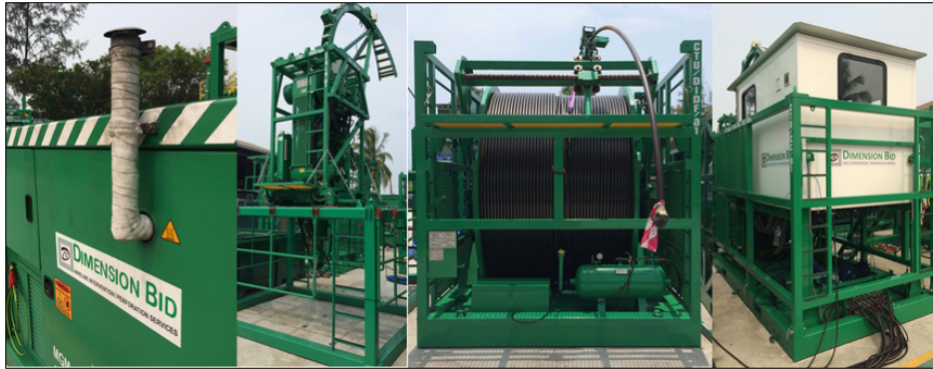



DIMENSION BID



DULANG-A04L ZONE SHUTOFF

Revision: 1
Prepared for: Haris Hamzah
Date Prepared: 26th March 2022
Well: A-04L
Field: Dulang
Operation Region: PMA
Prepared by: Muhammad Hafiz Saharuddin
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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG-A04L	ZONE SHUTOFF	

DESIGN VERIFICATION

PREPARED BY DB
CTS Operation Engineer



Muhammad Hafiz Bin Saharuddin

18/6/2022

Date

APPROVED BY DB
CTS Operation Manager



Aliff Adenan

18/6/2022

Date

APPROVED BY PCSB
Dulang
Well Intervention Engineer

M Haris Hamzah

Date

APPROVED BY PCSB
Technical Professional
Well Intervention, PMA

M. Izwan B. A. Jalil

Date


APPROVED BY PCSB
Head of Cluster 2
Well Intervention, PMA

Ahmad Hafizi B Ahmad Zaini

Date

Remark: Do not execute the procedures in this document if it is not fully approved and signed by all parties.


Prepared By: Muhammad Hafiz	Reviewed By: Aliff Adenan	Date: 18/6/2022	Rev. Rev1	Controlled Document DB-CT-MHS-22004	Pg. 2
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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG-A04L	ZONE SHUTOFF	

DISTRIBUTION LIST

No	Personnel	Company	Name	Email
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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG-A04L	ZONE SHUTOFF	

PERSONNEL CONTACT

Any means of following doubt / unusual parameters / Emergency, please contact Dimension Bid personnel in onshore immediately.

No	Name	Position	Company	Location	Contact No
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2	Khairul Ridhwan	Field Services Manager	DB	Kemaman	014 – 515 4452
3	Nazri Mastam	Technical Manager	DB	Kemaman	017 – 668 8477
4	Mohammad Faizal Ali	Operation Engineer	DB	Kemaman	013 – 736 1046
5	Muhammad Hafiz	Operation Engineer	DB	Kemaman	019 – 264 0410

REVISION HISTORY

Rev. No	Section	Date	Revised By
0	All	26/3/2022	Muhammad Hafiz Bin saharuddin
1	<ol style="list-style-type: none"> 1. TFW Formula, Added friction Reducer 2. Run#3 and run#6-8, Revised step as per archer procedure 3. Revised TFA graph, Tenaris String 4. Revised CBU step 5. Revised Cement dart step for cementing operation 6. Change CT string details, Tenaris 7. Revised cementing volume details 8. Revised Contingency procedure sequences 	16/6/2022	Muhammad Hafiz Bin saharuddin

ACRONYM


Acronym	Abbreviation
BHA	Bottom Hole Assembly
RIH	Run In Hole
POOH	Pull Out Of Hole
HUD	Hang Up Depth
TCC	Tubing Clearance Check
SCO	Sand Clean Out

BOP	Blow Out Preventer
CT	Coil Tubing
ZSO	Zone Shut Off

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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG-A04L	ZONE SHUTOFF	

OBJECTIVES

The objective of this job is;

1. To perform zone shut off and WLD on Long string

BACKGROUND

Well Dulang A4ST1 was completed as an oil producer well with 2 7/8" (6.4#, 13CR-L80) lower completion, 7" stack pack assembly in the middle completion and 3 1/2" (9.2#, 13CRL80) dual string upper completion inside the 9-5/8" x 7" production casing targeting E34, E40 and E47 oil zones as primary zones. The initial plan was to produce oil from E34 zone through the Short String (SS) tubing and from E40 and E47 zones through the Long String (LS) tubing. During the installation of the 2 7/8" lower completion, two production packers in the lower completion string were unable to be set since the POP ball unable to properly seat on the ball seat due to high angle.


