DRILLING PROGRAM

SAVIA-Z2B-24-LO16-29D

Lobitos offshore

January - 2014

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SAVIA PERU S.A.
SAVIA-Z2B-24-LO16-29D

OPERATING PRACTICES ON DIRECTIONAL WELLS

Rules-of-Thumb (source: Murchison Drilling Schools, Inc. 2004)

- Hydraulics horsepower should be higher to account for mud motor losses and flowrate designed with special emphasis given to hole cleaning.
- Connection practices need to be optimized with special attention given to preventing stuck pipe, surge and bit damage.
- Trips (short and long) need to be optimized and supervised closely.
- Special reciprocating and rotating practices should be implemented when trying to remove cuttings that settle out on the low side of the hole.
- The key drilling parameters have to be recorded on a trend basis.
- A driller should be told to monitor: The pressure-stroke relationship; the drag trend (up drag - down drag and difference between up and down, sometimes referred to as a ΔW) and the torque trends.
- Many hole cleaning and stuck pipe problems can be caught in the early stages if good discipline is exercised at the drillers' console.

In addition, this is a well with inclination higher than 40 degree, below practice should followed:

- Circulate 30 minutes after long slide interval.
- If there is abundant caving, stop drilling and circulate out of the well. If the caving continues, short trip to shoe to check hole condition.
- If you encounter tight spots while POOH, run back in the hole 3~5 stands (or until the BHA is free from the obstruction) and circulate at least 30 minutes to remove cutting.
- Never back reaming without permission of Drilling Operation Head or Drilling Superintendent.

Keys to communications

A drilling problem is anything that interfered with carrying out a successful drilling program. The drilling problem can be loss of hole stability, such as lost circulation, shale heaving, hole cleaning, stuck pipe, well control, etc., but many times the problem is people and, more specifically, communications between people. Most drilling problems can be either prevented or solved by being more effective at the art of communications. Communications is really just a question and answer session to interchange knowledge between people to get work done in an effective way and, if work isn't done correctly, to find out why.

Recommended Drilling Parameters

The following tables illustrate recommended drilling parameters to minimize hole cleaning problems which may occur at various holes sizes.

Minimum Flow Rate (gpm) against hole size and angle

ANGLE INTERVAL (degree)	HOLE SIZE (in)			
	26	**17 ½ – 16**	**12 ¼**	**8 ½**
0 – 35	700	500	400	300
35 – 55	1250	950	650	450
Higher than 55		1,100	750	500

Maximum ROP (fh/hr) against hole size and angle

ANGLE INTERVAL (degree)	H OLE SIZE (in)			
	26	**17 ½ – 16**	**12 ¼**	**8 ½**
0 – 35	60	110	155	240
35 – 55	40	75	85	125
Higher than 55		60	75	100

Circulation Strokes Factor (CSF) to clean hole

ANGLE INTERVAL (degree)	HOLE SIZE (in)			
	26	**17 ½ – 16**	**12 ¼**	**8 ½**
0 – 35	2	1.7	1.4	1.4
35 – 55	2.5	2.5	1.8	1.6
Higher than 55		3	2	1.7

Minimum Circulation Strokes (MCS)

1) Separating the hole in sections according to hole intervals showed in table of Minimum Circulation Strokes Factor to clean hole.
2) Multiplying each section length of hole (section length) by CSF and calculate Matched Measured Depth.
3) Calculating Minimum Circulation Strokes (MCS).

$$MCS = \frac{(\text{Matched Measured Depth}) \text{ x } (\text{Bottoms} - \text{up Strokes})}{\text{Measured Depth}}$$

I. INTRODUCTION

A. SUMMARY

The SAVIA-Z2B-24-LO16-29D development well is the twenty-second well to be drilled in the LO16 platform. The purpose of this project is to test potential reserves of the main objective Mogollon formation.

The offset wells for this project are: LO16-17, LO6-27D, LO6-29D, and LO16-27D. The well design will be type "J" of high angle. The main objective is cross the pay zone with a maximum inclination of 51.6° in direction N 52.3° W at depth of 6,611 ft MD (4,750 ft TVD), then continue drilling tangent section until total depth at 7,870 ft MD (5,532 ft TVD).

The PEPESA Rig 44 will be utilized to drill this well. It will have 18" x ⅜" WT (70.59 ppf, ASTM A-53 grade B) Conductor Pipe set at 480 ft MD (480 ft TVD); 13 ⅜" (54.50 ppf, K-55, BTC) Surface Casing set at 2,350 ft MD (2,102 ft TVD); 9 ⅝" (43.50 ppf, N-80, BTC) Intermediate Casing set at 5,600 ft MD (4,122 ft TVD); 5 ½" (17.00 ppf, N-80, BTC) Production Casing set at 7,870 ft MD (5,532 ft TVD). The well completion will be 5 ½" cemented thru Mogollon formation.

The 17" hole will be drilled with spud mud and fresh water based mud system with viscous sweeps. After setting surface casing, the 12 ¼" and 8 ½" holes will be drilled with KLASHIELD / POTASSIUM SULPHATE mud system.

Note: The depths on this drilling program are measured from the Top Rotary Table.

GEOLOGICAL EVALUATION

Mud logging service will be from 480 ft MD to total depth and will be run by TGT Company. Savia's geologist will monitor the geological behavior during the drilling. Samples are required every 30 ft from 480 ft to 4,000 ft MD and every 10 ft from 4,000 ft MD to total depth. Paleontology Samples will be taken every 150 ft from 480 ft to 4,000 ft MD, and every 90 ft from 4,000 ft MD to total depth. Palynology will be taken to request of Geology Lima office.

The geological top of main objective at 6,611 ft MD (4,750 ft TVD) and it will be drilled with a maximum inclination of 51.6° in direction N 52.3° W. The recommended open hole logs to be run in 8 ½" section, Mogollon formation, are DLL-MSFL-GR; FDC-CNL-GR; FMI; Dipole Sonic. For cement evaluation on 5 ½" casing, the recommended logs will be CNL-GR-CCL. The high angle wellbore should be logging efficiently and safely using the conveyance technique with Compact shuttle for obtains data of formation that define completion decisions. An open-ended drill pipe with a special bottom hole assembly (BHA)

is run to the bottom of the well. The Compact tools positioned inside BHA is out pipe and the well and drill pipe is tripped to surface with the Compact tools acquiring data in memory mode.

INCLINATION AND DIRECTIONAL SURVEYS

Directional Drilling Service will start at 490 ft MD, Gyro Survey will start from surface for drilling the surface phase. The well will be drilled using a Conventional Mud Motor and combination Gyro and MWD System will be used until collision risk and magnetic interference disappears. After that, continue directional drilling and take surveys with MWD system to total depth. The well design is "J" Shape of high angle. The Directional Drilling plan will be as follows: **The conductor has to be run vertically**, drill orientated section until Kick off point (KOP) in the surface hole section at 550 ft MD; start building with a Build Up Rate (BUR) 3.0°/100 ft to 883 ft, from this depth perform nudge and continue with BUR 3.0°/100 ft to reach End of Build (EOB) with a maximum inclination angle of 51.6° in direction N 52.3° W at 2,288 ft MD (2,063 ft TVD), continue drilling holding tangent section to Total Depth at 7,870 ft MD (5,532 ft TVD).

Company man has to check that the directional drilling engineer has present all items indicate below before commencement of the directional drilling operation.

- Confirm that all the offset well data are loaded in the computer.
- Check that the directional driller and MWD engineer know the directional drilling plan.
- Check that all the tool calibration has been done (Certificates).
- Check that tool face is correctly aligned with survey tool.
- Check that Scribe line is used until the depth of collision risk.
- Confirm that there is no magnetic interference.
- Check MWD data is matching with Gyro data.
- Gyro survey must be used to about **1,000 ft MD** or as per directional driller recommendation.
- Monitor the interference with MWD, it tool will be out of magnetic interference from nearby wells at **1,000 ft**.
- Scribe line must be used as a backup to confirm the Gyro orientation.
- During the KOP the azimuth and the inclination need to be monitored to assure the trajectory of the well will be far away from the offset wells.

- ROP, vibrations, Torque and motor stalling must be monitored because this could indicate about a collision.

DRILL PIPE STRAPS

The drilling string shall be strapped (measured in derrick) on trip out prior to running casing, logging and at any other time deemed necessary. Any difference in excess of 4 ft with the tally book will require SLM (steel line measurement) back in hole. The company representative must witness and check all straps. Check and maintain good control with tally 5" DP because this is the method to measure depth hole and reference logging depth.

Ensure that the electronic instrument of drilling rig, Pason electronic System, is working appropriate. For logging operations is necessary use the Tough Logging Condition (TLC) system and needs support by electronic system mainly the measure depth.

DRILLING HAZARDS

The anti-collision report showed risks with LO16-26, LO16-21, and LO16-22 according to Anti-collision analysis (Weatherford Policy: Minimum acceptable separation factor higher than 1.0 to continue drilling).

- **LO16-26 (gyro survey):** Expect to have a minimum SF of 2.50 (ct-ct = 8.92 ft) at 480 ft MD.
- **LO16-21:** Expect to have a minimum SF of 1.83 (ct-ct = 13.7 ft) at 560 ft MD.
- **LO16-22 (gyro survey):** Expect to have a minimum SF of 3.61 (ct-ct = 15.3 ft) at 689 ft MD.

Slant conductors – possible restriction while run conductor from slot D.

- **LO16-8:** It is a well with slant conductor (direction S 44.4° W) and expect to have a minimum ct-ct = 0.3 ft at 144 ft MD.
- **LO16-7:** It is a well with slant conductor (direction S 7.5° W) and expect to have a minimum ct-ct = 5.25 ft at 130 ft MD.
- **LO16-9:** It is a well with slant conductor (direction S 72.9° W) and expect to have a minimum ct-ct = 11.6 ft at 143 ft MD.

Note:

Multi-shots gyro surveys were taken to LO16-22 and LO16-26 wells to match anti-collision analysis of LO16-27D well.

After this analysis, it is necessary start with Gyro Survey from surface to get away from risk of collision and magnetic interference at **1,000 ft MD**, after this just MWD tool will be used as sensor survey to continue drilling.

Mud weight will be increased as dictated by wellbore stability conditions and Mud logging unit information. Also, expect lost circulation while Pariñas formation is drilled, so that enough bridging material must be stocked at the rig site. Differential sticking is a problem of stuck pipe that must be avoided; prevent this problem mainly when sand is drilled as Mogollon & Basal Salina formations. Treatment drilling fluid with bridging material and all time is necessary hold the BHA in moving.

Keep as much barite as possible at the rig site with recommendation to raise the mud weight by two pounds if it's was necessary equivalent at 1,200 Sx of barite.

GEOLOGIC PROGNOSIS

AREA	OFFICIAL WELL NUMBER	SAVIA PERU S.A. Slot C	TYPE OF WELL	RIG N°
LOBITOS OFFSHORE		LO16 - 29D	DEVELOPMENT	PEPESA-44

PRIMARY OBJECTIVE	SECONDARY OBJECTIVE
MOGOLLON	

SURFACE COORDINATES (UTM) (WGS-84)		TARGET COORDINATES (UTM) (WGS-84)	
9'505,994.60 MN	459,446.50 ME	9'506,750.13 MN	458,446.05 ME

ELEVATIONS		WELL		TARGET		TOTAL	
KB:	50 FT	DIRECTION OF DEVIATE WELL	N 52.25° W	DRILLED DEPTH	6611 FT	ESTIMATED FINAL	7,866 FT
WATER DEPTH	309 FT	ANGLE CONDUCTOR FROM VERTICAL	VERT.	VERTICAL DEPTH	4750 FT	HORIZONTAL DRIFT	5,096 FT
GROUND LEVEL	FT	RECOMENDED DEPTH OF K.O.P.	550 FT	HORIZONTAL DRIFT	4113 FT	MAX. ANGLE	51.58°
		BUILD UP ANGLE AT	Drop vert. Angle 3°/100 FT.	LIMITS (DIAMETER) TO MAIN OBJECTIVE. (LOW. BS)	TOP: 100 ft.	BASE:	100ft.

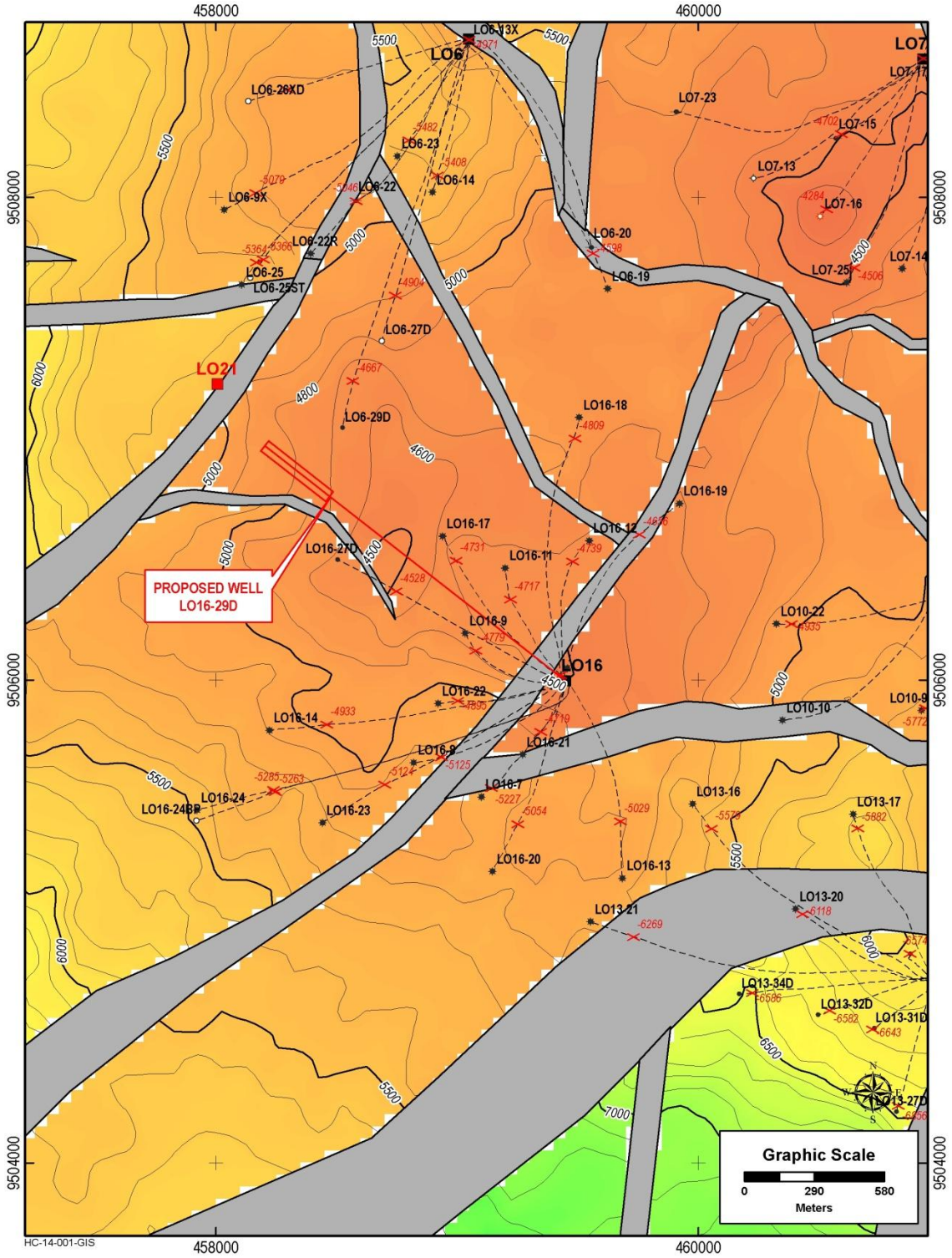
STRATIGRAPHIC SEQUENCE — FORMATION / MEMBER	DRILLED TOP (MD/FT)	VERT. TOP (VD/FT)	SUBSEA TOP (SS/FT)	OBSERVATIONS
TALARA	AT SEA BOTTOM			
CHACRA	3115	2,600	2,550	
PARIÑAS	4439	3,400	3,350	
PALEGREDA	4,841	3,650	3,600	
MOGOLLON	6,611	4,750	4,700	MAIN OBJECTIVE
TD.	7,866	5,530	5,480	

