. Rig floor is defined as the area immediately around the rotary table; the area immediately above the substructure on which the draw works are located, this does not include the dog house or stairway area.

3. The record of the drilling rate along with the GR/N well log run from TD to surface (horizontal well – vertical portion of hole) shall be submitted to the BLM office as well as all other logs run on the borehole 30 days from completion. If available, a digital copy of the logs is to be submitted in addition to the paper copies. The Rustler top and top and bottom of Salt are to be recorded on the Completion Report.

A. CASING

1. Changes to the approved APD casing program need prior approval if the items substituted are of lesser grade or different casing size or are Non-API. The Operator can exchange the components of the proposal with that of superior strength (i.e. changing from J-55 to N-80, or from 36# to 40#). Changes to the approved cement program need prior approval if the altered cement plan has less volume or strength or if the changes are substantial (i.e. Multistage tool, ECP, etc.). The initial wellhead installed on the well will remain on the well with spools used as needed.
2. Wait on cement (WOC) for Potash Areas: After cementing but before commencing any tests, the casing string shall stand cemented under pressure until both of the following conditions have been met: 1) cement reaches a minimum compressive strength of 500 psi for all cement blends, 2) until cement has been in place at least 24 hours. WOC time will be recorded in the driller's log.
3. Wait on cement (WOC) for Water Basin: After cementing but before commencing any tests, the casing string shall stand cemented under pressure until both of the following conditions have been met: 1) cement reaches a minimum compressive strength of 500 psi at the shoe, 2) until cement has been in place at least 8 hours. WOC time will be recorded in the driller's log. See individual casing strings for details regarding lead cement slurry requirements.
4. Provide compressive strengths including hours to reach required 500 pounds compressive strength prior to cementing each casing string. Have well specific cement details onsite prior to pumping the cement for each casing string.
5. No pea gravel permitted for remedial or fall back remedial without prior authorization from the BLM engineer.
6. On that portion of any well approved for a 5M BOPE system or greater, a pressure integrity test of each casing shoe shall be performed. Formation at the shoe shall be tested to a minimum of the mud weight equivalent anticipated to control the formation pressure to the next casing depth or at total depth of the well. This test shall be performed before drilling more than 20 feet of new hole.
7. If hardband drill pipe is rotated inside casing, returns will be monitored for metal. If metal is found in samples, drill pipe will be pulled and rubber protectors which have a larger diameter than the tool joints of the drill pipe will be installed prior to continuing drilling operations.

8. Whenever a casing string is cemented in the R-111-P potash area, the NMOCD requirements shall be followed.

B. PRESSURE CONTROL

1. All blowout preventer (BOP) and related equipment (BOPE) shall comply with well control requirements as described in Onshore Oil and Gas Order No. 2 and API RP 53 Sec. 17.
2. If a variance is approved for a flexible hose to be installed from the BOP to the choke manifold, the following requirements apply: Check condition of flexible line from BOP to choke manifold, replace if exterior is damaged or if line fails test. Line to be as straight as possible with no hard bends and is to be anchored according to Manufacturer's requirements. The flexible hose can be exchanged with a hose of equal size and equal or greater pressure rating. Anchor requirements, specification sheet and hydrostatic pressure test certification matching the hose in service, to be onsite for review. These documents shall be posted in the company man's trailer and on the rig floor.
3. 5M or higher system requires an HCR valve, remote kill line and annular to match. The remote kill line is to be installed prior to testing the system and tested to stack pressure.
4. If the operator has proposed a multi-bowl wellhead assembly in the APD. The following requirements must be met:
 - a. Wellhead shall be installed by manufacturer's representatives, submit documentation with subsequent sundry.
 - b. If the welding is performed by a third party, the manufacturer's representative shall monitor the temperature to verify that it does not exceed the maximum temperature of the seal.
 - c. Manufacturer representative shall install the test plug for the initial BOP test.
 - d. Operator shall perform the intermediate casing integrity test to 70% of the casing burst. This will test the multi-bowl seals.
 - e. If the cement does not circulate and one inch operations would have been possible with a standard wellhead, the well head shall be cut off, cementing operations performed and another wellhead installed.
5. The appropriate BLM office shall be notified a minimum of 4 hours in advance for a representative to witness the tests.
 - a. In a water basin, for all casing strings utilizing slips, these are to be set as soon as the crew and rig are ready and any fallback cement remediation has been done. The casing cut-off and BOP installation can be initiated four hours after installing the slips, which will be approximately six hours after bumping the

plug. For those casing strings not using slips, the minimum wait time before cut-off is eight hours after bumping the plug. BOP/BOPE testing can begin after cut-off or once cement reaches 500 psi compressive strength (including lead when specified), whichever is greater. However, if the float does not hold, cut-off cannot be initiated until cement reaches 500 psi compressive strength (including lead when specified).

- b. In potash areas, for all casing strings utilizing slips, these are to be set as soon as the crew and rig are ready and any fallback cement remediation has been done. For all casing strings, casing cut-off and BOP installation can be initiated at twelve hours after bumping the plug. However, **no tests** shall commence until the cement has had a minimum of 24 hours setup time.
- c. The tests shall be done by an independent service company utilizing a test plug not a cup or J-packer. The operator also has the option of utilizing an independent tester to test without a plug (i.e. against the casing) pursuant to Onshore Order 2 with the pressure not to exceed 70% of the burst rating for the casing. Any test against the casing must meet the WOC time for water basin (8 hours) or potash (24 hours) or 500 pounds compressive strength, whichever is greater, prior to initiating the test (see casing segment as lead cement may be critical item).
- d. The test shall be run on a 5000 psi chart for a 2-3M BOP/BOP, on a 10000 psi chart for a 5M BOP/BOPE and on a 15000 psi chart for a 10M BOP/BOPE. If a linear chart is used, it shall be a one hour chart. A circular chart shall have a maximum 2 hour clock. If a twelve hour or twenty-four hour chart is used, tester shall make a notation that it is run with a two hour clock.
- e. The results of the test shall be reported to the appropriate BLM office.
- f. All tests are required to be recorded on a calibrated test chart. A copy of the BOP/BOPE test chart and a copy of independent service company test will be submitted to the appropriate BLM office.
- g. The BOP/BOPE test shall include a low pressure test from 250 to 300 psi. The test will be held for a minimum of 10 minutes if test is done with a test plug and 30 minutes without a test plug. This test shall be performed prior to the test at full stack pressure.
- h. BOP/BOPE must be tested by an independent service company within 500 feet of the top of the Wolfcamp formation if the time between the setting of the intermediate casing and reaching this depth exceeds 20 days. This test does not exclude the test prior to drilling out the casing shoe as per Onshore Order No. 2.

C. DRILLING MUD

Mud system monitoring equipment, with derrick floor indicators and visual and audio alarms, shall be operating before drilling into the Wolfcamp formation, and shall be used until production casing is run and cemented.

D. WASTE MATERIAL AND FLUIDS

All waste (i.e. drilling fluids, trash, salts, chemicals, sewage, gray water, etc.) created as a result of drilling operations and completion operations shall be safely contained and disposed of properly at a waste disposal facility. No waste material or fluid shall be disposed of on the well location or surrounding area.

Porto-johns and trash containers will be on-location during fracturing operations or any other crew-intensive operations.

4. Pressure Control Equipment

N	A variance is requested for the use of a diverter on the surface casing. See attached for schematic.
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BOP installed and tested before drilling which hole?	Size?	Min. Required WP	Type	x	Tested to:
12-1/4"	13-5/8"	3M	Annular	x	1500 psi
			Blind Ram	x	3M
			Pipe Ram	x	
			Double Ram		
			Other*		
8-3/4"	13-5/8"	5M	Annular	x	50% testing pressure
			Blind Ram	x	5M
			Pipe Ram	x	
			Double Ram		
			Other*		

BOP/BOPE will be tested by an independent service company to 250 psi low and the high pressure indicated above per Onshore Order 2 requirements. The System may be upgraded to a higher pressure but still tested to the working pressure listed in the table above. If the system is upgraded all the components installed will be functional and tested.

Pipe rams will be operationally checked each 24 hour period. Blind rams will be operationally checked on each trip out of the hole. These checks will be noted on the daily tour sheets. Other accessories to the BOP equipment will include a Kelly cock and floor safety valve (inside BOP) and choke lines and choke manifold. See attached schematics.

X	Formation integrity test will be performed per Onshore Order #2. On Exploratory wells or on that portion of any well approved for a 5M BOPE system or greater, a pressure integrity test of each casing shoe shall be performed. Will be tested in accordance with Onshore Oil and Gas Order #2 III.B.1.i.
Y	A variance is requested for the use of a flexible choke line from the BOP to Choke Manifold. See attached for specs and hydrostatic test chart.
N	Are anchors required by manufacturer?
N	A multibowl wellhead is being used. The BOP will be tested per Onshore Order #2 after installation on the surface casing which will cover testing requirements for a maximum of 30 days. If any seal subject to test pressure is broken the system must be tested.

Approval Date: 08/07/2018

**PECOS DISTRICT
SURFACE USE
CONDITIONS OF APPROVAL**

OPERATOR'S NAME:	COG OPERATING, LLC
LEASE NO.:	NMNM0000082
WELL NAME & NO.:	8H-LITTLE BEAR FEDERAL COM
SURFACE HOLE FOOTAGE:	696'/S & 2197'/E
BOTTOM HOLE FOOTAGE:	2440'/S & 2310'/W
LOCATION:	T-20S, R-34E, S-33. NMPM
COUNTY:	LEA, NM

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Standard Conditions of Approval (COA) apply to this APD. If any deviations to these standards exist or special COAs are required, the section with the deviation or requirement will be checked below.

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I. GENERAL PROVISIONS

The approval of the Application For Permit To Drill (APD) is in compliance with all applicable laws and regulations: 43 Code of Federal Regulations 3160, the lease terms, Onshore Oil and Gas Orders, Notices To Lessees, New Mexico Oil Conservation Division (NMOCD) Rules, National Historical Preservation Act As Amended, and instructions and orders of the Authorized Officer. Any request for a variance shall be submitted to the Authorized Officer on Form 3160-5, Sundry Notices and Report on Wells.

II. PERMIT EXPIRATION

If the permit terminates prior to drilling and drilling cannot be commenced within 60 days after expiration, an operator is required to submit Form 3160-5, Sundry Notices and Reports on Wells, requesting surface reclamation requirements for any surface disturbance. However, if the operator will be able to initiate drilling within 60 days after the expiration of the permit, the operator must have set the conductor pipe in order to allow for an extension of 60 days beyond the expiration date of the APD. (Filing of a Sundry Notice is required for this 60 day extension.)

III. ARCHAEOLOGICAL, PALEONTOLOGY & HISTORICAL SITES

Any cultural and/or paleontological resource discovered by the operator or by any person working on the operator's behalf shall immediately report such findings to the Authorized Officer. The operator is fully accountable for the actions of their contractors and subcontractors. The operator shall suspend all operations in the immediate area of such discovery until written authorization to proceed is issued by the Authorized Officer. An evaluation of the discovery shall be made by the Authorized Officer to determine the appropriate actions that shall be required to prevent the loss of significant cultural or scientific values of the discovery. The operator shall be held responsible for the cost of the proper mitigation measures that the Authorized Officer assesses after consultation with the operator on the evaluation and decisions of the discovery. Any unauthorized collection or disturbance of cultural or paleontological resources may result in a shutdown order by the Authorized Officer.

IV. NOXIOUS WEEDS

The operator shall be held responsible if noxious weeds become established within the areas of operations. Weed control shall be required on the disturbed land where noxious weeds exist, which includes the roads, pads, associated pipeline corridor, and adjacent land affected by the establishment of weeds due to this action. The operator shall consult with the Authorized Officer for acceptable weed control methods, which include following EPA and BLM requirements and policies.

V. SPECIAL REQUIREMENT(S)

Timing Limitation Stipulation / Condition of Approval for lesser prairie-chicken:

Oil and gas activities including 3-D geophysical exploration, and drilling will not be allowed in lesser prairie-chicken habitat during the period from March 1st through June 15th annually. During that period, other activities that produce noise or involve human activity, such as the maintenance of oil and gas facilities, pipeline, road, and well pad construction, will be allowed except between 3:00 am and 9:00 am. The 3:00 am to 9:00 am restriction will not apply to normal, around-the-clock operations, such as venting, flaring, or pumping, which do not require a human presence during this period.

Additionally, no new drilling will be allowed within up to 200 meters of leks known at the time of permitting. Normal vehicle use on existing roads will not be restricted.

Exhaust noise from pump jack engines must be muffled or otherwise controlled so as not to exceed 75 db measured at 30 feet from the source of the noise.

Below Ground-level Abandoned Well Marker to avoid raptor perching: Upon the plugging and subsequent abandonment of the well, the well marker will be installed at ground level on a plate containing the pertinent information for the plugged well. For more installation details, contact the Carlsbad Field Office at 575-234-5972.

Timing Limitation Exceptions:

The Carlsbad Field Office will publish an annual map of where the LPC timing and noise stipulations and conditions of approval (Limitations) will apply for the identified year (between March 1 and June 15) based on the latest survey information. The LPC Timing Area map will identify areas which are Habitat Areas (HA), Isolated Population Area (IPA), and Primary Population Area (PPA). The LPC Timing Area map will also have an area in red crosshatch. The red crosshatch area is the only area where an operator is required to submit a request for exception to the LPC Limitations. If an operator is operating outside the red crosshatch area, the LPC Limitations do not apply for that year and an exception to LPC Limitations is not required.

Watershed

The entire well pad will be bermed to prevent oil, salt, and other chemical contaminants from leaving the well pad. Topsoil shall not be used to construct the berm. No water flow from the uphill side(s) of the pad shall be allowed to enter the well pad. The berm shall be maintained through the life of the well and after interim reclamation has been completed. Any water erosion that may occur due to the construction of the well pad during the life of the well will be quickly corrected and proper measures will be taken to prevent future erosion.

Tank battery locations will be lined and bermed. A 20 mil permanent liner will be installed with a 4 oz. felt backing to prevent tears or punctures. Tank battery berms must be large enough to contain 1 ½ times the content of the largest tank or 24 hour production, whichever is greater. Automatic shut off, check valves, or similar systems

will be installed for tanks to minimize the effects of catastrophic line failures used in production or drilling.

A leak detection plan will be submitted to the BLM Carlsbad Field Office for approval prior to pipeline installation. The method could incorporate gauges to detect pressure drops, situating valves and lines so they can be visually inspected periodically or installing electronic sensors to alarm when a leak is present. The leak detection plan will incorporate an automatic shut off system that will be installed for proposed pipelines to minimize the effects of an undesirable event.

Range

The proponent shall not damage the allotment fence. If fence is damaged during construction all operations must cease till the BLM has been contacted along with the BLM grazing permittee.

Potash

Lessees must comply with the 2012 Secretarial Potash Order. The Order is designed to manage the efficient development of oil, gas, and potash resources. Section 6 of the Order provides general provisions which must be followed to minimize conflict between the industries and ensure the safety of operations.

To minimize impacts to potash resources, the proposed well is confined within the boundaries of the established Little Bear Drill Island (See Potash Memo and Map in attached file for Drill Island description).

VI. CONSTRUCTION

A. NOTIFICATION

The BLM shall administer compliance and monitor construction of the access road and well pad. Notify the Carlsbad Field Office at (575) 234-5909 at least 3 working days prior to commencing construction of the access road and/or well pad.

When construction operations are being conducted on this well, the operator shall have the approved APD and Conditions of Approval (COA) on the well site and they shall be made available upon request by the Authorized Officer.

B. TOPSOIL

The operator shall strip the top portion of the soil (root zone) from the entire well pad area and stockpile the topsoil along the edge of the well pad as depicted in the APD. The root zone is typically six (6) inches in depth. All the stockpiled topsoil will be redistributed over the interim reclamation areas. Topsoil shall not be used for berming the pad or facilities. For final reclamation, the topsoil shall be spread over the entire pad area for seeding preparation.

Other subsoil (below six inches) stockpiles must be completely segregated from the topsoil stockpile. Large rocks or subsoil clods (not evident in the surrounding terrain) must be buried within the approved area for interim and final reclamation.

C. CLOSED LOOP SYSTEM

Tanks are required for drilling operations: No Pits.

The operator shall properly dispose of drilling contents at an authorized disposal site.

D. FEDERAL MINERAL MATERIALS PIT

Payment shall be made to the BLM prior to removal of any federal mineral materials. Call the Carlsbad Field Office at (575) 234-5972.

E. WELL PAD SURFACING

Surfacing of the well pad is not required.

If the operator elects to surface the well pad, the surfacing material may be required to be removed at the time of reclamation. The well pad shall be constructed in a manner which creates the smallest possible surface disturbance, consistent with safety and operational needs.

F. EXCLOSURE FENCING (CELLARS & PITS)

Exclosure Fencing

The operator will install and maintain exclosure fencing for all open well cellars to prevent access to public, livestock, and large forms of wildlife before and after drilling operations until the pit is free of fluids and the operator initiates backfilling. (For examples of exclosure fencing design, refer to BLM's Oil and Gas Gold Book, Exclosure Fence Illustrations, Figure 1, Page 18.)

G. ON LEASE ACCESS ROADS**Road Width**

The access road shall have a driving surface that creates the smallest possible surface disturbance and does not exceed fourteen (14) feet in width. The maximum width of surface disturbance, when constructing the access road, shall not exceed twenty-five (25) feet.

Surfacing

Surfacing material is not required on the new access road driving surface. If the operator elects to surface the new access road or pad, the surfacing material may be required to be removed at the time of reclamation.

Where possible, no improvements should be made on the unsurfaced access road other than to remove vegetation as necessary, road irregularities, safety issues, or to fill low areas that may sustain standing water.

The Authorized Officer reserves the right to require surfacing of any portion of the access road at any time deemed necessary. Surfacing may be required in the event the road deteriorates, erodes, road traffic increases, or it is determined to be beneficial for future field development. The surfacing depth and type of material will be determined at the time of notification.

Crowning

Crowning shall be done on the access road driving surface. The road crown shall have a grade of approximately 2% (i.e., a 1" crown on a 14' wide road). The road shall conform to Figure 1; cross section and plans for typical road construction.

Ditching

Ditching shall be required on both sides of the road.

Turnouts

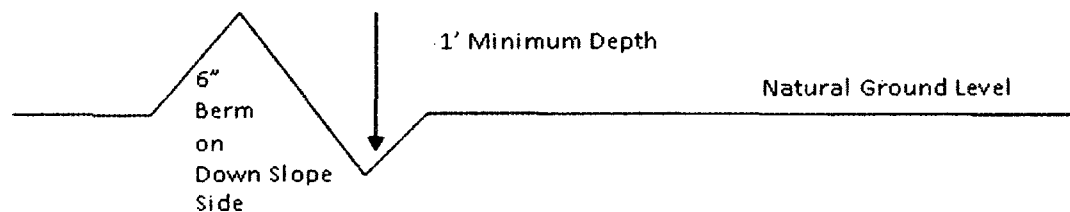
Vehicle turnouts shall be constructed on the road. Turnouts shall be intervisible with interval spacing distance less than 1000 feet. Turnouts shall conform to Figure 1; cross section and plans for typical road construction.

Drainage

Drainage control systems shall be constructed on the entire length of road (e.g. ditches, sidehill outslowing and insloping, lead-off ditches, culvert installation, and low water crossings).

A typical lead-off ditch has a minimum depth of 1 foot below and a berm of 6 inches above natural ground level. The berm shall be on the down-slope side of the lead-off ditch.

Cross Section of a Typical Lead-off Ditch



All lead-off ditches shall be graded to drain water with a 1 percent minimum to 3 percent maximum ditch slope. The spacing interval are variable for lead-off ditches and shall be determined according to the formula for spacing intervals of lead-off ditches, but may be amended depending upon existing soil types and centerline road slope (in %);

Formula for Spacing Interval of Lead-off Ditches

Example - On a 4% road slope that is 400 feet long, the water flow shall drain water into a lead-off ditch. Spacing interval shall be determined by the following formula:

$$400 \text{ foot road with } 4\% \text{ road slope: } \frac{400'}{4\%} + 100' = 200' \text{ lead-off ditch interval}$$

Cattle guards

An appropriately sized cattle guard sufficient to carry out the project shall be installed and maintained at fence/road crossings. Any existing cattle guards on the access road route shall be repaired or replaced if they are damaged or have deteriorated beyond practical use. The operator shall be responsible for the condition of the existing cattle guards that are in place and are utilized during lease operations.

Fence Requirement

Where entry is granted across a fence line, the fence shall be braced and tied off on both sides of the passageway prior to cutting. The operator shall notify the private surface landowner or the grazing allotment holder prior to crossing any fences.

Public Access

Public access on this road shall not be restricted by the operator without specific written approval granted by the Authorized Officer.

Construction Steps

1. Salvage topsoil
2. Construct road

3. Redistribute topsoil
4. Revegetate slopes

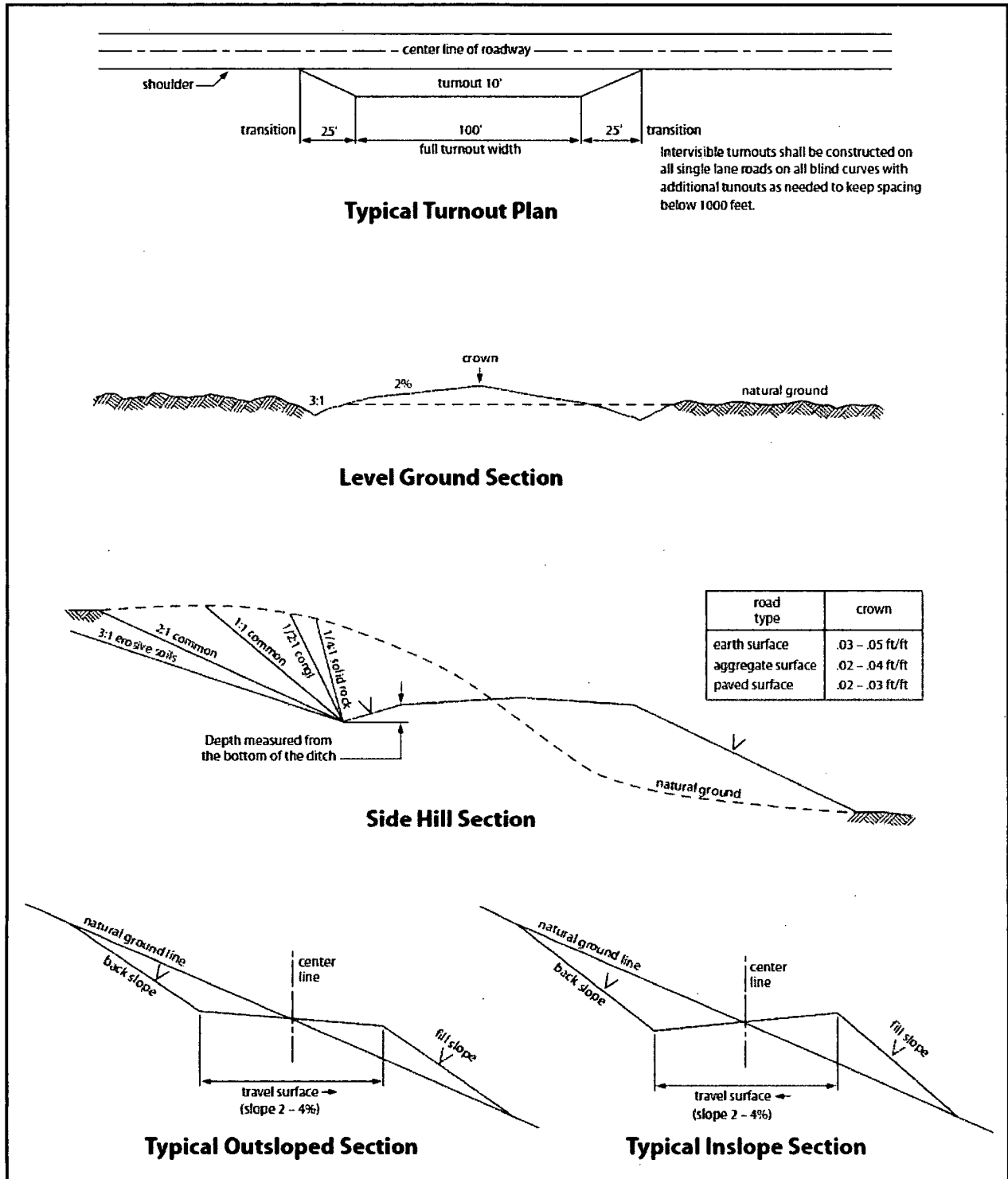


Figure 1. Cross-sections and plans for typical road sections representative of BLM resource or FS local and higher-class roads.

VII. PRODUCTION (POST DRILLING)

A. WELL STRUCTURES & FACILITIES

Placement of Production Facilities

Production facilities should be placed on the well pad to allow for maximum interim recontouring and revegetation of the well location.

Exclosure Netting (Open-top Tanks)

Immediately following active drilling or completion operations, the operator will take actions necessary to prevent wildlife and livestock access, including avian wildlife, to all open-topped tanks that contain or have the potential to contain salinity sufficient to cause harm to wildlife or livestock, hydrocarbons, or Resource Conservation and Recovery Act of 1976-exempt hazardous substances. At a minimum, the operator will net, screen, or cover open-topped tanks to exclude wildlife and livestock and prevent mortality. If the operator uses netting, the operator will cover and secure the open portion of the tank to prevent wildlife entry. The operator will net, screen, or cover the tanks until the operator removes the tanks from the location or the tanks no longer contain substances that could be harmful to wildlife or livestock. Use a maximum netting mesh size of 1 ½ inches. The netting must not be in contact with fluids and must not have holes or gaps.

Chemical and Fuel Secondary Containment and Exclosure Screening

The operator will prevent all hazardous, poisonous, flammable, and toxic substances from coming into contact with soil and water. At a minimum, the operator will install and maintain an impervious secondary containment system for any tank or barrel containing hazardous, poisonous, flammable, or toxic substances sufficient to contain the contents of the tank or barrel and any drips, leaks, and anticipated precipitation. The operator will dispose of fluids within the containment system that do not meet applicable state or U. S. Environmental Protection Agency livestock water standards in accordance with state law; the operator must not drain the fluids to the soil or ground. The operator will design, construct, and maintain all secondary containment systems to prevent wildlife and livestock exposure to harmful substances. At a minimum, the operator will install effective wildlife and livestock exclosure systems such as fencing, netting, expanded metal mesh, lids, and grate covers. Use a maximum netting mesh size of 1 ½ inches.

Open-Vent Exhaust Stack Exclosures

The operator will construct, modify, equip, and maintain all open-vent exhaust stacks on production equipment to prevent birds and bats from entering, and to discourage perching, roosting, and nesting. (*Recommended exclosure structures on open-vent exhaust stacks are in the shape of a cone.*) Production equipment includes, but may not be limited to, tanks, heater-treaters, separators, dehydrators, flare stacks, in-line units, and compressor mufflers.

Containment Structures

Proposed production facilities such as storage tanks and other vessels will have a secondary containment structure that is constructed to hold the capacity of 1.5 times the largest tank, plus freeboard to account for precipitation, unless more stringent protective requirements are deemed necessary.

Painting Requirement

All above-ground structures including meter housing that are not subject to safety requirements shall be painted a flat non-reflective paint color, **Shale Green** from the BLM Standard Environmental Color Chart (CC-001: June 2008).

B. PIPELINES

STANDARD STIPULATIONS FOR SURFACE INSTALLED PIPELINES

A copy of the Grant and attachments, including stipulations, survey plat(s) and/or map(s), shall be on location during construction. BLM personnel may request to review a copy of your permit during construction to ensure compliance with all stipulations.

Holder agrees to comply with the following stipulations to the satisfaction of the Authorized Officer:

1. Holder shall indemnify the United States against any liability for damage to life or property arising from the occupancy or use of public lands under this grant.
2. Holder shall comply with all applicable Federal laws and regulations existing or hereafter enacted or promulgated. In any event, Holder shall comply with the Toxic Substances Control Act of 1976 as amended, 15 USC § 2601 *et seq.* (1982) with regard to any toxic substances that are used, generated by or stored on the right-of-way or on facilities authorized under this right-of-way grant (*see* 40 CFR, Part 702-799 and in particular, provisions on polychlorinated biphenyls, 40 CFR 761.1-761.193). Additionally, any release of toxic substances (leaks, spills, etc.) in excess of the reportable quantity established by 40 CFR, Part 117 shall be reported as required by the Comprehensive Environmental Response, Compensation, and Liability Act, section 102b. A copy of any report required or requested by any Federal agency or State government as a result of a reportable release or spill of any toxic substances shall be furnished to the Authorized Officer concurrent with the filing of the reports to the involved Federal agency or State government.
3. Holder agrees to indemnify the United States against any liability arising from the release of any hazardous substance or hazardous waste (as these terms are defined in the Comprehensive Environmental Response, Compensation and Liability Act of 1980, 42 U.S.C. § 9601, *et seq.* or the Resource Conservation and Recovery Act, 42 U.S.C. 6901, *et seq.*) on the Right-of-Way (unless the release or threatened release is wholly unrelated to activity of the Right-of-Way Holder's activity on the Right-of-Way), or resulting from the activity of the Right-of-Way Holder on the Right-of-Way. This provision applies without

regard to whether a release is caused by Holder, its agent, or unrelated third parties.