After completing the installation of middle completion, completion operation continued with the installation of dual Upper completion. There was leaking observed in the LS and DIAL units in the LS were not functional. Despite the issues encountered, it was decided to proceed with well handover since minimum barrier requirement has been achieved. However, due to the unforeseen events as stated above, the production strategy has been changed to commingle all the zones (E34, E40 and E47) and produce thru the SS.

PCSB engaging Dimension Bid CTS to perform Zone shut off in Long string by install bridge plug on top of SSD#3 and perform WLD, will proceed with cementing after obtained WLD result

WELL DATA

Input Parameter	Parameter Value
Field	Dulang-A04L
Max. Deviation (degrees)	81.2 Deg
Min. Restriction (inch)	2.205" (Landing Nipple) @ 3,473.32m MDDF
Type of Fluid & Density	9.1 PPG NaCl (based on Packer fluid data in Well Diagram)
Top of Fluid	TBA
Current Well Status	Shut In
Depth of zone	E-34A: 1372.37m – 1374.24m TVD, 3098m – 3105m MDDF E-40A: 1415.12m – 1417m TVD, 3257m – 3264m MDDF E-47A: 1448.24m – 1449.59m TVD, 3380m – 3385m MDDF
Reservoir Pressure	E-40A: 1650 psi E-47A: 2100 psi
Reservoir Temperature	98 deg Celcius
Porosity	E-40A: 0.28 , E-47A: 0.30
Permeability	E-40A: 150 mD E-47A: 30 mD

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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG-A04L	ZONE SHUTOFF	

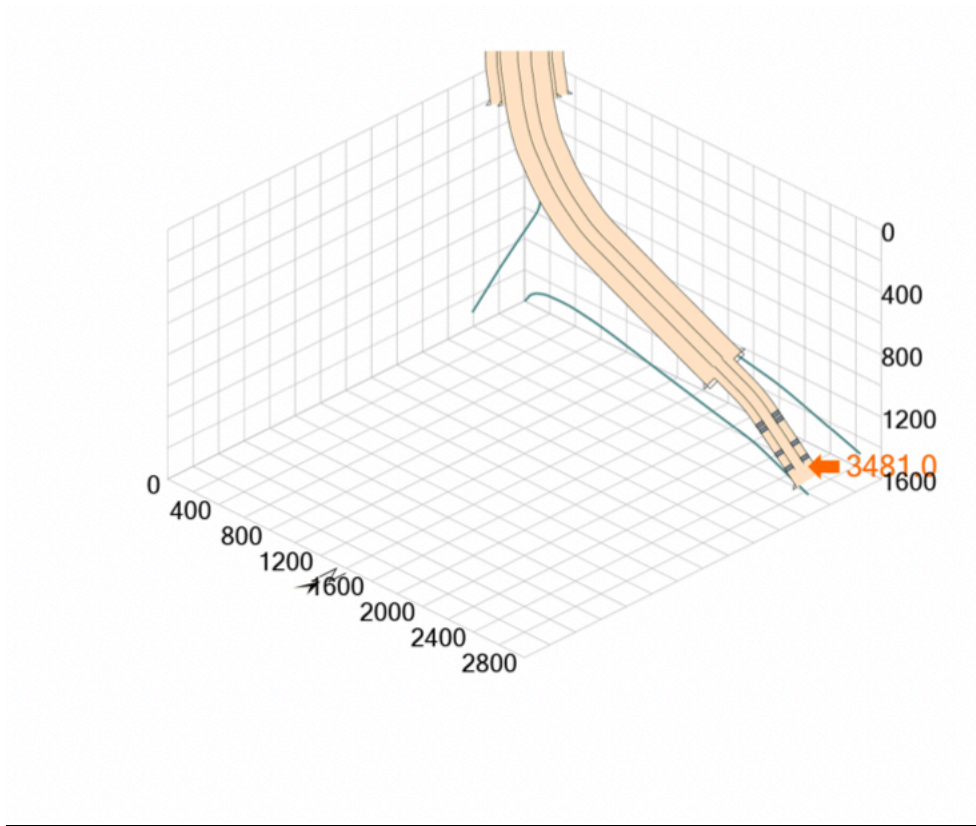
Fracture Gradient	0.61psi/ft
H ₂ S Content	TBC
CO ₂ Content	TBC
Mercury, HG	TBC
Additional Information / Notes / Special Requirement:	
<ul style="list-style-type: none"> N/A 	