COTNR.	BIT SAMPLES TO BE TAKEN	EVERY 30 FT.FROM SURFACE TO 4000' EVERY 10 FT. FROM 4000' TO TOTAL DEPTH
	RECOMMENDED FOR PALEO-PALYNOLOGY	PALEONTOLOGY EVERY 150' FROM SURFACE TO 4000' PALEONTOLOGY EVERY 90' FROM 4000' TO TOTAL DEPTH PALYNOLOGY AT REQUESTED BY LIMA OFFICE
LOGGING	RECOMMENDED OPEN HOLE	DLL-MSFL-GR; FDC-CNL-GR, FMI, SONICO DIPOLAR
	RECOMMENDED AFTER CASING	GR-CCL
	NEARBY WELLS FOR CORRELATION	LO16-17,LO6-29D,LO6-27D,LO16-27D
EVALUAT.	SIDEWALL CORES	SWC * HRCT NOT CONSIDERED
	CONVENTIONAL CORES	NOT CONSIDERED
	GAS LOGGER	MUD LOGGING UNIT.
	FORMATION TESTING	NOT CONSIDERED

REMARKS

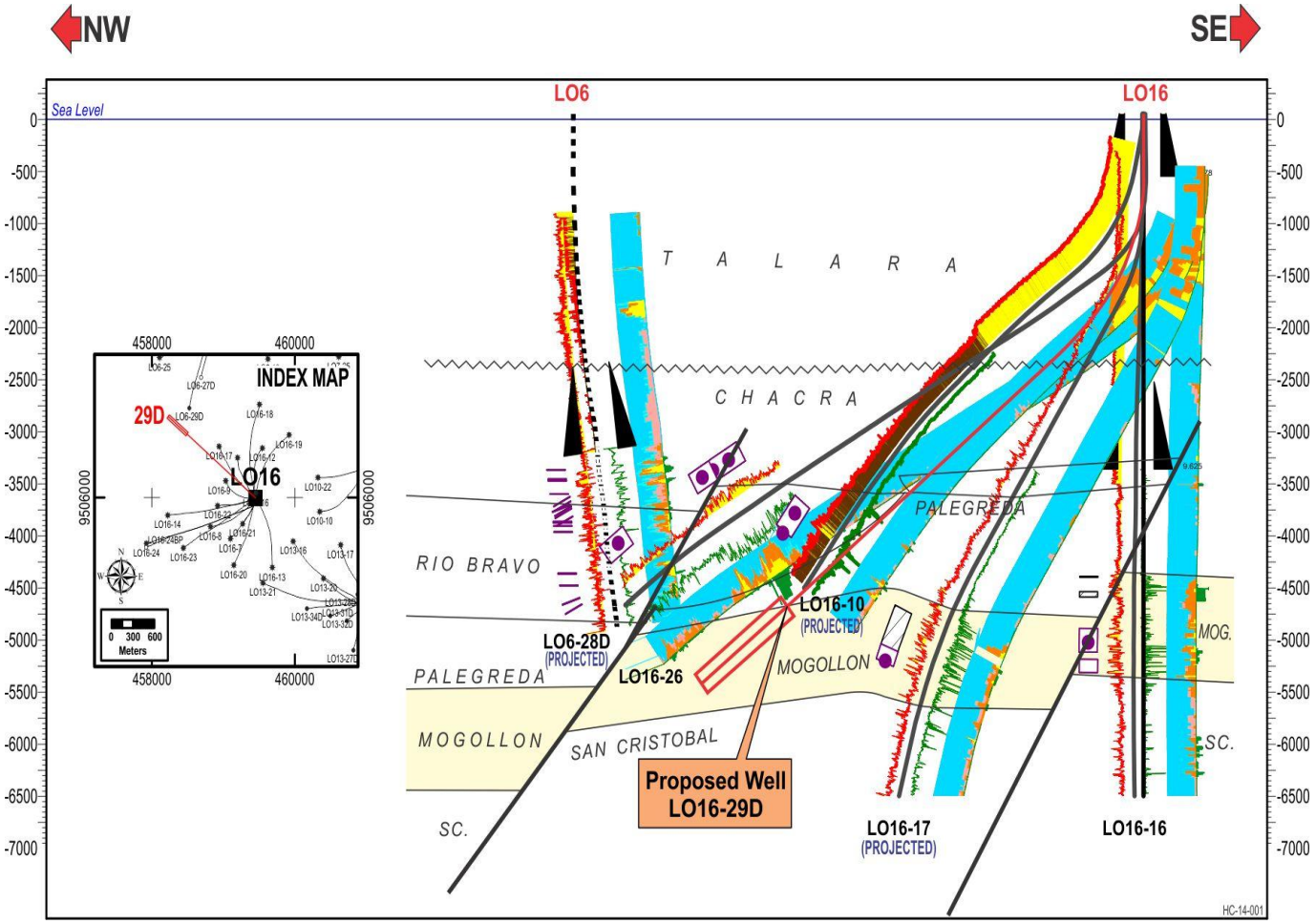
RECOMMENDED BY	DATE:	REVISED BY	DATE:	APPROVED BY	DATE:
H.Cornejo / J.C. Muñoz/ E. Borda	Jan. 2014	V. DELGADO / H. JANAMPA	Jan. 2014	P. ALARCON	Jan. 2014

STRUCTURAL MAP – TOP OF MOGOLLON FORMATION

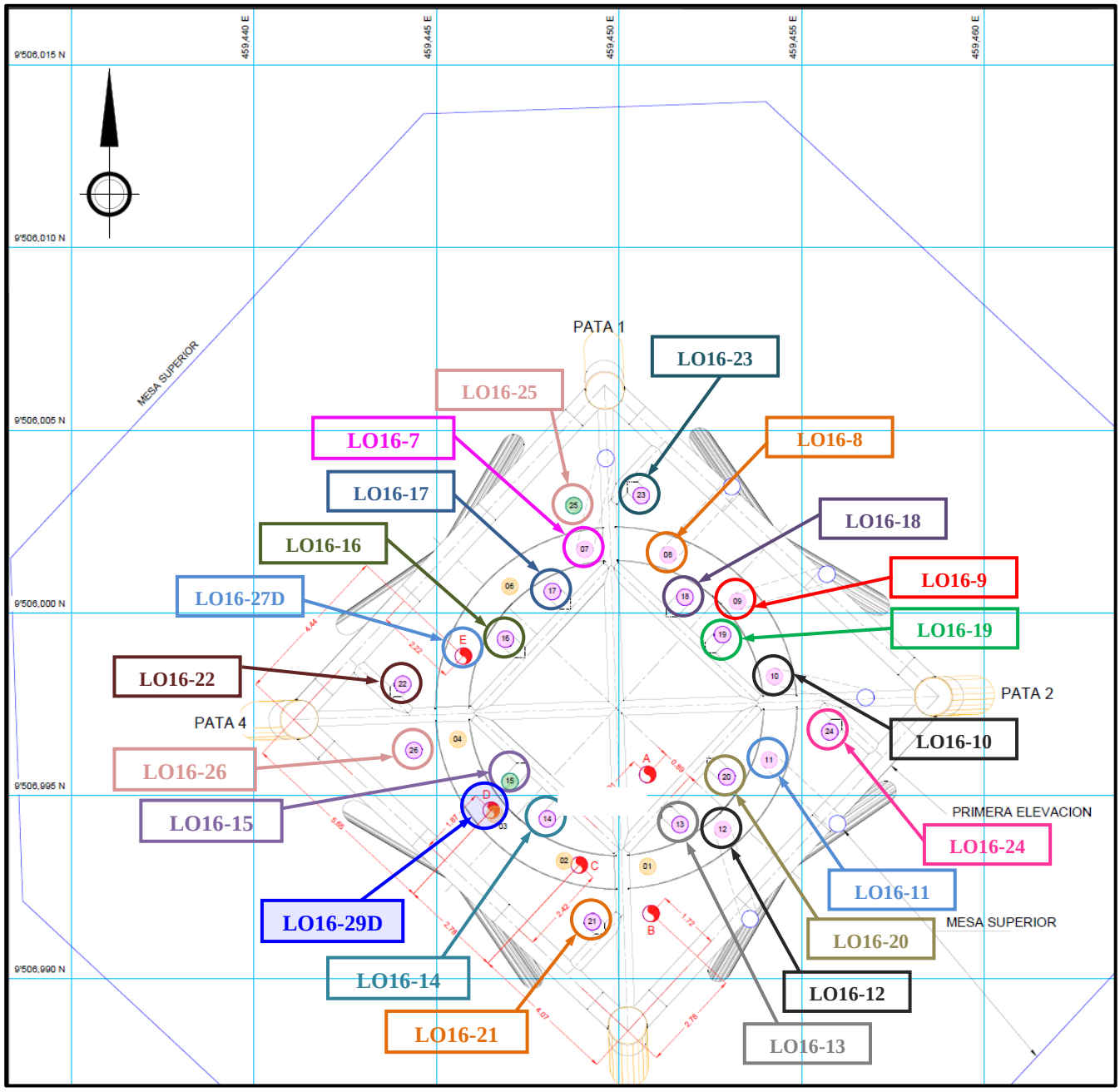


Prepared by:	Reviewed by:	Approved by:
Luis Torres: Drilling Engineer	Jose Chuyes: Drilling Engineering Head Ricardo Gilabert: Drilling Operation Head Carlos Ramirez: Drilling Superintendent (e) Sang-il Lee: Drilling Advisor	Gregorio Idiaquez: Operation Manager

SW – NE STRUCTURAL SECTION



CONDUCTOR PLANE



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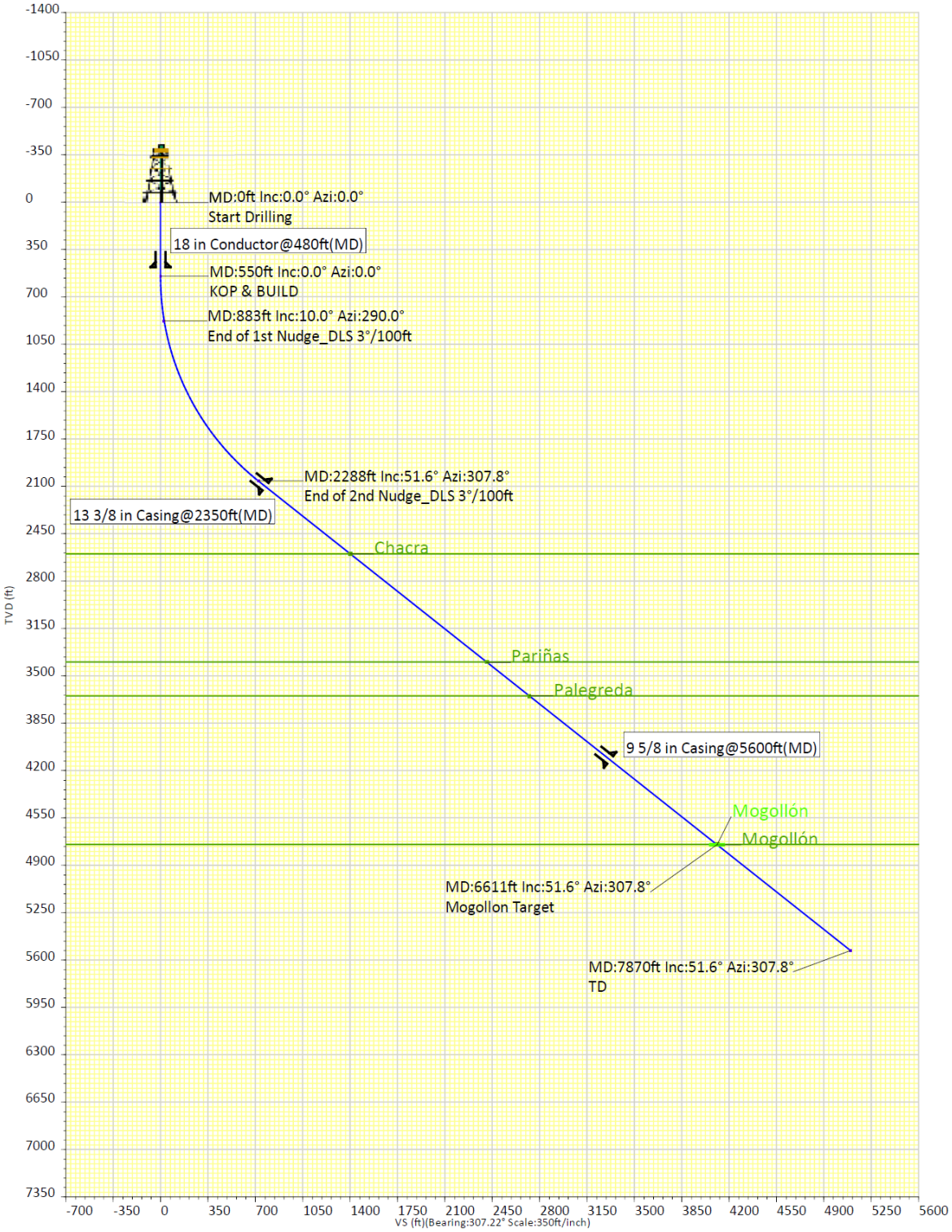
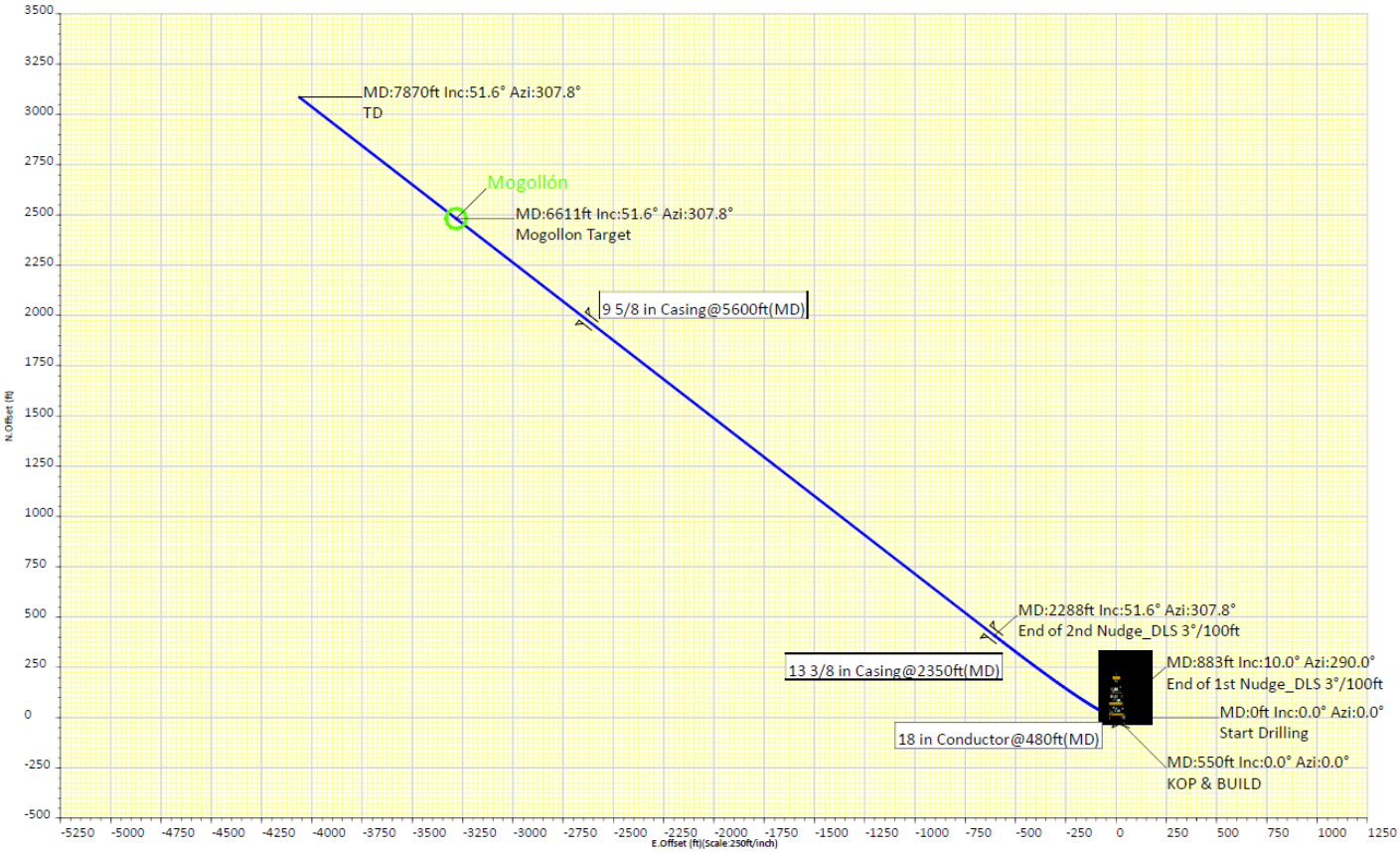
PLANNING REPORT