4. Holder shall be liable for damage or injury to the United States to the extent provided by 43 CFR Sec. 2883.1-4. Holder shall be held to a standard of strict liability for damage or injury to the United States resulting from pipe rupture, fire, or spills caused or substantially aggravated by any of the following within the right-of-way or permit area:

- a. Activities of Holder including, but not limited to: construction, operation, maintenance, and termination of the facility;
- b. Activities of other parties including, but not limited to:
 - (1) Land clearing
 - (2) Earth-disturbing and earth-moving work
 - (3) Blasting
 - (4) Vandalism and sabotage;

c. Acts of God.

The maximum limitation for such strict liability damages shall not exceed one million dollars (\$1,000,000) for any one event, and any liability in excess of such amount shall be determined by the ordinary rules of negligence of the jurisdiction in which the damage or injury occurred.

This section shall not impose strict liability for damage or injury resulting primarily from an act of war or from the negligent acts or omissions of the United States.

5. If, during any phase of the construction, operation, maintenance, or termination of the pipeline, any oil, salt water, or other pollutant should be discharged from the pipeline system, impacting Federal lands, the control and total removal, disposal, and cleaning up of such oil, salt water, or other pollutant, wherever found, shall be the responsibility of Holder, regardless of fault. Upon failure of Holder to control, dispose of, or clean up such discharge on or affecting Federal lands, or to repair all damages resulting therefrom, on the Federal lands, the Authorized Officer may take such measures as he/she deems necessary to control and clean up the discharge and restore the area, including, where appropriate, the aquatic environment and fish and wildlife habitats, at the full expense of Holder. Such action by the Authorized Officer shall not relieve Holder of any responsibility as provided herein.

6. All construction and maintenance activity shall be confined to the authorized right-of-way width of 20 feet. If the pipeline route follows an existing road or buried pipeline right-of-way, the surface pipeline shall be installed no farther than 10 feet from the edge of the road or buried pipeline right-of-way. If existing surface pipelines prevent this distance, the proposed surface pipeline shall be installed immediately adjacent to the outer surface pipeline. All construction and maintenance activity shall be confined to existing roads or right-of-ways.

7. No blading or clearing of any vegetation shall be allowed unless approved in

writing by the Authorized Officer.

8. Holder shall install the pipeline on the surface in such a manner that will minimize suspension of the pipeline across low areas in the terrain. In hummocky or dune areas, the pipeline shall be "snaked" around hummocks and dunes rather than suspended across these features.

9. The pipeline shall be buried with a minimum of 24 inches under all roads, "two-tracks," and trails. Burial of the pipe will continue for 20 feet on each side of each crossing. The condition of the road, upon completion of construction, shall be returned to at least its former state with no bumps or dips remaining in the road surface.

10. The holder shall minimize disturbance to existing fences and other improvements on public lands. The holder is required to promptly repair improvements to at least their former state. Functional use of these improvements will be maintained at all times. The holder will contact the owner of any improvements prior to disturbing them. When necessary to pass through a fence line, the fence shall be braced on both sides of the passageway prior to cutting of the fence. No permanent gates will be allowed unless approved by the Authorized Officer.

11. In those areas where erosion control structures are required to stabilize soil conditions, the holder will install such structures as are suitable for the specific soil conditions being encountered and which are in accordance with sound resource management practices.

12. Excluding the pipe, all above-ground structures not subject to safety requirement shall be painted by the holder to blend with the natural color of the landscape. The paint used shall be a color which simulates "Standard Environmental Colors" – **Shale Green**, Munsell Soil Color No. 5Y 4/2; designated by the Rocky Mountain Five State Interagency Committee.

13. The pipeline will be identified by signs at the point of origin and completion of the right-of-way and at all road crossings. At a minimum, signs will state the holder's name, BLM serial number, and the product being transported. Signs will be maintained in a legible condition for the life of the pipeline.

14. The holder shall not use the pipeline route as a road for purposes other than routine maintenance as determined necessary by the Authorized Officer in consultation with the holder. The holder will take whatever steps are necessary to ensure that the pipeline route is not used as a roadway.

15. Any cultural and/or paleontological resource (historic or prehistoric site or object) discovered by the holder, or any person working on his behalf, on public or Federal land shall be immediately reported to the authorized officer. Holder shall suspend all operations in the immediate area of such discovery until written authorization to proceed is issued by the authorized officer. An evaluation of the discovery will be made by the authorized officer to determine appropriate cultural or scientific values. The holder will be responsible

for the cost of evaluation and any decision as to proper mitigation measures will be made by the authorized officer after consulting with the holder.

16. The operator shall be held responsible if noxious weeds become established within the areas of operations. Weed control shall be required on the disturbed land where noxious weeds exist, which includes the roads, powerline corridor, and adjacent land affected by the establishment of weeds due to this action. The operator shall consult with the Authorized Officer for acceptable weed control methods, which include following EPA and BLM requirements and policies.

17. Surface pipelines shall be less than or equal to 4 inches and a working pressure below 125 psi.

18. Special Stipulations:

- a. **Lesser Prairie-Chicken:** Oil and gas activities will not be allowed in lesser prairie-chicken habitat during the period from March 1st through June 15th annually. During that period, other activities that produce noise or involve human activity, such as the maintenance of oil and gas facilities and pipeline, road, and well pad construction, will be allowed except between 3:00 am and 9:00 am. The 3:00 am to 9:00 am restriction will not apply to normal, around-the-clock operations, such as venting, flaring, or pumping, which do not require a human presence during this period. Normal vehicle use on existing roads will not be restricted.

VIII. INTERIM RECLAMATION

During the life of the development, all disturbed areas not needed for active support of production operations should undergo interim reclamation in order to minimize the environmental impacts of development on other resources and uses.

Within six (6) months of well completion, operators should work with BLM surface management specialists (Jim Amos: 575-234-5909) to devise the best strategies to reduce the size of the location. Interim reclamation should allow for remedial well operations, as well as safe and efficient removal of oil and gas.

During reclamation, the removal of caliche is important to increasing the success of revegetating the site. Removed caliche that is free of contaminants may be used for road repairs, fire walls or for building other roads and locations. In order to operate the well or complete workover operations, it may be necessary to drive, park and operate on restored interim vegetation within the previously disturbed area. Disturbing revegetated areas for production or workover operations will be allowed. If there is significant disturbance and loss of vegetation, the area will need to be revegetated. Communicate with the appropriate BLM office for any exceptions/exemptions if needed.

All disturbed areas after they have been satisfactorily prepared need to be reseeded with the seed mixture provided below.

Upon completion of interim reclamation, the operator shall submit a Sundry Notices and Reports on Wells, Subsequent Report of Reclamation (Form 3160-5).

IX. FINAL ABANDONMENT & RECLAMATION

At final abandonment, well locations, production facilities, and access roads must undergo "final" reclamation so that the character and productivity of the land are restored.

Earthwork for final reclamation must be completed within six (6) months of well plugging. All pads, pits, facility locations and roads must be reclaimed to a satisfactory revegetated, safe, and stable condition, unless an agreement is made with the landowner or BLM to keep the road and/or pad intact.

After all disturbed areas have been satisfactorily prepared, these areas need to be revegetated with the seed mixture provided below. Seeding should be accomplished by drilling on the contour whenever practical or by other approved methods. Seeding may need to be repeated until revegetation is successful, as determined by the BLM.

Operators shall contact a BLM surface protection specialist prior to surface abandonment operations for site specific objectives (Jim Amos: 575-234-5909).

Below Ground-level Abandoned Well Marker to avoid raptor perching: Upon the plugging and subsequent abandonment of the well, the well marker will be installed at ground level on a plate containing the pertinent information for the plugged well.

Seed Mixture for LPC Sand/Shinnery Sites

Holder shall seed all disturbed areas with the seed mixture listed below. The seed mixture shall be planted in the amounts specified in pounds of pure live seed (PLS)* per acre. There shall be no primary or secondary noxious weeds in the seed mixture. Seed will be tested and the viability testing of seed shall be done in accordance with State law(s) and within nine (9) months prior to purchase. Commercial seed shall be either certified or registered seed. The seed container shall be tagged in accordance with State law(s) and available for inspection by the Authorized Officer.

Seed will be planted using a drill equipped with a depth regulator to ensure proper depth of planting where drilling is possible. The seed mixture will be evenly and uniformly planted over the disturbed area (smaller/heavier seeds have a tendency to drop the bottom of the drill and are planted first). Holder shall take appropriate measures to ensure this does not occur. Where drilling is not possible, seed will be broadcast and the area shall be raked or chained to cover the seed. When broadcasting the seed, the pounds per acre are to be doubled. Seeding shall be repeated until a satisfactory stand is established as determined by the Authorized Officer. Evaluation of growth may not be made before completion of at least one full growing season after seeding.

Species to be planted in pounds of pure live seed* per acre:

<u>Species</u>	<u>lb/acre</u>
Plains Bristlegrass	5lbs/A
Sand Bluestem	5lbs/A
Little Bluestem	3lbs/A
Big Bluestem	6lbs/A
Plains Coreopsis	2lbs/A
Sand Dropseed	1lbs/A

*Pounds of pure live seed:

Pounds of seed x percent purity x percent germination = pounds pure live seed

COG OPERATING LLC
HYDROGEN SULFIDE DRILLING OPERATIONS PLAN

1. HYDROGEN SULFIDE TRAINING

All personnel, whether regularly assigned, contracted, or employed on an unscheduled basis, will receive training from a qualified instructor in the following areas prior to commencing drilling operations on this well:

- a. The hazards and characteristics of hydrogen sulfide (H₂S).
- b. The proper use and maintenance of personal protective equipment and life support systems.
- c. The proper use of H₂S detectors, alarms, warning systems, briefing areas, evacuation procedures, and prevailing winds.
- d. The proper techniques for first aid and rescue procedures.

In addition, supervisory personnel will be trained in the following areas:

- a. The effects of H₂S on metal components. If high tensile tubulars are to be used, personnel will be trained in their special maintenance requirements.
- b. Corrective action and shut-in procedures when drilling or reworking a well and blowout prevention and well control procedures.
- c. The contents and requirements of the H₂S Drilling Operations Plan and the Public Protection Plan.

There will be an initial training session just prior to encountering a known or probable H₂S zone (within 3 days or 500 feet) and weekly H₂S and well control drills for all personnel in each crew. The initial training session shall include a review of the site specific H₂S Drilling Operations Plan and the Public Protection Plan. This plan shall be available at the well site. All personnel will be required to carry documentation that they have received the proper training.

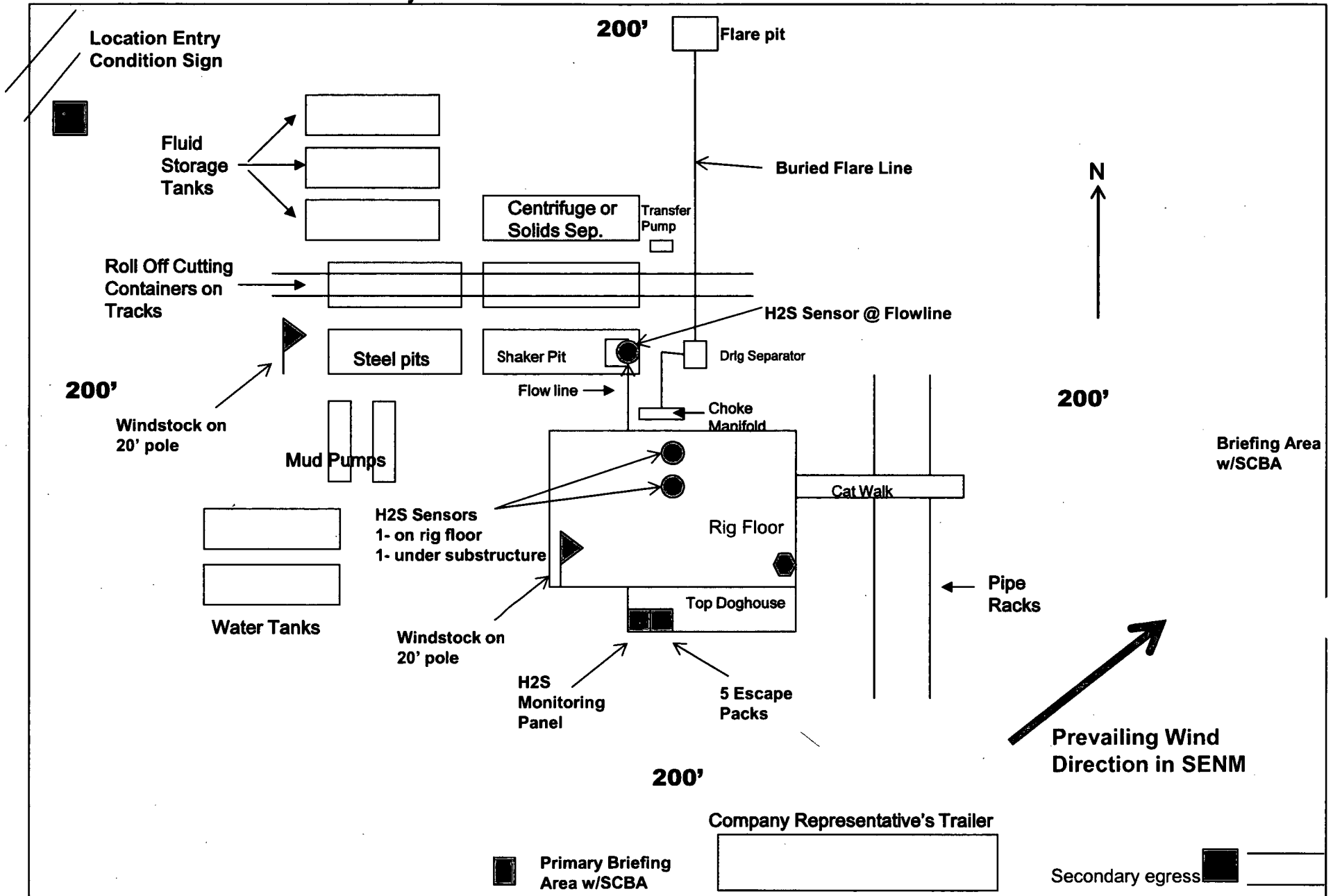
2. H₂S SAFETY EQUIPMENT AND SYSTEMS

Note: All H₂S safety equipment and systems will be installed, tested, and operational when drilling reaches a depth of 500 feet above, or three days prior to penetrating the first zone containing or reasonably expected to contain H₂S. If H₂S greater than 100 ppm is encountered in the gas stream we will shut in and install H₂S equipment.

- a. Well Control Equipment:
 - Flare line.
 - Choke manifold with remotely operated choke.
 - Blind rams and pipe rams to accommodate all pipe sizes with properly sized closing unit.
 - Auxiliary equipment to include: annular preventer, mud-gas separator, rotating head.

COG Operating LLC
H₂S Equipment Schematic
Terrain: Shinnery sand hills.

Well pad will be 400' x 400'
with cellar in center of pad



- b. Protective equipment for essential personnel:
Mark II Surviveair 30-minute units located in the dog house and at briefing areas.
- c. H2S detection and monitoring equipment:
2 - portable H2S monitor positioned on location for best coverage and response. These units have warning lights and audible sirens when H2S levels of 20 ppm are reached.
- d. Visual warning systems:
Caution/Danger signs shall be posted on roads providing direct access to location. Signs will be painted a high visibility yellow with black lettering of sufficient size to be readable at a reasonable distance from the immediate location. Bilingual signs will be used, when appropriate. See example attached.
- e. Mud Program:
The mud program has been designed to minimize the volume of H2S circulated to the surface.
- f. Metallurgy:
All drill strings, casings, tubing, wellhead, blowout preventers, drilling spool, kill lines, choke manifold and lines, and valves shall be suitable for H2S service.
- g. Communication:
Company vehicles equipped with cellular telephone.

COG OPERATING LLC has conducted a review to determine if an H2S contingency plan is required for the above referenced well. We were able to conclude that any potential hazardous volume would be minimal. H2S concentrations of wells in this area from surface to TD are low enough; therefore, we do not believe that an H2S contingency plan is necessary.

W A R N I N G

**YOU ARE ENTERING AN H₂S AREA
AUTHORIZED PERSONNEL ONLY**

- 1. BEARDS OR CONTACT LENSES NOT ALLOWED***
- 2. HARD HATS REQUIRED***
- 3. SMOKING IN DESIGNATED AREAS ONLY***
- 4. BE WIND CONSCIOUS AT ALL TIMES***
- 5. CK WITH COG OPERATING LLC FOREMAN AT MAIN OFFICE***

COG OPERATING LLC

1-575-748-6940

EMERGENCY CALL LIST

	<u>OFFICE</u>	<u>MOBILE</u>
COG OPERATING LLC OFFICE	575-748-6940	
SETH WILD	432-683-7443	432-528-3633
WALTER ROYE	575-748-6940	432-934-1886

EMERGENCY RESPONSE NUMBERS

	<u>OFFICE</u>
STATE POLICE	575-748-9718
EDDY COUNTY SHERIFF	575-746-2701
EMERGENCY MEDICAL SERVICES (AMBULANCE)	911 or 575-746-2701
EDDY COUNTY EMERGENCY MANAGEMENT (HARRY BURGESS)	575-887-9511
STATE EMERGENCY RESPONSE CENTER (SERC)	575-476-9620
CARLSBAD POLICE DEPARTMENT	575-885-2111
CARLSBAD FIRE DEPARTMENT	575-885-3125
NEW MEXICO OIL CONSERVATION DIVISION	575-748-1283
INDIAN FIRE & SAFETY	800-530-8693
HALLIBURTON SERVICES	800-844-8451



Project: Lea County, NM (NAD27 NME)
Site: Little Bear Federal Com
Well: 8H
Wellbore: OH
Design: Plan 1 04-12-18
Rig: McVay 8



PHOENIX
TECHNOLOGY SERVICES



Azimuths to Grid North
True North: -0.41°
Magnetic North: 6.34°
Magnetic Field
Strength: 48258.9nT
Dip Angle: 60.45°
Date: 4/10/2018
Model: MVHD

Map System: US State Plane 1927 (Exact solution)
Datum: NAD 1927 (NADCON CONUS)
Ellipsoid: Clarke 1866
Zone Name: New Mexico East 3001

Local Origin: Well 8H, Grid North

Latitude: 32° 31' 26.81264 N
Longitude: 103° 33' 47.81115 W

Grid East: 737347.40
Grid North: 555242.90
Scale Factor: 1.000

Geomagnetic Model: MVHD
Sample Date: 10-Apr-18
Magnetic Declination: 6.76°
Dip Angle from Horizontal: 60.45°
Magnetic Field Strength: 48258.86823912nT

To convert a Magnetic Direction to a Grid Direction, Add 6.34°
To convert a Magnetic Direction to a True Direction, Add 6.76° East
To convert a True Direction to a Grid Direction, Subtract 0.41°

WELL DETAILS

	3805.00
Northings	555242.90
Easting	737347.40
Latitude	32° 31' 26.81264 N
Longitude	103° 33' 47.81115 W

DESIGN TARGET DETAILS

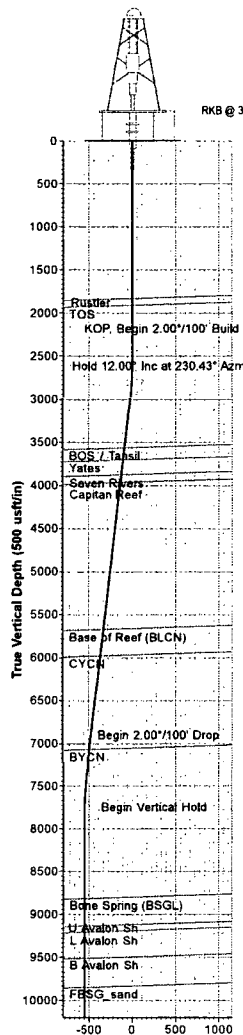
Name	TVD	+N/-S	+E/-W	Northings	Easting	Latitude	Longitude
BHL - Little Bear Fed Com BH11369.00	7023.30	-846.10	-846.10	562266.20	736501.30	32° 32' 36.36859 N	103° 33' 57.10181 W
LTP - Little Bear Fed Com BH11372.11	6893.16	-845.28	-845.28	562136.06	736502.12	32° 32' 35.08080 N	103° 33' 57.10320 W
FTP - Little Bear Fed Com BH11559.00	-371.94	-791.09	-791.09	554870.96	736556.31	32° 31' 23.16880 N	103° 33' 57.08160 W

SECTION DETAILS

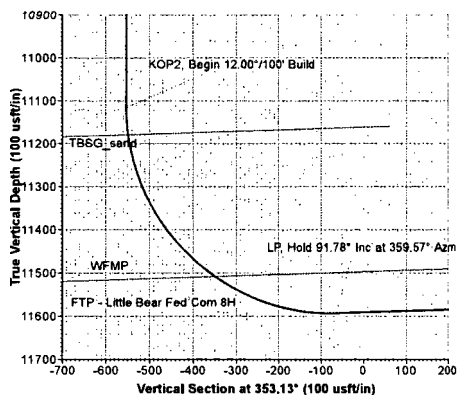
Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSecl	Target	Annotation
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2	2500.00	0.00	0.00	2500.00	0.00	0.00	0.00	0.00	0.00	0.00	KOP, Begin 2.00°/100' Build
3	3099.95	12.00	230.43	3095.58	-39.87	-48.25	2.00	230.43	-33.82		Hold 12.00° Inc at 230.43° Azm
4	7421.21	12.00	230.43	7322.42	-612.15	-740.76	0.00	0.00	-519.16		Begin 2.00°/100' Drop
5	8021.17	0.00	0.00	7918.00	-652.03	-789.01	2.00	180.00	-552.98		Begin Vertical Hold
6	11218.17	0.00	0.00	11115.00	-652.03	-789.01	0.00	0.00	-552.98		KOP2, Begin 12.00°/100' Build
7	11983.00	91.78	359.57	11592.23	-159.74	-792.67	12.00	359.57	-63.79		LP, Hold 91.78° Inc at 359.57° Azm
8	19169.71	91.78	359.57	11369.00	7023.30	-846.10	0.00	0.00	7074.08		BHL - Little Bear Fed Com 8H

LEGEND

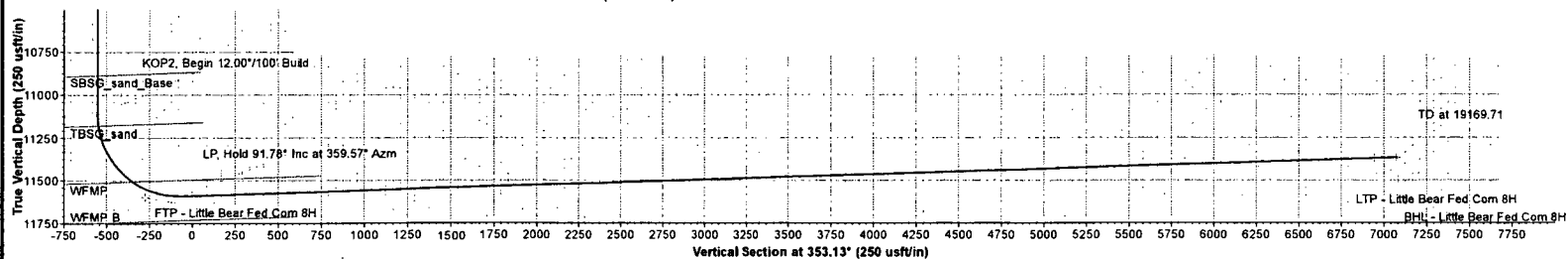
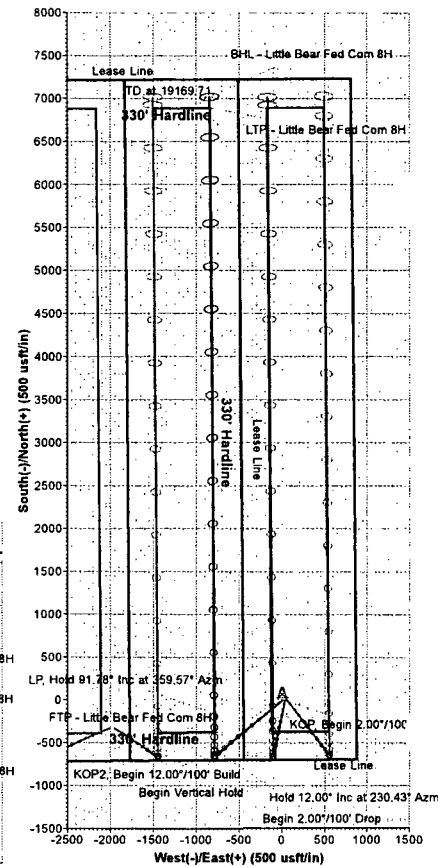
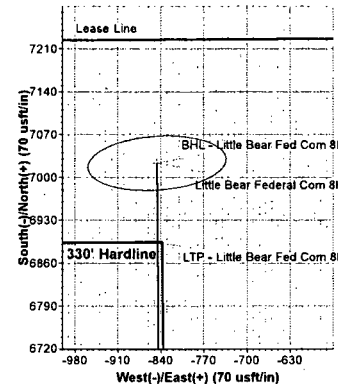
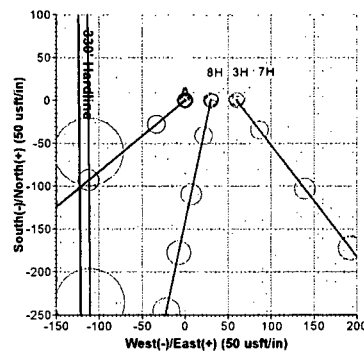
— 4H, OH, Plan 1 04-12-18 V0
— 7H, OH, Plan 1 04-12-18 V0
— 5H, OH, Plan 1 04-12-18 V0
— 3H, OH, Plan 1 04-12-18 V0
— Plan 1 04-12-18



Vertical Section at 353.13° (500 usft/in)



Vertical Section at 353.13° (100 usft/in)



COG Operating LLC

Lea County, NM (NAD27 NME)

Little Bear Federal Com

8H

OH

Plan: Plan 1 04-12-18

Standard Planning Report

12 April, 2018

Planning Report

Database:	USA Compass	Local Co-ordinate Reference:	Well 8H
Company:	COG Operating LLC	TVD Reference:	RKB @ 3831.00usft (McVay 8)
Project:	Lea County, NM (NAD27 NME)	MD Reference:	RKB @ 3831.00usft (McVay 8)
Site:	Little Bear Federal Com	North Reference:	Grid
Well:	8H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Plan 1 04-12-18		

Project	Lea County, NM (NAD27 NME)		
Map System:	US State Plane 1927 (Exact solution)	System Datum:	Mean Sea Level
Geo Datum:	NAD 1927 (NADCON CONUS)		
Map Zone:	New Mexico East 3001		

Site	Little Bear Federal Com				
Site Position:		Northing:	555,243.20 usft	Latitude:	32° 31' 26.81346 N
From:	Map	Easting:	737,377.40 usft	Longitude:	103° 33' 47.46075 W
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.41 °

Well	8H					
Well Position	+N/-S	-0.30 usft	Northing:	555,242.90 usft	Latitude:	32° 31' 26.81264 N
	+E/-W	-30.00 usft	Easting:	737,347.40 usft	Longitude:	103° 33' 47.81115 W
Position Uncertainty	0.00 usft		Wellhead Elevation:		Ground Level:	3,805.00 usft

Wellbore	OH				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	MVHD	4/10/2018	6.76	60.45	48,258.86823912

Design	Plan 1 04-12-18			
Audit Notes:				
Version:	Phase:	PROTOTYPE	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
	0.00	0.00	0.00	353.13