OPERATION SUMMARY

<i>Item</i>	<i>Job Description</i>	<i>Remark</i>
A	Coiled Tubing Operation	Run#1: Drift run until 2-7/8 prod tubing Run#2: Close SSD#2 at, 2,502m/8,242ft MDDF Run#3: Drift run until SSD#3
B	Coiled Tubing / Archer Operation	Run#4: Depth Correlation run with GRCCL
C	Coiled Tubing Operation	Run#5: CT Zone isolation (set bridge plug)
D	Coiled Tubing / Archer Operation	Run#6: WLD Baseline run Run#7: WLD Pressurize LS condition Run#8: WLD Contingency run
E	Coiled Tubing Operation	Run#9: CT Cementing
F	Coiled Tubing Operation	Contingency #1 Cementing Contingency #2 WLD run#3 Contingency #3 Spin Cat Contingency #4 Milling

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WELL 3D PLOT



<i>Input Parameter</i>	<i>Parameter Value</i>
Field	Dulang A
Max DLS	4.420 deg / 100ft at 103.3m
Max. Deviation (degrees)	81.2" at depth 1912m-MDDF
Min. Restriction (inch)	2.205" (Landing Nipple) @ 3,473.32m MDDF

DIMENSION BID

DIMENSION BID COILED TUBING SERVICES



DULANG-A04L

ZONE SHUTOFF

TREATMENT VOLUME

DULANG A04L

Downhole Calculation

Prepared Date:
27/03/2022

Type	External Pipe			Internal Pipe			Internal Pipe			Caps	From	To	From	To	Length	Total Volume (bbbls)
	OD (inch)	ID (inch)	W(lb/ft)	OD (inch)	ID (inch)	W(lb/ft)	OD (inch)	ID (inch)	W(lb/ft)							
	ft	ft	ft	ft	ft	ft	ft	ft	ft							
THF to 2543m	3 1/2	2.992	9.2							0.00870	33.00	2543.00	108	8344	8235	72
2543m - 3212m	2 7/8	2.441	6.4							0.00579	2543.00	3212.00	8344	10539	2195	13
TOTAL															84	

Type	External Pipe			Internal Pipe			Internal Pipe			Caps	From	To	From	To	Length	Total Volume (bbbls)
	OD (inch)	ID (inch)	W(lb/ft)	OD (inch)	ID (inch)	W(lb/ft)	OD (inch)	ID (inch)	W(lb/ft)							
	ft	ft	ft	ft	ft	ft	ft	ft	ft							
THF to Top of Bridge Plug	2 7/8	2.441	6.4							0.00579	33.00	3192.00	108	10473	10365	60.0
TOTAL															90.0	

Type	External Pipe			Internal Pipe			Internal Pipe			Caps	From	To	From	To	Length	Total Volume (bbbls)
	OD (inch)	ID (inch)	W(lb/ft)	OD (inch)	ID (inch)	W(lb/ft)	OD (inch)	ID (inch)	W(lb/ft)							
	ft	ft	ft	ft	ft	ft	ft	ft	ft							
Bridge plug to seal assembly (3,192 - 3,110.6)	2 7/8	2.441	6.4							0.00579	3110.60	3192.00	10206	10473	267	1.55
Seal assembly - Btm of perforation zone E34	2 7/8	2.441	6.4							0.00579	3105.00	3110.60	10188	10206	18	0.11
TOTAL															0.00	
TOTAL															1.65	

Type	External Pipe			Internal Pipe			Internal Pipe			Caps	From	To	From	To	Length	Total Volume (bbbls)
	OD (inch)	ID (inch)	W(lb/ft)	OD (inch)	ID (inch)	W(lb/ft)	OD (inch)	ID (inch)	W(lb/ft)							
	ft	ft	ft	ft	ft	ft	ft	ft	ft							
Annulus between prod tubing from seal assembly until btm of perforation zone E34	5.001	3.939		2 7/8						0.00704	3105.00	3110.60	10188	10206	18	0.13
Wire wrap screen	6.184	6.184		4						0.02208	3105.00	3110.60	10188	10206	18	0.11
TOTAL															0.24	