Comment	MD (ft)	Inc (°)	Az (°)	TVD (ft)	TVDss (ft)	DLS (°/100 ft)	VS (ft)	NS (ft)	EW (ft)	Northing (m)	Easting (m)
Start Drilling	0.00	0.00	0.00	0.00	50.00	0.00	0.00	0.00	0.00	9,505,994.60	459,446.50
18" Conductor	480.00	0.00	0.00	480.00	-430.00	0.00	0.00	0.00	0.00	9,505,994.60	459,446.50
KOP & BUILD	550.00	0.00	0.00	550.00	-500.00	0.00	0.00	0.00	0.00	9,505,994.60	459,446.50
End of 1st Nudge	883.33	10.00	290.00	881.64	-831.64	3.00	27.71	9.92	-27.27	9,505,997.62	459,438.19
End of 2nd Nudge	2,287.85	51.58	307.75	2,063.39	-2,013.39	3.00	726.13	406.54	-603.06	9,506,118.42	459,262.63
13 3/8" Casing	2,350.00	51.58	307.75	2,102.01	-2,052.01	0.00	774.82	436.35	-641.55	9,506,127.50	459,250.89
Chacra	3,151.36	51.58	307.75	2,600.00	-2,550.00	0.00	1,402.64	820.77	-1,137.95	9,506,244.60	459,099.53
Pariñas	4,438.72	51.58	307.75	3,400.00	-3,350.00	0.00	2,411.19	1,438.31	-1,935.40	9,506,432.70	458,856.37
Palegreda	4,841.01	51.58	307.75	3,650.00	-3,600.00	0.00	2,726.37	1,631.29	-2,184.60	9,506,491.49	458,780.39
9 5/8" Casing	5,600.00	51.58	307.75	4,121.66	-4,071.66	0.00	3,320.98	1,995.37	-2,654.75	9,506,602.39	458,637.03
Mogollon - Target	6,611.12	51.58	307.75	4,750.00	-4,700.00	0.00	4,113.13	2,480.40	-3,281.08	9,506,750.13	458,446.05
TD - 5 1/2" Casing	7,870.00	51.58	307.75	5,532.31	-5,482.31	0.00	5,099.38	3,084.29	-4,060.89	9,506,934.08	458,208.27

DIRECTIONAL PLAN DIAGRAM





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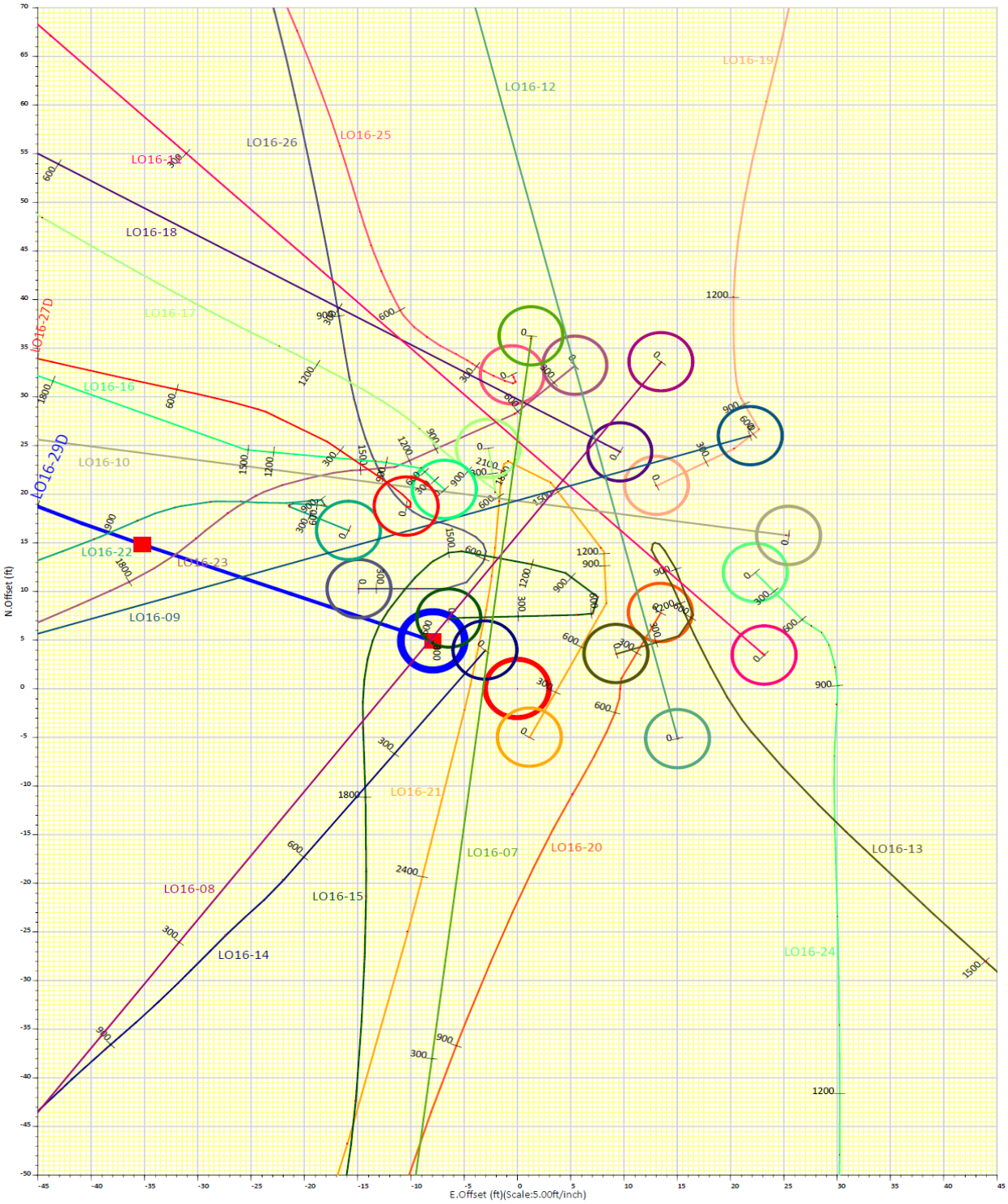
ANTI COLLISION DIAGRAM



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B. GENERAL

Well Name	: LO16-29D	
Well Official Number	: SAVIA-Z2B-24-LO16-29D	
Well Type	: Development	
Contract area	: Z2B – Offshore Peru	
Surface coordinates (WGS-84)	: 9'505,994.60 m N	459,446.50 m E
Target coordinates (WGS-84)	: 9'506,750.13 m N	458,446.05 m E
Top Depth (Mogollon)	: 6,611 ft MD	4,750 ft TVD
Water Depth	: 309 ft	
RKB elevation	: 50 ft	

GEOLOGICAL RECOMMENDATION

FORMATION	MEASURED DEPTH (ft)	VERTICAL DEPTH SUBSEA (ft)	REMARKS
TALARA	359	-309	From sea to bottom
CHACRA	3,115	-2,550	
PARIÑAS	4,439	-3,350	**Oil Bearing**
PALEGREDA	4,841	-3,600	
MOGOLLON	6,611	-4,700	**Main Objective**
TOTAL DEPTH	7,866	-5,480	

DIRECCIONAL PLAN

Kick off point	: 550 ft
Rate of build	: 3.0°/100 ft
Maximum Angle	: 51.6º
Direction (Vertical section)	: N 52.3º W
Drilled Depth to Target	: 6,611 ft
Vertical Depth to Target	: 4,750 ft
Horizontal Section to Target	: 4,113 ft
Total Depth	: 7,870 ft

Estimated Operating Days : 44 days

CHARACTERISTIC OF RIG

Maximum continuous drill torque of Rig Top Drive:	**30,000 ft-lbs**
Make-up torque of Top Drive:	**39,000 ft-lbs**
Breakout torque of Top Drive:	**45,000 ft-lbs**
Maximum speed of Top Drive:	**220 rpm**
Maximum capacity of mast (in low):	**375,000 lbs**
Traveling block:	**8 lines**
Hook weight:	**25,000 lbs**

MUD PUMP PERFORMANCE DATA					
02 White Star pumps, model 1,300 HP			**01 Gardner Denver PZ8 pump, model 750 HP**		
Liner size (in)	**GPS**	**Max. discharge pressure (psi)**	**Liner size (in)**	**GPS**	**Max. discharge pressure (psi)**
7	5.7	2,786	7	3.8	1,996
6.5	4.92	3,231	6.5	3.28	2,315
6	4.19	3,791	6	2.79	2,417
5.5	3.52	4,512	5.5	2.35	3,233
5	2.91	5,000	5	1.94	3,912

G.P.S.: Gallon per stroke; S.P.M.: Stroke per minute; 100% volumetric efficiency; 90% mechanical efficiency.

DP O.D. (in)	WEIGHT (ppf)	GRADE	CLASS	MAX. MAKE-UP TORQUE (ft-lbs)
5	19.5	S-135	Premium	28,380
3 ½	15.5	G-105	Premium	10,950

Torque off bottom at TD (Friction Factor: Cased Hole 0.39, Open Hole 0.55): 21,200 ft-lbs.

II. DRILLING PROGRAM

BEFORE SETTING THE CONDUCTOR PIPE CHECK THE FOLLOWING

- Rig Up over Slot "D".
- Inspect equipment as required, include Zero discharge system. Inspect the drilling rig (use attached form) and correct any deficiencies.
- Top drive is installed and all crews are trained on its operation.
- Conduct a comprehensive safety meeting with rig and service companies personnel.
- Install 6" liners in mud pumps (02xWhite Star 1,300 HP pumps and 01 Gardner Denver 750 HP one) for 17" and 12 ¼" sections, 5 ½" ones for 8 ½" section.

A. DRILL-RUN 18" CONDUCTOR PIPE

From surface to 480 ft MD

1. RIH 18" conductor pipe to seabed. RIH rotary BHA with 17" (RR) tricone bit ***XR+CP*** manufactured by Smith (IADC = 115M, Nozzles = 3x16, 1x16, TFA = 0.785 in^2) and run multi-shots gyro survey to know direction of conductor on bottom.

   Slick BHA: 17" bit, bit sub with lateral jets, UBHO, 03 x 7 ¾" DC's, X/O, 03 x 6 ½" DC's, 5" HWDP string.

2. Drill to 480 ft (±120 ft of formation) with sea water. Pump 25 bbls heavy-viscous sweep pill (9.6 ppg and 80 sec/qt) every 30 ft. Sink-slide down 18" conductor below seabed while drilling 17" hole, weld 4 stops.
3. RIH gyro tool and monitor inclination angle and azimuth on bottom hole with multi-shots gyro surveys.
4. At TD, pump 50 bbls high-viscous pill and circulate 3 bottoms-up. Spot high viscous pill, POOH to surface.

Conductor Pipe Running Checklist

- Drift and measure the conductor pipe on the rack.
- Paint length and joint number on each joint with white paint.
- Check conductor pipe tools (including backup tools) for proper size.

5. Secure conductor pipe with pads to wellhead floor and weld adapter flange.
6. Weld 18" x 21 ¼" adapter flange, install 21 ¼" diverter and 6" lines. Perform function test (pressure test 300 psi).
7. RIH 5" cementing drill pipe to bottom with the end of string opens, pump sea water until obtain circulation without return on surface. Verify and ensure that well is clean to bottom.
8. With annular preventer opened to pump cement as per the CEMENTING PROGRAM.

   Note:

   If circulation without return on surface is not achieved, close annular diverter and pump water until lose circulation.

   With annular preventer closed, pump slurry 60 bbls (15.6 ppg) as per the CEMENTING PROGRAM. Remember that last 22 bbls slurry must be pumped with lateral valve of annular BOP opens to assure the cement column lift inside 18" conductor.
9. POOH 5" DP quickly at 100 ft (about 3 minutes per stand), install circulation head and connect lines to cementing ship. Circulate to clean pipe and casing; meanwhile the cement plug stabilizes in the hole (balance between columns).
10. Close annular BOP, pump 15 bbls sea water to 2-3 bpm and displace cement (will leave 30 ft of cement inside conductor pipe).
11. WOC 12 hour with the well closed. Open well and POOH 5" cementing DP.

B. DRILL 17" SURFACE HOLE

From 480 ft MD to 2,350 ft MD (2,102 ft TVD)

- R/U mud loggers and gas detector before drilling out cement.
- At all times, while conducting drilling and testing operations, ensure that a Drill String Safety Valve (DSSV) in open position, an inside BOP and the necessary crossovers for the string being used are on the rig floor ready for immediate use.
- Install 6" liners in the three pumps prior to begin drilling 17" hole.
- Before drilling out of 18" conductor pipe, hold evacuation drill and safety meeting.
- Hold daily diverter drills meeting with each crew. Each crewmember should know his responsibility and a pre-plan must be in place before any incident occurrence.

- Have regular discussions with the rig crew regarding plans of action in the event of a well control situation.
- Function test diverter daily.
- Maintain a support boat in the area until BOP is nipple up on 13 ⅜" casing.
- Two mud pumps have to be used for good drilling hydraulics circulating at ± 850 gpm (02xWhite Star 1,300 HP pumps and 01 Gardner Denver 750 HP one). The rate of penetration should be 70-80 ft/hr to ensure good hole cleaning.

1. Prepare **9.0 ppg** drilling fluid, **slightly treated KLASHIELD / POTASSIUM SULPHATE**, to start drilling this section.
2. M/U and RIH slick BHA, tag cement and clean out cement into 18"conductor, displace sea water by drilling fluid, and continue cleaning out junks into hole, about 10 ft. The recommended slick BHA is the following: 17" (RR) tricone bit ***XR+CP*** manufactured by Smith (IADC = 115M, Nozzles = 3x16, 1x16, TFA = 0.785 in^2), bit sub, 03 x 7 ¾" DC's, X/O, 03 x 6 ½" DC's, 03 x 5" HWDP's, 5" DP String.
3. RIH Gyro survey tool, record survey and POOH (Gyro tool calibration is required).
4. MU and RIH the following recommended BHA: 17" tooth bit ***MSDSMC*** manufactured by Halliburton (IADC 115M, Nozzles = 3x16, 1x16, TFA = 0.785 in^2), ***FrontLine*** – 9 ⅝" Mud Motor (BH = 1.5°, 0.12 rev/gal and 16 ¾" sleeve STB), 8" UBHO for Gyro, 02 x 8" DC's, 8" Drilling Jar, 01 x 8" DC, XO, 03 x 6 ½" DC's, 6 x 5" HWDP's, 5" DP String, maximum WOB 10 klbs (Check with Weatherford Operator the minimum ID needed in the Drill String for MWD tool and fishing tools pass thru, also check whether the screen filter for 4 ½" IF connection is on location). POOH drill string to surface.
5. With the conductor vertical, drill 17" hole and start (KOP) at 550 ft with a Build Up Rate (BUR) 3.0°/100 ft in direction N 70.0° W to 883 ft MD, start nudge with a Build Up Rate (BUR) 3.0°/100 ft to 1,000 ft MD, reach with an inclination of 13.3° in direction N 64.6° W and mud weight must be in 9.2 ppg. Take gyro survey at the moment to orientate mud motor, every 45 ft while drilling. POOH drill string to surface.

   Remark:

   At 1,000 ft MD, expect to be separated a Ct-Ct distance 30 ft with the well of higher collision risk, LO16-22.

   Expect to be out of magnetic interference at **1,000 ft MD**, (according to results of Weatherford's simulator).

6. MU and RIH the following recommended BHA: 17" PDC bit ***TFR519S-A1*** manufactured by NOV (IADC = S422, Nozzles = 5x15, TFA = 0.863 in^2), ***FrontLine*** - 9 ⅝" Mud Motor, (BH = 1.5°, 0.12 rev/gal and 16 ¾" sleeve STB), 01 x 8" Mule Shoe, 8" MWD tool, 01 x 8" NMDC, 03 x 8" DC's, 8" Drilling Jar, 01 x 8" DC, XO, 03 x 6 ½" DC's, 06 x 5" HWDP's, 5" DP String, maximum WOB 10 klbs.

7. Drill 17" hole, continue with nudge to reach End of Build (EOB) with a maximum inclination angle of 51.6° in direction N 52.3° W at 2,288 ft MD (2,063 ft TVD), continue drilling holding the tangent section to casing point at 2,350 ft MD (2,102 ft TVD). The 13 ⅜" casing will be set at 2,350 ft MD (2,102 ft TVD).