Plan Sections										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	TFO (°)	Target
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2,500.00	0.00	0.00	2,500.00	0.00	0.00	0.00	0.00	0.00	0.00	
3,099.96	12.00	230.43	3,095.58	-39.87	-48.25	2.00	2.00	0.00	230.43	
7,421.21	12.00	230.43	7,322.42	-612.15	-740.76	0.00	0.00	0.00	0.00	
8,021.17	0.00	0.00	7,918.00	-652.03	-789.01	2.00	-2.00	0.00	180.00	
11,218.17	0.00	0.00	11,115.00	-652.03	-789.01	0.00	0.00	0.00	0.00	
11,983.00	91.78	359.57	11,592.23	-159.74	-792.67	12.00	12.00	0.00	359.57	
19,169.71	91.78	359.57	11,369.00	7,023.30	-846.10	0.00	0.00	0.00	0.00	BHL - Little Bear Fe

Planning Report

Database:	USA Compass	Local Co-ordinate Reference:	Well 8H
Company:	COG Operating LLC	TVD Reference:	RKB @ 3831.00usft (McVay 8)
Project:	Lea County, NM (NAD27 NME)	MD Reference:	RKB @ 3831.00usft (McVay 8)
Site:	Little Bear Federal Com	North Reference:	Grid
Well:	8H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Plan 1 04-12-18		

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,826.00	0.00	0.00	1,826.00	0.00	0.00	0.00	0.00	0.00	0.00
Rustler									
1,906.00	0.00	0.00	1,906.00	0.00	0.00	0.00	0.00	0.00	0.00
TOS									
2,500.00	0.00	0.00	2,500.00	0.00	0.00	0.00	0.00	0.00	0.00
KOP, Begin 2.00°/100' Build									
2,600.00	2.00	230.43	2,599.98	-1.11	-1.35	-0.94	2.00	2.00	0.00
2,700.00	4.00	230.43	2,699.84	-4.45	-5.38	-3.77	2.00	2.00	0.00
2,800.00	6.00	230.43	2,799.45	-10.00	-12.10	-8.48	2.00	2.00	0.00
2,900.00	8.00	230.43	2,898.70	-17.76	-21.49	-15.06	2.00	2.00	0.00
3,000.00	10.00	230.43	2,997.47	-27.72	-33.55	-23.51	2.00	2.00	0.00
3,099.96	12.00	230.43	3,095.58	-39.87	-48.25	-33.82	2.00	2.00	0.00
Hold 12.00° Inc at 230.43° Azm									
3,100.00	12.00	230.43	3,095.62	-39.88	-48.26	-33.82	0.00	0.00	0.00
3,200.00	12.00	230.43	3,193.44	-53.12	-64.28	-45.05	0.00	0.00	0.00
3,300.00	12.00	230.43	3,291.25	-66.37	-80.31	-56.28	0.00	0.00	0.00
3,400.00	12.00	230.43	3,389.07	-79.61	-96.33	-67.52	0.00	0.00	0.00
3,500.00	12.00	230.43	3,486.88	-92.85	-112.36	-78.75	0.00	0.00	0.00
3,572.40	12.00	230.43	3,557.70	-102.44	-123.96	-86.88	0.00	0.00	0.00
BOS / Tansil									
3,600.00	12.00	230.43	3,584.70	-106.10	-128.39	-89.98	0.00	0.00	0.00
3,700.00	12.00	230.43	3,682.51	-119.34	-144.41	-101.21	0.00	0.00	0.00
3,717.06	12.00	230.43	3,699.20	-121.60	-147.15	-103.13	0.00	0.00	0.00
Yates									
3,800.00	12.00	230.43	3,780.33	-132.58	-160.44	-112.44	0.00	0.00	0.00
3,893.54	12.00	230.43	3,871.82	-144.97	-175.43	-122.95	0.00	0.00	0.00
Seven Rivers									
3,900.00	12.00	230.43	3,878.14	-145.83	-176.46	-123.67	0.00	0.00	0.00
3,986.90	12.00	230.43	3,963.15	-157.33	-190.39	-133.43	0.00	0.00	0.00
Capitan Reef									
4,000.00	12.00	230.43	3,975.96	-159.07	-192.49	-134.90	0.00	0.00	0.00
4,100.00	12.00	230.43	4,073.77	-172.31	-208.51	-146.14	0.00	0.00	0.00
4,200.00	12.00	230.43	4,171.59	-185.56	-224.54	-157.37	0.00	0.00	0.00
4,300.00	12.00	230.43	4,269.40	-198.80	-240.57	-168.60	0.00	0.00	0.00
4,400.00	12.00	230.43	4,367.22	-212.04	-256.59	-179.83	0.00	0.00	0.00
4,500.00	12.00	230.43	4,465.03	-225.29	-272.62	-191.06	0.00	0.00	0.00
4,600.00	12.00	230.43	4,562.85	-238.53	-288.64	-202.29	0.00	0.00	0.00
4,700.00	12.00	230.43	4,660.66	-251.77	-304.67	-213.53	0.00	0.00	0.00
4,800.00	12.00	230.43	4,758.48	-265.02	-320.69	-224.76	0.00	0.00	0.00
4,900.00	12.00	230.43	4,856.29	-278.26	-336.72	-235.99	0.00	0.00	0.00
5,000.00	12.00	230.43	4,954.11	-291.50	-352.74	-247.22	0.00	0.00	0.00
5,100.00	12.00	230.43	5,051.92	-304.75	-368.77	-258.45	0.00	0.00	0.00
5,200.00	12.00	230.43	5,149.74	-317.99	-384.80	-269.68	0.00	0.00	0.00
5,300.00	12.00	230.43	5,247.56	-331.23	-400.82	-280.91	0.00	0.00	0.00
5,400.00	12.00	230.43	5,345.37	-344.48	-416.85	-292.15	0.00	0.00	0.00
5,500.00	12.00	230.43	5,443.19	-357.72	-432.87	-303.38	0.00	0.00	0.00
5,600.00	12.00	230.43	5,541.00	-370.96	-448.90	-314.61	0.00	0.00	0.00
5,700.00	12.00	230.43	5,638.82	-384.21	-464.92	-325.84	0.00	0.00	0.00
5,734.18	12.00	230.43	5,672.25	-388.73	-470.40	-329.68	0.00	0.00	0.00
Base of Reef (BLCN)									
5,800.00	12.00	230.43	5,736.63	-397.45	-480.95	-337.07	0.00	0.00	0.00
5,900.00	12.00	230.43	5,834.45	-410.69	-496.98	-348.30	0.00	0.00	0.00

Planning Report

Database: USA Compass
 Company: COG Operating LLC
 Project: Lea County, NM (NAD27 NME)
 Site: Little Bear Federal Com
 Well: 8H
 Wellbore: OH
 Design: Plan 1 04-12-18

Local Co-ordinate Reference: Well 8H
 TVD Reference: RKB @ 3831.00usft (McVay 8)
 MD Reference: RKB @ 3831.00usft (McVay 8)
 North Reference: Grid
 Survey Calculation Method: Minimum Curvature

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
6,000.00	12.00	230.43	5,932.26	-423.94	-513.00	-359.54	0.00	0.00	0.00
6,050.18	12.00	230.43	5,981.35	-430.58	-521.04	-365.17	0.00	0.00	0.00
CYCN									
6,100.00	12.00	230.43	6,030.08	-437.18	-529.03	-370.77	0.00	0.00	0.00
6,200.00	12.00	230.43	6,127.89	-450.42	-545.05	-382.00	0.00	0.00	0.00
6,300.00	12.00	230.43	6,225.71	-463.67	-561.08	-393.23	0.00	0.00	0.00
6,400.00	12.00	230.43	6,323.52	-476.91	-577.10	-404.46	0.00	0.00	0.00
6,500.00	12.00	230.43	6,421.34	-490.15	-593.13	-415.69	0.00	0.00	0.00
6,600.00	12.00	230.43	6,519.15	-503.40	-609.16	-426.92	0.00	0.00	0.00
6,700.00	12.00	230.43	6,616.97	-516.64	-625.18	-438.16	0.00	0.00	0.00
6,800.00	12.00	230.43	6,714.78	-529.88	-641.21	-449.39	0.00	0.00	0.00
6,900.00	12.00	230.43	6,812.60	-543.13	-657.23	-460.62	0.00	0.00	0.00
7,000.00	12.00	230.43	6,910.41	-556.37	-673.26	-471.85	0.00	0.00	0.00
7,100.00	12.00	230.43	7,008.23	-569.61	-689.28	-483.08	0.00	0.00	0.00
7,163.39	12.00	230.43	7,070.23	-578.01	-699.44	-490.20	0.00	0.00	0.00
BYCN									
7,200.00	12.00	230.43	7,106.04	-582.86	-705.31	-494.31	0.00	0.00	0.00
7,300.00	12.00	230.43	7,203.86	-596.10	-721.34	-505.55	0.00	0.00	0.00
7,400.00	12.00	230.43	7,301.67	-609.34	-737.36	-516.78	0.00	0.00	0.00
7,421.21	12.00	230.43	7,322.42	-612.15	-740.76	-519.16	0.00	0.00	0.00
Begin 2.00°/100' Drop									
7,500.00	10.42	230.43	7,399.70	-621.91	-752.57	-527.44	2.00	-2.00	0.00
7,600.00	8.42	230.43	7,498.35	-632.34	-765.19	-536.28	2.00	-2.00	0.00
7,700.00	6.42	230.43	7,597.50	-640.57	-775.15	-543.26	2.00	-2.00	0.00
7,800.00	4.42	230.43	7,697.05	-646.59	-782.43	-548.37	2.00	-2.00	0.00
7,900.00	2.42	230.43	7,796.87	-650.39	-787.04	-551.59	2.00	-2.00	0.00
8,000.00	0.42	230.43	7,896.83	-651.98	-788.95	-552.93	2.00	-2.00	0.00
8,021.17	0.00	0.00	7,918.00	-652.03	-789.01	-552.98	2.00	-2.00	612.12
Begin Vertical Hold									
8,916.35	0.00	0.00	8,813.18	-652.03	-789.01	-552.98	0.00	0.00	0.00
Bone Spring (BSGL)									
9,237.35	0.00	0.00	9,134.18	-652.03	-789.01	-552.98	0.00	0.00	0.00
U Avalon Sh									
9,305.35	0.00	0.00	9,202.18	-652.03	-789.01	-552.98	0.00	0.00	0.00
L Avalon Sh									
9,610.35	0.00	0.00	9,507.18	-652.03	-789.01	-552.98	0.00	0.00	0.00
B Avalon Sh									
9,946.35	0.00	0.00	9,843.18	-652.03	-789.01	-552.98	0.00	0.00	0.00
FBSG_sand									
10,495.35	0.00	0.00	10,392.18	-652.03	-789.01	-552.98	0.00	0.00	0.00
SBSG_sand									
10,987.35	0.00	0.00	10,884.18	-652.03	-789.01	-552.98	0.00	0.00	0.00
SBSG_sand_Base									
11,218.17	0.00	0.00	11,115.00	-652.03	-789.01	-552.98	0.00	0.00	0.00
KOP2, Begin 12.00°/100' Build									
11,282.41	7.71	359.57	11,179.05	-647.71	-789.04	-548.69	12.00	12.00	0.00
TBSG_sand									
11,300.00	9.82	359.57	11,196.43	-645.03	-789.06	-546.02	12.00	12.00	0.00
11,400.00	21.82	359.57	11,292.47	-617.82	-789.26	-518.98	12.00	12.00	0.00
11,500.00	33.82	359.57	11,380.75	-571.24	-789.61	-472.69	12.00	12.00	0.00
11,600.00	45.82	359.57	11,457.41	-507.32	-790.09	-409.18	12.00	12.00	0.00
11,677.81	55.16	359.57	11,506.86	-447.36	-790.53	-349.59	12.00	12.00	0.00

Planning Report

Database: USA Compass
Company: COG Operating LLC
Project: Lea County, NM (NAD27 NME)
Site: Little Bear Federal Com
Well: 8H
Wellbore: OH
Design: Plan 1 04-12-18

Local Co-ordinate Reference: Well 8H
TVD Reference: RKB @ 3831.00usft (McVay 8)
MD Reference: RKB @ 3831.00usft (McVay 8)
North Reference: Grid
Survey Calculation Method: Minimum Curvature

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
WFMP									
11,700.00	57.82	359.57	11,519.12	-428.86	-790.67	-331.21	12.00	12.00	0.00
11,800.00	69.82	359.57	11,563.15	-339.28	-791.34	-242.20	12.00	12.00	0.00
11,900.00	81.82	359.57	11,587.61	-242.51	-792.06	-146.03	12.00	12.00	0.00
11,983.00	91.78	359.57	11,592.23	-159.74	-792.67	-63.79	12.00	12.00	0.00
LP, Hold 91.78° Inc at 359.57° Azm									
12,000.00	91.78	359.57	11,591.70	-142.75	-792.80	-46.90	0.00	0.00	0.00
12,100.00	91.78	359.57	11,588.60	-42.80	-793.54	52.42	0.00	0.00	0.00
12,200.00	91.78	359.57	11,585.49	57.15	-794.28	151.74	0.00	0.00	0.00
12,300.00	91.78	359.57	11,582.39	157.10	-795.03	251.06	0.00	0.00	0.00
12,400.00	91.78	359.57	11,579.28	257.04	-795.77	350.38	0.00	0.00	0.00
12,500.00	91.78	359.57	11,576.17	356.99	-796.52	449.70	0.00	0.00	0.00
12,600.00	91.78	359.57	11,573.07	456.94	-797.26	549.02	0.00	0.00	0.00
12,700.00	91.78	359.57	11,569.96	556.89	-798.00	648.34	0.00	0.00	0.00
12,800.00	91.78	359.57	11,566.86	656.84	-798.75	747.66	0.00	0.00	0.00
12,900.00	91.78	359.57	11,563.75	756.79	-799.49	846.98	0.00	0.00	0.00
13,000.00	91.78	359.57	11,560.64	856.74	-800.23	946.30	0.00	0.00	0.00
13,100.00	91.78	359.57	11,557.54	956.69	-800.98	1,045.62	0.00	0.00	0.00
13,200.00	91.78	359.57	11,554.43	1,056.64	-801.72	1,144.94	0.00	0.00	0.00
13,300.00	91.78	359.57	11,551.32	1,156.59	-802.46	1,244.26	0.00	0.00	0.00
13,400.00	91.78	359.57	11,548.22	1,256.53	-803.21	1,343.58	0.00	0.00	0.00
13,500.00	91.78	359.57	11,545.11	1,356.48	-803.95	1,442.90	0.00	0.00	0.00
13,600.00	91.78	359.57	11,542.01	1,456.43	-804.69	1,542.22	0.00	0.00	0.00
13,700.00	91.78	359.57	11,538.90	1,556.38	-805.44	1,641.54	0.00	0.00	0.00
13,800.00	91.78	359.57	11,535.79	1,656.33	-806.18	1,740.86	0.00	0.00	0.00
13,900.00	91.78	359.57	11,532.69	1,756.28	-806.92	1,840.18	0.00	0.00	0.00
14,000.00	91.78	359.57	11,529.58	1,856.23	-807.67	1,939.50	0.00	0.00	0.00
14,100.00	91.78	359.57	11,526.47	1,956.18	-808.41	2,038.83	0.00	0.00	0.00
14,200.00	91.78	359.57	11,523.37	2,056.13	-809.15	2,138.15	0.00	0.00	0.00
14,300.00	91.78	359.57	11,520.26	2,156.08	-809.90	2,237.47	0.00	0.00	0.00
14,400.00	91.78	359.57	11,517.16	2,256.02	-810.64	2,336.79	0.00	0.00	0.00
14,500.00	91.78	359.57	11,514.05	2,355.97	-811.38	2,436.11	0.00	0.00	0.00
14,600.00	91.78	359.57	11,510.94	2,455.92	-812.13	2,535.43	0.00	0.00	0.00
14,700.00	91.78	359.57	11,507.84	2,555.87	-812.87	2,634.75	0.00	0.00	0.00
14,800.00	91.78	359.57	11,504.73	2,655.82	-813.61	2,734.07	0.00	0.00	0.00
14,900.00	91.78	359.57	11,501.63	2,755.77	-814.36	2,833.39	0.00	0.00	0.00
15,000.00	91.78	359.57	11,498.52	2,855.72	-815.10	2,932.71	0.00	0.00	0.00
15,100.00	91.78	359.57	11,495.41	2,955.67	-815.84	3,032.03	0.00	0.00	0.00
15,200.00	91.78	359.57	11,492.31	3,055.62	-816.59	3,131.35	0.00	0.00	0.00
15,300.00	91.78	359.57	11,489.20	3,155.56	-817.33	3,230.67	0.00	0.00	0.00
15,400.00	91.78	359.57	11,486.09	3,255.51	-818.07	3,329.99	0.00	0.00	0.00
15,500.00	91.78	359.57	11,482.99	3,355.46	-818.82	3,429.31	0.00	0.00	0.00
15,600.00	91.78	359.57	11,479.88	3,455.41	-819.56	3,528.63	0.00	0.00	0.00
15,700.00	91.78	359.57	11,476.78	3,555.36	-820.31	3,627.95	0.00	0.00	0.00
15,800.00	91.78	359.57	11,473.67	3,655.31	-821.05	3,727.27	0.00	0.00	0.00
15,900.00	91.78	359.57	11,470.56	3,755.26	-821.79	3,826.59	0.00	0.00	0.00
16,000.00	91.78	359.57	11,467.46	3,855.21	-822.54	3,925.91	0.00	0.00	0.00
16,100.00	91.78	359.57	11,464.35	3,955.16	-823.28	4,025.23	0.00	0.00	0.00
16,200.00	91.78	359.57	11,461.24	4,055.11	-824.02	4,124.55	0.00	0.00	0.00
16,300.00	91.78	359.57	11,458.14	4,155.05	-824.77	4,223.87	0.00	0.00	0.00
16,400.00	91.78	359.57	11,455.03	4,255.00	-825.51	4,323.19	0.00	0.00	0.00
16,500.00	91.78	359.57	11,451.93	4,354.95	-826.25	4,422.52	0.00	0.00	0.00
16,600.00	91.78	359.57	11,448.82	4,454.90	-827.00	4,521.84	0.00	0.00	0.00
16,700.00	91.78	359.57	11,445.71	4,554.85	-827.74	4,621.16	0.00	0.00	0.00

Planning Report

Database: USA Compass
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Site: Little Bear Federal Com
Well: 8H
Wellbore: OH
Design: Plan 1 04-12-18

Local Co-ordinate Reference: Well 8H
TVD Reference: RKB @ 3831.00usft (McVay 8)
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Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
16,800.00	91.78	359.57	11,442.61	4,654.80	-828.48	4,720.48	0.00	0.00	0.00
16,900.00	91.78	359.57	11,439.50	4,754.75	-829.23	4,819.80	0.00	0.00	0.00
17,000.00	91.78	359.57	11,436.40	4,854.70	-829.97	4,919.12	0.00	0.00	0.00
17,100.00	91.78	359.57	11,433.29	4,954.65	-830.71	5,018.44	0.00	0.00	0.00
17,200.00	91.78	359.57	11,430.18	5,054.60	-831.46	5,117.76	0.00	0.00	0.00
17,300.00	91.78	359.57	11,427.08	5,154.54	-832.20	5,217.08	0.00	0.00	0.00
17,400.00	91.78	359.57	11,423.97	5,254.49	-832.94	5,316.40	0.00	0.00	0.00
17,500.00	91.78	359.57	11,420.86	5,354.44	-833.69	5,415.72	0.00	0.00	0.00
17,600.00	91.78	359.57	11,417.76	5,454.39	-834.43	5,515.04	0.00	0.00	0.00
17,700.00	91.78	359.57	11,414.65	5,554.34	-835.17	5,614.36	0.00	0.00	0.00
17,800.00	91.78	359.57	11,411.55	5,654.29	-835.92	5,713.68	0.00	0.00	0.00
17,900.00	91.78	359.57	11,408.44	5,754.24	-836.66	5,813.00	0.00	0.00	0.00
18,000.00	91.78	359.57	11,405.33	5,854.19	-837.40	5,912.32	0.00	0.00	0.00
18,100.00	91.78	359.57	11,402.23	5,954.14	-838.15	6,011.64	0.00	0.00	0.00
18,200.00	91.78	359.57	11,399.12	6,054.09	-838.89	6,110.96	0.00	0.00	0.00
18,300.00	91.78	359.57	11,396.02	6,154.03	-839.63	6,210.28	0.00	0.00	0.00
18,400.00	91.78	359.57	11,392.91	6,253.98	-840.38	6,309.60	0.00	0.00	0.00
18,500.00	91.78	359.57	11,389.80	6,353.93	-841.12	6,408.92	0.00	0.00	0.00
18,600.00	91.78	359.57	11,386.70	6,453.88	-841.86	6,508.24	0.00	0.00	0.00
18,700.00	91.78	359.57	11,383.59	6,553.83	-842.61	6,607.56	0.00	0.00	0.00
18,800.00	91.78	359.57	11,380.48	6,653.78	-843.35	6,706.88	0.00	0.00	0.00
18,900.00	91.78	359.57	11,377.38	6,753.73	-844.09	6,806.21	0.00	0.00	0.00
19,000.00	91.78	359.57	11,374.27	6,853.68	-844.84	6,905.53	0.00	0.00	0.00
19,100.00	91.78	359.57	11,371.17	6,953.63	-845.58	7,004.85	0.00	0.00	0.00
19,169.71	91.78	359.57	11,369.00	7,023.30	-846.10	7,074.08	0.00	0.00	0.00

TD at 19169.71

Design Targets

Target Name

- hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
BHL - Little Bear Fed - plan hits target center - Point	0.00	0.00	11,369.00	7,023.30	-846.10	562,266.20	736,501.30	32° 32' 36.36859 N	03° 33' 57.10181 W
LTP - Little Bear Fed - plan misses target center by 0.95usft at 19039.53usft MD (11373.04 TVD, 6893.19 N, -845.13 E) - Point	0.00	0.00	11,372.11	6,893.16	-845.28	562,136.06	736,502.11	32° 32' 35.08080 N	03° 33' 57.10320 W
FTP - Little Bear Fed - plan misses target center by 45.35usft at 11786.48usft MD (11558.31 TVD, -351.90 N, -791.24 E) - Point	0.00	0.00	11,599.00	-371.94	-791.09	554,870.97	736,556.30	32° 31' 23.18880 N	03° 33' 57.08160 W

Planning Report

Database:	USA Compass	Local Co-ordinate Reference:	Well 8H
Company:	COG Operating LLC	TVD Reference:	RKB @ 3831.00usft (McVay 8)
Project:	Lea County, NM (NAD27 NME)	MD Reference:	RKB @ 3831.00usft (McVay 8)
Site:	Little Bear Federal Com	North Reference:	Grid
Well:	8H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Plan 1 04-12-18		

Formations

Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)
1,826.00	1,826.00	Rustler		-1.78	353.13
1,906.00	1,906.00	TOS		-1.78	353.13
3,572.40	3,557.70	BOS / Tansil		-1.78	353.13
3,717.06	3,699.20	Yates		-1.78	353.13
3,893.54	3,871.82	Seven Rivers		-1.78	353.13
3,986.90	3,963.15	Capitan Reef		-1.78	353.13
5,734.18	5,672.25	Base of Reef (BLCN)		-1.78	353.13
6,050.18	5,981.35	CYCN		-1.78	353.13
7,163.39	7,070.23	BYCN		-1.78	353.13
8,916.35	8,813.18	Bone Spring (BSGL)		-1.78	353.13
9,237.35	9,134.18	U Avalon Sh		-1.78	353.13
9,305.35	9,202.18	L Avalon Sh		-1.78	353.13
9,610.35	9,507.18	B Avalon Sh		-1.78	353.13
9,946.35	9,843.18	FBSG_sand		-1.78	353.13
10,495.35	10,392.18	SBSG_sand		-1.78	353.13
10,987.35	10,884.18	SBSG_sand_Base		-1.78	353.13
11,282.41	11,179.05	TBSG_sand		-1.78	353.13
11,677.81	11,506.86	WFMP		-1.78	353.13

Plan Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
2,500.00	2,500.00	0.00	0.00	KOP, Begin 2.00°/100' Build
3,099.96	3,095.58	-39.87	-48.25	Hold 12.00° Inc at 230.43° Azm
7,421.21	7,322.42	-612.15	-740.76	Begin 2.00°/100' Drop
8,021.17	7,918.00	-652.03	-789.01	Begin Vertical Hold
11,218.17	11,115.00	-652.03	-789.01	KOP2, Begin 12.00°/100' Build
11,983.00	11,592.23	-159.74	-792.67	LP, Hold 91.78° Inc at 359.57° Azm
19,169.71	11,369.00	7,023.30	-846.10	TD at 19169.71

COG Operating LLC

Lea County, NM (NAD27 NME)

Little Bear Federal Com

8H

OH

Plan 1 04-12-18

Anticollision Report

12 April, 2018

Anticollision Report

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 8H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	RKB @ 3831.00usft (McVay 8)
Reference Site:	Little Bear Federal Com	MD Reference:	RKB @ 3831.00usft (McVay 8)
Site Error:	0.00 usft	North Reference:	Grid
Reference Well:	8H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	USA Compass
Reference Design:	Plan 1 04-12-18	Offset TVD Reference:	Offset Datum

Reference	Plan 1 04-12-18
Filter type:	NO GLOBAL FILTER: Using user defined selection & filtering criteria
Interpolation Method:	MD Interval 100.00usft
Depth Range:	Unlimited
Results Limited by:	Maximum center-center distance of 50,000.00 u
Warning Levels Evaluated at:	2.00 Sigma
Error Model:	ISCWSA
Scan Method:	Closest Approach 3D
Error Surface:	Major Axis
Casing Method:	Not applied

Survey Tool Program	Date 4/11/2018			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
0.00	19,169.67	Plan 1 04-12-18 (OH)	MWD+HDGM	OWSG Rev.2 MWD + HDGM

Summary						
Site Name	Reference Measured Depth (usft)	Offset Measured Depth (usft)	Distance Between Centres (usft)	Distance Between Ellipses (usft)	Separation Factor	Warning
Offset Well - Wellbore - Design						
Little Bear Federal Com						
3H - OH - Plan 1 04-12-18	2,500.00	2,500.00	30.00	12.53	1.717	CC, ES
3H - OH - Plan 1 04-12-18	2,600.00	2,600.21	30.98	12.83	1.706	SF
4H - OH - Plan 1 04-12-18	8,082.79	8,017.29	659.73	598.87	10.840	CC
4H - OH - Plan 1 04-12-18	19,169.71	18,885.57	696.30	468.60	3.058	ES, SF
5H - OH - Plan 1 04-12-18	8,082.79	8,050.79	1,979.62	1,917.45	31.845	CC
5H - OH - Plan 1 04-12-18	19,169.71	18,967.44	1,992.41	1,764.60	8.746	ES, SF
7H - OH - Plan 1 04-12-18	2,416.33	2,417.33	60.00	43.13	3.556	CC
7H - OH - Plan 1 04-12-18	2,500.00	2,500.99	60.00	42.53	3.434	ES, SF

Offset Design Little Bear Federal Com - 3H - OH - Plan 1 04-12-18														Offset Site Error: 0.00 usft
Survey Program: 0-MWD+HDGM														Offset Well Error: 0.00 usft
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Semi Major Axis (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	Offset Wellbore Centre +E/-W (usft)	Distance Between Centres (usft)	Distance Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	Warning
0.00	0.00	0.00	0.00	0.00	0.00	89.43		0.30	30.00	30.00				
100.00	100.00	100.00	100.00	0.13	0.13	89.43		0.30	30.00	30.00	29.74	0.27	113.098	
200.00	200.00	200.00	200.00	0.49	0.49	89.43		0.30	30.00	30.00	29.02	0.98	30.545	
300.00	300.00	300.00	300.00	0.85	0.85	89.43		0.30	30.00	30.00	28.30	1.70	17.657	
400.00	400.00	400.00	400.00	1.21	1.21	89.43		0.30	30.00	30.00	27.59	2.42	12.417	
500.00	500.00	500.00	500.00	1.57	1.57	89.43		0.30	30.00	30.00	26.87	3.13	9.576	
600.00	600.00	600.00	600.00	1.92	1.92	89.43		0.30	30.00	30.00	26.15	3.85	7.793	
700.00	700.00	700.00	700.00	2.28	2.28	89.43		0.30	30.00	30.00	25.43	4.57	6.569	
800.00	800.00	800.00	800.00	2.64	2.64	89.43		0.30	30.00	30.00	24.72	5.28	5.678	
900.00	900.00	900.00	900.00	3.00	3.00	89.43		0.30	30.00	30.00	24.00	6.00	5.000	
1,000.00	1,000.00	1,000.00	1,000.00	3.36	3.36	89.43		0.30	30.00	30.00	23.28	6.72	4.466	
1,100.00	1,100.00	1,100.00	1,100.00	3.72	3.72	89.43		0.30	30.00	30.00	22.57	7.43	4.035	
1,200.00	1,200.00	1,200.00	1,200.00	4.08	4.08	89.43		0.30	30.00	30.00	21.85	8.15	3.680	
1,300.00	1,300.00	1,300.00	1,300.00	4.43	4.43	89.43		0.30	30.00	30.00	21.13	8.87	3.383	
1,400.00	1,400.00	1,400.00	1,400.00	4.79	4.79	89.43		0.30	30.00	30.00	20.42	9.59	3.130	
1,500.00	1,500.00	1,500.00	1,500.00	5.15	5.15	89.43		0.30	30.00	30.00	19.70	10.30	2.912	
1,600.00	1,600.00	1,600.00	1,600.00	5.51	5.51	89.43		0.30	30.00	30.00	18.98	11.02	2.723	
1,700.00	1,700.00	1,700.00	1,700.00	5.87	5.87	89.43		0.30	30.00	30.00	18.27	11.74	2.556	
1,800.00	1,800.00	1,800.00	1,800.00	6.23	6.23	89.43		0.30	30.00	30.00	17.55	12.45	2.409	
1,900.00	1,900.00	1,900.00	1,900.00	6.59	6.59	89.43		0.30	30.00	30.00	16.83	13.17	2.278	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Anticollision Report