Prepared By:
Muhammad Hafiz


Reviewed By:
Aliff Adenan

Date:
18/6/2022

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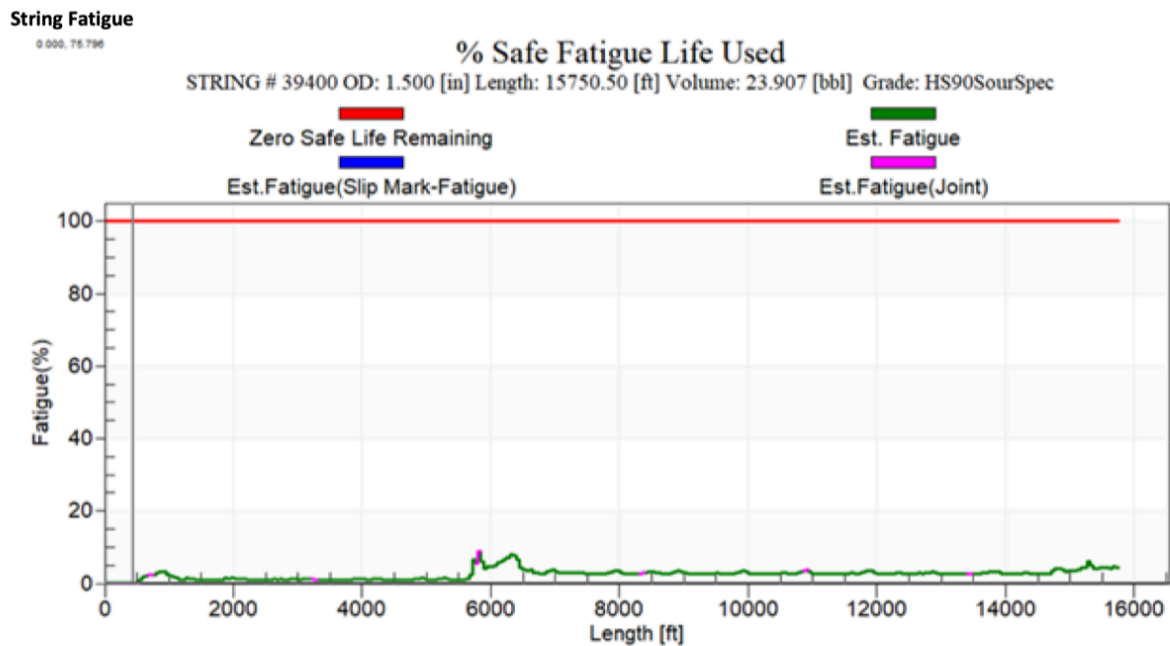
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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG-A04L	ZONE SHUTOFF	

COILED TUBING STRING INFORMATION

OD (in)	Spec	W/T (in)	ID (in)	Length (ft)
1.5	Tenaris	0.125	1.25	15,750
CT Volume: 23.9 bbls				

CT STRING FATIGUE (39400)




MAXIMUM ALLOWABLE SURFACE TREATING PRESSURE (MASTP)

Zone E-34A – Treated Seawater

Fluid	Fluid Density, ppg	Fluid Column until Mid Perf. TVD, ft	Hyd. Pressure, psi	Fracture Pressure, psi	STP, psi	80% MASTP, psi
Treated Sea Water	8.58	4,505.8	2,011.6	2,748.55	736.9	590

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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG-A04L	ZONE SHUTOFF	

SAFETY OPERATIONAL PROCEDURES

Prior to commencement of the Coiled Tubing operation, a pre-job meeting will be held. This should be attended by the following parties as a minimum:


OIM, WSS, Coiled Tubing Supervisor, Representatives of other service companies involved and others as necessary.

Safety meetings should be held at the start of every shift and risk assessments must be evaluated during this time. Tool box talks should be held immediately prior to the job execution.

Note: The safety meeting must be driven by DB Supervisor addressing the following topics as a minimum:

1. Muster point.
2. Take list of personnel on site (Head count)
3. All personnel should review and be familiar with escape routes and emergency procedures.
4. Describe the **job objective, fluids and volumes to be pumped, pressures expected** during the job, and others.
5. Review **Dimension Bid Operations Policy and Procedure Manual**.
 - 5.1. Ensure at all steps carried out during the operations comply with this Manual.
 - 5.2. Management of change **MUST** be applied any time there is a need to deviate from the steps contained this procedure.
 - 5.3. A document **MUST** be created describing each the step of the deviation. This document shall also include the deviation Risk Assessment and it **MUST** be approved and signed by PCSB – Head of Well Intervention and Dimension Bid Operations Manager.
6. Exercise stop work authority if unsafe condition occurs and assess situation with all team members, resume operation after mitigation plan is in place.
7. Personnel responsibilities throughout the job.
8. Spills, fire, blow out, unexpected well behaviour.
9. Emergency shower station and eye wash station location.
10. Trapped potential energy such as pressure or coiled tubing stiffness.
11. Prepare related Job Hazard Analysis (JHA) prior commencement of any work, get approval from Client Site Representative (CSR) and review it with all personnel involved as well as to review Risk Assessment.
12. Discuss the well H₂S, CO₂, Hg (Mercury) content (if applicable).
13. Adhere all **PCSB Zeto Rules** and other guidelines.
14. Take a physical count of inventory and make sure all required materials are available on site.
15. **Barricade** the work area and display the appropriate **warning sign**.
16. On chemical mixing and handling; all personnel involved shall hold **safety meeting** and review **Safety Data Sheet** (SDS).
 - 16.1. Personnel involve during chemical handling shall be briefed by DB Chemical Specialist onsite and extra precautions must be taken. All SDS must be available on site and reviewed prior chemical handling.
 - 16.2. All non-essential personnel shall stay away from mixing site.
 - 16.3. Use PPE including respirators, hard hats, eye protection and steel-toed boots.
 - 16.4. Verify if there is any **dead Volume** in the mixing tanks and adjust volumes to account for non-usable volume in the blender / mix tank.