   - **Short trip must be performed until casing shoe previous and according to schedule recommended below or anytime the hole conditions dictate.**
     - **1,700 ft MD.**

   Remark:

   - Take multi-shots gyro surveys in mode continue from surface to end collision risk and in mode single shot while drilling until the end of magnetic interference.
   - The reasons of using MWD & Gyro in this Section: ***(a)*** Identify the Magnetic interference of the casing, in which the Gyro tool is not able to do it. As consequence, when the MWD tool is free of interference we can decide to drop off the Gyro sooner. ***(b)*** It is true that the Magnetic toolface of the MWD would be interfered but still there can be set an offset between the Gyro Toolface and MWD Toolface, so we can verify (and double check) the measurements of the Gyro. ***(c)*** Continuous Inclination to check BHA response. Through this you will be able to decide if we need to slide or not in order to maintain vertical. ***(d)*** Shocks and vibration package that the MWD provides (stick & slip, shocks, rpm of the BHA). ***(e)*** Provide Gamma Ray measurements to G&G.
   - Wellbore stability is a major issue in this hole section. The mud weight must be maintained as per the mud schedule in the PORE PRESSURE PROFILE SECTION of the drilling program. Wellbore stability problems become progressively worst as the clays and shale become unstable. The instability comes from the 30-35% swelling clay (smectite) in the formation. Increasing the mud weight may be necessary, however not increase the mud weight before discussing with Drilling Operation Head or Drilling Superintendent in Talara office.
   - Pump 50 bbls heavy-viscous sweep pills (current mud weight plus 0.5 ppg and 120 sec/qt) every 180 ft drilled (2 stands) or as needed to clean hole to casing point.

- Maximum mud weight required reaching 13 ⅜" casing point should be **10.0 ppg**. If it is required to increase mud weight above 10.0 ppg, consult to Drilling Operation Head or Drilling Superintendent in Talara. The MW could be increased if well dictates.
- Spot 100 bbls viscosity mud pill (10.0 ppg and 80 sec/qt) on bottom in order to keep hole open prior to run 13 ⅜" casing.
- Perform a flow check on each connection will.
- Wiper trips have to be kept to a minimum.

Note:

If lost circulation is observed at conductor shoe depth, drill 17" hole with sea water and pump sweep pill each stand to new casing point. Additionally, at casing point, displace sea water by 10.0 ppg mud in order to keep hole open prior to run 13 ⅜" casing.

8. At TD circulate 3 bottoms-up or until clean shakers while reciprocating pipe and rotating at 70 rpm, monitoring shakers for cutting volume trend. POOH to surface and L/D directional BHA and bit.
9. M/U slick BHA with 17" tooth bit, bit sub, w/float valve and near bit STB under gauge (⅛" less than gauge). RIH and wash down the last 5" stands to bottom and circulate. Circulate 3 bottoms-up while reciprocating pipe and rotating at 80 rpm, monitoring shakers for cuttings volume trend and condition mud. Pump and spot high-viscosity mud pill (10.0 ppg and 80 sec/qt) in open hole. POOH to surface to run 13 ⅜" casing. Keep hole properly filled when stripping out of hole. Strap out, use a trip sheet. L/D slick BHA, pull out and check wear bushing for damage.

   Note:

   The Top Drive must be used only if it's strictly necessary during the pull out of string. Ensure that mud properties are in good condition (MW = 10.0 ppg, PV = 16 cp, YP = 25 lbs/100 ft^2) prior to run casing.
10. Run 13 ⅜" casing to 2,350 ft MD and cement casing to surface as per program below.

C. RUN 13 ⅜" SURFACE CASING

From Surface to 2,350 ft MD (2,102 ft TVD)

13 ⅜" casing will be run with fill up tool system. It is considering that all 13 ⅜" casing to use must be **Range 3 (average length of 40 ft)**.

1. Run 13 ⅜" Surface casing, 54.5 ppf, K-55, BTC as follows:

- 13 ⅜" PDC drillable guide shoe, 54.5 ppf, K-55, BTC.
- 1 joint 13 ⅜" casing, 54.5 ppf, K-55, BTC. Install 02 semi-rigid centralizers, at 5 ft and 20 ft above guide shoe with stop collar (on shoe track body).
- 13 ⅜" PDC drillable float collar (non rotating type), 54.5 ppf, K-55, BTC.
- ±58 joints 13 ⅜" casing, 54.5 ppf, K-55, BTC.
- Install about 5 semi rigid centralizers and 9 bow-spring ones above float collar considering a bow-spring centralizer at 200 ft (this last centralizer inside 18" pipe conductor to center wellhead).

Have the following connections thread locked: Guide shoe, float collar and collar on the 1st joint.

(See APPENDIX: Casing Running Checklist)

2. With Fill up tool system in circulating position, break circulation at low rates and wash down last joints to setting depth. Pick up off bottom to last casing connection, record pick up and slack off hook load and drag, at bottom circulate hole and condition mud. Ensure that pipe measurements are accurate. Circulate and condition mud as long as necessary to get (MW = 10.0 ppg, PV = 12 cp, YP = 10 lbs/100 ft^2) good rheology properties. Slowly increase the circulation rate to 10 bpm maximum. While circulating, monitor returns for losses and reduce rate as required. Run ECD calculations to ensure not breaking down the formation.
3. Stop circulation, ND fill up tool. MU cementing head and circulates with 7 bpm, meanwhile performed safety and operation meeting. Discuss the cement job with the cementing company's supervisor. Test cementing lines to 2,000 psi. Verify that the cement head is loaded with the correct plugs. Release **bottom plug (red)**. Mix, pump and displace the pre-flush and cement slurry as per the CEMENTING PROGRAM. Cement should be lab tested (see simulation test lab results), as per the procedures in the CEMENTING PROGRAM, prior to job. Simulator should be utilized for cementing design. If hole conditions are good and drag values during the casing running were good, reciprocate casing 10 ft. If at any time there are indications of casing sticking, stop reciprocating and run casing to bottom.
4. Release **top plug (black)** and displace with drilling mud using cementing ship's pumps up to float collar at 8 bpm or as high rate as possible without breaking down formation. As plug approaches float collar, reduce the pump rate to 2 bpm. Bump the plug with 500 psi over the final circulating pressure (record this test as CIT). **If plug does not bump with calculated displacement, pump no more than ½ volume of the shoe**

track or continue displacing until SAVIA's drilling supervisor order to stop pumping operation.

5. Bleed off the pressure and check to ensure the float equipment is holding. (Record the volume of back flow, if float valves don't hold, record the back-pressure and close the valve at cementing head).

   Note:

   If there is lost circulation or no return of cement to surface during the cementing job a top job must be performed.

6. WOC 8 hours meanwhile cut 18" conductor and weld steel plate between 18" conductor and 13 ⅜" landing joint. Slack off weight casing string and check possible displacement. Make rough cut on 13 ⅜" casing and LD 13 ⅜" landing joint. ND the diverter and remove 21 ¼" flange. Install 13 ⅝" x 3M Casing Head Speed Grip type. The top flange must be near the level of the floor). **Measure rotary table to wellhead distance and record on Daily Drilling report**.

7. NU 13 ⅝"x5M psi BOP stack and 13 ⅝"x5M psi annular preventer and Drilling Spool Adapter (DSA). Connect Choke and kill lines to BOP stack. Function test BOP. Choke manifold upstream valves will be closed while drilling. Prior to closing any BOP, both choke manifold upstream valves will be opened.

D. DRILL 12 ¼" INTERMEDIATE HOLE

From 2,350 ft MD (2,102 ft TVD) to 5,600 ft MD (4,122 ft TVD)

1. Pressure test BOP system as per attached procedure (BOP Procedure Test). Install wear bushing and gas detector.

   - R/U mud loggers and gas detector prior to drilling out.
   - Before drilling out 13 ⅜" casing shoe, hold BOP drill, evacuation drill and safety meeting.
   - At all times, while conducting drilling and testing operations, ensure that a Drill String Safety Valve (DSSV) is on rig floor and it's in open position. An inside BOP and the necessary crossovers for the string being used are on the rig floor ready for immediate use.
   - Install 6" liners in the three pumps prior to begin drilling 12 ¼" hole.

- Pump rate at end of 12 ¼" hole section should be as high as possible ±800 gpm.
- Ensure that pump spare parts are available on the rig for immediate replacement and have the pop-offs set at ± 3,500 psi.
- Prepare **KLASHIELD / POTASSIUM SULPHATE** mud system with **10.0 ppg**.

2. M/U 12 ¼" PDC bit ***SKH419S-A1A*** manufactured by NOV (IADC = S422, Nozzles = 6x15, TFA = 1.035 in^2) and RIH with recommended Directional BHA: 12 ¼" Bit, ***FrontLine*** – 8" Mud Motor, (BH = 1.5º, 0.16 rev/gal and 12 ⅛" sleeve STB), 11 13/16" string stabilizer, 8" Mule Shoe, 8" MWD tool, 01 x 8" NMDC, 01 x 8" DC, XO, 03 x 6 ½" DC's, 12 x 5" HWDP's, 6 ½" Drilling Jar, 12 x 5" HWDP's, 5" DP String, max WOB 20 klbs. (Check with Weatherford Operator the minimum ID needed in the Drill String for MWD tool and fishing tools pass thru, also check whether the screen filter for 4 ½" IF connection is on location).
3. RIH to TOC (top of cement). Tag TOC and record depth.
4. Drill out cement, float collar, casing shoe and 10 ft of new formation. Circulate until clean shakers, get mud properties as per program (MW = 10.0 ppg, PV = 16 cp, YP = 20 lbs/100 ft^2) and perform Formation Integrity Test (FIT) with **EMW of 13.5 ppg** as per attached procedure in the FORMATION INTEGRITY SECTION of the program. Ensure that a positive displacement pump which can handle small volumes as needed for this job is available on location.
   - **Drill 12 ¼" hole using low RPM and light WOB until the string stabilizer is below 13 ⅜" casing shoe (use 450 gpm flow rate)**.
5. Drill 12 ¼" hole, continue drilling tangent section holding inclination angle of 51.6° in direction N 52.3° W to casing point at 5,600 ft MD (4,122 ft TVD).
   - Talara formation is mostly claystone, Pariñas formation is mostly sandstone with inter-bedded claystone and siltstone.
   - Maximum mud weight required at 9 ⅝" casing point depth should be **11.0 ppg**. If it is required to increase mud weight, consult to Drilling Operation Head or Drilling Superintendent in Talara. The MW could be increased as well dictates.
   - Drill with **KLASHIELD / POTASSIUM SULPHATE** system and heavy-viscous sweeps (current mud weight plus 1.0 ppg and 80 sec/qt) as needed to clean.
   - Take deviation and azimuth surveys in continues mode with MWD every 90 ft of progress.
   - Perform a flow check on each connection will.

- **Short trip must be performed until casing shoe previous and according to schedule recommended below or anytime the hole conditions dictate.**
  - **4,000 ft MD or 30 hrs drilling.**
- During the drilling operation, MW must to be 10.5 ppg at 4,000 ft MD (3,127 ft TVD), to evaluate hole condition and add bridging material to the drilling fluid (calcium carbonate) before drilling Pariñas will expect to 4,439 ft MD (3,400 ft TVD).
- If lost circulation is detected, the course of action will be to control the loss using maximum concentration of lost circulation material, POOH to 13 ⅜" casing shoe, perform flow check and ensure that well is controlled, continue POOH to surface. MU and RIH (packaged) rigid slick BHA with the same PDC bit and nozzles opener to continue drilling keeping tangent section, wash down the last 5 stands to bottom as minimum. Pump pill with lost circulation material and continue drilling to the planned 9 ⅝" casing point and cover Pariñas formation.

  If lost circulation is severe and it cannot be controlled, going to decide to stop drilling, spot pill with lost circulation material to ensure that well is under control, prepare equipment and personnel to run 9 ⅝" casing to bottom.

6. At TD circulate 3 bottoms-up or until clean shakers while reciprocating pipe and rotating at 70 rpm, monitoring shakers for cutting volume trend. POOH to surface and L/D directional BHA and bit.
7. MU and RIH slick BHA with 12 ¼" tooth bit, bit sub, w/float valve and near bit STB under gauge (⅛" less than gauge). RIH and wash down the last 5" stands to bottom and circulate. Circulate 3 bottoms-up while reciprocating pipe and rotating at 80 rpm, monitoring shakers for cuttings volume trend and condition mud. Pump and spot high-viscosity mud pill (11.0 ppg and 80 sec/qt) in open hole. POOH to surface to run 9 ⅝" casing. Keep hole properly filled when stripping out of hole. Strap out, use a trip sheet. LD slick BHA, pull out and check wear bushing for damage.

   Note:

   The Top Drive must be used only if it's strictly necessary during the pull out of string. Ensure that mud properties are in good condition (MW = 11.0 ppg, PV = 24 cp, YP = 35 lbs/100 ft^2) prior to run casing.
8. Run 9 ⅝" intermediate casing to planned depth of 5,600 ft MD (4,122 ft TVD) or to depth where had lost circulation, cement to 500 ft above 13 ⅜" casing shoe as per program below (top of cement expected at 1,850 ft MD).

E. RUN 9 ⅝" INTERMEDIATE CASING

From Surface to 5,600 ft MD (4,122 ft TVD)

9 ⅝" casing will be run with fill up tool system. It is considering that all 9 ⅝" casing to use must be **Range 3 (average length of 40 ft)**.

1. Run 9 ⅝" Intermediate casing, 43.5 ppf, N-80, BTC as follows:
    - 9 ⅝" PDC drillable float shoe, 43.5 ppf, N-80, BTC.
    - 2 joints 9 ⅝" casing, 43.5 ppf, N-80, BTC. Install 02 semi-rigid centralizers, one centralizer on each joint with stop collars (on shoe track body).
    - 9 ⅝" PDC drillable float collar (non rotating type), 43.5 ppf, N-80, BTC. Install 01 semi-rigid centralizer at 20 ft above float collar with stop collar.
    - ±138 joints 9 ⅝" casing, 43.5 ppf, N-80, BTC.
    - Install 12 semi-rigid centralizers in open hole above float collar and the remaining 11 bow-spring centralizers considering a centralizer at 200 ft (this last centralizer inside 13 ⅜" casing to center wellhead).

Have the following connections thread locked: Float shoe, float collar and collar on the 2nd joint.

(See APPENDIX: Casing Running Checklist)

Additional suggestions:

- Ensure that all of the 9 ⅝" casing to be run is drifted.
- Break circulation at least every 1,500 ft. Start always the circulation slowly to break gels of the mud. If bridging is found don't set pipe down, attempt to wash down instead. Also is necessary check that each joint run in the hole is displacing the correct mud volume.

2. With Fill up tool system in circulating position, break circulation at low rates and wash down last joints to setting depth. Pick up off bottom to last casing connection, record pick up and slack off hook load and drag, at bottom circulate hole and condition mud. Ensure that pipe measurements are accurate. Circulate and condition mud as long as necessary to get good rheology properties (MW = 11.0 ppg, PV = 12 cp, YP = 12 lbs/100 ft^2). Slowly increase the circulation rate to 12 bpm maximum. While circulating, monitor returns for losses and reduce rate as required. Run ECD calculations to ensure not breaking down the formation.

In case of lost circulation, maximum ECD has not to be higher than mud weight with what had lost circulation.

3. Stop circulation. ND fill up tool. MU cementing head and circulate with 12 bpm. Meanwhile performed safety and operation meeting. Discuss the cement job with the cementing company's supervisor. Test cementing lines to 3,000 psi. Verify that the cement head is loaded with the correct plugs. Release **bottom plug (red)**. Mix, pump and displace the pre-flush and cement slurries as per the CEMENTING PROGRAM. Cement should be lab tested (see simulation test lab results), as per the procedures in the CEMENT PROGRAM, prior to perform the cementing job. Simulator should be utilized for cementing job design. If hole condition is good and drag values during the casing running operation were good, reciprocate casing 10 ft. If at any time there are indications of casing sticking, stop reciprocating and run casing to bottom.

8. Release **top plug (black)** and displace with drilling mud using cementing ship's pumps to float collar at 8 bpm or at a rate as high as possible without breaking down formation. As plug approaches float collar, reduce the pump rate to 2-3 bpm. Bump plug with 500 psi over the final circulating pressure (record this test as CIT). **If plug does not bump with calculated displacement, continue displacing until SAVIA's drilling supervisor order to stop pumping operation.**

4. Bleed off the pressure and check to ensure the float equipment is holding (Record the back flow volume, if float valves don't hold, record the back-pressure and close the cementing head valve).

5. WOC 6 hours meanwhile lift BOP and set casing hanger with sufficient to tension casing all the way to the shoe. Make rough cut on 9 ⅝"casing and L/D cut-off joint.

6. ND BOP stack and install Casing Head Spool 13 ⅝"x3M – 11"x3M. Test ring gasket and Pack off on spool avoiding to exceed 50% of the casing collapse rating 1,905 psi. Be sure of having the annular 13 ⅜" x 9 ⅝" annulus wellhead valves open during the test.

7. NU 13 ⅝"x5M BOP stack with 11"x5M - 13 ⅝"x5M riser. Connect choke lines in manifold (choke lines and HCR valves will be closed while drilling). Connect kill line to BOP stack. Test BOP using test plug as per attached procedure (BOP Pressure test).