Company: COG Operating LLC
Project: Lea County, NM (NAD27 NME)
Reference Site: Little Bear Federal Com
Site Error: 0.00 usft
Reference Well: 8H
Well Error: 0.00 usft
Reference Wellbore: OH
Reference Design: Plan 1 04-12-18

Local Co-ordinate Reference: Well 8H
TVD Reference: RKB @ 3831.00usft (McVay 8)
MD Reference: RKB @ 3831.00usft (McVay 8)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: USA Compass
Offset TVD Reference: Offset Datum

Offset Design Little Bear Federal Com - 3H - OH - Plan 1 04-12-18													Offset Site Error:	0.00 usft
Survey Program: 0-MWD+HDGM													Offset Well Error:	0.00 usft
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N-S (usft)	+E-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	Warning	
2,000.00	2,000.00	2,000.00	2,000.00	6.94	6.94	89.43	0.30	30.00	30.00	16.11	13.89	2.160		
2,100.00	2,100.00	2,100.00	2,100.00	7.30	7.30	89.43	0.30	30.00	30.00	15.40	14.60	2.054		
2,200.00	2,200.00	2,200.00	2,200.00	7.66	7.66	89.43	0.30	30.00	30.00	14.68	15.32	1.958		
2,300.00	2,300.00	2,300.00	2,300.00	8.02	8.02	89.43	0.30	30.00	30.00	13.96	16.04	1.871		
2,400.00	2,400.00	2,400.00	2,400.00	8.38	8.38	89.43	0.30	30.00	30.00	13.25	16.75	1.791		
2,500.00	2,500.00	2,500.00	2,500.00	8.74	8.74	89.43	0.30	30.00	30.00	12.53	17.47	1.717 CC, ES		
2,600.00	2,599.98	2,600.21	2,600.19	9.08	9.08	-139.86	-1.41	29.64	30.98	12.83	18.16	1.706 SF		
2,700.00	2,699.84	2,700.35	2,700.19	9.41	9.40	-136.84	-6.55	28.55	33.99	15.18	18.81	1.807		
2,800.00	2,799.45	2,800.33	2,799.78	9.75	9.73	-132.84	-15.09	26.74	39.17	19.69	19.47	2.011		
2,900.00	2,898.70	2,900.07	2,898.77	10.08	10.06	-128.76	-26.98	24.21	46.63	26.49	20.14	2.315		
3,000.00	2,997.47	2,999.57	2,997.30	10.43	10.39	-126.85	-40.54	21.34	56.36	35.55	20.81	2.708		
3,099.96	3,095.58	3,098.81	3,095.57	10.78	10.72	-127.82	-54.05	18.47	68.21	46.71	21.50	3.172		
3,200.00	3,193.44	3,197.98	3,193.78	11.14	11.07	-129.60	-67.56	15.61	81.19	58.98	22.20	3.657		
3,300.00	3,291.25	3,297.11	3,291.95	11.51	11.41	-130.89	-81.07	12.74	94.21	71.29	22.92	4.111		
3,400.00	3,389.07	3,396.24	3,390.11	11.88	11.76	-131.87	-94.57	9.88	107.27	83.63	23.64	4.538		
3,500.00	3,486.88	3,495.37	3,488.27	12.26	12.11	-132.64	-108.07	7.02	120.35	95.98	24.37	4.938		
3,600.00	3,584.70	3,594.50	3,586.44	12.65	12.47	-133.25	-121.57	4.15	133.45	108.33	25.12	5.313		
3,700.00	3,682.51	3,693.63	3,684.60	13.04	12.83	-133.76	-135.08	1.29	146.56	120.70	25.87	5.666		
3,800.00	3,780.33	3,792.76	3,782.76	13.43	13.19	-134.18	-148.58	-1.57	159.68	133.06	26.62	5.998		
3,900.00	3,878.14	3,891.89	3,880.93	13.83	13.56	-134.54	-162.08	-4.44	172.81	145.42	27.39	6.309		
4,000.00	3,975.96	3,991.02	3,979.09	14.24	13.92	-134.84	-175.59	-7.30	185.95	157.79	28.16	6.603		
4,100.00	4,073.77	4,090.15	4,077.25	14.65	14.29	-135.11	-189.09	-10.16	199.09	170.15	28.94	6.880		
4,200.00	4,171.59	4,189.27	4,175.42	15.06	14.66	-135.35	-202.59	-13.03	212.23	182.51	29.72	7.141		
4,300.00	4,269.40	4,288.40	4,273.58	15.47	15.03	-135.55	-216.10	-15.89	225.38	194.87	30.51	7.388		
4,400.00	4,367.22	4,387.53	4,371.74	15.89	15.41	-135.74	-229.60	-18.76	238.52	207.23	31.30	7.621		
4,500.00	4,465.03	4,486.66	4,469.91	16.31	15.78	-135.90	-243.10	-21.62	251.68	219.58	32.09	7.842		
4,600.00	4,562.85	4,585.79	4,568.07	16.73	16.16	-136.05	-256.60	-24.48	264.83	231.94	32.89	8.051		
4,700.00	4,660.66	4,684.92	4,666.23	17.15	16.54	-136.18	-270.11	-27.35	277.98	244.29	33.70	8.250		
4,800.00	4,758.48	4,784.05	4,764.40	17.58	16.92	-136.30	-283.61	-30.21	291.14	256.64	34.50	8.438		
4,900.00	4,856.29	4,883.18	4,862.56	18.01	17.30	-136.42	-297.11	-33.07	304.29	268.98	35.31	8.617		
5,000.00	4,954.11	4,982.31	4,960.72	18.44	17.68	-136.52	-310.62	-35.94	317.45	281.33	36.12	8.788		
5,100.00	5,051.92	5,081.44	5,058.89	18.87	18.07	-136.61	-324.12	-38.80	330.61	293.67	36.94	8.950		
5,200.00	5,149.74	5,180.57	5,157.05	19.30	18.45	-136.70	-337.62	-41.66	343.77	306.01	37.76	9.105		
5,300.00	5,247.56	5,279.69	5,255.21	19.74	18.84	-136.78	-351.12	-44.53	356.93	318.35	38.58	9.253		
5,400.00	5,345.37	5,378.82	5,353.38	20.17	19.22	-136.86	-364.63	-47.39	370.09	330.69	39.40	9.394		
5,500.00	5,443.19	5,477.95	5,451.54	20.61	19.61	-136.92	-378.13	-50.26	383.25	343.03	40.22	9.528		
5,600.00	5,541.00	5,577.08	5,549.70	21.05	20.00	-136.99	-391.63	-53.12	396.41	355.37	41.05	9.657		
5,700.00	5,638.82	5,676.21	5,647.87	21.49	20.39	-137.05	-405.14	-55.98	409.58	367.70	41.88	9.781		
5,800.00	5,736.63	5,775.34	5,746.03	21.93	20.78	-137.11	-418.64	-58.85	422.74	380.03	42.71	9.899		
5,900.00	5,834.45	5,874.47	5,844.19	22.37	21.17	-137.16	-432.14	-61.71	435.90	392.37	43.54	10.012		
6,000.00	5,932.26	5,973.60	5,942.36	22.81	21.56	-137.21	-445.64	-64.57	449.07	404.70	44.37	10.121		
6,100.00	6,030.08	6,072.73	6,040.52	23.26	21.95	-137.26	-459.15	-67.44	462.23	417.03	45.20	10.225		
6,200.00	6,127.89	6,171.86	6,138.68	23.70	22.34	-137.30	-472.65	-70.30	475.39	429.35	46.04	10.326		
6,300.00	6,225.71	6,270.99	6,236.85	24.15	22.73	-137.35	-486.15	-73.16	488.56	441.68	46.88	10.422		
6,400.00	6,323.52	6,370.11	6,335.01	24.59	23.12	-137.39	-499.66	-76.03	501.72	454.01	47.72	10.515		
6,500.00	6,421.34	6,469.24	6,433.17	25.04	23.52	-137.43	-513.16	-78.89	514.89	466.33	48.55	10.604		
6,600.00	6,519.15	6,568.37	6,531.34	25.49	23.91	-137.46	-526.66	-81.76	528.05	478.66	49.39	10.690		
6,700.00	6,616.97	6,667.50	6,629.50	25.93	24.30	-137.50	-540.16	-84.62	541.22	490.98	50.24	10.773		
6,800.00	6,714.78	6,766.63	6,727.66	26.38	24.70	-137.53	-553.67	-87.48	554.38	503.31	51.08	10.854		
6,900.00	6,812.60	6,865.76	6,825.83	26.83	25.09	-137.56	-567.17	-90.35	567.55	515.63	51.92	10.931		
7,000.00	6,910.41	6,964.89	6,923.99	27.28	25.49	-137.59	-580.67	-93.21	580.72	527.95	52.77	11.005		
7,100.00	7,008.23	7,064.02	7,022.15	27.73	25.88	-137.62	-594.18	-96.07	593.88	540.27	53.61	11.077		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Anticollision Report

Company: COG Operating LLC
 Project: Lea County, NM (NAD27 NME)
 Reference Site: Little Bear Federal Com
 Site Error: 0.00 usft
 Reference Well: 8H
 Well Error: 0.00 usft
 Reference Wellbore: OH
 Reference Design: Plan 1 04-12-18

Local Co-ordinate Reference: Well 8H
 TVD Reference: RKB @ 3831.00usft (McVay 8)
 MD Reference: RKB @ 3831.00usft (McVay 8)
 North Reference: Grid
 Survey Calculation Method: Minimum Curvature
 Output errors are at: 2.00 sigma
 Database: USA Compass
 Offset TVD Reference: Offset Datum

Offset Design Little Bear Federal Com - 3H - OH - Plan 1 04-12-18													Offset Site Error: 0.00 usft
Survey Program: 0-MWD+HDGM													Offset Well Error: 0.00 usft
Reference		Offset		Semi Major Axis		Highside Toolface (°)	Offset Wellbore Centre		Distance		Minimum Separation (usft)	Separation Factor	Warning
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)		+N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)			
7,200.00	7,106.04	7,163.15	7,120.32	28.18	26.28	-137.65	-607.68	-98.94	607.05	552.59	54.46	11.147	
7,300.00	7,203.86	7,261.83	7,218.05	28.63	26.67	-137.68	-621.10	-101.78	620.22	564.92	55.30	11.215	
7,400.00	7,301.67	7,357.32	7,312.85	29.08	27.04	-137.88	-632.17	-104.13	633.74	577.61	56.12	11.292	
7,500.00	7,399.70	7,452.55	7,407.73	29.53	27.40	-138.43	-640.13	-105.82	647.05	590.13	56.93	11.366	
7,600.00	7,498.35	7,547.74	7,502.78	29.95	27.74	-139.06	-645.00	-106.85	658.47	600.78	57.69	11.414	
7,700.00	7,597.50	7,642.81	7,597.84	30.35	28.07	-139.72	-646.77	-107.23	667.95	609.53	58.42	11.434	
7,800.00	7,697.05	7,742.03	7,697.05	30.72	28.39	-140.33	-646.78	-107.23	675.20	616.09	59.11	11.422	
7,900.00	7,796.87	7,841.84	7,796.87	31.08	28.71	-140.71	-646.78	-107.23	679.81	620.03	59.78	11.371	
8,000.00	7,896.83	7,941.81	7,896.83	31.41	29.03	-140.87	-646.78	-107.23	681.74	621.30	60.44	11.280	
8,100.00	7,996.83	8,041.81	7,996.83	31.71	29.35	89.56	-646.78	-107.23	681.80	620.74	61.06	11.166	
8,200.00	8,096.83	8,141.81	8,096.83	32.02	29.67	89.56	-646.78	-107.23	681.80	620.11	61.69	11.052	
8,300.00	8,196.83	8,241.81	8,196.83	32.32	30.00	89.56	-646.78	-107.23	681.80	619.48	62.32	10.941	
8,400.00	8,296.83	8,341.81	8,296.83	32.63	30.32	89.56	-646.78	-107.23	681.80	618.85	62.95	10.831	
8,500.00	8,396.83	8,441.81	8,396.83	32.94	30.64	89.56	-646.78	-107.23	681.80	618.22	63.58	10.723	
8,600.00	8,496.83	8,541.81	8,496.83	33.24	30.97	89.56	-646.78	-107.23	681.80	617.59	64.21	10.618	
8,700.00	8,596.83	8,641.81	8,596.83	33.55	31.30	89.56	-646.78	-107.23	681.80	616.95	64.85	10.514	
8,800.00	8,696.83	8,741.81	8,696.83	33.86	31.62	89.56	-646.78	-107.23	681.80	616.31	65.49	10.411	
8,900.00	8,796.83	8,841.81	8,796.83	34.17	31.95	89.56	-646.78	-107.23	681.80	615.67	66.13	10.311	
9,000.00	8,896.83	8,941.81	8,896.83	34.49	32.28	89.56	-646.78	-107.23	681.80	615.03	66.77	10.212	
9,100.00	8,996.83	9,041.81	8,996.83	34.80	32.61	89.56	-646.78	-107.23	681.80	614.39	67.41	10.114	
9,200.00	9,096.83	9,141.81	9,096.83	35.11	32.94	89.56	-646.78	-107.23	681.80	613.75	68.05	10.019	
9,300.00	9,196.83	9,241.81	9,196.83	35.43	33.27	89.56	-646.78	-107.23	681.80	613.10	68.70	9.925	
9,400.00	9,296.83	9,341.81	9,296.83	35.74	33.60	89.56	-646.78	-107.23	681.80	612.46	69.34	9.832	
9,500.00	9,396.83	9,441.81	9,396.83	36.06	33.93	89.56	-646.78	-107.23	681.80	611.81	69.99	9.741	
9,600.00	9,496.83	9,541.81	9,496.83	36.38	34.26	89.56	-646.78	-107.23	681.80	611.16	70.64	9.652	
9,700.00	9,596.83	9,641.81	9,596.83	36.69	34.60	89.56	-646.78	-107.23	681.80	610.51	71.29	9.564	
9,800.00	9,696.83	9,741.81	9,696.83	37.01	34.93	89.56	-646.78	-107.23	681.80	609.86	71.94	9.477	
9,900.00	9,796.83	9,841.81	9,796.83	37.33	35.26	89.56	-646.78	-107.23	681.80	609.20	72.60	9.392	
10,000.00	9,896.83	9,941.81	9,896.83	37.65	35.60	89.56	-646.78	-107.23	681.80	608.55	73.25	9.308	
10,100.00	9,996.83	10,041.81	9,996.83	37.97	35.93	89.56	-646.78	-107.23	681.80	607.90	73.90	9.225	
10,200.00	10,096.83	10,141.81	10,096.83	38.29	36.27	89.56	-646.78	-107.23	681.80	607.24	74.56	9.144	
10,300.00	10,196.83	10,241.81	10,196.83	38.62	36.60	89.56	-646.78	-107.23	681.80	606.58	75.22	9.064	
10,400.00	10,296.83	10,341.81	10,296.83	38.94	36.94	89.56	-646.78	-107.23	681.80	605.92	75.88	8.986	
10,500.00	10,396.83	10,441.81	10,396.83	39.26	37.27	89.56	-646.78	-107.23	681.80	605.26	76.54	8.908	
10,600.00	10,496.83	10,541.81	10,496.83	39.59	37.61	89.56	-646.78	-107.23	681.80	604.60	77.20	8.832	
10,700.00	10,596.83	10,641.81	10,596.83	39.91	37.95	89.56	-646.78	-107.23	681.80	603.94	77.86	8.757	
10,800.00	10,696.83	10,741.81	10,696.83	40.24	38.29	89.56	-646.78	-107.23	681.80	603.28	78.52	8.683	
10,900.00	10,796.83	10,841.81	10,796.83	40.56	38.62	89.56	-646.78	-107.23	681.80	602.62	79.18	8.610	
11,000.00	10,896.83	10,941.81	10,896.83	40.89	38.96	89.56	-646.78	-107.23	681.80	601.95	79.85	8.539	
11,018.21	10,915.04	10,960.02	10,915.04	40.95	39.02	89.52	-646.36	-107.23	681.80	601.83	79.97	8.526	
11,100.00	10,996.83	11,040.39	10,994.68	41.21	39.27	88.67	-636.25	-107.32	681.88	601.39	80.49	8.472	
11,200.00	11,096.83	11,131.08	11,081.04	41.54	39.51	86.39	-609.03	-107.54	683.00	601.95	81.05	8.427	
11,300.00	11,196.43	11,212.23	11,152.73	41.85	39.69	83.71	-571.22	-107.86	686.58	605.04	81.54	8.420	
11,400.00	11,292.47	11,289.21	11,213.91	42.11	39.82	80.75	-524.63	-108.25	691.84	609.90	81.93	8.444	
11,500.00	11,380.75	11,363.25	11,264.96	42.30	39.93	78.12	-471.12	-108.69	697.91	615.69	82.23	8.488	
11,600.00	11,457.41	11,435.14	11,306.04	42.41	40.01	75.89	-412.21	-109.18	703.98	621.56	82.42	8.541	
11,700.00	11,519.12	11,505.50	11,337.25	42.45	40.07	74.14	-349.21	-109.71	709.32	626.80	82.52	8.596	
11,800.00	11,563.15	11,575.00	11,358.66	42.42	40.12	72.91	-283.16	-110.26	713.33	630.78	82.54	8.642	
11,900.00	11,587.61	11,643.55	11,370.18	42.35	40.16	72.24	-215.65	-110.82	715.60	633.09	82.51	8.673	
12,000.00	11,591.70	11,715.37	11,371.87	42.25	40.20	72.11	-143.91	-111.42	715.97	633.52	82.45	8.684	
12,100.00	11,588.60	11,815.37	11,368.77	42.16	40.30	72.11	-43.96	-112.25	715.88	633.42	82.46	8.681	
12,200.00	11,585.49	11,915.37	11,365.66	42.09	40.45	72.11	55.98	-113.08	715.80	633.26	82.54	8.672	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Anticollision Report

Company: COG Operating LLC
Project: Lea County, NM (NAD27 NME)
Reference Site: Little Bear Federal Com
Site Error: 0.00 usft
Reference Well: 8H
Well Error: 0.00 usft
Reference Wellbore: OH
Reference Design: Plan 1 04-12-18

Local Co-ordinate Reference: Well 8H
TVD Reference: RKB @ 3831.00usft (McVay 8)
MD Reference: RKB @ 3831.00usft (McVay 8)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: USA Compass
Offset TVD Reference: Offset Datum

Offset Design Little Bear Federal Com - 3H - OH - Plan 1 04-12-18

Survey Program: 0-MWD+HDGM

Offset Site Error: 0.00 usft

Offset Well Error: 0.00 usft

Reference		Offset		Semi Major Axis			Distance				Warning		
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N-S (usft)	+E-W (usft)	Between Centres (usft)	Between Ellipses (usft)		Minimum Separation (usft)	Separation Factor
12,300.00	11,582.39	12,015.37	11,362.55	42.03	40.65	72.11	155.93	-113.91	715.72	633.03	82.69	8.656	
12,400.00	11,579.28	12,115.37	11,359.45	42.00	40.91	72.10	255.88	-114.74	715.63	632.68	82.96	8.627	
12,500.00	11,576.17	12,215.37	11,356.34	42.15	41.21	72.10	355.83	-115.57	715.55	632.01	83.54	8.565	
12,600.00	11,573.07	12,315.37	11,353.24	42.48	41.56	72.10	455.78	-116.41	715.46	631.25	84.22	8.495	
12,700.00	11,569.96	12,415.37	11,350.13	42.87	41.96	72.10	555.73	-117.24	715.38	630.39	84.99	8.417	
12,800.00	11,566.86	12,515.37	11,347.02	43.31	42.41	72.09	655.67	-118.07	715.29	629.45	85.85	8.332	
12,900.00	11,563.75	12,615.37	11,343.92	43.79	42.90	72.09	755.62	-118.90	715.21	628.41	86.80	8.240	
13,000.00	11,560.64	12,715.37	11,340.81	44.30	43.43	72.09	855.57	-119.73	715.13	627.30	87.83	8.142	
13,100.00	11,557.54	12,815.37	11,337.70	44.86	44.01	72.09	955.52	-120.57	715.04	626.10	88.94	8.039	
13,200.00	11,554.43	12,915.37	11,334.60	45.45	44.62	72.09	1,055.47	-121.40	714.96	624.82	90.14	7.932	
13,300.00	11,551.32	13,015.37	11,331.49	46.08	45.27	72.08	1,155.41	-122.23	714.87	623.47	91.40	7.821	
13,400.00	11,548.22	13,115.37	11,328.39	46.74	45.96	72.08	1,255.36	-123.06	714.79	622.05	92.74	7.707	
13,500.00	11,545.11	13,215.37	11,325.28	47.44	46.68	72.08	1,355.31	-123.89	714.71	620.55	94.15	7.591	
13,600.00	11,542.01	13,315.37	11,322.17	48.17	47.43	72.08	1,455.26	-124.72	714.62	618.99	95.63	7.473	
13,700.00	11,538.90	13,415.37	11,319.07	48.93	48.22	72.07	1,555.21	-125.56	714.54	617.37	97.17	7.354	
13,800.00	11,535.79	13,515.37	11,315.96	49.72	49.04	72.07	1,655.16	-126.39	714.45	615.69	98.77	7.234	
13,900.00	11,532.69	13,615.37	11,312.86	50.54	49.88	72.07	1,755.10	-127.22	714.37	613.95	100.42	7.114	
14,000.00	11,529.58	13,715.37	11,309.75	51.38	50.75	72.07	1,855.05	-128.05	714.29	612.15	102.14	6.994	
14,100.00	11,526.47	13,815.37	11,306.64	52.25	51.65	72.07	1,955.00	-128.88	714.20	610.30	103.90	6.874	
14,200.00	11,523.37	13,915.37	11,303.54	53.14	52.57	72.06	2,054.95	-129.72	714.12	608.40	105.72	6.755	
14,300.00	11,520.26	14,015.37	11,300.43	54.06	53.52	72.06	2,154.90	-130.55	714.03	606.45	107.58	6.637	
14,400.00	11,517.16	14,115.37	11,297.32	55.00	54.48	72.06	2,254.85	-131.38	713.95	604.46	109.49	6.521	
14,500.00	11,514.05	14,215.37	11,294.22	55.96	55.47	72.06	2,354.79	-132.21	713.87	602.43	111.43	6.406	
14,600.00	11,510.94	14,315.37	11,291.11	56.94	56.48	72.05	2,454.74	-133.04	713.78	600.36	113.42	6.293	
14,700.00	11,507.84	14,415.37	11,288.01	57.94	57.51	72.05	2,554.69	-133.87	713.70	598.25	115.45	6.182	
14,800.00	11,504.73	14,515.37	11,284.90	58.96	58.55	72.05	2,654.64	-134.71	713.61	596.10	117.51	6.073	
14,900.00	11,501.63	14,615.37	11,281.79	59.99	59.61	72.05	2,754.59	-135.54	713.53	593.92	119.61	5.966	
15,000.00	11,498.52	14,715.37	11,278.69	61.05	60.69	72.05	2,854.53	-136.37	713.44	591.71	121.73	5.861	
15,100.00	11,495.41	14,815.37	11,275.58	62.11	61.78	72.04	2,954.48	-137.20	713.36	589.47	123.89	5.758	
15,200.00	11,492.31	14,915.37	11,272.48	63.20	62.88	72.04	3,054.43	-138.03	713.28	587.20	126.08	5.657	
15,300.00	11,489.20	15,015.37	11,269.37	64.29	64.00	72.04	3,154.38	-138.87	713.19	584.90	128.30	5.559	
15,400.00	11,486.09	15,115.37	11,266.26	65.40	65.14	72.04	3,254.33	-139.70	713.11	582.57	130.54	5.463	
15,500.00	11,482.99	15,215.37	11,263.16	66.52	66.28	72.04	3,354.28	-140.53	713.02	580.22	132.80	5.369	
15,600.00	11,479.88	15,315.37	11,260.05	67.66	67.44	72.03	3,454.22	-141.36	712.94	577.85	135.09	5.277	
15,700.00	11,476.78	15,415.37	11,256.94	68.80	68.60	72.03	3,554.17	-142.19	712.86	575.45	137.41	5.188	
15,800.00	11,473.67	15,515.37	11,253.84	69.96	69.78	72.03	3,654.12	-143.02	712.77	573.03	139.74	5.101	
15,900.00	11,470.56	15,615.37	11,250.73	71.13	70.97	72.03	3,754.07	-143.86	712.69	570.59	142.09	5.016	
16,000.00	11,467.46	15,715.37	11,247.63	72.30	72.16	72.02	3,854.02	-144.69	712.60	568.14	144.47	4.933	
16,100.00	11,464.35	15,815.37	11,244.52	73.49	73.37	72.02	3,953.97	-145.52	712.52	565.66	146.86	4.852	
16,200.00	11,461.24	15,915.37	11,241.41	74.69	74.58	72.02	4,053.91	-146.35	712.44	563.17	149.27	4.773	
16,300.00	11,458.14	16,015.37	11,238.31	75.89	75.80	72.02	4,153.86	-147.18	712.35	560.65	151.70	4.696	
16,400.00	11,455.03	16,115.37	11,235.20	77.10	77.03	72.02	4,253.81	-148.02	712.27	558.13	154.14	4.621	
16,500.00	11,451.93	16,215.37	11,232.09	78.32	78.27	72.01	4,353.76	-148.85	712.18	555.59	156.60	4.548	
16,600.00	11,448.82	16,315.37	11,228.99	79.55	79.52	72.01	4,453.71	-149.68	712.10	553.03	159.07	4.477	
16,700.00	11,445.71	16,415.37	11,225.88	80.79	80.77	72.01	4,553.66	-150.51	712.02	550.46	161.55	4.407	
16,800.00	11,442.61	16,515.37	11,222.78	82.03	82.02	72.01	4,653.60	-151.34	711.93	547.88	164.05	4.340	
16,900.00	11,439.50	16,615.37	11,219.67	83.28	83.29	72.00	4,753.55	-152.17	711.85	545.28	166.56	4.274	
17,000.00	11,436.40	16,715.37	11,216.56	84.53	84.56	72.00	4,853.50	-153.01	711.76	542.67	169.09	4.209	
17,100.00	11,433.29	16,815.37	11,213.46	85.79	85.83	72.00	4,953.45	-153.84	711.68	540.06	171.62	4.147	
17,200.00	11,430.18	16,915.37	11,210.35	87.06	87.11	72.00	5,053.40	-154.67	711.59	537.43	174.17	4.086	
17,300.00	11,427.08	17,015.37	11,207.25	88.33	88.40	72.00	5,153.34	-155.50	711.51	534.78	176.73	4.026	
17,400.00	11,423.97	17,115.37	11,204.14	89.61	89.69	71.99	5,253.29	-156.33	711.43	532.13	179.29	3.968	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Anticollision Report

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 8H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	RKB @ 3831.00usft (McVay 8)
Reference Site:	Little Bear Federal Com	MD Reference:	RKB @ 3831.00usft (McVay 8)
Site Error:	0.00 usft	North Reference:	Grid
Reference Well:	8H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore:	OH	Database:	USA Compass
Reference Design:	Plan 1 04-12-18	Offset TVD Reference:	Offset Datum