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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG-A04L	ZONE SHUTOFF	

- 16.5. Consider wind direction and note all trip hazards in the mix / pumping area.
- 16.6. Prior to mixing chemicals, clean and verify the tank/batch mixer and lines are free of any debris and or contaminants.
- 16.7. In case of spill; wash the place where any chemical has been spilt with available spill kit.
- 16.8. Take care to prevent leakage due to ejection from valves, fittings, flanges, or other joints flexible chemical hoses and pumps. Never repair the equipment during transfer into mixing tank/container.
17. Take reading of Shut in / Flowing Tubing Head Pressure (SI/F/THP), Casing Head Pressure (CHP) and fluid sample (if available) prior to operation.
18. Check gas lift condition and capability with Site Operation Representative (SOR).
19. Ensure fitness prior to perform duties assigned.
20. Ensure all barriers are in place and followed.

HEALTH, SAFETY & ENVIRONMENT

1. Evaluate possible risks to arise during the job execution.
2. Evaluate risk assessment. Report any abnormal or insecure condition on site, taking into account all the steps or procedures to follow. Discuss with PCSB HSE coordinator, the execution or suspension of the job.
3. Review SDS of each product that will be used. Verify that all personnel on location handling toxic or corrosive products have the proper PPE.
4. Review the contingency plan for spills.
5. Do not vent / release any hydrocarbons from the well to atmosphere. Returns from the well should be handled safely by Flowback Company.
6. Prior to DB personnel walking on upper deck, DB Supervisor to inspect upper deck and ensure that the area it is in good condition (Gratings, Hatches, etc.)

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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG-A04L	ZONE SHUTOFF	

EQUIPMENT RIG UP PROCEDURE

Conduct safety meeting with all personnel on location detailing the program, pressure limitations, and personnel responsibilities, well control emergency drill and safety precautions.

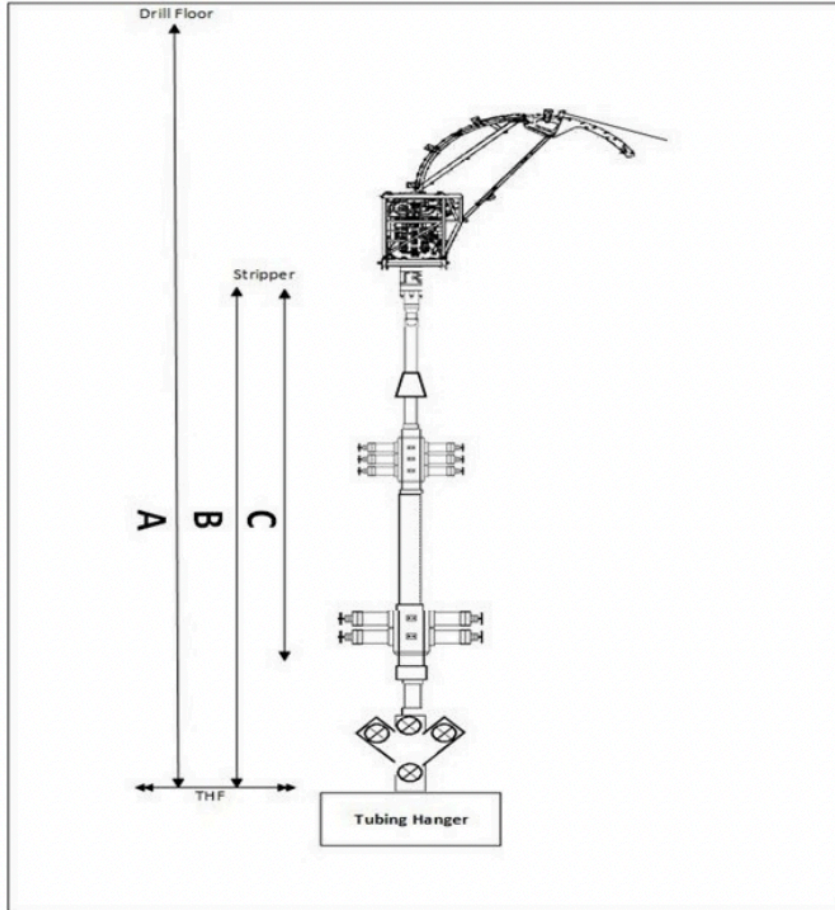
1. Spot the equipment accordingly to space availability, ensure reel position is aligned with the well.
2. Spot jacking frame at available space with sufficient height and crane capacity to rig up the injector head and gooseneck.
3. Rig up the 4" LP hoses from fluid storage tanks to batch mixer and single pump unit
4. Rig up 2" HP treating line as per DB Technical Standard from single pump unit and N2 converter unit to coiled tubing reel manifold. Include bleed off line on both lines as well.
5. Install correct wellhead crossover on the wellhead. Ensure well is fully secure and record the MV and CV turns.
6. Install Blowout Preventer (BOPs):
 - 6.1. Rig up Single BOP with necessary length of risers on top of the wellhead crossover.
 - 6.2. Rig up Combi BOP with flow tee above the risers
 - 6.3. Hook up BOP hoses and conduct function test for each ram.
7. Rig up 2" kill line from single pump unit line to BOP kill port
8. Rig up flow back line from flow tee to Choke manifold -> desander unit / production system
9. Spot injector head assembly with jacking frame on top of wellhead area. Ensure the gooseneck is aligned with the reel position
10. Inspect the chain and gripper block condition and ensure the alignment is correct
11. Rig up the following hydraulic hoses:
 - 11.1. From CT Power Pack to CT Control Cabin
 - 11.2. From CT Power Pack to CT Injector hose reel
 - 11.3. From CT Control Cabin to CT Reel
 - 11.4. From CT Control Cabin to CT BOPs
 - 11.5. From CT Power Pack to Jacking Frame
12. Perform EMC 1 for all equipment. Start up and run all equipment for few minutes.
13. Jack up CT control cabin.
14. Function test both BOP rams.