F. DRILL 8 ½" PRODUCTION HOLE

From 5,600 ft MD (4,122 ft TVD) to 7,870 ft MD (5,532 ft TVD)

1. Pressure test BOP system as per attached procedure (BOP Procedure Test). Install wear bushing and gas detector.
    - R/U mud loggers prior to drilling out.
    - 5 ½" liners have to be installed in the three pumps prior to begin drilling 8 ½" hole phase.
    - Before drilling out of 9 ⅝" casing shoe have BOP drill safety meeting.
    - Condition and make **KLASHIELD / POTASSIUM SULPHATE** mud system with **11.0 ppg**.
2. MU 8 ½" PDC bit ***SKHI519M-A2D*** manufactured by NOV (IADC = M322, Nozzles = 5x15, TFA = 0.773 in^2) and RIH with recommended Directional BHA: 8 ½" Bit, 6 ¾" ***FrontLine*** – 6 ¾" Mud Motor (BH = 1.5°, 0.29 rev/gal and 8 ⅜" sleeve STB), 6 ¾" Mule Shoe, 6 ¾" MWD tool, 01 x 6 ¾" Flex NMDC, 01 x 6 ½" DC, 01 x 5" HWDP's, 6 ½" Hydraulic Jar, 27 x 5" HWDP's, 5" DP String maximum WOB 25 klbs. (Check with Weatherford Operator the minimum ID needed in the Drill String for MWD tool and fishing tools pass thru, also check whether the screen filter for 4 ½" IF connection is on location). Install 5" protectors, 01 each stand (Make sure rubber don´t work in open hole).
3. RIH to tag TOC (top of cement) and record depth.
4. Drill out cement, float collar and cement to 15 ft above the casing shoe, perform casing integrity test with 1,500 psi. Continue drilling out cement, casing shoe and 10 ft new formation. Circulate until clean shakers, get mud properties as per program (MW = 11.0 ppg, PV = 20 cp, YP = 25 lbs/100 ft^2) and perform Formation Integrity Test (FIT) to an **EMW of 14.0 ppg** as per attached procedure in the FORMATION INTEGRITY SECTION of the program.
5. Continue drilling 8 ½" hole tangent section holding inclination angle of 51.6° in direction N 52.3° W to total depth of 7,870 ft MD (5,532 ft TVD), using maximum flow rate 550 gpm.
    - **Drill 8 ½" hole using low RPM and low WOB until the string stabilizer is below 9 ⅝" casing shoe (use 250 gpm flow rate)**.
    - Mogollon formation is mostly sandstone, sand and siltstone with inter-bedded claystone.
    - San Cristobal formation is mostly claystone with intercalations to siltstone.
    - Maximum mud weight required to reach casing point should be **11.3 ppg**, but the MW could be increased as well dictates.

- ***Offset wells***:

  LO16-17 well, spud date on July 20th 1,989; had blowout event at 5,680 ft MD (5,007 ft TVD) drilling with MW = 10.8 ppg into Mogollon formation (Top of Mogollon at 5,430 ft MD), BOP stack failed, this event generated fire and drilling rig N°4 was burned. The fire was extinguished and well controlled with MW = 11.8 ppg. Drilling rig was replaced by drilling rig N°8.

  LO16-27D well, spud date on November 20th 2,013; found Mogollon formation at 5,383 ft MD and showed connection gas (156 units) with MW 11.0 ppg. MW was increased to 11.3 ppg and connection gas reduced to average 30 – 40 units.

- The 5 ½" casing will cover the Mogollon, San Cristobal, Basal Salina and Balcones formations.

- **Short trip must be performed until casing shoe previous and according to schedule recommended below or anytime the hole conditions dictate.**

  - **6,600 ft MD or 30 hrs drilling.**

- During the drilling operation, MW must to be 11.3 ppg at 6,400 ft MD (4,619 ft TVD), to evaluate hole condition and add bridging material to the drilling fluid (calcium carbonate) before drilling Mogollon target will expect to 6,611 ft MD (4,750 ft TVD).

6. At TD circulate 3 bottoms-up until hole clean up while reciprocating pipe and rotating at 80 rpm, monitoring shakers for cutting volume trend. POOH to surface and LD directional BHA and bit.

7. MU slick BHA with 8 ½" tooth bit, bit sub, w/float valve and near bit STB under gauge (⅛" less than gauge). RIH and wash down the last 5" stands to bottom and circulate. Circulate 3 bottoms-up while reciprocating pipe and rotating at 80 rpm, monitoring shakers for cuttings volume trend. Pump and spot viscosity mud pill (11.3 ppg and 80 sec/qt) in open hole. POOH to surface to run log. Keep hole full when stripping out. Strap out, use a trip sheet. LD slick BHA.

8. RU and run open hole logs with conveyance technique.

(See APPENDIX: Log Running Checklist)

Remark

Before running FMI log must perform conditioning trip with slick BHA.

9. After running electrical log, MU slick BHA with 8 ½" tooth bit, bit sub, w/float valve and near bit STB under gauge (⅛" less than gauge). RIH to bottom and circulate 3 bottoms-up while reciprocating pipe and rotating at 80 RPM, monitoring shakers for

cuttings volume trend and condition mud in preparation to run and cement Production casing string. POOH 5" DP in Stands to derrick. Keep hole properly filled when tripping. Strap out. Use a trip sheet. Pull and check wear bushing for damage

Note:

The Top Drive must be used only if it's strictly necessary during the pull out of string. Ensure that mud properties are in good condition (MW = 11.3 ppg, VP = 28 cp, YP = 35 lbs/100 ft^2) prior to running casing.

- In the last condition trip, when running casing is decided, use high viscosity pill (11.3 ppg and 80 sec/qt) as sweep pill. The Super Sweep can be used with previous consent of drilling superintendent.

The detailed contingency plan will be sent after evaluating well current conditions and the drilling team, with approval of operation manager, decides its execution.

G. RUN 5 ½" PRODUCTION CASING

From Surface to 7,870 ft MD (5,532 ft TVD)

5 ½" casing will be run with fill up tool system. It is considering that all 5 ½" casing to use must be **Range 3 (average length of 40 ft)**.

1. Run 5 ½" Production casing, 17.0 ppf, N-80, BTC as follows:
   - 5 ½" guide shoe, 17.0 ppf, N-80, BTC.
   - 2 joints 5 ½" casing, 17.0 ppf, N-80, BTC. Install 02 semi-rigid centralizers, one centralizer on each joint with stop collars (on shoe track body).
   - 5 ½" float collar, 17.0 ppf, N-80, BTC. Install 01 semi-rigid centralizer at 20 ft above float collar with stop collar.
   - ±195 joints 5 ½" casing, 17.0 ppf, N-80, BTC.
   - Install 9 semi-rigid centralizers in open hole above float collar and the remaining 33 bow-spring centralizers considering a centralizer at 200 ft (this last centralizer inside 9 ⅝" casing to centralize the wellhead).

Have the following connections thread locked: Float shoe, float collar and collar on the 2nd joint.

(See APPENDIX: Casing Running Checklist)

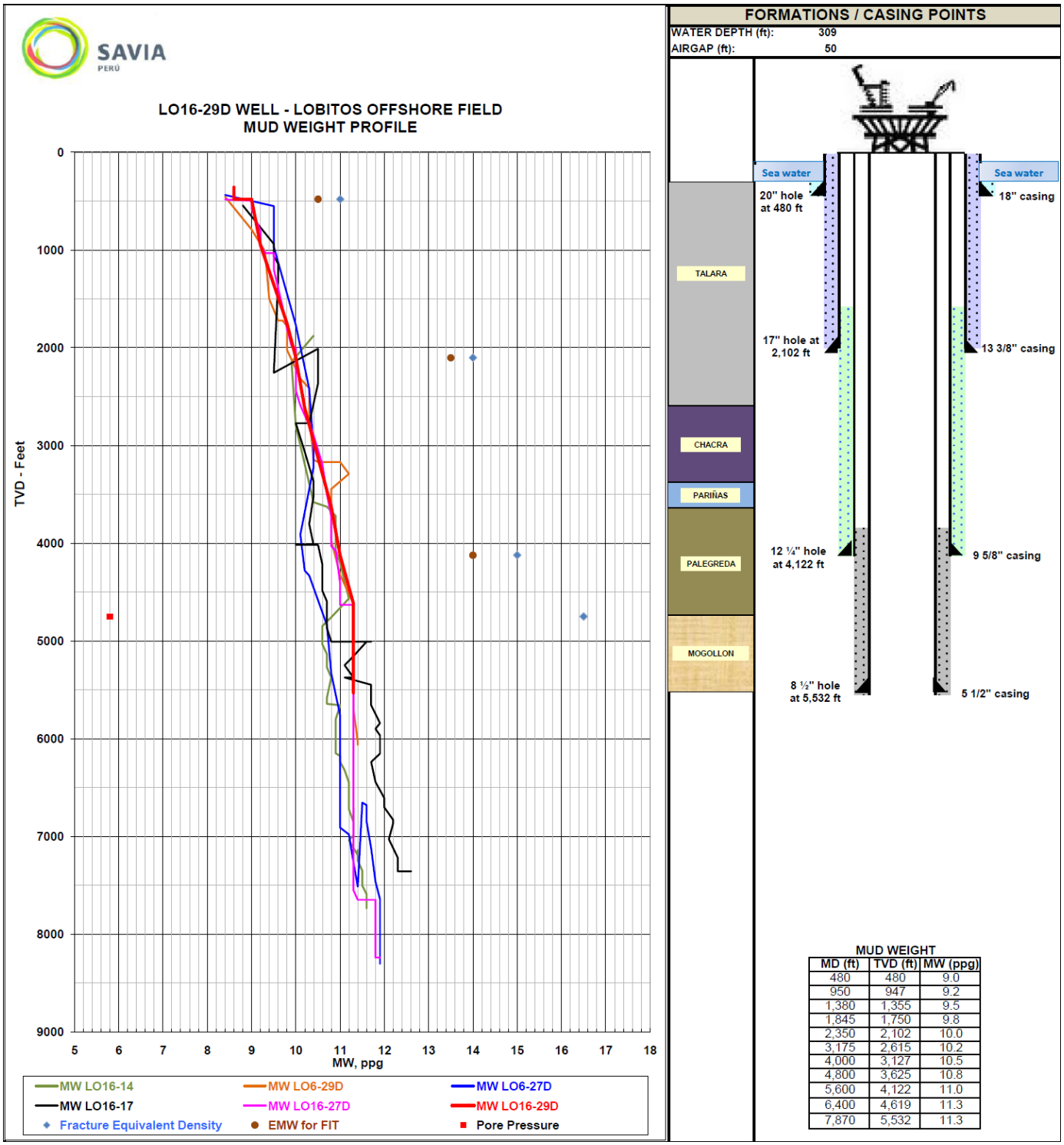
- Break circulation at least every 1,500 ft always start the circulation slowly to break gels of the mud. If bridging is found don't set pipe down, attempt to wash down instead. Also is necessary check that each joint running in the hole is displacement the correct mud volume.

2. With Fill up tool system, break circulation at low rates and wash down last joints to setting depth. Pick up off bottom to last casing connection, record pick up and slack off hook load and drag, at bottom circulate hole and condition mud. Ensure that pipe measurements are accurate. Circulate and condition mud as long as necessary to get good rheology properties (MW = 11.3 ppg, PV = 15 cp, YP = 12 lbs/100 ft^2). Slowly increase the circulation rate to 6 bpm maximum. While circulating, monitor returns for losses and reduce rate as required. Run ECD calculations to ensure not breaking down the formation.
3. Stop circulation. ND fill up tool. NU cementing head and circulates with 6 bpm, meanwhile performed safety and operation meeting. Discuss the cement job with the cementing company's supervisor. Test cementing lines to 3,000 psi. Verify that the cementing head is loaded with the correct plugs. Release **bottom plug (red)**. Mix, pump and displace the pre-flush and cement slurry as per the CEMENTING PROGRAM. Cement should be lab tested (see simulation test lab results), as per the procedures in the CEMENT PROGRAM, prior to the job. Simulator should be utilized for cementing job design. If hole conditions are good and drag values during casing running were good, reciprocate casing 10 ft. If at any time there are indications of casing sticking, stop reciprocating and run casing to bottom.
4. Release **top plug (black)** from container and displace with drilling mud using cementing ship's pumps to float collar at 6 bpm or as high rate as possible without breaking down formation. As plug approaches float collar, reduce the pump rate to 2-3 bpm. Bump plug with 500 psi over the final circulating pressure. If plug does not bump with calculated displacement, pump no more than ½ the volume of the two joints between the float collar and float shoe over the calculated displacement. Bleed off the pressure and check to ensure the float equipment is holding. (Record the volume of back flow, if float valves don't hold, record the back-pressure and close the cementing head valve).
5. While WOC, LD 5" DP's. ND BOP stack and set casing hanger. Make rough cut and LD cut-off joint.
6. Install 11"x5M - 7 1/16"x5M Tubing Head Spool and 7 1/16" BOP stack. Test BOP's. Test ring gasket and Pack off on Tubing Head avoiding to exceed 3,145 psi (50 % of

the 5 ½" collapse rating). Be sure of having 9 5/8" x 5 ½" casing annulus valves on wellhead open during test.

The final program to run and cement 5 ½" production casing with its respective detail will be prepared according to the current well conditions and evaluation electric logs. This program must be approved by the Reservoir and Production Departments.

III. PORE PRESSURE / MUD WEIGHT PROFILES



MUD WEIGHT

MD (ft)	TVD (ft)	MW (ppg)
480	480	9.0
950	947	9.2
1,380	1,355	9.5
1,845	1,750	9.8
2,350	2,102	10.0
3,175	2,615	10.2
4,000	3,127	10.5
4,800	3,625	10.8
5,600	4,122	11.0
6,400	4,619	11.3
7,870	5,532	11.3

IV. MUD PROGRAM

A. 18" CONDUCTOR HOLE

INTERVAL (MD)	MUD TYPE
0' - 480'	Sea Water and High Viscosity Pill

Use sea water to drill and high viscosity pills for cleaning large diameter to bottom and support unconsolidated formations and maximize solids removal.

B. 17" SURFACE HOLE

INTERVAL (MD)	MUD TYPE
480' - 2,350'	Slightly Treated KLASHIELD / POTASSIUM SULPHATE

After cementing 18" conductor pipe, clean out sand trap and discharge pit, prepare slightly treated Klashield / Potassium Sulphate fluid.

- It is important that cleaning pills 50 bbls maintain high fluid rheology to have a good hole cleaning capacity every 180 ft drilled.
- Use the ***Hydraulics Virtual Program*** to optimize hole cleaning capacity.
- At TD, circulate hole to clean shakers, pump viscous pill, perform wiper trip to conductor shoe, leave on bottom 100 bbls heavy viscous pill of 10.0 ppg before POOH to run 13 ⅜" casing.
- For this interval will use water, POLYPAC REG and POLYPAC UL with a concentration between 1.0 ppb – 1.25 ppb; followed by addition of DUOVIS, KLAGARD / ULTRAHIB and Potassium Sulphate for good inhibition and drive capacity, with minor additions of caustic soda to maintain the pH at 9.0 and prevent activation of clays.
- Monitor that pills funnel viscosity is within the range from 60 sec/qt to 80 sec/qt, in order to clean the hole, avoiding the problems with cluster section minimize fluid loss to the formation and integrity endure the gap, if necessary you can use Super Sweep.
- Use PA-10 to avoid balling effect on BHA and bit. Add 5 gal of this product into pills.

- Add 0.5 ppb sodium bicarbonate to prepare fresh water mud pills in order to reduce the hardness.
- It is very important that inhibition level of fluid because at the end of the interval should be 51.6 degrees inclination.
- Monitor well conditions observing the size and shape of the cuts by the screens, tight spots in the connections and gas units during trip.
- Maintaining 6 rpm reading at 13 or higher in pills, to improve cleaning (it has a very large annular space).
- Circulate to clean hole, spot 100 bbls viscous-heavy pill 10.0 ppg on bottom before pulling out drill string.
- Once run 13 ⅜" casing, circulate bottom-up to get clean shakers, and then pump a pill 100 bbls of low rheology before cementing job.

Note:
Maintain 1000 sx of barite on location as a contingency.
Maintain stock screen: 10 meshes 140 API (XR230 Mesh), 4 meshes 200 API (200 XR325).

PROPERTIES:

Interval (ft)	Weight ppg	Viscosity Sec/qt	PV cp	YP lb/100ft²	MBT ppb	Filtrate cc/30'	pH
480' - 2,350'	9.0 – 10.0	> 60	12 - 16	18 - 35	< 15	< 10	9.5

C. 12 ¼" INTERMEDIATE HOLE

INTERVAL (MD)	MUD TYPE
2,350' - 5,600'	KLASHIELD / POTASSIUM SULPHATE

After setting and cementing surface casing, propose to use seawater short circuit cement rotate and wipe the remaining tanks to prepare fluid KLASHIELD/POTASSIUM SULPHATE 10.0 ppg without addition os caustic soda, this with order that the remaining cement in the well does not raise the pH of the mud > 11.0

- After to drill cement change the drilling fluid with new mud KLASHIELD / POTASSIUM SULPHATE 10.0 ppg, depending on the available space in tanks.