Offset Design: Little Bear Federal Com - 3H - OH - Plan 1 04-12-18													Offset Site Error: 0.00 usft
Survey Program: 0-MWD+HDGM													Offset Well Error: 0.00 usft
Reference		Offset		Semi Major Axis		Highside Toolface (°)	Distance		Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	Warning
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)		Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)					
17,500.00	11,420.86	17,215.37	11,201.03	90.89	90.98	71.99	5,353.24	-157.17	711.34	529.47	181.87	3.911	
17,600.00	11,417.76	17,315.37	11,197.93	92.17	92.28	71.99	5,453.19	-158.00	711.26	526.80	184.45	3.856	
17,700.00	11,414.65	17,415.37	11,194.82	93.47	93.58	71.99	5,553.14	-158.83	711.17	524.12	187.05	3.802	
17,800.00	11,411.55	17,515.37	11,191.71	94.76	94.89	71.98	5,653.09	-159.66	711.09	521.44	189.65	3.749	
17,900.00	11,408.44	17,615.37	11,188.61	96.06	96.20	71.98	5,753.03	-160.49	711.01	518.74	192.26	3.698	
18,000.00	11,405.33	17,715.37	11,185.50	97.36	97.52	71.98	5,852.98	-161.32	710.92	516.04	194.88	3.648	
18,100.00	11,402.23	17,815.37	11,182.40	98.67	98.84	71.98	5,952.93	-162.16	710.84	513.33	197.51	3.599	
18,200.00	11,399.12	17,915.37	11,179.29	99.98	100.16	71.98	6,052.88	-162.99	710.75	510.61	200.14	3.551	
18,300.00	11,396.02	18,015.37	11,176.18	101.30	101.48	71.97	6,152.83	-163.82	710.67	507.89	202.78	3.505	
18,400.00	11,392.91	18,115.37	11,173.08	102.62	102.81	71.97	6,252.78	-164.65	710.59	505.15	205.43	3.459	
18,500.00	11,389.80	18,215.37	11,169.97	103.94	104.15	71.97	6,352.72	-165.48	710.50	502.42	208.09	3.414	
18,600.00	11,386.70	18,315.37	11,166.86	105.27	105.48	71.97	6,452.67	-166.32	710.42	499.67	210.75	3.371	
18,700.00	11,383.59	18,415.37	11,163.76	106.59	106.82	71.96	6,552.62	-167.15	710.33	496.92	213.41	3.328	
18,800.00	11,380.48	18,515.37	11,160.65	107.92	108.16	71.96	6,652.57	-167.98	710.25	494.17	216.08	3.287	
18,900.00	11,377.38	18,615.37	11,157.55	109.26	109.50	71.96	6,752.52	-168.81	710.17	491.40	218.76	3.246	
19,000.00	11,374.27	18,715.37	11,154.44	110.60	110.85	71.96	6,852.46	-169.64	710.08	488.64	221.44	3.207	
19,100.00	11,371.17	18,815.37	11,151.33	111.94	112.20	71.96	6,952.41	-170.48	710.00	485.87	224.13	3.168	
19,169.71	11,369.00	18,885.08	11,149.17	112.87	113.14	71.95	7,022.09	-171.05	709.94	483.93	226.01	3.141	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Anticollision Report

Company: COG Operating LLC
Project: Lea County, NM (NAD27 NME)
Reference Site: Little Bear Federal Com
Site Error: 0.00 usft
Reference Well: 8H
Well Error: 0.00 usft
Reference Wellbore: OH
Reference Design: Plan 1 04-12-18

Local Co-ordinate Reference: Well 8H
TVD Reference: RKB @ 3831.00usft (McVay 8)
MD Reference: RKB @ 3831.00usft (McVay 8)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at 2.00 sigma
Database: USA Compass
Offset TVD Reference: Offset Datum

Offset Design Little Bear Federal Com - 4H - OH - Plan 1 04-12-18														Offset Site Error:	0.00 usft
Survey Program: 0-MWD+HDGM														Offset Well Error:	0.00 usft
Reference		Offset		Semi Major Axis		Highside Toolface (°)	Offset Wellbore Centre		Distance		Minimum Separation (usft)	Separation Factor	Warning		
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)		+N-S (usft)	+E-W (usft)	Between Centres (usft)	Between Ellipses (usft)					
0.00	0.00	0.00	0.00	0.00	0.00	-99.52	-327.00	-1,950.40	1,977.62						
100.00	100.00	97.00	97.00	0.13	0.13	-99.52	-327.00	-1,950.40	1,977.62	1,977.36	0.26	7,469.280			
200.00	200.00	197.00	197.00	0.49	0.48	-99.52	-327.00	-1,950.40	1,977.62	1,976.65	0.98	2,028.241			
300.00	300.00	297.00	297.00	0.85	0.84	-99.52	-327.00	-1,950.40	1,977.62	1,975.93	1.69	1,168.817			
400.00	400.00	397.00	397.00	1.21	1.20	-99.52	-327.00	-1,950.40	1,977.62	1,975.21	2.41	820.955			
500.00	500.00	497.00	497.00	1.57	1.56	-99.52	-327.00	-1,950.40	1,977.62	1,974.50	3.13	632.663			
600.00	600.00	597.00	597.00	1.92	1.92	-99.52	-327.00	-1,950.40	1,977.62	1,973.78	3.84	514.628			
700.00	700.00	697.00	697.00	2.28	2.28	-99.52	-327.00	-1,950.40	1,977.62	1,973.06	4.56	433.712			
800.00	800.00	797.00	797.00	2.64	2.63	-99.52	-327.00	-1,950.40	1,977.62	1,972.35	5.28	374.784			
900.00	900.00	897.00	897.00	3.00	2.99	-99.52	-327.00	-1,950.40	1,977.62	1,971.63	5.99	329.953			
1,000.00	1,000.00	997.00	997.00	3.36	3.35	-99.52	-327.00	-1,950.40	1,977.62	1,970.91	6.71	294.702			
1,100.00	1,100.00	1,097.00	1,097.00	3.72	3.71	-99.52	-327.00	-1,950.40	1,977.62	1,970.19	7.43	266.256			
1,200.00	1,200.00	1,197.00	1,197.00	4.08	4.07	-99.52	-327.00	-1,950.40	1,977.62	1,969.48	8.14	242.818			
1,300.00	1,300.00	1,297.00	1,297.00	4.43	4.43	-99.52	-327.00	-1,950.40	1,977.62	1,968.76	8.86	223.172			
1,400.00	1,400.00	1,397.00	1,397.00	4.79	4.79	-99.52	-327.00	-1,950.40	1,977.62	1,968.04	9.58	206.468			
1,500.00	1,500.00	1,497.00	1,497.00	5.15	5.14	-99.52	-327.00	-1,950.40	1,977.62	1,967.33	10.30	192.090			
1,600.00	1,600.00	1,597.00	1,597.00	5.51	5.50	-99.52	-327.00	-1,950.40	1,977.62	1,966.61	11.01	179.584			
1,700.00	1,700.00	1,697.00	1,697.00	5.87	5.86	-99.52	-327.00	-1,950.40	1,977.62	1,965.89	11.73	168.607			
1,800.00	1,800.00	1,797.00	1,797.00	6.23	6.22	-99.52	-327.00	-1,950.40	1,977.62	1,965.18	12.45	158.895			
1,900.00	1,900.00	1,897.00	1,897.00	6.59	6.58	-99.52	-327.00	-1,950.40	1,977.62	1,964.46	13.16	150.240			
2,000.00	2,000.00	1,997.00	1,997.00	6.94	6.94	-99.52	-327.00	-1,950.40	1,977.62	1,963.74	13.88	142.480			
2,100.00	2,100.00	2,097.00	2,097.00	7.30	7.29	-99.52	-327.00	-1,950.40	1,977.62	1,963.03	14.60	135.482			
2,200.00	2,200.00	2,197.00	2,197.00	7.66	7.65	-99.52	-327.00	-1,950.40	1,977.62	1,962.31	15.31	129.139			
2,300.00	2,300.00	2,297.00	2,297.00	8.02	8.01	-99.52	-327.00	-1,950.40	1,977.62	1,961.59	16.03	123.364			
2,400.00	2,400.00	2,397.00	2,397.00	8.38	8.37	-99.52	-327.00	-1,950.40	1,977.62	1,960.87	16.75	118.083			
2,500.00	2,500.00	2,497.00	2,497.00	8.74	8.73	-99.52	-327.00	-1,950.40	1,977.62	1,960.16	17.46	113.235			
2,600.00	2,599.98	2,695.90	2,695.75	9.08	9.40	30.01	-330.68	-1,944.81	1,973.68	1,955.20	18.48	106.781			
2,700.00	2,699.84	2,895.28	2,894.02	9.41	10.08	29.87	-341.97	-1,927.66	1,961.62	1,942.13	19.49	100.654			
2,800.00	2,799.45	2,995.90	2,993.67	9.75	10.42	29.89	-349.67	-1,915.97	1,943.96	1,923.79	20.17	96.379			
2,900.00	2,898.70	3,093.69	3,090.51	10.08	10.77	30.00	-357.15	-1,904.60	1,923.34	1,902.49	20.85	92.249			
3,000.00	2,997.47	3,190.85	3,186.72	10.43	11.11	30.19	-364.58	-1,893.31	1,899.77	1,878.24	21.54	88.213			
3,099.96	3,095.58	3,287.23	3,282.17	10.78	11.45	30.47	-371.96	-1,882.10	1,873.30	1,851.07	22.23	84.264			
3,200.00	3,193.44	3,383.29	3,377.29	11.14	11.80	30.50	-379.31	-1,870.94	1,845.35	1,822.41	22.94	80.451			
3,300.00	3,291.25	3,479.30	3,472.37	11.51	12.15	30.54	-386.65	-1,859.78	1,817.42	1,793.76	23.65	76.834			
3,400.00	3,389.07	3,575.32	3,567.45	11.88	12.50	30.57	-394.00	-1,848.62	1,789.48	1,765.10	24.38	73.401			
3,500.00	3,486.88	3,671.33	3,662.53	12.26	12.85	30.60	-401.35	-1,837.46	1,761.55	1,736.43	25.11	70.143			
3,600.00	3,584.70	3,767.35	3,757.61	12.65	13.21	30.64	-408.69	-1,826.30	1,733.62	1,707.76	25.86	67.049			
3,700.00	3,682.51	3,863.36	3,852.89	13.04	13.57	30.68	-416.04	-1,815.14	1,705.68	1,679.08	26.61	64.111			
3,800.00	3,780.33	3,959.37	3,947.77	13.43	13.93	30.71	-423.39	-1,803.98	1,677.75	1,650.39	27.36	61.319			
3,900.00	3,878.14	4,055.39	4,042.85	13.83	14.29	30.75	-430.73	-1,792.82	1,649.82	1,621.70	28.12	58.665			
4,000.00	3,975.96	4,151.40	4,137.93	14.24	14.65	30.79	-438.08	-1,781.66	1,621.89	1,593.00	28.89	56.140			
4,100.00	4,073.77	4,247.42	4,233.01	14.65	15.02	30.83	-445.42	-1,770.50	1,593.96	1,564.30	29.66	53.737			
4,200.00	4,171.59	4,343.43	4,328.09	15.06	15.38	30.88	-452.77	-1,759.34	1,566.03	1,535.59	30.44	51.448			
4,300.00	4,269.40	4,439.44	4,423.17	15.47	15.75	30.92	-460.12	-1,748.18	1,538.11	1,506.88	31.22	49.266			
4,400.00	4,367.22	4,535.46	4,518.25	15.89	16.12	30.97	-467.46	-1,737.02	1,510.18	1,478.17	32.01	47.184			
4,500.00	4,465.03	4,631.47	4,613.33	16.31	16.49	31.02	-474.81	-1,725.86	1,482.25	1,449.46	32.80	45.197			
4,600.00	4,562.85	4,727.49	4,708.41	16.73	16.86	31.07	-482.16	-1,714.70	1,454.33	1,420.74	33.59	43.299			
4,700.00	4,660.66	4,823.50	4,803.49	17.15	17.23	31.12	-489.50	-1,703.54	1,426.40	1,392.02	34.38	41.485			
4,800.00	4,758.48	4,919.51	4,898.57	17.58	17.60	31.17	-496.85	-1,692.38	1,398.48	1,363.30	35.18	39.750			
4,900.00	4,856.29	5,015.53	4,993.65	18.01	17.97	31.23	-504.19	-1,681.22	1,370.56	1,334.58	35.98	38.089			
5,000.00	4,954.11	5,111.54	5,088.73	18.44	18.35	31.29	-511.54	-1,670.06	1,342.64	1,305.85	36.79	36.497			
5,100.00	5,051.92	5,207.56	5,183.81	18.87	18.72	31.35	-518.89	-1,658.90	1,314.72	1,277.13	37.59	34.972			

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Anticollision Report

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Project: Lea County, NM (NAD27 NME)
Reference Site: Little Bear Federal Com
Site Error: 0.00 usft
Reference Well: 8H
Well Error: 0.00 usft
Reference Wellbore: OH
Reference Design: Plan 1 04-12-18

Local Co-ordinate Reference: Well 8H
TVD Reference: RKB @ 3831.00usft (McVay 8)
MD Reference: RKB @ 3831.00usft (McVay 8)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at 2.00 sigma
Database: USA Compass
Offset TVD Reference: Offset Datum

Offset Design Little Bear Federal Com - 4H - OH - Plan 1 04-12-18													Offset Site Error:	0.00 usft
Survey Program: 0-MWD+HDGM													Offset Well Error:	0.00 usft
Reference		Offset		Semi Major Axis			Distance							Warning
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	Offset Wellbore Centre +E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor		
5,200.00	5,149.74	5,303.57	5,278.89	19.30	19.10	31.41	-526.23	-1,647.74	1,286.80	1,248.40	38.40	33.508		
5,300.00	5,247.56	5,399.58	5,373.97	19.74	19.48	31.48	-533.58	-1,636.58	1,258.89	1,219.67	39.21	32.103		
5,400.00	5,345.37	5,495.60	5,469.05	20.17	19.85	31.55	-540.93	-1,625.42	1,230.97	1,190.95	40.03	30.754		
5,500.00	5,443.19	5,591.61	5,564.13	20.61	20.23	31.62	-548.27	-1,614.26	1,203.06	1,162.22	40.84	29.457		
5,600.00	5,541.00	5,687.63	5,659.21	21.05	20.61	31.70	-555.62	-1,603.10	1,175.15	1,133.49	41.66	28.210		
5,700.00	5,638.82	5,783.64	5,754.29	21.49	20.99	31.78	-562.96	-1,591.94	1,147.24	1,104.77	42.48	27.010		
5,800.00	5,736.63	5,879.65	5,849.37	21.93	21.37	31.86	-570.31	-1,580.78	1,119.34	1,076.04	43.30	25.854		
5,900.00	5,834.45	5,975.67	5,944.45	22.37	21.74	31.95	-577.66	-1,569.62	1,091.43	1,047.31	44.12	24.740		
6,000.00	5,932.26	6,071.68	6,039.53	22.81	22.12	32.04	-585.00	-1,558.46	1,063.53	1,018.59	44.94	23.666		
6,100.00	6,030.08	6,167.70	6,134.61	23.26	22.51	32.14	-592.35	-1,547.31	1,035.63	989.87	45.76	22.631		
6,200.00	6,127.89	6,263.71	6,229.68	23.70	22.89	32.24	-599.70	-1,536.15	1,007.73	961.15	46.59	21.631		
6,300.00	6,225.71	6,359.72	6,324.76	24.15	23.27	32.35	-607.04	-1,524.99	979.84	932.43	47.41	20.666		
6,400.00	6,323.52	6,455.74	6,419.84	24.59	23.65	32.47	-614.39	-1,513.83	951.95	903.71	48.24	19.733		
6,500.00	6,421.34	6,551.75	6,514.92	25.04	24.03	32.59	-621.74	-1,502.67	924.07	875.00	49.07	18.832		
6,600.00	6,519.15	6,647.77	6,610.00	25.49	24.41	32.72	-629.08	-1,491.51	896.19	846.29	49.90	17.960		
6,700.00	6,616.97	6,743.78	6,705.08	25.93	24.80	32.86	-636.43	-1,480.35	868.31	817.58	50.73	17.117		
6,800.00	6,714.78	6,835.06	6,795.49	26.38	25.16	33.00	-643.37	-1,469.80	840.51	788.97	51.54	16.308		
6,900.00	6,812.60	6,914.18	6,874.05	26.83	25.47	33.21	-648.50	-1,462.00	814.19	761.90	52.30	15.569		
7,000.00	6,910.41	7,000.00	6,959.52	27.28	25.79	33.57	-652.73	-1,455.59	789.96	736.89	53.07	14.885		
7,100.00	7,008.23	7,074.52	7,033.90	27.73	26.06	34.00	-655.25	-1,451.76	767.80	714.01	53.79	14.274		
7,200.00	7,106.04	7,155.51	7,114.84	28.18	26.34	34.59	-656.78	-1,449.43	747.87	693.35	54.52	13.716		
7,300.00	7,203.86	7,241.53	7,200.86	28.63	26.63	35.37	-657.11	-1,448.94	730.15	674.89	55.27	13.212		
7,400.00	7,301.67	7,339.35	7,298.67	29.08	26.96	36.33	-657.11	-1,448.94	713.18	657.14	56.04	12.727		
7,500.00	7,399.70	7,437.38	7,396.70	29.53	27.28	37.13	-657.11	-1,448.94	697.26	640.45	56.80	12.275		
7,600.00	7,498.35	7,536.02	7,495.35	29.95	27.60	37.80	-657.11	-1,448.94	684.20	626.64	57.55	11.888		
7,700.00	7,597.50	7,635.18	7,594.50	30.35	27.93	38.34	-657.11	-1,448.94	673.99	615.71	58.28	11.565		
7,800.00	7,697.05	7,734.73	7,694.05	30.72	28.26	38.75	-657.11	-1,448.94	666.59	607.60	58.99	11.301		
7,900.00	7,796.87	7,834.54	7,793.87	31.08	28.59	39.01	-657.11	-1,448.94	661.93	602.26	59.67	11.093		
8,000.00	7,896.83	7,934.51	7,893.83	31.41	28.92	39.13	-657.11	-1,448.94	660.01	599.67	60.33	10.939		
8,082.79	7,979.62	8,017.29	7,976.62	31.66	29.20	39.14	-657.11	-1,448.94	659.73	598.87	60.86	10.840 CC		
8,100.00	7,996.83	8,034.51	7,993.83	31.71	29.26	-90.44	-657.11	-1,448.94	659.94	598.97	60.97	10.824		
8,200.00	8,096.83	8,134.51	8,093.83	32.02	29.59	-90.44	-657.11	-1,448.94	659.94	598.34	61.61	10.712		
8,300.00	8,196.83	8,234.51	8,193.83	32.32	29.92	-90.44	-657.11	-1,448.94	659.94	597.70	62.25	10.602		
8,400.00	8,296.83	8,334.51	8,293.83	32.63	30.26	-90.44	-657.11	-1,448.94	659.94	597.06	62.89	10.494		
8,500.00	8,396.83	8,434.51	8,393.83	32.94	30.59	-90.44	-657.11	-1,448.94	659.94	596.41	63.53	10.388		
8,600.00	8,496.83	8,534.51	8,493.83	33.24	30.93	-90.44	-657.11	-1,448.94	659.94	595.77	64.17	10.284		
8,700.00	8,596.83	8,634.51	8,593.83	33.55	31.27	-90.44	-657.11	-1,448.94	659.94	595.13	64.82	10.181		
8,800.00	8,696.83	8,734.51	8,693.83	33.86	31.60	-90.44	-657.11	-1,448.94	659.94	594.48	65.47	10.081		
8,900.00	8,796.83	8,834.51	8,793.83	34.17	31.94	-90.44	-657.11	-1,448.94	659.94	593.83	66.11	9.982		
9,000.00	8,896.83	8,934.51	8,893.83	34.49	32.28	-90.44	-657.11	-1,448.94	659.94	593.18	66.76	9.885		
9,100.00	8,996.83	9,034.51	8,993.83	34.80	32.62	-90.44	-657.11	-1,448.94	659.94	592.53	67.42	9.789		
9,200.00	9,096.83	9,134.51	9,093.83	35.11	32.95	-90.44	-657.11	-1,448.94	659.94	591.88	68.07	9.695		
9,300.00	9,196.83	9,234.51	9,193.83	35.43	33.29	-90.44	-657.11	-1,448.94	659.94	591.22	68.72	9.603		
9,400.00	9,296.83	9,334.51	9,293.83	35.74	33.63	-90.44	-657.11	-1,448.94	659.94	590.57	69.38	9.513		
9,500.00	9,396.83	9,434.51	9,393.83	36.06	33.97	-90.44	-657.11	-1,448.94	659.94	589.91	70.03	9.423		
9,600.00	9,496.83	9,534.51	9,493.83	36.38	34.31	-90.44	-657.11	-1,448.94	659.94	589.26	70.69	9.336		
9,700.00	9,596.83	9,634.51	9,593.83	36.69	34.65	-90.44	-657.11	-1,448.94	659.94	588.60	71.35	9.250		
9,800.00	9,696.83	9,734.51	9,693.83	37.01	34.99	-90.44	-657.11	-1,448.94	659.94	587.94	72.01	9.165		
9,900.00	9,796.83	9,834.51	9,793.83	37.33	35.34	-90.44	-657.11	-1,448.94	659.94	587.28	72.67	9.082		
10,000.00	9,896.83	9,934.51	9,893.83	37.65	35.68	-90.44	-657.11	-1,448.94	659.94	586.62	73.33	9.000		
10,100.00	9,996.83	10,034.51	9,993.83	37.97	36.02	-90.44	-657.11	-1,448.94	659.94	585.95	73.99	8.919		
10,200.00	10,096.83	10,134.51	10,093.83	38.29	36.36	-90.44	-657.11	-1,448.94	659.94	585.29	74.66	8.840		

CC - Min centre to center distance or covergent point, SF - min separation factor, ES - min ellipse separation

Anticollision Report

Company: COG Operating LLC
Project: Lea County, NM (NAD27 NME)
Reference Site: Little Bear Federal Com
Site Error: 0.00 usft
Reference Well: 8H
Well Error: 0.00 usft
Reference Wellbore: OH
Reference Design: Plan 1 04-12-18

Local Co-ordinate Reference: Well 8H
TVD Reference: RKB @ 3831.00usft (McVay 8)
MD Reference: RKB @ 3831.00usft (McVay 8)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: USA Compass
Offset TVD Reference: Offset Datum

Offset Design Little Bear Federal Com - 4H - OH - Plan 1 04-12-18													Offset Site Error:	0.00 usft
Survey Program: 0-MWD+HDGM													Offset Well Error:	0.00 usft
Reference		Offset		Semi Major Axis			Distance							Warning
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N-S (usft)	+E-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor		
10,300.00	10,196.83	10,234.51	10,193.83	38.62	36.70	-90.44	-657.11	-1,448.94	659.94	584.62	75.32	8.762		
10,400.00	10,296.83	10,334.51	10,293.83	38.94	37.05	-90.44	-657.11	-1,448.94	659.94	583.96	75.99	8.685		
10,500.00	10,396.83	10,434.51	10,393.83	39.26	37.39	-90.44	-657.11	-1,448.94	659.94	583.29	76.65	8.610		
10,600.00	10,496.83	10,534.51	10,493.83	39.59	37.73	-90.44	-657.11	-1,448.94	659.94	582.63	77.32	8.535		
10,700.00	10,596.83	10,634.51	10,593.83	39.91	38.08	-90.44	-657.11	-1,448.94	659.94	581.96	77.99	8.462		
10,800.00	10,696.83	10,734.51	10,693.83	40.24	38.42	-90.44	-657.11	-1,448.94	659.94	581.29	78.66	8.390		
10,900.00	10,796.83	10,834.51	10,793.83	40.56	38.77	-90.44	-657.11	-1,448.94	659.94	580.62	79.33	8.319		
11,000.00	10,896.83	10,934.51	10,893.83	40.89	39.11	-90.44	-657.11	-1,448.94	659.94	579.95	80.00	8.250		
11,018.77	10,915.60	10,953.28	10,912.60	40.95	39.17	-90.43	-656.94	-1,448.94	659.94	579.82	80.12	8.237		
11,100.00	10,996.83	11,033.36	10,992.11	41.21	39.44	-89.66	-648.15	-1,449.00	660.01	579.35	80.65	8.183		
11,200.00	11,096.83	11,125.00	11,079.79	41.54	39.71	-87.40	-621.99	-1,449.20	661.02	579.77	81.25	8.136		
11,300.00	11,196.43	11,207.03	11,152.77	41.85	39.91	-83.85	-584.75	-1,449.47	664.40	582.64	81.77	8.126		
11,400.00	11,292.47	11,284.99	11,215.26	42.11	40.07	-80.88	-538.29	-1,449.82	669.45	587.27	82.18	8.146		
11,500.00	11,380.75	11,359.95	11,267.46	42.30	40.18	-78.24	-484.60	-1,450.22	675.33	592.86	82.47	8.188		
11,600.00	11,457.41	11,432.73	11,309.50	42.41	40.25	-76.00	-425.29	-1,450.66	681.24	598.58	82.66	8.242		
11,700.00	11,519.12	11,503.94	11,341.46	42.45	40.28	-74.24	-361.72	-1,451.13	686.46	603.73	82.73	8.297		
11,800.00	11,563.15	11,575.00	11,363.57	42.42	40.29	-73.00	-294.26	-1,451.64	690.41	607.69	82.72	8.347		
11,900.00	11,587.61	11,643.63	11,375.21	42.35	40.29	-72.33	-226.69	-1,452.14	692.68	610.04	82.64	8.382		
12,000.00	11,591.70	11,715.86	11,376.97	42.25	40.28	-72.20	-154.54	-1,452.68	693.12	610.59	82.53	8.399		
12,100.00	11,588.60	11,815.86	11,373.72	42.16	40.36	-72.19	-54.60	-1,453.42	693.16	610.59	82.57	8.394		
12,200.00	11,585.49	11,915.86	11,370.48	42.09	40.59	-72.18	45.35	-1,454.17	693.20	610.48	82.73	8.380		
12,300.00	11,582.39	12,015.86	11,367.23	42.03	40.88	-72.17	145.29	-1,454.91	693.25	610.31	82.94	8.358		
12,400.00	11,579.28	12,115.86	11,363.99	42.00	41.21	-72.16	245.24	-1,455.65	693.29	610.02	83.28	8.325		
12,500.00	11,576.17	12,215.86	11,360.74	42.15	41.59	-72.15	345.18	-1,456.40	693.34	609.41	83.92	8.262		
12,600.00	11,573.07	12,315.86	11,357.50	42.48	42.02	-72.14	445.12	-1,457.14	693.38	608.71	84.66	8.190		
12,700.00	11,569.96	12,415.86	11,354.25	42.87	42.49	-72.13	545.07	-1,457.89	693.42	607.92	85.50	8.110		
12,800.00	11,566.86	12,515.86	11,351.00	43.31	43.00	-72.12	645.01	-1,458.63	693.47	607.04	86.43	8.024		
12,900.00	11,563.75	12,615.86	11,347.76	43.79	43.55	-72.10	744.96	-1,459.38	693.51	606.07	87.44	7.931		
13,000.00	11,560.64	12,715.86	11,344.51	44.30	44.14	-72.09	844.90	-1,460.12	693.55	605.02	88.53	7.834		
13,100.00	11,557.54	12,815.86	11,341.27	44.86	44.77	-72.08	944.85	-1,460.86	693.60	603.90	89.70	7.732		
13,200.00	11,554.43	12,915.86	11,338.02	45.45	45.43	-72.07	1,044.79	-1,461.61	693.64	602.70	90.95	7.627		
13,300.00	11,551.32	13,015.86	11,334.78	46.08	46.13	-72.06	1,144.74	-1,462.35	693.68	601.42	92.26	7.519		
13,400.00	11,548.22	13,115.86	11,331.53	46.74	46.87	-72.05	1,244.68	-1,463.10	693.73	600.08	93.65	7.408		
13,500.00	11,545.11	13,215.86	11,328.28	47.44	47.63	-72.04	1,344.62	-1,463.84	693.77	598.67	95.10	7.295		
13,600.00	11,542.01	13,315.86	11,325.04	48.17	48.43	-72.03	1,444.57	-1,464.59	693.82	597.20	96.62	7.181		
13,700.00	11,538.90	13,415.86	11,321.79	48.93	49.26	-72.02	1,544.51	-1,465.33	693.86	595.66	98.20	7.066		
13,800.00	11,535.79	13,515.86	11,318.55	49.72	50.11	-72.01	1,644.46	-1,466.07	693.90	594.07	99.84	6.950		
13,900.00	11,532.69	13,615.86	11,315.30	50.54	50.99	-72.00	1,744.40	-1,466.82	693.95	592.42	101.53	6.835		
14,000.00	11,529.58	13,715.86	11,312.06	51.38	51.90	-71.98	1,844.35	-1,467.56	693.99	590.72	103.27	6.720		
14,100.00	11,526.47	13,815.86	11,308.81	52.25	52.82	-71.97	1,944.29	-1,468.31	694.04	588.96	105.07	6.605		
14,200.00	11,523.37	13,915.86	11,305.56	53.14	53.78	-71.96	2,044.24	-1,469.05	694.08	587.16	106.92	6.492		
14,300.00	11,520.26	14,015.86	11,302.32	54.06	54.75	-71.95	2,144.18	-1,469.80	694.12	585.32	108.81	6.379		
14,400.00	11,517.16	14,115.86	11,299.07	55.00	55.74	-71.94	2,244.12	-1,470.54	694.17	583.43	110.74	6.268		
14,500.00	11,514.05	14,215.86	11,295.83	55.96	56.76	-71.93	2,344.07	-1,471.28	694.21	581.50	112.72	6.159		
14,600.00	11,510.94	14,315.86	11,292.58	56.94	57.79	-71.92	2,444.01	-1,472.03	694.26	579.53	114.73	6.051		
14,700.00	11,507.84	14,415.86	11,289.34	57.94	58.83	-71.91	2,543.96	-1,472.77	694.30	577.53	116.78	5.946		
14,800.00	11,504.73	14,515.86	11,286.09	58.96	59.90	-71.90	2,643.90	-1,473.52	694.35	575.49	118.86	5.842		
14,900.00	11,501.63	14,615.86	11,282.84	59.99	60.98	-71.89	2,743.85	-1,474.26	694.39	573.42	120.97	5.740		
15,000.00	11,498.52	14,715.86	11,279.60	61.05	62.07	-71.87	2,843.79	-1,475.01	694.43	571.31	123.12	5.640		
15,100.00	11,495.41	14,815.86	11,276.35	62.11	63.18	-71.86	2,943.74	-1,475.75	694.48	569.18	125.30	5.543		
15,200.00	11,492.31	14,915.86	11,273.11	63.20	64.31	-71.85	3,043.68	-1,476.49	694.52	567.02	127.50	5.447		
15,300.00	11,489.20	15,015.86	11,269.86	64.29	65.44	-71.84	3,143.62	-1,477.24	694.57	564.83	129.73	5.354		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Anticollision Report