***Observe indicator pin to confirm that all rams are in good working condition.**
15. Install the stab-in-guide on the CT then stab the string into injector head.
16. Make up the CT connector and perform pull test at least 15,000 lbs as per DB SOP. This test to be recorded in OrionNET.

***Do not perform pull test more than 80% from CT Limit.**
17. Install pressure test plate onto the CT connector.
18. Circulate the string with water until clean return is seen prior to proceed with pressure test CT Connector.
19. Pressure up the CT string to 5000 psi gradually by 500 psi increment then hold for 10 minutes.
20. Open the needle valve to release the pressure slowly.

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21. Make up the BHA onto the string as per BHA diagram provided.
22. Use the jacking frame to pick up the injector and risers then connect to the Combi BOP. Secure down the injector assembly with chains.
23. Measure the following length to set the CT depth:




Distance	Length (ft)
A: Tubing Hanger (THF) to RKB	
B: Tubing Hanger (THF) to Stripper	
C: BHA Length	

24. Pick up CT and tag the stripper to set CT depth based on this calculation "A-B+C".

EQUIPMENT PRESSURE TESTING PROCEDURE

Conduct safety meeting with all personnel on location detailing the program, pressure limitations, and personnel responsibilities, well control emergency drill and safety precautions. Refer the following procedure to pressure test BOP Body, Blind Ram, Surface Line and Wellhead connection.

1. Isolate the line to Coiled Tubing. Double confirm the valve is closed.
2. Fill and pressure test the treating line with water to 500 psi and hold for 5 minutes. Inspect the lines for leaks and observe for any pressure drop.

DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG-A04L	ZONE SHUTOFF	

3. Increase pressure to 3000 psi and hold for 10 minutes. Inspect the lines for leaks and observe for any pressure drop.
4. Fill the pressure control equipment and ensure air is vented from the system by leaving the blind ram and blind ram equalizing valves open.
5. Close blind ram and equalizing valve. Pressure up the surface lines, BOP body, blind rams and wellhead connection to 500 psi then increase gradually to 3000 psi through the kill line, hold for 10 minutes. Inspect the lines for leaks and observe for any pressure drop.
6. Once test complete, open blind ram pressure equalizing port then bleed off any residual pressure and open the blind rams.

Conduct safety meeting with all personnel on location detailing the program, pressure limitations, and personnel responsibilities, well control emergency drill and safety precautions. Refer the following procedure to pressure test BOP Body, Blind Ram, Surface Line and Wellhead connection.

1. Fill up the CT string and stack up until leak can be seen at stripper.
2. Energize the stripper and begin pressure test the complete stack up (CT string, stripper, CT stack and risers) to 3000 psi against Crown Valve, hold for 10 minutes.
3. Bleed off pressure inside CT to 0 psi to test the Double Flapper Check Valve to 1500 psi and hold for 10 minutes.
4. Bleed off the pressure from BOP kill port side.