- Add citric acid to the fluid/caustic soda according to the pH of the mud at the end of rotating cement. Sodium bicarbonate is also used if the concentration of free calcium is greater than 300 mg/l.
- Gumbo Clay type will be found during drilling of this section in Lobitos and Chacra formations, these formations are very bentonite. Check the MBT < 20 ppb. If the system is needed to disperse add SPERSENE CFL.
- If have highly reactive clays, increasing potassium sulphate concentration to 22 ppb and KLAGARD to 5.5 ppb.
- The filtration control to maintain quality cake, this will be done with POLYPAC R and HIBTROL especially at the end of the interval.
- Maintain contingency material son location for the well which are listed the materials necessary contingency.
- Monitoring well conditions, observing the size, form and amount of cuttings, as well as drag tight spots or during trips and drilling.
- Circulate the well to clean Shale Shaker before short trip to shoe and then run 9 ⅝" casing. Pumping 30 bbls viscous pill and to ensure cleanliness of the hole before pulling out pipe to surface and run casing.
- To maintain the rheology of the system must maintain the pH between 9.5 and 10.0 at all times with additions of caustic soda to maintain the system performance Klashield. The additions of caustic soda are good for stabilizing the pH of the system, as well as additions of bactericide, especially before you travel records or coating runs.
- The section starts with a fluid density 10.0 ppg and 10.5 ppg at 4,000 ft MD before entering Pariñas formation; trip will be made to calibrate the well and see the stability thereof by the inclination of 51.6 degrees. If has difficulty in tripping density climbs to 10.6 ppg, and should be prepared to have a pill of 50 bbls LCM with 50 ppb loss material, when drilling Pariñas formation is observed and if possible loss circulation pump pill to cure this zone and stabilize the formation, if the zone control is objective loss is continued up to 5,600 ft MD. Interval TD, is circulated to clean sieve, and then climbs up to 11.0 ppg density to get run 9 ⅝" casing.
- It should be noted that Fann readings of range 3 and 6 must be maintained the system itself that is between 11 and 13.
- It's very important adjust rheology of mud for running and cementing of 9 ⅝" casing according to fluids properties. We recommended that the fluids properties disperse until obtained a gel strength 10 min < 15. For this have a lot of product as contingencies on the rig.

Note:
keep location of barite in 1,000 sxs and 80 sxs of lost circulation materials fine and medium as a contingency.
Maintain stock screen: 10 meshes 140 API (XR230 Mesh), 4 meshes 200 API (200 XR325).

PROPERTIES:

Interval (ft)	Weight ppg	Viscosity Sec/qt	PV cp	YP lb/100ft²	MBT ppb	Filtrate cc/30 min	pH
2,350 – 4,000	10.0 – 10.5	48 - 60	16 - 24	20 – 40	< 20	< 6	9.0 – 9.5
4,000 - 5,600	10.5 – 11.0	48 - 60	16 - 24	20 – 40	< 20	< 6	9.0 – 9.5

D. 8 ½" PRODUCTION HOLE

INTERVAL (MD)	MUD TYPE
5,600' – 7,870'	KLASHIELD / POTASSIUM SULPHATE

After setting and cementing intermediate casing, clean the sand trap and recover 500 bbls from last interval. Recover fluid on centrifuge to eliminate drill solids and maintain mud weight on 11.0 ppg adding calcium carbonate # 325. Rotate cement with fluid 11.0 ppg of the system active and treat cement contamination with sodium bicarbonate and citric acid. Condition fluid with polymers and inhibitory after being in formation.

- Add citric acid to the fluid according to the PH of the mud. Sodium bicarbonate is also used if the concentration of free calcium is greater than 300 mg/l.
- Use DRISPAC SL/POLYPAC REG to reduce API Fluid loss between 4-6 cc. This will reduce the invasion of filtrate and we will minimize damage to formation. Also improve the quality of the filter cake and the tendency of differential sticking.
- To prevent any loss to the formation by drilling and increased density, it is recommended the addition of bridging agents, on an hourly basis of:
  - Calcium Carbonate, 325 mesh, 4 ppb.
  - MIX II FINE 2 ppb.
  - Safe Carb 10, 40, 250 microns, 4 ppb.

- These items should be added to enter Mogollon formation so that the fluid has sufficient concentration and create a good cake with a good distribution of particles. The products will be added on an hourly basis at 1 sx/hr by controlling the density of the fluid does not exceed the programmed weight. The mud weight at the end of the interval should be 11.3 ppg depending of stabilization of well.

PROPERTIES:

Interval (ft)	Weight ppg	Viscosity Sec/qt	PV cp	YP lb/100ft²	MBT ppb	Filtrate cc/30 min	pH
5,600 - 6,400	11.0 – 11.3	48 - 65	20 - 28	25 – 40	< 15	< 5	9.5 - 10
6,400 - 7,870	11.3	48 - 65	20 - 28	25 – 40	< 15	< 5	9.5 - 10

GENERAL RECOMMENDATIONS

Apply hole cleaning best practices through the well in special on 12 ¼" section; initial practices to consider:

- For bottoms-up cleaning cycles: 1.7 times the total circulation time in 12 ¼" section and 1.5 times on the other sections. Check returns on shakers before pulling out.
- Working with flow rates as high as possible in order to ensure hole cleaning.
- Maintain Drilling Solids (DS) < 5%, using the finest mesh that allowed the flow rate.
- Maintain reading 6 rpm at 13 or higher.
- Maintain pipe rotation over 80 rpm; minimum acceptable: 60 rpm
- Monitor returns on shaker in terms of amount and type of material and correlate it with ROP and flow rate. In case of observing any abnormal behavior, report it and act accordingly.
- Avoid back reaming as much as possible.
- Treat any tight hole as cutting bed as first approach.
- Optimize rheological properties of the mud.
- Run in regular hydraulics software to verify field observations against simulated outcomes.

V. BITS, DRILLING PARAMETERS AND HYDRAULICS

BITS AND DRILLING PARAMETERS										
Hole	**Formation**	**Section interval (ft)**	**Bit Type**	**Supplier**	**IADC Code**	**WOB (Klbs)**	**Flow rate (GPM)**	**RPM Rotary/Motor**	**System pressure (psi)**	**Remark**
17" - 20"	Talara	359 - 480	XR+CP	Smith	115M	5	400-500	40 - 60		Used tooth bit to drill 18" conductor phase
17"	Talara	480 – 1,000	MSDSMC	HALLIBURTON	115M	10	800	60 / 96	1604	Used tooth bit
		1,000 – 2,350	TFR519S-A1	NOV	S422	10	800	60 / 96	1814	PDC bit, 5 blades, face cutters (50) 19 mm
12 ¼"	Talara Chacra Pariñas Palegreda	2,350 - 5,600	SKH419S-A1A	NOV	S422	10-20	750-800	60 / 128-136	2596	PDC bit, 4 blades, face cutters (25) 19 mm
			DSH419S-E6 (Back up)	NOV	S422					PDC bit, 4 blades, face cutters (32) 19 mm
8 ½"	Palegreda Mogollon	5,600 - 7,870	SKFI519M-A2D	NOV	M322	10-25	530	60 / 154	2380	PDC bit, 5 blades, face cutters (24) 19 mm
			SKHI519M-A3F (Back up)	NOV	M322					PDC bit, 5 blades, face cutters (24) 16 mm

HYDRAULIC												
Hole	**Section interval (ft)**	**Nozzles**	**Flow rate (gpm)**	**Pressure (psi)**		**Velocity (ft/min)**			**HSI (HP/in^2)**	**Jet Vel. (ft/sec)**	**Jet Impact Force (lbs-f)**	**ECD (ppg)**	**Type of BHA**
				Bit	System	D.P.	D.C.	Crit.					
17"	359 - 480	1x16, 3x16, TFA = 0.785											Slick
17"	480 - 2,350	5x15, TFA = 0.863	800	720	1814	74	87	441	1.11	268	998	10.42	Directional
12 ¼"	2,350 - 5,600	6x15, TFA = 1.035	800	800	2596	157	182	508	2.25	248	1130	11.41	Directional
8 ½"	5,600 - 7,870	5x15, TFA = 0.863	530	453	2380	275	433	588	1.25	168	447	12.73	Directional

Prepared by:	Reviewed by:	Approved by:
Luis Torres: Drilling Engineer	Jose Chuyes: Drilling Engineering Head Ricardo Gilabert: Drilling Operation Head Carlos Ramirez: Drilling Superintendent (e) Sang-il Lee: Drilling Advisor	Gregorio Idiaquez: Operation Manager

VI. CEMENT PROGRAM

PHASE		CONDUCTOR	SURFACE		INTERMEDIATE		PRODUCTION	
BIT SIZE (in)		17	17		12 1/4		8 1/2	
INTERVAL OPEN HOLE (ft)		359 - 480	480 - 2,350		2,350 - 5,600		5,600 - 7,870	
CASING	OD (in)	18	13 3/8		9 5/8		7	
	WEIGHT (ppf)	70.6	54.5		43.5		26.0	
	ID (in)	17.25	12.615		8.755		6.276	
	Grade	ASTM A53 - B	BTC		BTC		BTC	
MUD WEIGHT (ppg)		8.6 (sea water)	10		11		11.3	
SLURRY	Type	Tail	Lead	Tail	Lead	Tail	Lead	Tail
	Density (ppg)	15.6	13.5	15.2	12.5	15.2	13.5	15.2
	Cement	Pacasmayo / type I	Pacasmayo / type I	Pacasmayo / type I	Pacasmayo / type V	Pacasmayo / type V	Pacasmayo / type V	Pacasmayo / type V
	TOC	Seabed	Surface	1,845	1,850	5,100	5,100	6,400
	BHCT (°F)	80	90	90	112	112	164	164
	Filter (ml/30 min)	NA	540	200	450	250	200	100
	Thickening time @ 50 BC (hh:mm)	1:49	5:00	3:30	4:30	3:00	4:30	3:30
	Additives	Anti-Foam	Anti-Foam	Anti-Foam	Fluid loss - Cement	Anti-Foam	Bonding	Bonding
		Sea water	Extender	Dispersant	Anti-Foam	Dispersant	Anti-Foam	Anti-Foam
			Sea water	Sea water	Extender	Sea water	Extender	Extender
					Sea water		Dispersant	Dispersant
							Gas migration control	Gas migration control
							Retarder	Retarder
							Sea water	Sea water

VIII. BOP PRESSURE TESTING PROCEDURES

GENERAL STANDARS:

1. Make sure that proper size test plug is available on the rig for all sizes of casing to be run.
2. Prior to any pressure testing the area should be isolated and personnel notify and/or evacuated.
3. The well site Supervisor shall witness all BOP pressure tests. Each test should be recorder on the drilling recorder. Savia's BOP test form shall be completed after pressure testing the BOP's.
4. All BOP pressure test shall be performed using water as the test fluid. Tests should include a low-pressure test (200 psi) for 10 minutes before proceeding to the full pressure test.
5. A satisfactory pressure test shall be achieved when the test pressure has been maintained for 10 minutes. A pressure drop of up to 2 % within the first 5 minutes is acceptable; provide the pressure the remains constant for the remaining 5 minutes.
6. BOP's shall be function tested:

PRESSURE TESTING - WELL CONTROL EQUIPMENT

1. All well control equipment shall be pressure tested after installation of any wellhead body component or prior to be drilling out each casing string. the testing shall occur:
   - On the initial installation/running of the BOP
   - When there is any change in the application of the BOP.
   - Every 14 Days or to area specific regulatory requirements.
2. Testing shall be to the lowest of the following criteria:
   - Maximum anticipated wellhead pressure to be encountered in the hole section being drilled but no exceeding the working pressure of the BOP's.
   - 80% of casing burst pressure.
   - Wellhead rated pressure.
   - BOP rated pressure.
3. Annular BOP's shall be tested to a maximum of 35 % of rated working pressure if not otherwise specified (35 % of 5,000 psi = 1,750 psi).
4. The opening and closing volumes of all BOP functions shall be monitored and recorded.
5. The opening and closing times of all BOP functions shall be recorded.
6. Install HCR valve adjacent to the BOP inside the manual choke line valve.
7. Replace threaded companion flanges on 13 5/8" spacer spool with blank flanges.

8. Drain stack and flush with fresh water.
9. Make sure you have proper size cleaned and doped test plug on location for all casings to be run.
    - Pick up well head test plug to fit bowl of last casing head or spool.
    - Pull bore protector by using "j" studs on test plugs.
    - Remove bore protector from test plug.
    - Set test plug down into casing bowl and proceed with test.
    - When test are completed run cleaned and doped bore protector back into casing bowl and remove test plug.

Alternative: If well head test plug cannot be used.

- Pick up cup tester of proper size.
- Make sure cups are cleaned and doped.
- Space cup tester out so that it can be set in casing below casing bowl
- Pick up slightly, fill with water, close well in and pressure up to set cups.
- Proceed with test program.
- Release cup tester by bleeding off test pressure and slacking off cup tester slightly then pick up and remove plug.
- Circulate BOP, manifold and degasser with clean fresh water.
- Tests well control equipment as follow.

Test	Low Test (psi)	High Test (psi)	Time (min)	COMPONENTS
1	200	3,000	10	**Blind Rams**, Pack off bushing and seals.
2	200	3,000	10	**Pipe Rams**, Inside kill line valve (manual) HCR valve.
3	200	3,000	10	Annular Preventer
4	200	3,000	10	Bleed off valve and flare valve (to degasser).
5	200	3,000	10	Valves after chokes (left, right and two central)
6	200	3,000	10	Manual chokes, left and right
7	200	3,000	10	Two valves before chokes.
8	200	3,000	10	Master valve.
9	200	3,500	10	Mud pumps line, standpipe, rotary hose, IBOP of the top drive.

10. Remove test plug and lay down 5" drill pipe and test plug.
11. Install wear bushing and secure in casing hanger spool.

WELL CONTROL PROCEDURE

DIVERTER PROCEDURE

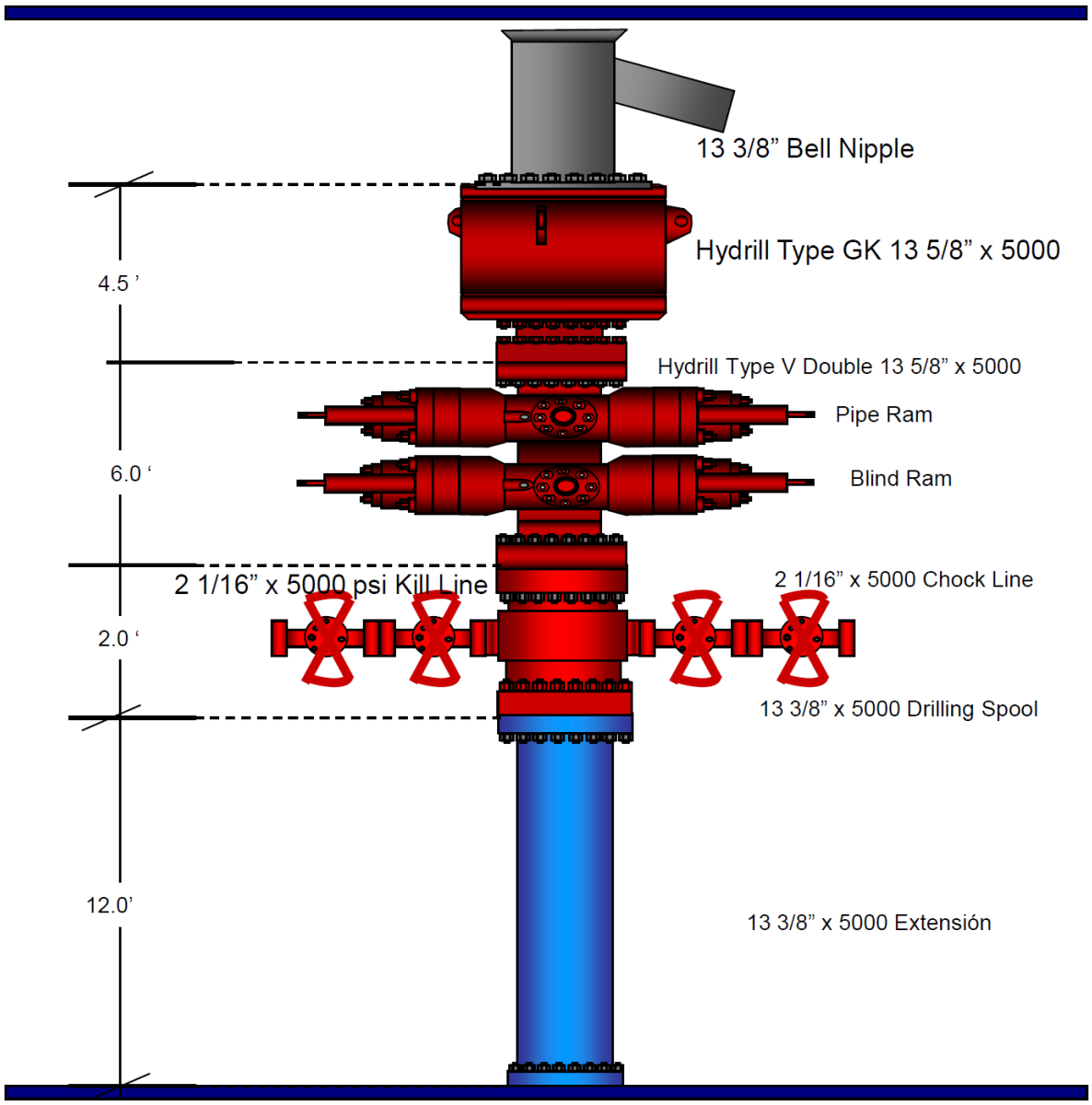
1. Prior to drilling below conductor pipe, the diverter system will be nippled up, operational and function tested to 200 psi.
2. Should a shallow gas kick be encountered while drilling, the following well control procedures will be implementeds.
   - Pick up Top Drive so that a tool joint of last DP is ± 4 feet above floor.
   - Open diverter valve on downwind side of rig. Diverter valve must be open before annular preventer is closed in order to prevent well bore fluids from fraccing around conductor pipe shoe.
   - Close annular preventer and start circulating through diverter system will kill mud. Be prepared to switch to seawater without shutting down if necessary due to lost returns or until the well is dead