Company: COG Operating LLC
Project: Lea County, NM (NAD27 NME)
Reference Site: Little Bear Federal Com
Site Error: 0.00 usft
Reference Well: 8H
Well Error: 0.00 usft
Reference Wellbore: OH
Reference Design: Plan 1 04-12-18

Local Co-ordinate Reference: Well 8H
TVD Reference: RKB @ 3831.00usft (McVay 8)
MD Reference: RKB @ 3831.00usft (McVay 8)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: USA Compass
Offset TVD Reference: Offset Datum

Offset Design Little Bear Federal Com - 4H - OH - Plan 1 04-12-18													Offset Site Error:	0.00 usft
Survey Program: 0-MWD+HDGM													Offset Well Error:	0.00 usft
Reference		Offset		Semi Major Axis			Distance							Warning
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N-S (usft)	+E-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor		
15,400.00	11,486.09	15,115.86	11,266.62	65.40	66.59	-71.83	3,243.57	-1,477.98	694.61	562.62	131.99	5.263		
15,500.00	11,482.99	15,215.86	11,263.37	66.52	67.75	-71.82	3,343.51	-1,478.73	694.66	560.39	134.27	5.174		
15,600.00	11,479.88	15,315.86	11,260.12	67.66	68.92	-71.81	3,443.46	-1,479.47	694.70	558.13	136.57	5.087		
15,700.00	11,476.78	15,415.86	11,256.88	68.80	70.10	-71.80	3,543.40	-1,480.22	694.74	555.85	138.90	5.002		
15,800.00	11,473.67	15,515.86	11,253.63	69.96	71.28	-71.79	3,643.35	-1,480.96	694.79	553.54	141.24	4.919		
15,900.00	11,470.56	15,615.86	11,250.39	71.13	72.48	-71.78	3,743.29	-1,481.70	694.83	551.22	143.61	4.838		
16,000.00	11,467.46	15,715.86	11,247.14	72.30	73.69	-71.77	3,843.24	-1,482.45	694.88	548.88	145.99	4.760		
16,100.00	11,464.35	15,815.86	11,243.90	73.49	74.91	-71.75	3,943.18	-1,483.19	694.92	546.53	148.40	4.683		
16,200.00	11,461.24	15,915.86	11,240.65	74.69	76.13	-71.74	4,043.12	-1,483.94	694.97	544.15	150.82	4.608		
16,300.00	11,458.14	16,015.86	11,237.40	75.89	77.36	-71.73	4,143.07	-1,484.68	695.01	541.76	153.25	4.535		
16,400.00	11,455.03	16,115.86	11,234.16	77.10	78.60	-71.72	4,243.01	-1,485.43	695.06	539.35	155.70	4.464		
16,500.00	11,451.93	16,215.86	11,230.91	78.32	79.84	-71.71	4,342.96	-1,486.17	695.10	536.93	158.17	4.395		
16,600.00	11,448.82	16,315.86	11,227.67	79.55	81.10	-71.70	4,442.90	-1,486.91	695.15	534.50	160.65	4.327		
16,700.00	11,445.71	16,415.86	11,224.42	80.79	82.35	-71.69	4,542.85	-1,487.66	695.19	532.05	163.14	4.261		
16,800.00	11,442.61	16,515.86	11,221.18	82.03	83.62	-71.68	4,642.79	-1,488.40	695.24	529.59	165.65	4.197		
16,900.00	11,439.50	16,615.86	11,217.93	83.28	84.89	-71.67	4,742.74	-1,489.15	695.28	527.11	168.17	4.135		
17,000.00	11,436.40	16,715.86	11,214.68	84.53	86.16	-71.66	4,842.68	-1,489.89	695.32	524.63	170.70	4.073		
17,100.00	11,433.29	16,815.86	11,211.44	85.79	87.44	-71.65	4,942.62	-1,490.64	695.37	522.13	173.24	4.014		
17,200.00	11,430.18	16,915.86	11,208.19	87.06	88.73	-71.63	5,042.57	-1,491.38	695.41	519.63	175.79	3.956		
17,300.00	11,427.08	17,015.86	11,204.95	88.33	90.02	-71.62	5,142.51	-1,492.12	695.46	517.11	178.35	3.899		
17,400.00	11,423.97	17,115.86	11,201.70	89.61	91.32	-71.61	5,242.46	-1,492.87	695.50	514.58	180.92	3.844		
17,500.00	11,420.86	17,215.86	11,198.45	90.89	92.62	-71.60	5,342.40	-1,493.61	695.55	512.04	183.50	3.790		
17,600.00	11,417.76	17,315.86	11,195.21	92.17	93.92	-71.59	5,442.35	-1,494.36	695.59	509.50	186.09	3.738		
17,700.00	11,414.65	17,415.86	11,191.96	93.47	95.23	-71.58	5,542.29	-1,495.10	695.64	506.95	188.69	3.687		
17,800.00	11,411.55	17,515.86	11,188.72	94.76	96.54	-71.57	5,642.24	-1,495.85	695.68	504.38	191.30	3.637		
17,900.00	11,408.44	17,615.86	11,185.47	96.06	97.85	-71.56	5,742.18	-1,496.59	695.73	501.81	193.92	3.588		
18,000.00	11,405.33	17,715.86	11,182.23	97.36	99.17	-71.55	5,842.12	-1,497.33	695.77	499.23	196.54	3.540		
18,100.00	11,402.23	17,815.86	11,178.98	98.67	100.50	-71.54	5,942.07	-1,498.08	695.82	496.65	199.17	3.494		
18,200.00	11,399.12	17,915.86	11,175.73	99.98	101.82	-71.53	6,042.01	-1,498.82	695.86	494.06	201.81	3.448		
18,300.00	11,396.02	18,015.86	11,172.49	101.30	103.15	-71.52	6,141.96	-1,499.57	695.91	491.46	204.45	3.404		
18,400.00	11,392.91	18,115.86	11,169.24	102.62	104.48	-71.50	6,241.90	-1,500.31	695.95	488.85	207.10	3.360		
18,500.00	11,389.80	18,215.86	11,166.00	103.94	105.82	-71.49	6,341.85	-1,501.06	696.00	486.24	209.76	3.318		
18,600.00	11,386.70	18,315.86	11,162.75	105.27	107.16	-71.48	6,441.79	-1,501.80	696.04	483.62	212.42	3.277		
18,700.00	11,383.59	18,415.86	11,159.51	106.59	108.50	-71.47	6,541.74	-1,502.54	696.09	481.00	215.09	3.236		
18,800.00	11,380.48	18,515.86	11,156.26	107.92	109.84	-71.46	6,641.68	-1,503.29	696.13	478.37	217.77	3.197		
18,900.00	11,377.38	18,615.86	11,153.01	109.26	111.19	-71.45	6,741.62	-1,504.03	696.18	475.73	220.45	3.158		
19,000.00	11,374.27	18,715.86	11,149.77	110.60	112.54	-71.44	6,841.57	-1,504.78	696.23	473.09	223.13	3.120		
19,100.00	11,371.17	18,815.86	11,146.52	111.94	113.89	-71.43	6,941.51	-1,505.52	696.27	470.45	225.82	3.083		
19,169.71	11,369.00	18,885.57	11,144.26	112.87	114.83	-71.42	7,011.18	-1,506.04	696.30	468.60	227.70	3.058 ES, SF		

Anticollision Report

Company: COG Operating LLC
Project: Lea County, NM (NAD27 NME)
Reference Site: Little Bear Federal Com
Site Error: 0.00 usft
Reference Well: 8H
Well Error: 0.00 usft
Reference Wellbore: OH
Reference Design: Plan 1 04-12-18

Local Co-ordinate Reference: Well 8H
TVD Reference: RKB @ 3831.00usft (McVay 8)
MD Reference: RKB @ 3831.00usft (McVay 8)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: USA Compass
Offset TVD Reference: Offset Datum

Offset Design Little Bear Federal Com - 5H - OH - Plan 1 04-12-18													Offset Site Error:	0.00 usft
Survey Program: 0-MWD+HDGM													Offset Well Error:	0.00 usft
Reference		Offset		Semi Major Axis			Distance							Warning
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor		
0.00	0.00	1.00	1.00	0.00	0.00	-99.25	-327.50	-2,010.30	2,036.80					
100.00	100.00	101.00	101.00	0.13	0.14	-99.25	-327.50	-2,010.30	2,036.80	2,036.53	0.27	7,476.184		
200.00	200.00	201.00	201.00	0.49	0.50	-99.25	-327.50	-2,010.30	2,036.80	2,035.81	0.99	2,058.661		
300.00	300.00	301.00	301.00	0.85	0.86	-99.25	-327.50	-2,010.30	2,036.80	2,035.10	1.71	1,193.678		
400.00	400.00	401.00	401.00	1.21	1.22	-99.25	-327.50	-2,010.30	2,036.80	2,034.38	2.42	840.519		
500.00	500.00	501.00	501.00	1.57	1.57	-99.25	-327.50	-2,010.30	2,036.80	2,033.66	3.14	648.619		
600.00	600.00	601.00	601.00	1.92	1.93	-99.25	-327.50	-2,010.30	2,036.80	2,032.94	3.86	528.058		
700.00	700.00	701.00	701.00	2.28	2.29	-99.25	-327.50	-2,010.30	2,036.80	2,032.23	4.57	445.291		
800.00	800.00	801.00	801.00	2.64	2.65	-99.25	-327.50	-2,010.30	2,036.80	2,031.51	5.29	384.953		
900.00	900.00	901.00	901.00	3.00	3.01	-99.25	-327.50	-2,010.30	2,036.80	2,030.79	6.01	339.016		
1,000.00	1,000.00	1,001.00	1,001.00	3.36	3.37	-99.25	-327.50	-2,010.30	2,036.80	2,030.08	6.72	302.874		
1,100.00	1,100.00	1,101.00	1,101.00	3.72	3.72	-99.25	-327.50	-2,010.30	2,036.80	2,029.36	7.44	273.695		
1,200.00	1,200.00	1,201.00	1,201.00	4.08	4.08	-99.25	-327.50	-2,010.30	2,036.80	2,028.64	8.16	249.644		
1,300.00	1,300.00	1,301.00	1,301.00	4.43	4.44	-99.25	-327.50	-2,010.30	2,036.80	2,027.93	8.88	229.479		
1,400.00	1,400.00	1,401.00	1,401.00	4.79	4.80	-99.25	-327.50	-2,010.30	2,036.80	2,027.21	9.59	212.328		
1,500.00	1,500.00	1,501.00	1,501.00	5.15	5.16	-99.25	-327.50	-2,010.30	2,036.80	2,026.49	10.31	197.563		
1,600.00	1,600.00	1,601.00	1,601.00	5.51	5.52	-99.25	-327.50	-2,010.30	2,036.80	2,025.78	11.03	184.717		
1,700.00	1,700.00	1,701.00	1,701.00	5.87	5.88	-99.25	-327.50	-2,010.30	2,036.80	2,025.06	11.74	173.440		
1,800.00	1,800.00	1,801.00	1,801.00	6.23	6.23	-99.25	-327.50	-2,010.30	2,036.80	2,024.34	12.46	163.461		
1,900.00	1,900.00	1,901.00	1,901.00	6.59	6.59	-99.25	-327.50	-2,010.30	2,036.80	2,023.62	13.18	154.558		
2,000.00	2,000.00	2,001.00	2,001.00	6.94	6.95	-99.25	-327.50	-2,010.30	2,036.80	2,022.91	13.89	146.592		
2,100.00	2,100.00	2,101.00	2,101.00	7.30	7.31	-99.25	-327.50	-2,010.30	2,036.80	2,022.19	14.61	139.399		
2,200.00	2,200.00	2,201.00	2,201.00	7.66	7.67	-99.25	-327.50	-2,010.30	2,036.80	2,021.47	15.33	132.879		
2,300.00	2,300.00	2,301.00	2,301.00	8.02	8.03	-99.25	-327.50	-2,010.30	2,036.80	2,020.76	16.05	126.942		
2,400.00	2,400.00	2,401.00	2,401.00	8.38	8.38	-99.25	-327.50	-2,010.30	2,036.80	2,020.04	16.76	121.512		
2,416.33	2,416.33	2,417.33	2,417.33	8.44	8.44	-99.25	-327.50	-2,010.30	2,036.80	2,019.92	16.88	120.669		
2,500.00	2,500.00	2,500.00	2,500.00	8.74	8.74	-99.25	-327.50	-2,010.30	2,036.80	2,019.33	17.48	116.552		
2,600.00	2,599.98	2,599.87	2,599.86	9.08	9.05	30.33	-327.76	-2,010.87	2,036.32	2,018.29	18.03	112.963		
2,700.00	2,699.84	2,699.00	2,699.98	9.41	9.09	30.36	-328.21	-2,011.89	2,034.97	2,016.47	18.50	110.018		
2,800.00	2,799.45	2,678.41	2,678.30	9.75	9.35	30.45	-329.77	-2,015.37	2,032.31	2,013.21	19.09	106.438		
2,900.00	2,898.70	2,737.69	2,737.42	10.08	9.55	30.56	-331.53	-2,019.29	2,028.79	2,009.16	19.63	103.343		
3,000.00	2,997.47	2,800.00	2,799.45	10.43	9.76	30.71	-333.92	-2,024.62	2,024.28	2,004.10	20.19	100.282		
3,099.96	3,095.58	2,856.23	2,855.31	10.78	9.95	30.87	-336.54	-2,030.49	2,018.78	1,998.05	20.73	97.386		
3,200.00	3,193.44	2,900.00	2,898.70	11.14	10.10	30.96	-338.90	-2,035.74	2,013.90	1,992.66	21.24	94.816		
3,300.00	3,291.25	2,975.15	2,972.97	11.51	10.36	31.10	-343.57	-2,046.18	2,010.83	1,988.96	21.87	91.947		
3,400.00	3,389.07	3,058.18	3,054.77	11.88	10.66	31.25	-349.43	-2,059.24	2,009.53	1,987.00	22.54	89.166		
3,500.00	3,486.88	3,157.99	3,153.06	12.26	11.02	31.42	-356.51	-2,075.05	2,008.43	1,985.16	23.28	86.290		
3,600.00	3,584.70	3,257.80	3,251.35	12.65	11.38	31.60	-363.60	-2,090.87	2,007.35	1,983.32	24.02	83.553		
3,700.00	3,682.51	3,357.61	3,349.64	13.04	11.75	31.77	-370.69	-2,106.69	2,006.28	1,981.50	24.78	80.951		
3,800.00	3,780.33	3,457.42	3,447.94	13.43	12.12	31.94	-377.77	-2,122.50	2,005.24	1,979.68	25.55	78.476		
3,900.00	3,878.14	3,557.23	3,546.23	13.83	12.49	32.12	-384.86	-2,138.32	2,004.21	1,977.88	26.33	76.122		
4,000.00	3,975.96	3,657.04	3,644.52	14.24	12.87	32.29	-391.95	-2,154.14	2,003.20	1,976.09	27.11	73.883		
4,100.00	4,073.77	3,756.85	3,742.82	14.65	13.26	32.47	-399.03	-2,169.95	2,002.21	1,974.30	27.90	71.753		
4,200.00	4,171.59	3,856.66	3,841.11	15.06	13.64	32.64	-406.12	-2,185.77	2,001.24	1,972.53	28.70	69.725		
4,300.00	4,269.40	3,956.47	3,939.40	15.47	14.03	32.81	-413.21	-2,201.58	2,000.28	1,970.78	29.50	67.795		
4,400.00	4,367.22	4,056.27	4,037.69	15.89	14.42	32.99	-420.29	-2,217.40	1,999.35	1,969.03	30.31	65.955		
4,500.00	4,465.03	4,156.08	4,135.99	16.31	14.82	33.16	-427.38	-2,233.22	1,998.43	1,967.30	31.13	64.202		
4,600.00	4,562.85	4,255.89	4,234.28	16.73	15.22	33.34	-434.46	-2,249.03	1,997.53	1,965.59	31.95	62.529		
4,700.00	4,660.66	4,355.70	4,332.57	17.15	15.61	33.51	-441.55	-2,264.85	1,996.65	1,963.89	32.77	60.933		
4,800.00	4,758.48	4,455.51	4,430.86	17.58	16.01	33.69	-448.64	-2,280.67	1,995.79	1,962.20	33.59	59.409		
4,900.00	4,856.29	4,555.32	4,529.16	18.01	16.42	33.86	-455.72	-2,296.48	1,994.95	1,960.53	34.42	57.952		
5,000.00	4,954.11	4,655.13	4,627.45	18.44	16.82	34.04	-462.81	-2,312.30	1,994.13	1,958.87	35.26	56.558		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Anticollision Report

Company: COG Operating LLC
 Project: Lea County, NM (NAD27 NME)
 Reference Site: Little Bear Federal Com
 Site Error: 0.00 usft
 Reference Well: 8H
 Well Error: 0.00 usft
 Reference Wellbore: OH
 Reference Design: Plan 1 04-12-18

Local Co-ordinate Reference: Well 8H
 TVD Reference: RKB @ 3831.00usft (McVay 8)
 MD Reference: RKB @ 3831.00usft (McVay 8)
 North Reference: Grid
 Survey Calculation Method: Minimum Curvature
 Output errors are at: 2.00 sigma
 Database: USA Compass
 Offset TVD Reference: Offset Datum

Offset Design Little Bear Federal Com - 5H - OH - Plan 1 04-12-18

Survey Program: 0-MWD+HOGM

Offset Site Error: 0.00 usft

Offset Well Error: 0.00 usft

Reference		Offset		Semi Major Axis			Distance				Warning		
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Tooface (")	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Ellipses (usft)		Minimum Separation (usft)	Separation Factor
5,100.00	5,051.92	4,754.94	4,725.74	18.87	17.22	34.22	-469.90	-2,328.11	1,993.33	1,957.23	36.09	55.225	
5,200.00	5,149.74	4,854.75	4,824.03	19.30	17.63	34.39	-476.98	-2,343.93	1,992.54	1,955.61	36.93	53.949	
5,300.00	5,247.56	4,954.55	4,922.33	19.74	18.04	34.57	-484.07	-2,359.75	1,991.78	1,954.00	37.78	52.726	
5,400.00	5,345.37	5,054.36	5,020.62	20.17	18.45	34.74	-491.16	-2,375.56	1,991.03	1,952.41	38.62	51.553	
5,500.00	5,443.19	5,154.17	5,118.91	20.61	18.86	34.92	-498.24	-2,391.38	1,990.30	1,950.83	39.47	50.428	
5,600.00	5,541.00	5,253.98	5,217.21	21.05	19.27	35.10	-505.33	-2,407.19	1,989.59	1,949.27	40.32	49.348	
5,700.00	5,638.82	5,353.79	5,315.50	21.49	19.68	35.27	-512.42	-2,423.01	1,988.90	1,947.73	41.17	48.310	
5,800.00	5,736.63	5,453.60	5,413.79	21.93	20.09	35.45	-519.50	-2,438.83	1,988.23	1,946.21	42.02	47.313	
5,900.00	5,834.45	5,553.41	5,512.08	22.37	20.51	35.63	-526.59	-2,454.64	1,987.58	1,944.70	42.88	46.354	
6,000.00	5,932.26	5,653.22	5,610.38	22.81	20.92	35.80	-533.68	-2,470.46	1,986.94	1,943.21	43.74	45.431	
6,100.00	6,030.08	5,753.03	5,708.67	23.26	21.34	35.98	-540.76	-2,486.28	1,986.33	1,941.73	44.59	44.542	
6,200.00	6,127.89	5,852.83	5,806.96	23.70	21.75	36.16	-547.85	-2,502.09	1,985.73	1,940.28	45.45	43.686	
6,300.00	6,225.71	5,952.64	5,905.25	24.15	22.17	36.33	-554.93	-2,517.91	1,985.16	1,938.84	46.32	42.861	
6,400.00	6,323.52	6,052.45	6,003.55	24.59	22.59	36.51	-562.02	-2,533.72	1,984.60	1,937.42	47.18	42.065	
6,500.00	6,421.34	6,152.26	6,101.84	25.04	23.01	36.69	-569.11	-2,549.54	1,984.06	1,936.02	48.04	41.296	
6,600.00	6,519.15	6,252.07	6,200.13	25.49	23.42	36.87	-576.19	-2,565.36	1,983.54	1,934.63	48.91	40.555	
6,700.00	6,616.97	6,351.88	6,298.42	25.93	23.84	37.04	-583.28	-2,581.17	1,983.04	1,933.26	49.78	39.838	
6,800.00	6,714.78	6,451.69	6,396.72	26.38	24.26	37.22	-590.37	-2,596.99	1,982.56	1,931.91	50.65	39.146	
6,900.00	6,812.60	6,551.50	6,495.01	26.83	24.68	37.40	-597.45	-2,612.81	1,982.10	1,930.58	51.51	38.477	
7,000.00	6,910.41	6,651.31	6,593.30	27.28	25.10	37.58	-604.54	-2,628.62	1,981.66	1,929.27	52.38	37.829	
7,100.00	7,008.23	6,751.12	6,691.60	27.73	25.53	37.76	-611.63	-2,644.44	1,981.23	1,927.98	53.26	37.202	
7,200.00	7,106.04	6,850.92	6,789.89	28.18	25.95	37.93	-618.71	-2,660.25	1,980.83	1,926.70	54.13	36.595	
7,300.00	7,203.86	6,950.73	6,888.18	28.63	26.37	38.11	-625.80	-2,676.07	1,980.44	1,925.44	55.00	36.007	
7,400.00	7,301.67	7,050.54	6,986.47	29.08	26.79	38.29	-632.89	-2,691.89	1,980.08	1,924.20	55.87	35.438	
7,416.37	7,317.69	7,066.88	7,002.56	29.15	26.86	38.32	-634.05	-2,694.48	1,980.05	1,924.03	56.02	35.348	
7,500.00	7,399.70	7,150.39	7,084.80	29.53	27.22	38.46	-639.97	-2,707.71	1,980.58	1,923.84	56.74	34.905	
7,600.00	7,498.35	7,250.27	7,183.17	29.95	27.64	38.59	-647.07	-2,723.54	1,983.76	1,926.17	57.59	34.447	
7,700.00	7,597.50	7,349.91	7,281.42	30.35	28.51	38.77	-659.98	-2,752.36	1,987.82	1,928.96	58.86	33.772	
7,800.00	7,697.05	7,449.65	7,378.48	30.72	29.50	39.02	-667.19	-2,768.44	1,986.33	1,926.11	60.23	32.980	
7,900.00	7,796.87	7,549.47	7,477.87	31.08	29.92	39.10	-667.34	-2,768.78	1,981.82	1,920.82	61.00	32.489	
8,000.00	7,896.83	7,649.30	7,577.83	31.41	30.24	39.13	-667.34	-2,768.78	1,979.89	1,918.25	61.65	32.116	
8,082.79	7,979.62	8,050.79	7,980.62	31.66	30.50	39.13	-667.34	-2,768.78	1,979.62	1,917.45	62.16	31.845	CC
8,100.00	7,996.83	8,068.00	7,997.83	31.71	30.56	-90.44	-667.34	-2,768.78	1,979.83	1,917.56	62.27	31.793	
8,200.00	8,096.83	8,168.00	8,097.83	32.02	30.88	-90.44	-667.34	-2,768.78	1,979.83	1,916.94	62.90	31.478	
8,300.00	8,196.83	8,268.00	8,197.83	32.32	31.20	-90.44	-667.34	-2,768.78	1,979.83	1,916.31	63.52	31.168	
8,400.00	8,296.83	8,368.00	8,297.83	32.63	31.52	-90.44	-667.34	-2,768.78	1,979.83	1,915.68	64.15	30.863	
8,500.00	8,396.83	8,468.00	8,397.83	32.94	31.84	-90.44	-667.34	-2,768.78	1,979.83	1,915.05	64.78	30.563	
8,600.00	8,496.83	8,568.00	8,497.83	33.24	32.17	-90.44	-667.34	-2,768.78	1,979.83	1,914.42	65.41	30.268	
8,700.00	8,596.83	8,668.00	8,597.83	33.55	32.49	-90.44	-667.34	-2,768.78	1,979.83	1,913.79	66.04	29.977	
8,800.00	8,696.83	8,768.00	8,697.83	33.86	32.82	-90.44	-667.34	-2,768.78	1,979.83	1,913.15	66.68	29.692	
8,900.00	8,796.83	8,868.00	8,797.83	34.17	33.14	-90.44	-667.34	-2,768.78	1,979.83	1,912.52	67.32	29.411	
9,000.00	8,896.83	8,968.00	8,897.83	34.49	33.47	-90.44	-667.34	-2,768.78	1,979.83	1,911.88	67.95	29.135	
9,100.00	8,996.83	9,068.00	8,997.83	34.80	33.79	-90.44	-667.34	-2,768.78	1,979.83	1,911.24	68.59	28.863	
9,200.00	9,096.83	9,168.00	9,097.83	35.11	34.12	-90.44	-667.34	-2,768.78	1,979.83	1,910.60	69.23	28.596	
9,300.00	9,196.83	9,268.00	9,197.83	35.43	34.45	-90.44	-667.34	-2,768.78	1,979.83	1,909.96	69.88	28.333	
9,400.00	9,296.83	9,368.00	9,297.83	35.74	34.78	-90.44	-667.34	-2,768.78	1,979.83	1,909.31	70.52	28.074	
9,500.00	9,396.83	9,468.00	9,397.83	36.06	35.11	-90.44	-667.34	-2,768.78	1,979.83	1,908.67	71.17	27.819	
9,600.00	9,496.83	9,568.00	9,497.83	36.38	35.44	-90.44	-667.34	-2,768.78	1,979.83	1,908.02	71.81	27.569	
9,700.00	9,596.83	9,668.00	9,597.83	36.69	35.77	-90.44	-667.34	-2,768.78	1,979.83	1,907.37	72.46	27.322	
9,800.00	9,696.83	9,768.00	9,697.83	37.01	36.10	-90.44	-667.34	-2,768.78	1,979.83	1,906.72	73.11	27.079	
9,900.00	9,796.83	9,868.00	9,797.83	37.33	36.43	-90.44	-667.34	-2,768.78	1,979.83	1,906.07	73.76	26.841	
10,000.00	9,896.83	9,968.00	9,897.83	37.65	36.76	-90.44	-667.34	-2,768.78	1,979.83	1,905.42	74.41	26.605	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Anticollision Report