*Step 4-8 can be neglected if pipe ram has been pressure tested prior to the job.
5. Place CT string across pipe ram then close the ram.
6. Open pipe ram equalizing valve then fill up the BOP slowly.
7. Close the equalizing valve and begin pressure test the pipe ram to 3000 psi, hold for 10 minutes.
8. When the tests are complete, bleed off the pressure.

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OPERATIONAL PROCEDURE

All depths specified below are in m-MDDF (Drill floor to THF is 30.1-m as per well schematic)

COILED TUBING OPERATION (LONG STRING) – RUN#1 DRIFT RUN UNTIL 2,529m/8,298ft MDDF

Conduct safety meeting with all personnel on location detailing the program, pressure limitations, personnel responsibilities, emergency well control drill, and safety precautions.

1. Prepare 100 bbls of Treated Sea Water, TSW as per recipe below:

Treated Sea Water (TSW)				100	BBL	Description
Seq.	Product	Concentration		Volume		
1	Sea Water	992	gptg	4,166	gal	Base Fluid
2	ACM H2S Clear 200	2	gptg	8	gal	CO2 & H2S Corrosion Inhibitor
3	ACM BACT 200	2	gptg	8	gal	Micro Biocide Control
4	ACM CORR 400	2	gptg	8	gal	Metal Corrosion Inhibitor
5	ACM OXYFREE 100	2	gptg	8	gal	Oxygen Scavenger
Mixing Instruction:						
<ol style="list-style-type: none"> 1. Prepare Sea Water into the mixing tank. 2. Add ACM H2S Clear 200 into the tank and circulate the mixture. 3. Add ACM BACT 200, ACM CORR 400 & ACM OXYFREE 100 into the tank and circulate the mixture until homogenous. 						

Note: The above recipe is for 100bbls of TSW. Please prepare another batch of Treated Sea Water once needed.

2. Prepare 50 bbls of friction reducer solution as per below recipe

Treated Sea Water (TSW)				50	BBL	Description
Seq.	Product	Concentration		Volume		
1	Sea Water	964	gptg	2024	gal	Base Fluid
2	ACM H2S Clear 200	2	gptg	4	gal	CO2 & H2S Corrosion Inhibitor
3	ACM BACT 200	2	gptg	4	gal	Micro Biocide Control
4	IM LUBE	30	gptg	63	gal	Friction reducer
5	ACM OXYFREE 100	2	gptg	4	gal	Oxygen Scavenger
Mixing Instruction:						
<ol style="list-style-type: none"> 1. Prepare sea water in the mixing tank. 2. Add ACM H2S Clear 200 into the tank and circulate the mixture. 3. Add ACM BACT 200, ACM IM LUBE & ACM OXYFREE 100 into the tank and circulate the mixture until homogenous. 						

Note: The above recipe is for 50 bbls of Friction reducer solution. Please prepare another batch of Treated Sea Water once needed.

3. Prepare 50bbls of Cleanout Gel as per recipe below:

D801 Cleanout Gel				50	BBL	Description
Seq.	Product	Concentration		Volume		
1	Sea Water	992	gptg	2,083	gal	Base Fluid
2	Gel	40.5	pptg	85	lbs	Gelling Agent
Mixing Instruction:						
<ol style="list-style-type: none"> 1. Prepare sea water in the mixing tank. 2. Add D801 Gel into the tank and circulate the mixture until homogenous. 						

Note: The above recipe is for 50 bbls of gel. Please prepare another batch once needed.

4. Rig up coiled tubing unit and surface line on DLG – A platform as per Site Visit Report:
 - 4.1. Review JHA and risk assessment with all personnel involve in the rig up operation. Please send a copy of JHA to Engineer in Charge.
 - 4.2. Lift up coiled tubing unit using crane and spot on platform.
 - 4.3. Rig up Coiled Tubing package and surface treating line.
 - 4.4. Rig up 2” kill line to BOP kill port.
 - 4.5. Rig up 2” flexible hose from pumping tee.
 - 4.6. Pig coil tubing with treated sea water to ensure no debris is inside coil. **Record coil tubing volume in treatment report.**
 - 4.7. Make up the **CT End Connector**.
 - 4.8. Install the Pull and Pressure Test Sub.
 - 4.9. Perform Pull Test on the CT End Connector **to 15,000 lbf** and record this in OrionNET.