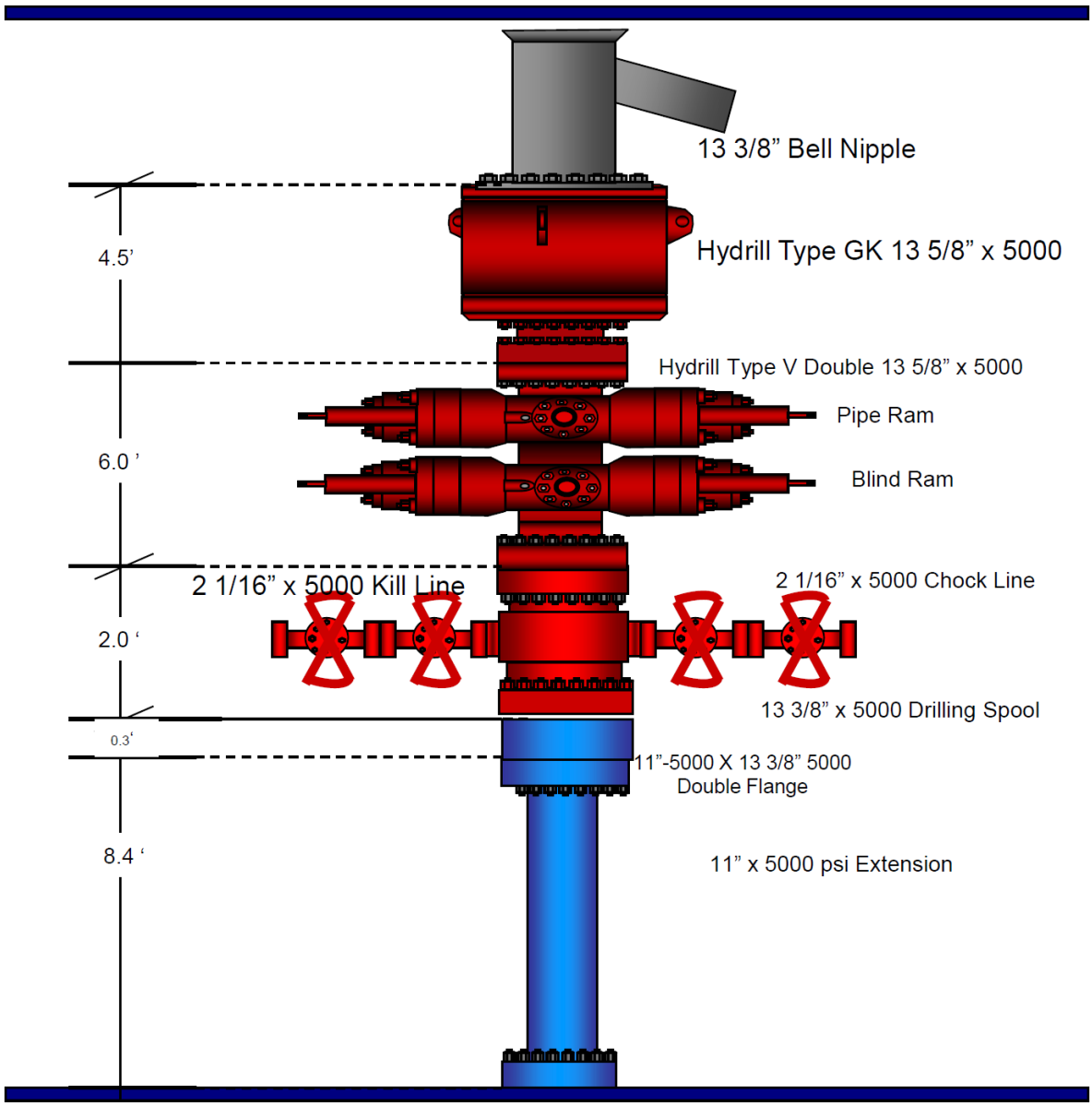
BOP PROCEDURE

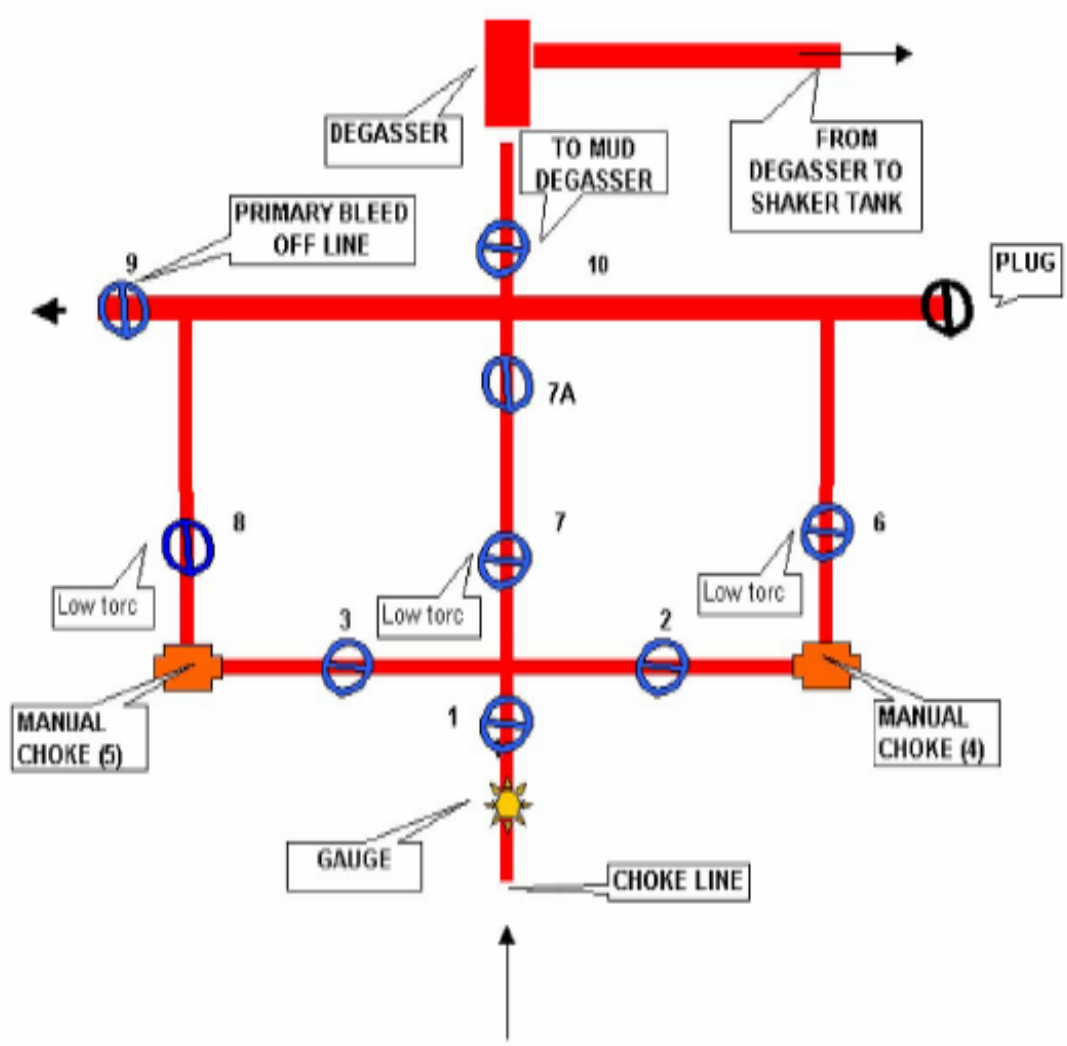
1. Prior to drilling out of surface casing, the BOP stack will be nippled up.
2. The rams, lines, valves and choke manifold will be tested to 200 psi low pressure and 3000 psi high pressure. The annular preventer will be tested to 1,750 psi. This pressure will be more than the anticipated surface pressure.
3. All BOP testing will be done with clear water.
4. BOP tests will be made every 14 days or less following initial test after nippling up. If hole conditions or other ongoing operations prevent the timely BOP test, the Talara Drilling Manager must be notified.
5. BOP tests will be performed from all control stations on a rotating basis.
6. BOPs are to be function tested as often as practical to insure adequate operation from all control stations. Blind and pipe rams are to be function tested each trip out of hole.
7. Pit drills and inside BOP drills are to be performed with each crew daily to ensure that each crew member understands his responsibility should a kick occur.

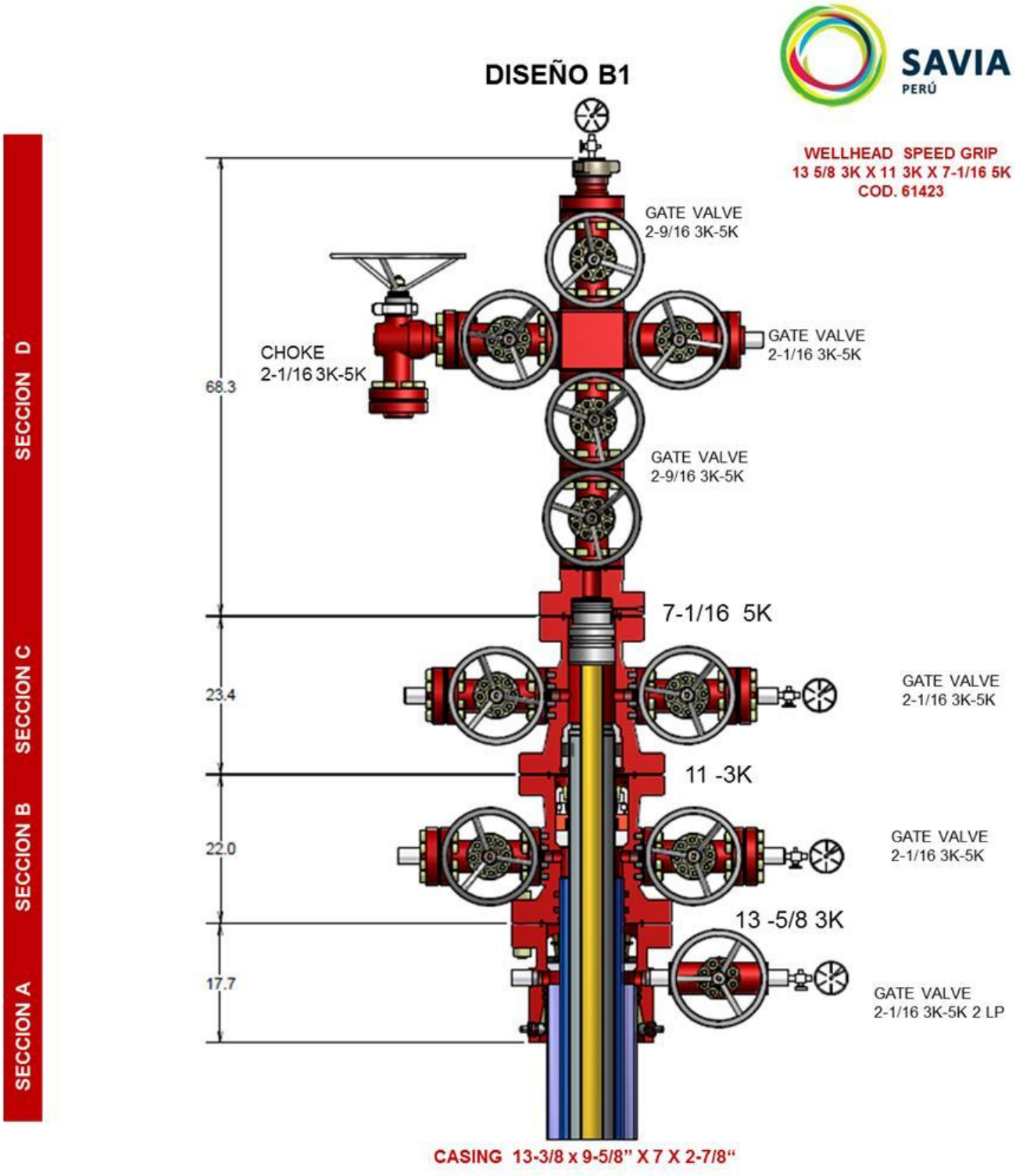
8. If it is necessary to use a tapered string of drill pipe, pipe rams will be changed to variable bore rams of the appropriate size range.
9. Should a kick occur while drilling, the following well control procedure will be initiated.
    - Stop the pumps.
    - Pick up drill string until tool joint is 4 ft above rig floor.
    - Close annular BOP and check for drill pipe pressure and casing pressure (hard shut_in).
    - Initiate kill procedure.
    - Monitor shut in casing pressure for not exceeding the MAASP.
10. Should a kick occur while tripping pipe, the following well control procedure will be initiated.
    - Set pipe on slips and install full opening safety valve and close same.
    - Close annular preventer (hard shut in).
    - Connect saver sub of the Top Drive to drill string.
    - Opened safety valve and check drill pipe pressure and casing pressure.
    - Close safety valve, disconnect saver sub of Top Drive and install inside BOP. Open safety valve.
    - If conditions permit, strip in hole to total depth and initiate kill procedure.
    - Monitor shut in casing pressure for not exceeding the MAASP.