Company: COG Operating LLC
Project: Lea County, NM (NAD27 NME)
Reference Site: Little Bear Federal Com
Site Error: 0.00 usft
Reference Well: 8H
Well Error: 0.00 usft
Reference Wellbore: OH
Reference Design: Plan 1 04-12-18

Local Co-ordinate Reference: Well 8H
TVD Reference: RKB @ 3831.00usft (McVay 8)
MD Reference: RKB @ 3831.00usft (McVay 8)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at 2.00 sigma
Database: USA Compass
Offset TVD Reference: Offset Datum

Offset Design Little Bear Federal Com - 5H - OH - Plan 1 04-12-18													Offset Site Error:	0.00 usft
Survey Program: 0-MWD+HDGM													Offset Well Error:	0.00 usft
Reference		Offset		Semi Major Axis			Distance							Warning
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N-S (usft)	+E-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor		
10,100.00	9,996.83	10,068.00	9,997.83	37.97	37.10	-90.44	-667.34	-2,768.78	1,979.83	1,904.77	75.07	26.374		
10,200.00	10,096.83	10,168.00	10,097.83	38.29	37.43	-90.44	-667.34	-2,768.78	1,979.83	1,904.11	75.72	26.146		
10,300.00	10,196.83	10,268.00	10,197.83	38.62	37.76	-90.44	-667.34	-2,768.78	1,979.83	1,903.46	76.38	25.922		
10,400.00	10,296.83	10,368.00	10,297.83	38.94	38.10	-90.44	-667.34	-2,768.78	1,979.83	1,902.80	77.03	25.701		
10,500.00	10,396.83	10,468.00	10,397.83	39.26	38.43	-90.44	-667.34	-2,768.78	1,979.83	1,902.14	77.69	25.483		
10,600.00	10,496.83	10,568.00	10,497.83	39.59	38.76	-90.44	-667.34	-2,768.78	1,979.83	1,901.48	78.35	25.269		
10,700.00	10,596.83	10,668.00	10,597.83	39.91	39.10	-90.44	-667.34	-2,768.78	1,979.83	1,900.82	79.01	25.058		
10,800.00	10,696.83	10,768.00	10,697.83	40.24	39.44	-90.44	-667.34	-2,768.78	1,979.83	1,900.16	79.67	24.850		
10,900.00	10,796.83	10,868.00	10,797.83	40.56	39.77	-90.44	-667.34	-2,768.78	1,979.83	1,899.50	80.33	24.646		
11,000.00	10,896.83	10,968.00	10,897.83	40.89	40.11	-90.44	-667.34	-2,768.78	1,979.83	1,898.84	80.99	24.444		
11,076.62	10,973.45	11,044.63	10,974.45	41.14	40.37	-90.43	-666.80	-2,768.79	1,979.83	1,898.33	81.50	24.292		
11,100.00	10,996.83	11,067.91	10,997.67	41.21	40.44	-90.38	-665.14	-2,768.80	1,979.83	1,898.18	81.66	24.246		
11,200.00	11,096.83	11,163.84	11,091.60	41.54	40.74	-89.84	-646.43	-2,768.94	1,979.95	1,897.67	82.28	24.064		
11,300.00	11,196.43	11,251.94	11,172.99	41.85	40.97	-88.55	-613.04	-2,769.19	1,980.54	1,897.72	82.82	23.914		
11,400.00	11,292.47	11,335.81	11,243.53	42.11	41.14	-87.73	-567.89	-2,769.53	1,981.52	1,898.27	83.25	23.803		
11,500.00	11,380.75	11,416.52	11,302.97	42.30	41.25	-86.99	-513.43	-2,769.93	1,982.73	1,899.18	83.55	23.730		
11,600.00	11,457.41	11,494.87	11,351.11	42.41	41.32	-86.36	-451.72	-2,770.39	1,983.99	1,900.26	83.73	23.694		
11,700.00	11,519.12	11,571.49	11,387.82	42.45	41.35	-85.86	-384.56	-2,770.89	1,985.13	1,901.33	83.80	23.688		
11,800.00	11,563.15	11,650.00	11,413.80	42.42	41.35	-85.49	-310.57	-2,771.45	1,986.02	1,902.24	83.77	23.707		
11,900.00	11,587.61	11,721.66	11,426.66	42.35	41.33	-85.30	-240.14	-2,771.97	1,986.53	1,902.85	83.68	23.740		
12,000.00	11,591.70	11,797.96	11,428.66	42.25	41.31	-85.26	-163.95	-2,772.54	1,986.64	1,903.08	83.56	23.775		
12,100.00	11,588.60	11,897.96	11,424.75	42.16	41.31	-85.24	-64.03	-2,773.29	1,986.71	1,903.24	83.47	23.801		
12,200.00	11,585.49	11,997.96	11,420.84	42.09	41.38	-85.21	35.89	-2,774.03	1,986.78	1,903.31	83.47	23.803		
12,300.00	11,582.39	12,097.95	11,416.93	42.03	41.56	-85.19	135.81	-2,774.78	1,986.85	1,903.26	83.59	23.769		
12,400.00	11,579.28	12,197.95	11,413.02	42.00	41.84	-85.17	235.72	-2,775.53	1,986.92	1,903.04	83.88	23.687		
12,500.00	11,576.17	12,297.95	11,409.12	42.15	42.19	-85.14	335.64	-2,776.27	1,986.99	1,902.48	84.51	23.511		
12,600.00	11,573.07	12,397.94	11,405.21	42.48	42.60	-85.12	435.56	-2,777.02	1,987.06	1,901.81	85.25	23.309		
12,700.00	11,569.96	12,497.94	11,401.30	42.87	43.06	-85.10	535.48	-2,777.76	1,987.13	1,901.06	86.08	23.086		
12,800.00	11,566.86	12,597.94	11,397.39	43.31	43.56	-85.08	635.39	-2,778.51	1,987.20	1,900.21	86.99	22.844		
12,900.00	11,563.75	12,697.93	11,393.48	43.79	44.10	-85.05	735.31	-2,779.25	1,987.28	1,899.28	87.99	22.585		
13,000.00	11,560.64	12,797.93	11,389.57	44.30	44.68	-85.03	835.23	-2,780.00	1,987.35	1,898.27	89.07	22.311		
13,100.00	11,557.54	12,897.93	11,385.67	44.86	45.30	-85.01	935.15	-2,780.75	1,987.42	1,897.18	90.24	22.025		
13,200.00	11,554.43	12,997.92	11,381.76	45.45	45.96	-84.98	1,035.06	-2,781.49	1,987.49	1,896.02	91.47	21.728		
13,300.00	11,551.32	13,097.92	11,377.85	46.08	46.65	-84.96	1,134.98	-2,782.24	1,987.57	1,894.79	92.78	21.422		
13,400.00	11,548.22	13,197.92	11,373.94	46.74	47.38	-84.94	1,234.90	-2,782.98	1,987.64	1,893.48	94.16	21.110		
13,500.00	11,545.11	13,297.91	11,370.03	47.44	48.13	-84.91	1,334.82	-2,783.73	1,987.71	1,892.11	95.60	20.792		
13,600.00	11,542.01	13,397.91	11,366.12	48.17	48.92	-84.89	1,434.73	-2,784.48	1,987.79	1,890.68	97.11	20.470		
13,700.00	11,538.90	13,497.91	11,362.22	48.93	49.73	-84.87	1,534.65	-2,785.22	1,987.86	1,889.18	98.68	20.145		
13,800.00	11,535.79	13,597.91	11,358.31	49.72	50.58	-84.84	1,634.57	-2,785.97	1,987.94	1,887.63	100.30	19.819		
13,900.00	11,532.69	13,697.90	11,354.40	50.54	51.45	-84.82	1,734.49	-2,786.71	1,988.01	1,886.03	101.99	19.493		
14,000.00	11,529.58	13,797.90	11,350.49	51.38	52.34	-84.80	1,834.41	-2,787.46	1,988.09	1,884.36	103.72	19.167		
14,100.00	11,526.47	13,897.90	11,346.58	52.25	53.26	-84.78	1,934.32	-2,788.20	1,988.16	1,882.65	105.51	18.843		
14,200.00	11,523.37	13,997.89	11,342.67	53.14	54.20	-84.75	2,034.24	-2,788.95	1,988.24	1,880.89	107.35	18.522		
14,300.00	11,520.26	14,097.89	11,338.76	54.06	55.17	-84.73	2,134.16	-2,789.70	1,988.31	1,879.09	109.23	18.204		
14,400.00	11,517.16	14,197.89	11,334.86	55.00	56.15	-84.71	2,234.08	-2,790.44	1,988.39	1,877.24	111.15	17.889		
14,500.00	11,514.05	14,297.88	11,330.95	55.96	57.15	-84.68	2,333.99	-2,791.19	1,988.47	1,875.35	113.11	17.579		
14,600.00	11,510.94	14,397.88	11,327.04	56.94	58.18	-84.66	2,433.91	-2,791.93	1,988.54	1,873.43	115.12	17.274		
14,700.00	11,507.84	14,497.88	11,323.13	57.94	59.21	-84.64	2,533.83	-2,792.68	1,988.62	1,871.47	117.15	16.974		
14,800.00	11,504.73	14,597.87	11,319.22	58.96	60.27	-84.61	2,633.75	-2,793.43	1,988.70	1,869.47	119.23	16.680		
14,900.00	11,501.63	14,697.87	11,315.31	59.99	61.34	-84.59	2,733.66	-2,794.17	1,988.78	1,867.44	121.34	16.391		
15,000.00	11,498.52	14,797.87	11,311.41	61.05	62.43	-84.57	2,833.58	-2,794.92	1,988.86	1,865.38	123.47	16.108		
15,100.00	11,495.41	14,897.86	11,307.50	62.11	63.53	-84.55	2,933.50	-2,795.66	1,988.93	1,863.29	125.64	15.830		

CC - Min centre to center distance or convergent point. SF - min separation factor, ES - min ellipse separation

Anticollision Report

Company: COG Operating LLC
Project: Lea County, NM (NAD27 NME)
Reference Site: Little Bear Federal Com
Site Error: 0.00 usft
Reference Well: 8H
Well Error: 0.00 usft
Reference Wellbore: OH
Reference Design: Plan 1 04-12-18

Local Co-ordinate Reference: Well 8H
TVD Reference: RKB @ 3831.00usft (McVay 8)
MD Reference: RKB @ 3831.00usft (McVay 8)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: USA Compass
Offset TVD Reference: Offset Datum

Offset Design Little Bear Federal Com - 5H - OH - Plan 1 04-12-18													Offset Site Error: 0.00 usft
Survey Program: 0-MWD+HDGM													Offset Well Error: 0.00 usft
Reference		Offset		Semi Major Axis			Distance						Warning
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N-S (usft)	+E-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	
15,200.00	11,492.31	14,997.86	11,303.59	63.20	64.64	-84.52	3,033.42	-2,796.41	1,989.01	1,861.18	127.84	15.559	
15,300.00	11,489.20	15,097.86	11,299.68	64.29	65.77	-84.50	3,133.33	-2,797.15	1,989.09	1,859.03	130.06	15.294	
15,400.00	11,486.09	15,197.85	11,295.77	65.40	66.91	-84.48	3,233.25	-2,797.90	1,989.17	1,856.87	132.31	15.034	
15,500.00	11,482.99	15,297.85	11,291.86	66.52	68.06	-84.45	3,333.17	-2,798.65	1,989.25	1,854.67	134.58	14.781	
15,600.00	11,479.88	15,397.85	11,287.96	67.66	69.22	-84.43	3,433.09	-2,799.39	1,989.33	1,852.46	136.88	14.534	
15,700.00	11,476.78	15,497.84	11,284.05	68.80	70.39	-84.41	3,533.00	-2,800.14	1,989.41	1,850.22	139.19	14.292	
15,800.00	11,473.67	15,597.84	11,280.14	69.96	71.57	-84.38	3,632.92	-2,800.88	1,989.50	1,847.96	141.53	14.057	
15,900.00	11,470.56	15,697.84	11,276.23	71.13	72.76	-84.36	3,732.84	-2,801.63	1,989.58	1,845.69	143.89	13.827	
16,000.00	11,467.46	15,797.83	11,272.32	72.30	73.96	-84.34	3,832.76	-2,802.38	1,989.66	1,843.39	146.27	13.603	
16,100.00	11,464.35	15,897.83	11,268.41	73.49	75.17	-84.32	3,932.67	-2,803.12	1,989.74	1,841.08	148.66	13.384	
16,200.00	11,461.24	15,997.83	11,264.50	74.69	76.39	-84.29	4,032.59	-2,803.87	1,989.82	1,838.75	151.08	13.171	
16,300.00	11,458.14	16,097.82	11,260.60	75.89	77.61	-84.27	4,132.51	-2,804.61	1,989.91	1,836.40	153.50	12.963	
16,400.00	11,455.03	16,197.82	11,256.69	77.10	78.84	-84.25	4,232.43	-2,805.36	1,989.99	1,834.04	155.95	12.761	
16,500.00	11,451.93	16,297.82	11,252.78	78.32	80.08	-84.22	4,332.34	-2,806.10	1,990.07	1,831.66	158.41	12.563	
16,600.00	11,448.82	16,397.82	11,248.87	79.55	81.33	-84.20	4,432.26	-2,806.85	1,990.16	1,829.27	160.88	12.370	
16,700.00	11,445.71	16,497.81	11,244.96	80.79	82.58	-84.18	4,532.18	-2,807.60	1,990.24	1,826.87	163.37	12.182	
16,800.00	11,442.61	16,597.81	11,241.05	82.03	83.84	-84.15	4,632.10	-2,808.34	1,990.32	1,824.45	165.87	11.999	
16,900.00	11,439.50	16,697.81	11,237.15	83.28	85.10	-84.13	4,732.02	-2,809.09	1,990.41	1,822.03	168.38	11.821	
17,000.00	11,436.40	16,797.80	11,233.24	84.53	86.37	-84.11	4,831.93	-2,809.83	1,990.49	1,819.59	170.91	11.647	
17,100.00	11,433.29	16,897.80	11,229.33	85.79	87.65	-84.09	4,931.85	-2,810.58	1,990.58	1,817.14	173.44	11.477	
17,200.00	11,430.18	16,997.80	11,225.42	87.06	88.93	-84.06	5,031.77	-2,811.33	1,990.66	1,814.67	175.99	11.311	
17,300.00	11,427.08	17,097.79	11,221.51	88.33	90.22	-84.04	5,131.69	-2,812.07	1,990.75	1,812.20	178.55	11.150	
17,400.00	11,423.97	17,197.79	11,217.60	89.61	91.51	-84.02	5,231.60	-2,812.82	1,990.84	1,809.72	181.11	10.992	
17,500.00	11,420.86	17,297.79	11,213.70	90.89	92.80	-83.99	5,331.52	-2,813.56	1,990.92	1,807.23	183.69	10.839	
17,600.00	11,417.76	17,397.78	11,209.79	92.17	94.10	-83.97	5,431.44	-2,814.31	1,991.01	1,804.73	186.27	10.689	
17,700.00	11,414.65	17,497.78	11,205.88	93.47	95.40	-83.95	5,531.36	-2,815.06	1,991.10	1,802.23	188.87	10.542	
17,800.00	11,411.55	17,597.78	11,201.97	94.76	96.71	-83.92	5,631.27	-2,815.80	1,991.18	1,799.71	191.47	10.399	
17,900.00	11,408.44	17,697.77	11,198.06	96.06	98.02	-83.90	5,731.19	-2,816.55	1,991.27	1,797.19	194.08	10.260	
18,000.00	11,405.33	17,797.77	11,194.15	97.36	99.34	-83.88	5,831.11	-2,817.29	1,991.36	1,794.66	196.70	10.124	
18,100.00	11,402.23	17,897.77	11,190.24	98.67	100.65	-83.86	5,931.03	-2,818.04	1,991.45	1,792.12	199.33	9.991	
18,200.00	11,399.12	17,997.76	11,186.34	99.98	101.98	-83.83	6,030.94	-2,818.78	1,991.54	1,789.58	201.96	9.861	
18,300.00	11,396.02	18,097.76	11,182.43	101.30	103.30	-83.81	6,130.86	-2,819.53	1,991.63	1,787.02	204.60	9.734	
18,400.00	11,392.91	18,197.76	11,178.52	102.62	104.63	-83.79	6,230.78	-2,820.28	1,991.71	1,784.47	207.25	9.610	
18,500.00	11,389.80	18,297.75	11,174.61	103.94	105.96	-83.76	6,330.70	-2,821.02	1,991.80	1,781.90	209.90	9.489	
18,600.00	11,386.70	18,397.75	11,170.70	105.27	107.30	-83.74	6,430.61	-2,821.77	1,991.89	1,779.33	212.56	9.371	
18,700.00	11,383.59	18,497.75	11,166.79	106.59	108.63	-83.72	6,530.53	-2,822.51	1,991.98	1,776.76	215.23	9.255	
18,800.00	11,380.48	18,597.74	11,162.89	107.92	109.97	-83.70	6,630.45	-2,823.26	1,992.08	1,774.18	217.90	9.142	
18,900.00	11,377.38	18,697.74	11,158.98	109.26	111.31	-83.67	6,730.37	-2,824.01	1,992.17	1,771.59	220.57	9.032	
19,000.00	11,374.27	18,797.74	11,155.07	110.60	112.66	-83.65	6,830.28	-2,824.75	1,992.26	1,769.00	223.25	8.924	
19,100.00	11,371.17	18,897.73	11,151.16	111.94	114.01	-83.63	6,930.20	-2,825.50	1,992.35	1,766.41	225.94	8.818	
19,169.71	11,369.00	18,967.44	11,148.44	112.87	114.95	-83.61	6,999.85	-2,826.02	1,992.41	1,764.60	227.82	8.746 ES, SF	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Anticollision Report

Company: COG Operating LLC
 Project: Lea County, NM (NAD27 NME)
 Reference Site: Little Bear Federal Com
 Site Error: 0.00 usft
 Reference Well: 8H
 Well Error: 0.00 usft
 Reference Wellbore: OH
 Reference Design: Plan 1 04-12-18

Local Co-ordinate Reference: Well 8H
 TVD Reference: RKB @ 3831.00usft (McVay 8)
 MD Reference: RKB @ 3831.00usft (McVay 8)
 North Reference: Grid
 Survey Calculation Method: Minimum Curvature
 Output errors are at: 2.00 sigma
 Database: USA Compass
 Offset TVD Reference: Offset Datum

Offset Design Little Bear Federal Com - 7H - OH - Plan 1 04-12-18													Offset Site Error: 0.00 usft
Survey Program: 0-MWD+HDGM													Offset Well Error: 0.00 usft
Reference	Offset	Semi Major Axis		Distance		Warning							
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	
0.00	0.00	1.00	1.00	0.00	0.00	89.52	0.50	60.00	60.00				
100.00	100.00	101.00	101.00	0.13	0.14	89.52	0.50	60.00	60.00	59.73	0.27	223.177	
200.00	200.00	201.00	201.00	0.49	0.49	89.52	0.50	60.00	60.00	59.02	0.99	60.867	
300.00	300.00	301.00	301.00	0.85	0.85	89.52	0.50	60.00	60.00	58.30	1.70	35.239	
400.00	400.00	401.00	401.00	1.21	1.21	89.52	0.50	60.00	60.00	57.58	2.42	24.797	
500.00	500.00	501.00	501.00	1.57	1.57	89.52	0.50	60.00	60.00	56.87	3.14	19.129	
600.00	600.00	601.00	601.00	1.92	1.93	89.52	0.50	60.00	60.00	56.15	3.85	15.571	
700.00	700.00	701.00	701.00	2.28	2.29	89.52	0.50	60.00	60.00	55.43	4.57	13.128	
800.00	800.00	801.00	801.00	2.64	2.65	89.52	0.50	60.00	60.00	54.71	5.29	11.348	
900.00	900.00	901.00	901.00	3.00	3.00	89.52	0.50	60.00	60.00	54.00	6.00	9.993	
1,000.00	1,000.00	1,001.00	1,001.00	3.36	3.36	89.52	0.50	60.00	60.00	53.28	6.72	8.927	
1,100.00	1,100.00	1,101.00	1,101.00	3.72	3.72	89.52	0.50	60.00	60.00	52.56	7.44	8.067	
1,200.00	1,200.00	1,201.00	1,201.00	4.08	4.08	89.52	0.50	60.00	60.00	51.85	8.16	7.357	
1,300.00	1,300.00	1,301.00	1,301.00	4.43	4.44	89.52	0.50	60.00	60.00	51.13	8.87	6.763	
1,400.00	1,400.00	1,401.00	1,401.00	4.79	4.80	89.52	0.50	60.00	60.00	50.41	9.59	6.257	
1,500.00	1,500.00	1,501.00	1,501.00	5.15	5.15	89.52	0.50	60.00	60.00	49.70	10.31	5.822	
1,600.00	1,600.00	1,601.00	1,601.00	5.51	5.51	89.52	0.50	60.00	60.00	48.98	11.02	5.443	
1,700.00	1,700.00	1,701.00	1,701.00	5.87	5.87	89.52	0.50	60.00	60.00	48.26	11.74	5.111	
1,800.00	1,800.00	1,801.00	1,801.00	6.23	6.23	89.52	0.50	60.00	60.00	47.55	12.46	4.817	
1,900.00	1,900.00	1,901.00	1,901.00	6.59	6.59	89.52	0.50	60.00	60.00	46.83	13.17	4.555	
2,000.00	2,000.00	2,001.00	2,001.00	6.94	6.95	89.52	0.50	60.00	60.00	46.11	13.89	4.320	
2,100.00	2,100.00	2,101.00	2,101.00	7.30	7.31	89.52	0.50	60.00	60.00	45.39	14.61	4.108	
2,200.00	2,200.00	2,201.00	2,201.00	7.66	7.66	89.52	0.50	60.00	60.00	44.68	15.32	3.915	
2,300.00	2,300.00	2,301.00	2,301.00	8.02	8.02	89.52	0.50	60.00	60.00	43.96	16.04	3.740	
2,400.00	2,400.00	2,401.00	2,401.00	8.38	8.38	89.52	0.50	60.00	60.00	43.24	16.76	3.580	
2,416.33	2,416.33	2,417.33	2,417.33	8.44	8.44	89.52	0.50	60.00	60.00	43.13	16.88	3.566 CC	
2,500.00	2,500.00	2,500.99	2,500.99	8.74	8.74	89.52	0.50	60.00	60.00	42.53	17.48	3.434 ES, SF	
2,600.00	2,599.98	2,600.00	2,599.98	9.08	9.08	-140.60	-0.88	61.06	62.42	44.26	18.16	3.437	
2,700.00	2,699.84	2,698.04	2,697.88	9.41	9.40	-139.85	-4.93	64.16	69.61	50.80	18.81	3.700	
2,800.00	2,799.45	2,795.71	2,795.19	9.75	9.72	-138.89	-11.60	69.28	81.56	62.10	19.47	4.190	
2,900.00	2,898.70	2,892.39	2,891.16	10.08	10.05	-137.91	-20.79	76.33	98.24	78.11	20.13	4.880	
3,000.00	2,997.47	2,987.76	2,985.40	10.43	10.37	-137.00	-32.37	85.21	119.57	98.77	20.80	5.749	
3,099.96	3,095.58	3,084.16	3,080.35	10.78	10.70	-136.57	-45.63	95.39	144.67	123.19	21.48	6.734	
3,200.00	3,193.44	3,180.67	3,175.39	11.14	11.04	-136.92	-58.93	105.59	171.04	148.86	22.18	7.711	
3,300.00	3,291.25	3,277.13	3,270.38	11.51	11.39	-137.18	-72.23	115.79	197.41	174.51	22.89	8.622	
3,400.00	3,389.07	3,373.58	3,365.37	11.88	11.74	-137.37	-85.52	125.99	223.77	200.15	23.62	9.474	
3,500.00	3,486.88	3,470.04	3,460.36	12.26	12.09	-137.53	-98.82	136.19	250.14	225.79	24.35	10.271	
3,600.00	3,584.70	3,566.50	3,555.35	12.65	12.45	-137.65	-112.11	146.39	276.51	251.41	25.10	11.017	
3,700.00	3,682.51	3,662.96	3,650.35	13.04	12.81	-137.75	-125.41	156.59	302.88	277.03	25.85	11.716	
3,800.00	3,780.33	3,759.42	3,745.34	13.43	13.18	-137.84	-138.70	166.79	329.26	302.64	26.61	12.371	
3,900.00	3,878.14	3,855.88	3,840.33	13.83	13.55	-137.92	-152.00	176.99	355.63	328.25	27.38	12.987	
4,000.00	3,975.96	3,952.34	3,935.32	14.24	13.92	-137.98	-165.29	187.19	382.00	353.84	28.16	13.566	
4,100.00	4,073.77	4,048.80	4,030.31	14.65	14.30	-138.04	-178.59	197.39	408.38	379.43	28.94	14.110	
4,200.00	4,171.59	4,145.25	4,125.31	15.06	14.67	-138.08	-191.88	207.59	434.75	405.02	29.73	14.623	
4,300.00	4,269.40	4,241.71	4,220.30	15.47	15.05	-138.13	-205.18	217.79	461.12	430.60	30.52	15.108	
4,400.00	4,367.22	4,338.17	4,315.29	15.89	15.43	-138.17	-218.47	227.98	487.50	456.18	31.32	15.565	
4,500.00	4,465.03	4,434.63	4,410.28	16.31	15.82	-138.20	-231.77	238.18	513.87	481.75	32.12	15.997	
4,600.00	4,562.85	4,531.09	4,505.28	16.73	16.20	-138.23	-245.06	248.38	540.25	507.32	32.93	16.406	
4,700.00	4,660.66	4,627.55	4,600.27	17.15	16.59	-138.26	-258.36	258.58	566.62	532.88	33.74	16.793	
4,800.00	4,758.48	4,724.01	4,695.26	17.58	16.98	-138.29	-271.65	268.78	593.00	558.44	34.56	17.161	
4,900.00	4,856.29	4,820.47	4,790.25	18.01	17.36	-138.31	-284.95	278.98	619.38	584.00	35.37	17.509	
5,000.00	4,954.11	4,916.92	4,885.24	18.44	17.76	-138.33	-298.24	289.18	645.75	609.56	36.19	17.841	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Anticollision Report

Company: COG Operating LLC
 Project: Lea County, NM (NAD27 NME)
 Reference Site: Little Bear Federal Com
 Site Error: 0.00 usft
 Reference Well: 8H
 Well Error: 0.00 usft
 Reference Wellbore: OH
 Reference Design: Plan 1 04-12-18

Local Co-ordinate Reference: Well 8H
 TVD Reference: RKB @ 3831.00usft (McVay 8)
 MD Reference: RKB @ 3831.00usft (McVay 8)
 North Reference: Grid
 Survey Calculation Method: Minimum Curvature
 Output errors are at: 2.00 sigma
 Database: USA Compass
 Offset TVD Reference: Offset Datum