IX. BOP STACK, CHOKE MANIFOLD & WELLHEAD DIAGRAM




13 3/8" Bell Nipple
Hydrill Type GK 13 5/8" x 5000
Hydrill Type V Double 13 5/8" x 5000
Pipe Ram
Blind Ram
2 1/16" x 5000 Kill Line
2 1/16" x 5000 Chock Line
13 3/8" x 5000 Drilling Spool
11"-5000 X 13 3/8" 5000
Double Flange
11" x 5000 psi Extension
4.5'
6.0 '
2.0 '
0.3'
8.4 '


DEGASSER
TO MUD DEGASSER
FROM DEGASSER TO SHAKER TANK
PRIMARY BLEED OFF LINE
9
10
PLUG
7A
8
7
6
Low torc
Low torc
Low torc
3
2
1
MANUAL CHOKE (5)
MANUAL CHOKE (4)
GAUGE
CHOKE LINE



Prepared by:	Reviewed by:	Approved by:
Luis Torres: Drilling Engineer	Jose Chuyes: Drilling Engineering Head Ricardo Gilabert: Drilling Operation Head Carlos Ramirez: Drilling Superintendent (e) Sang-il Lee: Drilling Advisor	Gregorio Idiaquez: Operation Manager

X. COST – AFE

CIA	ACD	BUDGET ITEM
06		

A F E No.
2214293

FU	WELL DESCRIPTION	OFICIAL NUMBER	MM / DD / AA
18	LO16-29D	SAVIA-Z2B-24-LO16-29D	

TOTAL ESTIMATED DAYS

FU	TYPE OF WELL	MOV / COND	DRILLING	COMPLETION	EST. FOOTAGE	A R E A
19	DEVELOPMENT	5	23	21	7870	LOBITOS

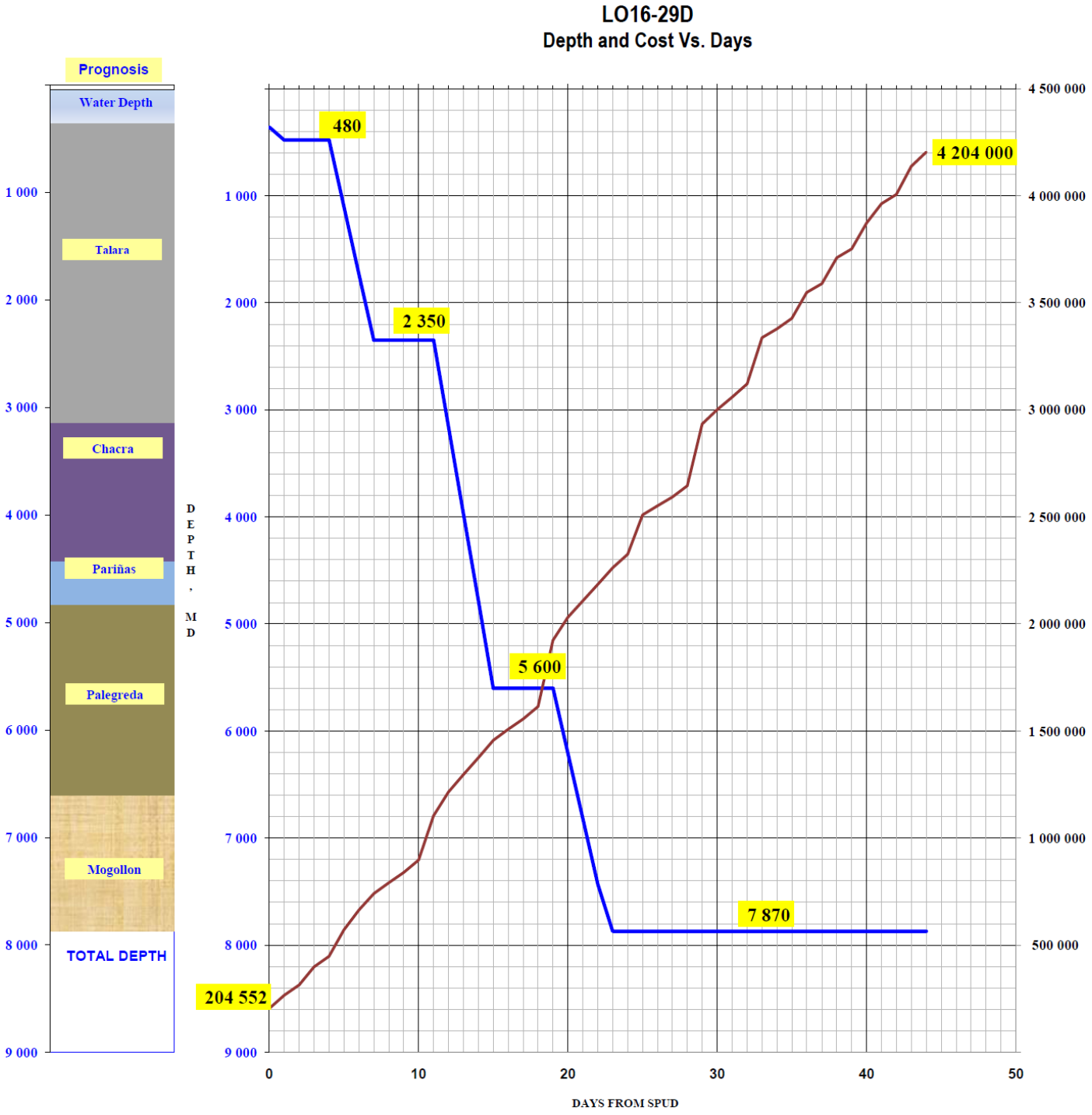
FU	GEN	CC	AREA
20		061	

WELL COST BREAKDOWN

SUB	DESCRIPTION	QUANTITY	UNIT COST	SUB-TOTAL	TOTAL US$
	OUTSIDE SERVICES:				
201	DRILLING RIG	26 23			1 043 500
203	DIRECTIONAL DRILLING				243 820
204	MUD LOGGING	24	1450		34 800
205	MUD ENGINEERING				194 580
206	CEMENT CONDUCTOR				13 990
206	CEMENT. SURF. CSG (13 3/8")				22 060
206	CEMENT. INTERM. CSG (9 5/8")				22 890
206	CEMENT. OTHERS				17 150
206	CEMENT 7" CSG.				0
206	CEMENT. 5.5" CSG				21 990
207	ELECTRIC LOGGING				140 000
208	PERFORATING				150 000
209	STIMULATION				120 000
211	TUBULAR INSPECTION				13 250
212	HYDRAULIC TONGS				55 200
213	DIVING				21 000
219	WELL TESTING				8 000
221	TOOL SERVICES				25 000
224	METALIC STRUCTURES CUT & WELD				2 500
228	MACHINE WORK				7 500
229	BARGE OPERATIONS				220 500
231	BOAT OPERATIONS				303 800
237	MATER. & EQUIP. TRANSP.				17 150
240	WATER FURNISHING				15 000
243	CHARTER				0
244	TOOLS RENTAL				26 700
248	CATERING				44 100
249	CONSULTING				61 250
252	ENVIRONMENTAL PROTECTION				5 750
	TOTAL OUTSIDE SERVICES:				**2 851 480**
	MATERIALS & SUPPLIES:				
301	FITTING SCREWED				210
303	VALVES AND PARTS				800
304	API FLANGES & RING GASKET				800
306	HARDWARE				1 000
325	BITS				84 600
326	TOOLS FOR DRILLING				63 790
327	COMPLETION EQUIPMENT				93 500
328	FLOATING EQUIPMENT - CMT.				18 710
329	PRODUCTION FACILITIES EQUIP.				3 000
335	OTHERS TUBULAR CONNECTIONS				12 000
336	STRUCTURAL CONST. MAT.				10 000
340	WELDING MATERIAL				700
341	MAT. CMT. CONDUCT.				2 400
341	MAT. CMT. SURF. CSG. (13 3/8")				17 160
341	MAT. CMT. INTERM. CSG. (9 5/8")				28 130
341	MAT. CMT. 7" CSG.				0
341	MAT. CMT. 5.5" CSG.				25 950
341	MAT. CMT. OTHERS				5 640
342	STIMULATION MATERIAL				120 000
343	DRILLING / COMPLETION FLUIDS				65 750
344	CONDUCTORS	480	45.50		21 840
344	SURFACE CSG. (13 3/8")	2350	45.50		106 930
344	INTERM. CSG. (9 5/8")	5600	34.00		190 400
344	7" CSG.	0	21.00		0
344	5.5" CSG.	7870	18.00		141 660
344	4.5" LINER	0	18.70		0
344	2 7/8" TUBING	7600	5.90		44 840
346	DIESEL-FUEL				285 210
347	OIL & GRASES				7 500
	TOTAL MATERIALS & SUPPLIES:				**1 352 520**
			TOTAL PROJECT COST US $		**4 204 000**

Prepared by:	Reviewed by:	Approved by:
Luis Torres: Drilling Engineer	Jose Chuyes: Drilling Engineering Head Ricardo Gilabert: Drilling Operation Head Carlos Ramirez: Drilling Superintendent (e) Sang-il Lee: Drilling Advisor	Gregorio Idiaquez: Operation Manager

XI. ESTIMATED DEPTH & COST vs. DAYS



XII. FORMATION INTEGRITY TEST (F.I.T.) PROCEDURE

1. Drill out the shoe track and 10 ft of new formation.

2. Circulate the hole clean and circulate until the mud in the annulus has homogenous density (in / out density is within 0.1 ppg).

3. Hoist the bit inside the casing shoe.

4. Close the annular BOP or the pipe rams, space out drill string and line up to perform leak off test to pump down the drill string.

5. Test lines to 2000 psi for 10 min (or max anticipated pressure), bleed off then commence pumping with the cement pump. Synchronize time between Mud logger and pumping unit.

6. Pump at a constant pump rate (0.5 bbl/min), start logging time, pressure and volume data at frequent intervals on pumping unit, mud logging unit and pressure gauges on rig floor. Record the test manually on worksheet / plot provided at 1/ 2 bbl.

   a. The pressure vs volume plot clearly deviates from a straight line (formation breakdown occurs). Pump for three additional data points to confirm the leakoff 1-2 minutes.
   b. If seepage is high, the curve will bend continuously and it may not be possible to identify a point where a clear deviation from a straight line occurs. Continue pumping until the pressure stops rising (levels or drops).

7. Shut down pumps and close the pump isolation valve to monitor the pressure decline. Record ISIP 10 seconds after shutting in.

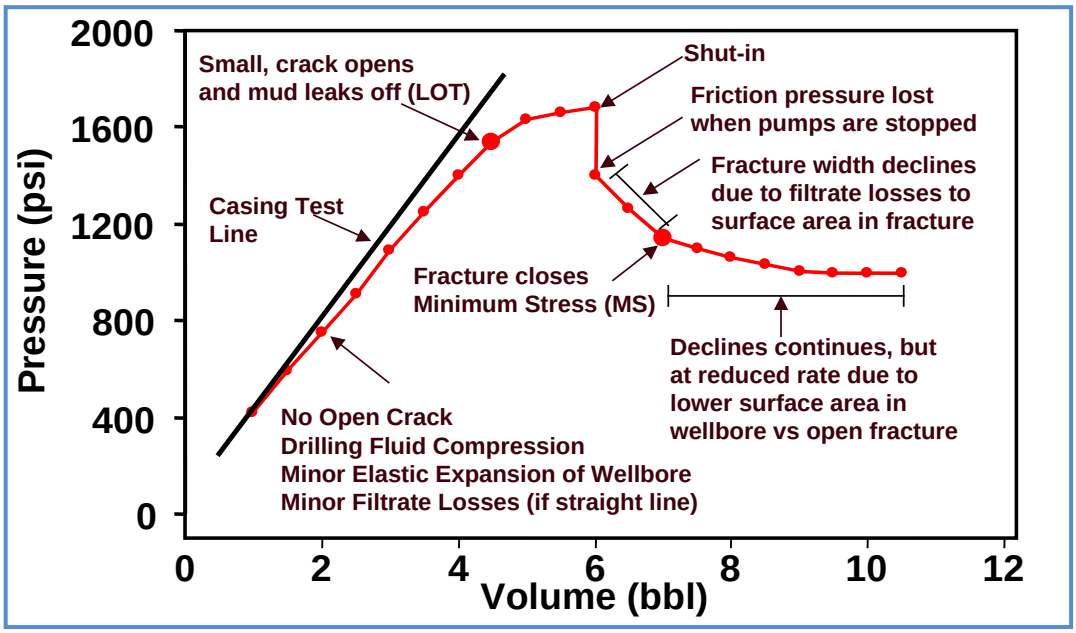
8. Record pressures at one-minute intervals for 15 minutes after shutting in. In some cases it may be necessary to remain shut in longer in order to establish the trend, particularly if the pressure is continuing to drop and has not begun to level.

   a. The initial vertical drop in pressure occurs due to the loss of pumping friction. Immediately after shut-in the leak off will be at its highest rate because of the large surface area of the fracture that is exposed.
   b. The rate of pressure decline will slow when the fracture closes and the leakage surface is reduced to only that exposed within the wellbore. This inflection point corresponds to zero fracture width and is a direct measure of Minimum Stress (psi).
   c. If the pressure decline continues to be significant after 15 minutes, continue to hold and record pressures until it starts to stabilize.
   d. Check the system for leaks during the shut in period.

9. Bleed off the remaining pressure with 1/4 of the choke and flow through pumping unit at a constant rate, and do not adjust during flowback period. Measure and record the return volume. After pressure drops below half of the estimated closure pressure.

10. Report leak off pressure, volumes pumped and returned and equivalent mud weight obtained from leak off as per the attached plot.

F.I.T. PRESSURE PROFILE



XII. DRILLING JAR TECHNICAL SPECIFICATION

Outside Diameter (in.)	4 3/4	4 3/4	6 1/4	6 1/2	7	7 3/4	8	9 1/2
Inside Diameter (in.)	2 1/16	2 1/4	2 1/4	2 3/4	2 3/4	3	3	3
Tool Joint Size (API)	NC-38 3 1/2 IF	NC-38 3 1/2 IF	NC-46 4 1/2 XH	NC-50 4 1/2 IF	5 1/2 FH	6 5/8 Reg	6 5/8 Reg.	7 5/8 Reg
Tensile Yield* (x 1000 lbs.)	436	500	832	934	1,200	1,600	1,750	2,300
Torsional Yield* (x 1000 ft. lbs.)	21.2	20	49.3	56.2	76.4	76.4	105	160
Max. Overpull Up/Down (x 1000 lbs.)	95	85	200	175	220	260	300	500
Approx. Length Extended (ft. - in.)	32' - 0"	32' - 0"	33' - 0"	33' - 0"	33' - 0"	33' - 0"	33' - 0"	33' - 0"
Approx. Weight (lbs.)	1,200	1,200	2,050	2,400	3,000	3,500	3,800	5,500
Free Travel Up/Down Stroke (in.)	5	5 1/2	6 1/4	6 1/2	6 1/2	7	7	7
Total Stroke (in.)	13 1/2	15	16 1/2	17	17	19 1/2	19 1/2	19 1/2
Max. BHT (°F)	400	400	400	400	400	400	400	400
Pump Open Area (sq. in.)	9.6	10.3	15.9	19.6	23.8	28.3	28.3	38.5

* Tensile and torsional yield values are calculated per A.P.I. RP7G based on nominal dimensions and the published yield strength of the material and do not constitute a guarantee, actual or implied.

U.S. Patent No. 4,361,195 and 5,086,853

APPENDIX

Log Running Checklist

- Have tools for log run on location.
- Have fishing tool kit on location. Have over shots available to fish body of the logging tool. Consult with logging engineer and check out fishing tools to ensure correct tools had been checked in Talara.
- Consult with logging engineer and identify over pull limits for the logging tools prior to logging.
- Instruct logging engineer to keep tool moving at all times.
- Down logs shall be run. RUN REPEATS AT THE BASE OF THE LAST CASING SHOE, NOT AT TOTAL DEPTH.
- Caliper information and log BHT data should be sent to the office.

Casing Running Checklist

- Remove thread-protectors, drift and measure the casing on the rack. Paint length and join number on each joint with white paint. Check the box connector for contamination or damage. It must verify that "steel tape measure" this in good conditions.
- Check casing tools (including backup tools) for proper size slips, elevator and tong jaws.
- Have the stabbing board in good working condition.
- Make sure the fill-up line works and is rigged up at the right height to fill the casing.
- Make sure casing is filled every joint.
- Have a casing swedge and lo-torq valve on the rig floor while running casing.
- Keep chicksan lines ready in case circulating is required prior to reaching bottom.
- Use API modified high pressure thread compound.
- Check the float equipment for operation and centralizers for proper size.
- Verify torque rating and torque the casing as per the Casing Program Table.
- Reduce accumulator annular pressure to required level to keep from collapsing the casing is being running if annular BOP has to be closed.
- Stab pin into the box carefully and fast slack off joint weight as the connection is being made up.

- Rotate the joint to the right with power tongs. Confirm make-up torque by verifying the optimum torque.
- After install joint # 3 fill casing and **check float equipment operation.**
- Fill Up casing on every joint while running.

SIZE (in)	DEPTH (ft)	WT (ppf)	GRADE	CONN	COLL (psi)	BURST (psi)	JOINT STRENGTH (lbs)	M/U TORQ (ft-lbs)	TEST PRESSURE (psi)
OD: 18.0 ID: 17.25	0 - 480	70.6	ASTM-A53 B	PIPE STEEL WELD	---	---	---	---	200 w/ 8.6 ppg sea water
OD: 13 3/8 ID: 12.615 Drift: 12.459 Cplg OD: 14.375	0 – 2,350	54.5	K-55	BTC	1,130	2,730	547, 000	Mainly use the triangle mark. **(Δ)/13,380**	800 w/ 10.0 ppg MW
OD : 9 5/8 ID: 8.755 Drift: 8.599 Cplg OD: 10.625	0 - 5,600	43.5	N-80	BTC	3,810	6,330	825,000	Mainly use the triangle mark. **(Δ)/9,630**	1,500 w/ 11.0 ppg MW
OD: 5 ½ ID: 4.892” Drift: 4.767” Cplg OD: 6.050”	0 - 7,870	17.0	N-80	BTC	6,290	7,740	397,000	Mainly use the triangle mark. **(Δ)/5,500**	---

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Minimum Security design factor

- Collapse = 1.125
- Tension (connection) = 2.00
- Tension (body) = 1.250
- Burst = 1.10