Offset Design Little Bear Federal Com - 7H - OH - Plan 1 04-12-18													Offset Site Error: 0.00 usft
Survey Program: 0-MWD+HDM													Offset Well Error: 0.00 usft
Reference		Offset		Semi Major Axis			Distance						Warning
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	
5,100.00	5,051.92	5,013.38	4,980.24	18.87	18.15	-138.35	-311.54	299.38	672.13	635.11	37.02	18.156	
5,200.00	5,149.74	5,109.84	5,075.23	19.30	18.54	-138.37	-324.83	309.58	698.50	660.66	37.85	18.457	
5,300.00	5,247.56	5,206.30	5,170.22	19.74	18.94	-138.39	-338.13	319.78	724.88	686.20	38.67	18.743	
5,400.00	5,345.37	5,302.76	5,265.21	20.17	19.33	-138.40	-351.42	329.98	751.25	711.75	39.51	19.016	
5,500.00	5,443.19	5,399.22	5,360.20	20.61	19.73	-138.42	-364.72	340.18	777.63	737.29	40.34	19.277	
5,600.00	5,541.00	5,495.68	5,455.20	21.05	20.13	-138.43	-378.01	350.37	804.00	762.83	41.18	19.526	
5,700.00	5,638.82	5,592.14	5,550.19	21.49	20.52	-138.44	-391.31	360.57	830.38	788.37	42.01	19.764	
5,800.00	5,736.63	5,688.59	5,645.18	21.93	20.92	-138.46	-404.60	370.77	856.76	813.90	42.85	19.992	
5,900.00	5,834.45	5,785.05	5,740.17	22.37	21.32	-138.47	-417.90	380.97	883.13	839.44	43.70	20.211	
6,000.00	5,932.26	5,881.51	5,835.17	22.81	21.73	-138.48	-431.19	391.17	909.51	864.97	44.54	20.420	
6,100.00	6,030.08	5,977.97	5,930.16	23.26	22.13	-138.49	-444.49	401.37	935.88	890.50	45.38	20.622	
6,200.00	6,127.89	6,074.43	6,025.15	23.70	22.53	-138.50	-457.78	411.57	962.26	916.03	46.23	20.814	
6,300.00	6,225.71	6,170.89	6,120.14	24.15	22.93	-138.51	-471.08	421.77	988.64	941.56	47.08	21.000	
6,400.00	6,323.52	6,267.35	6,215.13	24.59	23.34	-138.52	-484.37	431.97	1,015.01	967.08	47.93	21.178	
6,500.00	6,421.34	6,363.80	6,310.13	25.04	23.74	-138.52	-497.66	442.17	1,041.39	992.61	48.78	21.350	
6,600.00	6,519.15	6,460.26	6,405.12	25.49	24.14	-138.53	-510.96	452.37	1,067.76	1,018.13	49.63	21.515	
6,700.00	6,616.97	6,556.72	6,500.11	25.93	24.55	-138.54	-524.25	462.57	1,094.14	1,043.66	50.48	21.674	
6,800.00	6,714.78	6,653.18	6,595.10	26.38	24.95	-138.55	-537.55	472.77	1,120.52	1,069.18	51.34	21.827	
6,900.00	6,812.60	6,749.64	6,690.09	26.83	25.36	-138.55	-550.84	482.96	1,146.89	1,094.70	52.19	21.975	
7,000.00	6,910.41	6,846.10	6,785.09	27.28	25.77	-138.56	-564.14	493.16	1,173.27	1,120.22	53.05	22.118	
7,100.00	7,008.23	6,942.56	6,880.08	27.73	26.17	-138.57	-577.43	503.36	1,199.64	1,145.74	53.90	22.256	
7,200.00	7,106.04	7,039.02	6,975.07	28.18	26.58	-138.57	-590.73	513.56	1,226.02	1,171.26	54.76	22.389	
7,300.00	7,203.86	7,135.47	7,070.06	28.63	26.99	-138.58	-604.02	523.76	1,252.40	1,196.78	55.62	22.517	
7,400.00	7,301.67	7,260.11	7,193.10	29.08	27.50	-138.65	-619.78	535.85	1,277.96	1,221.37	56.59	22.585	
7,500.00	7,399.70	7,395.10	7,327.17	29.53	28.03	-139.12	-632.12	545.31	1,300.00	1,242.44	57.56	22.586	
7,600.00	7,498.35	7,532.01	7,463.76	29.95	28.53	-139.66	-639.49	550.97	1,316.66	1,258.18	58.48	22.515	
7,700.00	7,597.50	7,666.80	7,598.50	30.35	28.98	-140.20	-641.70	552.67	1,327.81	1,268.48	59.33	22.380	
7,800.00	7,697.05	7,766.35	7,698.05	30.72	29.29	-140.56	-641.70	552.67	1,335.11	1,275.09	60.02	22.245	
7,900.00	7,796.87	7,866.16	7,797.87	31.08	29.61	-140.78	-641.70	552.67	1,339.73	1,279.04	60.69	22.077	
8,000.00	7,896.83	7,966.13	7,897.83	31.41	29.92	-140.87	-641.70	552.67	1,341.65	1,280.32	61.33	21.876	
8,100.00	7,996.83	8,066.13	7,997.83	31.71	30.24	89.56	-641.70	552.67	1,341.71	1,279.76	61.95	21.657	
8,200.00	8,096.83	8,166.13	8,097.83	32.02	30.56	89.56	-641.70	552.67	1,341.71	1,279.14	62.57	21.442	
8,300.00	8,196.83	8,266.13	8,197.83	32.32	30.87	89.56	-641.70	552.67	1,341.71	1,278.52	63.20	21.231	
8,400.00	8,296.83	8,366.13	8,297.83	32.63	31.19	89.56	-641.70	552.67	1,341.71	1,277.89	63.82	21.023	
8,500.00	8,396.83	8,466.13	8,397.83	32.94	31.51	89.56	-641.70	552.67	1,341.71	1,277.27	64.45	20.818	
8,600.00	8,496.83	8,566.13	8,497.83	33.24	31.83	89.56	-641.70	552.67	1,341.71	1,276.64	65.08	20.617	
8,700.00	8,596.83	8,666.13	8,597.83	33.55	32.16	89.56	-641.70	552.67	1,341.71	1,276.01	65.71	20.419	
8,800.00	8,696.83	8,766.13	8,697.83	33.86	32.48	89.56	-641.70	552.67	1,341.71	1,275.37	66.34	20.224	
8,900.00	8,796.83	8,866.13	8,797.83	34.17	32.80	89.56	-641.70	552.67	1,341.71	1,274.74	66.98	20.033	
9,000.00	8,896.83	8,966.13	8,897.83	34.49	33.13	89.56	-641.70	552.67	1,341.71	1,274.10	67.61	19.844	
9,100.00	8,996.83	9,066.13	8,997.83	34.80	33.45	89.56	-641.70	552.67	1,341.71	1,273.47	68.25	19.659	
9,200.00	9,096.83	9,166.13	9,097.83	35.11	33.78	89.56	-641.70	552.67	1,341.71	1,272.83	68.89	19.477	
9,300.00	9,196.83	9,266.13	9,197.83	35.43	34.10	89.56	-641.70	552.67	1,341.71	1,272.19	69.53	19.297	
9,400.00	9,296.83	9,366.13	9,297.83	35.74	34.43	89.56	-641.70	552.67	1,341.71	1,271.54	70.17	19.121	
9,500.00	9,396.83	9,466.13	9,397.83	36.06	34.75	89.56	-641.70	552.67	1,341.71	1,270.90	70.81	18.947	
9,600.00	9,496.83	9,566.13	9,497.83	36.38	35.08	89.56	-641.70	552.67	1,341.71	1,270.26	71.46	18.776	
9,700.00	9,596.83	9,666.13	9,597.83	36.69	35.41	89.56	-641.70	552.67	1,341.71	1,269.61	72.11	18.608	
9,800.00	9,696.83	9,766.13	9,697.83	37.01	35.74	89.56	-641.70	552.67	1,341.71	1,268.96	72.75	18.442	
9,900.00	9,796.83	9,866.13	9,797.83	37.33	36.07	89.56	-641.70	552.67	1,341.71	1,268.31	73.40	18.279	
10,000.00	9,896.83	9,966.13	9,897.83	37.65	36.40	89.56	-641.70	552.67	1,341.71	1,267.66	74.05	18.119	
10,100.00	9,996.83	10,066.13	9,997.83	37.97	36.73	89.56	-641.70	552.67	1,341.71	1,267.01	74.70	17.961	
10,200.00	10,096.83	10,166.13	10,097.83	38.29	37.06	89.56	-641.70	552.67	1,341.71	1,266.36	75.36	17.805	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Anticollision Report

Company: COG Operating LLC
 Project: Lea County, NM (NAD27 NME)
 Reference Site: Little Bear Federal Com
 Site Error: 0.00 usft
 Reference Well: 8H
 Well Error: 0.00 usft
 Reference Wellbore: OH
 Reference Design: Plan 1 04-12-18

Local Co-ordinate Reference: Well 8H
 TVD Reference: RKB @ 3831.00usft (McVay 8)
 MD Reference: RKB @ 3831.00usft (McVay 8)
 North Reference: Grid
 Survey Calculation Method: Minimum Curvature
 Output errors are at: 2.00 sigma
 Database: USA Compass
 Offset TVD Reference: Offset Datum

Offset Design Little Bear Federal Com - 7H - OH - Plan 1 04-12-18													Offset Site Error: 0.00 usft
Survey Program: 0-MWD+HDGM													Offset Well Error: 0.00 usft
Reference	Offset	Semi Major Axis		Distance		Minimum Separation		Separation Factor		Warning			
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N-S (usft)	+E-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	Warning
10,300.00	10,196.83	10,266.13	10,197.83	38.62	37.39	89.56	-641.70	552.67	1,341.71	1,265.71	76.01	17.652	
10,400.00	10,296.83	10,366.13	10,297.83	38.94	37.73	89.56	-641.70	552.67	1,341.71	1,265.05	76.66	17.501	
10,500.00	10,396.83	10,466.13	10,397.83	39.26	38.06	89.56	-641.70	552.67	1,341.71	1,264.39	77.32	17.353	
10,600.00	10,496.83	10,566.13	10,497.83	39.59	38.39	89.56	-641.70	552.67	1,341.71	1,263.74	77.98	17.207	
10,700.00	10,596.83	10,666.13	10,597.83	39.91	38.72	89.56	-641.70	552.67	1,341.71	1,263.08	78.63	17.063	
10,800.00	10,696.83	10,766.13	10,697.83	40.24	39.06	89.56	-641.70	552.67	1,341.71	1,262.42	79.29	16.921	
10,900.00	10,796.83	10,866.13	10,797.83	40.56	39.39	89.56	-641.70	552.67	1,341.71	1,261.76	79.95	16.781	
11,000.00	10,896.83	10,966.13	10,897.83	40.89	39.73	89.56	-641.70	552.67	1,341.71	1,261.10	80.62	16.643	
11,100.00	10,996.83	11,066.13	10,997.83	41.21	40.06	89.56	-641.70	552.67	1,341.71	1,260.44	81.28	16.508	
11,200.00	11,096.83	11,166.13	11,097.83	41.54	40.40	89.56	-641.70	552.67	1,341.71	1,259.77	81.94	16.374	
11,300.00	11,196.43	11,266.19	11,197.42	41.85	40.72	89.95	-633.80	552.60	1,341.71	1,259.14	82.57	16.249	
11,400.00	11,292.47	11,366.05	11,293.03	42.11	40.98	89.90	-605.60	552.37	1,341.69	1,258.59	83.09	16.147	
11,500.00	11,380.75	11,465.70	11,380.52	42.30	41.19	89.87	-558.29	551.97	1,341.65	1,258.16	83.48	16.071	
11,600.00	11,457.41	11,565.14	11,456.17	42.41	41.32	89.83	-494.02	551.44	1,341.59	1,257.86	83.74	16.022	
11,700.00	11,519.12	11,664.41	11,516.81	42.45	41.40	89.81	-415.66	550.79	1,341.53	1,257.67	83.85	15.999	
11,800.00	11,563.15	11,763.53	11,559.91	42.42	41.43	89.79	-326.60	550.05	1,341.45	1,257.60	83.85	15.998	
11,900.00	11,587.61	11,862.55	11,583.72	42.35	41.42	89.78	-230.67	549.25	1,341.37	1,257.60	83.77	16.013	
12,000.00	11,591.70	11,961.69	11,587.61	42.25	41.39	89.78	-131.76	548.43	1,341.28	1,257.64	83.64	16.036	
12,100.00	11,588.60	12,061.69	11,584.64	42.16	41.40	89.79	-31.80	547.60	1,341.19	1,257.63	83.56	16.050	
12,200.00	11,585.49	12,161.69	11,581.67	42.09	41.47	89.80	68.15	546.77	1,341.10	1,257.55	83.55	16.051	
12,300.00	11,582.39	12,261.69	11,578.71	42.03	41.60	89.80	168.10	545.94	1,341.02	1,257.39	83.63	16.035	
12,400.00	11,579.28	12,361.69	11,575.74	42.00	41.80	89.81	268.05	545.10	1,340.93	1,257.04	83.89	15.985	
12,500.00	11,576.17	12,461.69	11,572.77	42.15	42.07	89.81	368.00	544.27	1,340.84	1,256.39	84.45	15.877	
12,600.00	11,573.07	12,561.69	11,569.81	42.48	42.40	89.82	467.96	543.44	1,340.75	1,255.64	85.11	15.752	
12,700.00	11,569.96	12,661.69	11,566.84	42.87	42.78	89.83	567.91	542.61	1,340.67	1,254.80	85.87	15.613	
12,800.00	11,566.86	12,761.69	11,563.87	43.31	43.21	89.83	667.86	541.78	1,340.58	1,253.87	86.71	15.460	
12,900.00	11,563.75	12,861.69	11,560.91	43.79	43.68	89.84	767.81	540.95	1,340.49	1,252.85	87.64	15.295	
13,000.00	11,560.64	12,961.69	11,557.94	44.30	44.20	89.84	867.77	540.12	1,340.40	1,251.75	88.65	15.119	
13,100.00	11,557.54	13,061.69	11,554.97	44.86	44.75	89.85	967.72	539.29	1,340.32	1,250.57	89.75	14.934	
13,200.00	11,554.43	13,161.69	11,552.01	45.45	45.35	89.86	1,067.67	538.46	1,340.23	1,249.31	90.92	14.740	
13,300.00	11,551.32	13,261.69	11,549.04	46.08	45.98	89.86	1,167.62	537.63	1,340.14	1,247.97	92.17	14.540	
13,400.00	11,548.22	13,361.69	11,546.07	46.74	46.65	89.87	1,267.58	536.80	1,340.05	1,246.56	93.49	14.334	
13,500.00	11,545.11	13,461.69	11,543.11	47.44	47.36	89.87	1,367.53	535.97	1,339.97	1,245.09	94.88	14.123	
13,600.00	11,542.01	13,561.69	11,540.14	48.17	48.10	89.88	1,467.48	535.14	1,339.88	1,243.55	96.33	13.909	
13,700.00	11,538.90	13,661.69	11,537.17	48.93	48.86	89.88	1,567.43	534.31	1,339.79	1,241.94	97.85	13.692	
13,800.00	11,535.79	13,761.69	11,534.21	49.72	49.66	89.89	1,667.39	533.48	1,339.70	1,240.28	99.43	13.474	
13,900.00	11,532.69	13,861.69	11,531.24	50.54	50.49	89.90	1,767.34	532.65	1,339.62	1,238.55	101.06	13.255	
14,000.00	11,529.58	13,961.69	11,528.27	51.38	51.34	89.90	1,867.29	531.81	1,339.53	1,236.77	102.76	13.036	
14,100.00	11,526.47	14,061.69	11,525.31	52.25	52.22	89.91	1,967.24	530.98	1,339.44	1,234.94	104.50	12.817	
14,200.00	11,523.37	14,161.69	11,522.34	53.14	53.13	89.91	2,067.20	530.15	1,339.35	1,233.06	106.30	12.600	
14,300.00	11,520.26	14,261.69	11,519.37	54.06	54.05	89.92	2,167.15	529.32	1,339.27	1,231.13	108.14	12.384	
14,400.00	11,517.16	14,361.69	11,516.41	55.00	55.00	89.93	2,267.10	528.49	1,339.18	1,229.15	110.03	12.171	
14,500.00	11,514.05	14,461.69	11,513.44	55.96	55.97	89.93	2,367.05	527.66	1,339.09	1,227.13	111.96	11.961	
14,600.00	11,510.94	14,561.69	11,510.47	56.94	56.96	89.94	2,467.01	526.83	1,339.01	1,225.08	113.93	11.753	
14,700.00	11,507.84	14,661.69	11,507.51	57.94	57.97	89.94	2,566.96	526.00	1,338.92	1,222.98	115.94	11.549	
14,800.00	11,504.73	14,761.69	11,504.54	58.96	59.00	89.95	2,666.91	525.17	1,338.83	1,220.85	117.98	11.348	
14,900.00	11,501.63	14,861.69	11,501.57	59.99	60.05	89.96	2,766.86	524.34	1,338.74	1,218.68	120.06	11.151	
15,000.00	11,498.52	14,961.69	11,498.61	61.05	61.11	89.96	2,866.81	523.51	1,338.66	1,216.49	122.17	10.957	
15,100.00	11,495.41	15,061.69	11,495.64	62.11	62.18	89.97	2,966.77	522.68	1,338.57	1,214.26	124.31	10.768	
15,200.00	11,492.31	15,161.69	11,492.67	63.20	63.27	89.97	3,066.72	521.85	1,338.48	1,212.00	126.48	10.582	
15,300.00	11,489.20	15,261.69	11,489.71	64.29	64.38	89.98	3,166.67	521.02	1,338.39	1,209.71	128.68	10.401	
15,400.00	11,486.09	15,361.69	11,486.74	65.40	65.50	89.99	3,266.62	520.19	1,338.31	1,207.40	130.91	10.223	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Anticollision Report

Company: COG Operating LLC
Project: Lea County, NM (NAD27 NME)
Reference Site: Little Bear Federal Com
Site Error: 0.00 usft
Reference Well: 8H
Well Error: 0.00 usft
Reference Wellbore: OH
Reference Design: Plan 1 04-12-18

Local Co-ordinate Reference: Well 8H
TVD Reference: RKB @ 3831.00usft (McVay 8)
MD Reference: RKB @ 3831.00usft (McVay 8)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at 2.00 sigma
Database: USA Compass
Offset TVD Reference: Offset Datum

Offset Design Little Bear Federal Com - 7H - OH - Plan 1 04-12-18													Offset Site Error:	0.00 usft
Survey Program: 0-MWD+HDGM													Offset Well Error:	0.00 usft
Reference		Offset		Semi Major Axis			Distance							Warning
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor		
15,500.00	11,482.99	15,461.69	11,483.77	66.52	66.63	89.99	3,366.58	519.36	1,338.22	1,205.06	133.16	10.050		
15,600.00	11,479.88	15,561.69	11,480.81	67.66	67.77	90.00	3,466.53	518.52	1,338.13	1,202.69	135.44	9.880		
15,700.00	11,476.78	15,661.69	11,477.84	68.80	68.92	90.00	3,566.48	517.69	1,338.05	1,200.31	137.74	9.714		
15,800.00	11,473.67	15,761.69	11,474.87	69.96	70.09	90.01	3,666.43	516.86	1,337.96	1,197.90	140.06	9.553		
15,900.00	11,470.56	15,861.69	11,471.91	71.13	71.26	90.02	3,766.39	516.03	1,337.87	1,195.47	142.40	9.395		
16,000.00	11,467.46	15,961.69	11,468.94	72.30	72.45	90.02	3,866.34	515.20	1,337.78	1,193.02	144.76	9.241		
16,100.00	11,464.35	16,061.69	11,465.97	73.49	73.64	90.03	3,966.29	514.37	1,337.70	1,190.56	147.14	9.091		
16,200.00	11,461.24	16,161.69	11,463.01	74.69	74.85	90.03	4,066.24	513.54	1,337.61	1,188.07	149.54	8.945		
16,300.00	11,458.14	16,261.69	11,460.04	75.89	76.06	90.04	4,166.20	512.71	1,337.52	1,185.57	151.95	8.802		
16,400.00	11,455.03	16,361.69	11,457.07	77.10	77.28	90.05	4,266.15	511.88	1,337.44	1,183.05	154.38	8.663		
16,500.00	11,451.93	16,461.69	11,454.11	78.32	78.50	90.05	4,366.10	511.05	1,337.35	1,180.52	156.83	8.527		
16,600.00	11,448.82	16,561.69	11,451.14	79.55	79.74	90.06	4,466.05	510.22	1,337.26	1,177.97	159.29	8.395		
16,700.00	11,445.71	16,661.69	11,448.17	80.79	80.98	90.06	4,566.01	509.39	1,337.17	1,175.41	161.77	8.266		
16,800.00	11,442.61	16,761.69	11,445.21	82.03	82.23	90.07	4,665.96	508.56	1,337.09	1,172.83	164.25	8.140		
16,900.00	11,439.50	16,861.69	11,442.24	83.28	83.48	90.08	4,765.91	507.73	1,337.00	1,170.24	166.76	8.018		
17,000.00	11,436.40	16,961.69	11,439.27	84.53	84.74	90.08	4,865.86	506.90	1,336.91	1,167.64	169.27	7.898		
17,100.00	11,433.29	17,061.69	11,436.31	85.79	86.01	90.09	4,965.82	506.07	1,336.83	1,165.03	171.80	7.781		
17,200.00	11,430.18	17,161.69	11,433.34	87.06	87.28	90.09	5,065.77	505.23	1,336.74	1,162.41	174.33	7.668		
17,300.00	11,427.08	17,261.69	11,430.37	88.33	88.55	90.10	5,165.72	504.40	1,336.65	1,159.77	176.88	7.557		
17,400.00	11,423.97	17,361.69	11,427.41	89.61	89.84	90.11	5,265.67	503.57	1,336.57	1,157.12	179.44	7.448		
17,500.00	11,420.86	17,461.69	11,424.44	90.89	91.12	90.11	5,365.63	502.74	1,336.48	1,154.47	182.01	7.343		
17,600.00	11,417.76	17,561.69	11,421.47	92.17	92.41	90.12	5,465.58	501.91	1,336.39	1,151.80	184.59	7.240		
17,700.00	11,414.65	17,661.69	11,418.51	93.47	93.71	90.12	5,565.53	501.08	1,336.31	1,149.13	187.17	7.139		
17,800.00	11,411.55	17,761.69	11,415.54	94.76	95.01	90.13	5,665.48	500.25	1,336.22	1,146.45	189.77	7.041		
17,900.00	11,408.44	17,861.69	11,412.57	96.06	96.31	90.14	5,765.43	499.42	1,336.13	1,143.76	192.37	6.945		
18,000.00	11,405.33	17,961.69	11,409.61	97.36	97.62	90.14	5,865.39	498.59	1,336.04	1,141.06	194.99	6.852		
18,100.00	11,402.23	18,061.69	11,406.64	98.67	98.93	90.15	5,965.34	497.76	1,335.96	1,138.35	197.61	6.761		
18,200.00	11,399.12	18,161.69	11,403.67	99.98	100.25	90.15	6,065.29	496.93	1,335.87	1,135.64	200.23	6.672		
18,300.00	11,396.02	18,261.69	11,400.71	101.30	101.57	90.16	6,165.24	496.10	1,335.78	1,132.92	202.87	6.584		
18,400.00	11,392.91	18,361.69	11,397.74	102.62	102.89	90.17	6,265.20	495.27	1,335.70	1,130.19	205.51	6.499		
18,500.00	11,389.80	18,461.69	11,394.77	103.94	104.22	90.17	6,365.15	494.44	1,335.61	1,127.45	208.16	6.416		
18,600.00	11,386.70	18,561.69	11,391.81	105.27	105.55	90.18	6,465.10	493.61	1,335.52	1,124.71	210.81	6.335		
18,700.00	11,383.59	18,661.69	11,388.84	106.59	106.88	90.18	6,565.05	492.78	1,335.44	1,121.97	213.47	6.256		
18,800.00	11,380.48	18,761.69	11,385.87	107.92	108.21	90.19	6,665.01	491.94	1,335.35	1,119.21	216.14	6.178		
18,900.00	11,377.38	18,861.69	11,382.91	109.26	109.55	90.20	6,764.96	491.11	1,335.26	1,116.45	218.81	6.102		
19,000.00	11,374.27	18,961.69	11,379.94	110.60	110.89	90.20	6,864.91	490.28	1,335.18	1,113.69	221.49	6.028		
19,100.00	11,371.17	19,061.68	11,376.98	111.94	112.23	90.21	6,964.86	489.45	1,335.09	1,110.92	224.17	5.956		
19,158.71	11,369.34	19,120.39	11,375.23	112.72	113.02	90.21	7,023.54	488.97	1,335.04	1,109.29	225.75	5.914		
19,169.71	11,369.00	19,128.87	11,374.98	112.87	113.14	90.21	7,032.01	488.89	1,335.03	1,109.02	226.01	5.907		

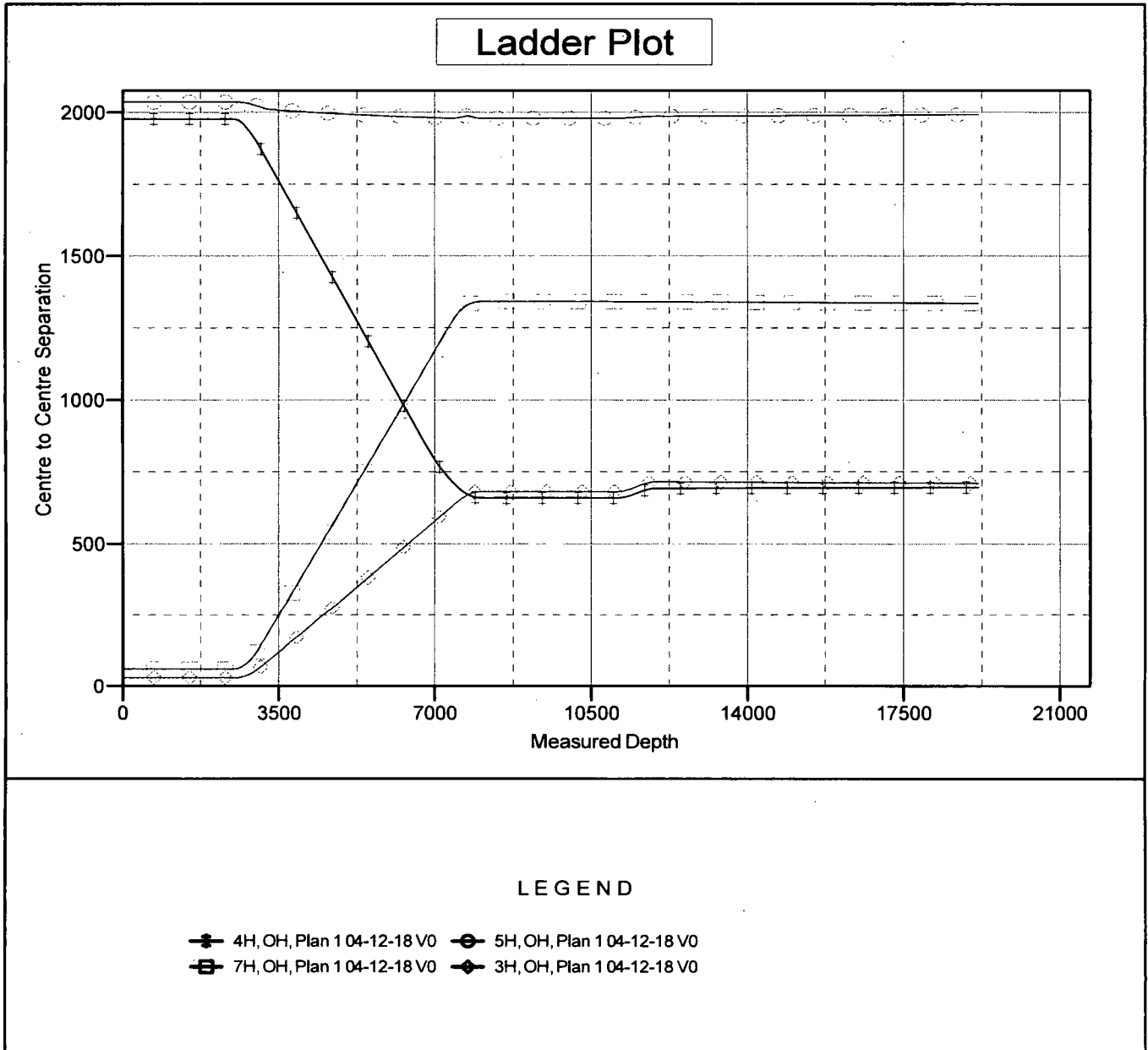
Anticollision Report

Company: COG Operating LLC
Project: Lea County, NM (NAD27 NME)
Reference Site: Little Bear Federal Com
Site Error: 0.00 usft
Reference Well: 8H
Well Error: 0.00 usft
Reference Wellbore: OH
Reference Design: Plan 1 04-12-18

Local Co-ordinate Reference: Well 8H
TVD Reference: RKB @ 3831.00usft (McVay 8)
MD Reference: RKB @ 3831.00usft (McVay 8)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: USA Compass
Offset TVD Reference: Offset Datum

Reference Depths are relative to RKB @ 3831.00usft (McVay 8)
 Offset Depths are relative to Offset Datum
 Central Meridian is 104° 19' 60.00000 W

Coordinates are relative to: 8H
 Coordinate System is US State Plane 1927 (Exact solution), New Mexico East 30
 Grid Convergence at Surface is: 0.41°



CC - Min centre to center distance or covergent point. SF - min separation factor, ES - min ellipse separation