Note: Do not perform pull test more than 80% coil limit. Consult with town if require.
 - 4.10. Perform Pressure Test on CT End Connector. Pumping treated sea water through the coiled tubing, apply low pressure test of **300 psi for 5 minutes** and high-pressure test of **5,000 psi for 15 minutes** after stabilization. Record the pressure test.
 - 4.10.1. For low pressure:

Acceptance criteria: No visible leaks. Pressure drop is less than 10% (above 270 psi) over 5-minutes test interval after the pressure stabilizes.
 - 4.10.2. For high pressure:

Acceptance criteria: No visible leaks. Pressure drop is less than 10% (above 4,500 psi) over the 15- minutes test interval after the pressure stabilizes.
5. Make up 2-1/8” MultiJet c/w 2.79” FC per **BHA#1: MultiJet Nozzle** in **Appendix 1**.
6. Perform function test of the Multi Jet nozzle to determine pump rate and pressure Parameter. Record the data in the table below, do not exceed 5,000psi. Recommended flowrate is 0.7bpm to 1.3bpm.

Flow rates (bpm)	Pressure (psi)	Remark (Tool start to rotate)
0.3		
0.5		
0.6		
0.7		
0.8		
0.9		
1.0		
1.1		
1.2		
1.3		
1.4		

1.5		
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7. Pick up coiled tubing and tag the stripper with the BHA.
8. Make up the Injector Head and Stripper to the stick up.
9. Coiled tubing stack up pressure test against Wellhead Swab valve. Pumping treated sea water through the coiled tubing, apply low pressure test of **300 psi for 5 minutes** and high-pressure test of **3,000 psi for 15 minutes** after stabilization. Record the pressure test. Record test on a chart. Upon successful pressure test, bleed off pressure via Pump-In Sub.
 - 9.1. For low pressure:

Acceptance criteria: No visible leaks. Pressure drop is less than 10% (above 270 psi) over 5-minutes test interval after the pressure stabilizes.
 - 9.2. For high pressure:

Acceptance criteria: No visible leaks. Pressure drop is less than 10% (above 2,700 psi) over the 15- minutes test interval after the pressure stabilizes.
10. Pressure test the BHA Check Valve. With **3,000 psi** in the coiled tubing stack up, bleed off the stack up pressure to **1,500 psi** via pump-in sub; and bleed off pressure in the coiled tubing to zero (0) psi via reel manifold.
 - 10.1. Acceptance criteria: **Pressure drop is less than 10% (above 1,350 psi) over the 15- minute test interval after the pressure stabilizes.** Observe for any pressure changes in the stack up. If the BHA check valve is not holding, proceed to replace the MHA; do not run in hole with leaking check valve; repeat steps 8.2, and 9.
11. Upon successful test, bleed off the pressure in the coiled tubing stack up to zero through the pump-in sub.
12. Zero both depth counters at reference point.
13. Confirm all wellhead and BOP valves are in open position via physical check.
 - 13.1. Prior to opening the wellhead valve pressure up above master valves to a pressure equal to the expected shut in wellhead pressure.
 - 13.2. Count wellhead valves turns while opening and record it the treatment report for reference in future.
 - 13.3. Manipulate surface valve to the following position:

Valve	Position
Reel Manifold	OPEN
Lower Master Valve	OPEN
Swab Valve	OPEN
Flow Cross Return Valve	OPEN
Wing Valve	CLOSE


14. Start running in hole coil tubing to **Long string until tag 2-7/8 production tubing crossover at depth 2,529m/8,298ft MDDF** while pumping **TSW** at minimum rate permissible.
 - 14.1. Refer to CT Tubing Force simulation (Orpheus modelling), refer Appendix III.
 - 14.2. Conduct pull test as per for every 300m (1,000ft), use CT Fatigue graph as reference. **Ensure the CT Fatigue graph is available at location before RIH. Record RIH, Hanging and POOH weight in treatment report.**
 - 14.3. After performing pull test every 1,000ft, pump 2 bbls of friction reducer solution through the kill port line to lubricate through annulus of CT String.

- 14.4. Maximum coil speed running in hole is **30-50 ft/min.**
- 14.5. Slow down coil speed to **10 ft/min**, 50 ft before and after passing through completion accessories.
- 14.6. Closely observe weight indicator in control cabin while running in hole.
- 14.7. Observe return all the times.
- 14.8. Regularly inform WSS on job status at all times.
- 14.9. Do not exceed operating safety limits **5,000 psi.**
- 14.10. If the well condition differs from original job design, contact appropriate personnel in charge before proceeding.
- 14.11. At all time, while run-in hole, the injector torque control shall be set at the minimum pressure required to move the Coiled Tubing at specified speed.
- 15. Once CT at **2,529m/8,298ft MDDF**, fluted centralizer will act as stopper, tag 3 times at 2-7/8 production tubing to confirm the depth, do not exceed set down weight 500 – 1000 lbf. Flag the coil, reset mechanical and depth counter accordingly.

Flag Number	Colour
Flag#1	

- 16. If there is HUD before reach target depth, pick up CT 30 ft above HUD and increase pump rate to establish return. Inject N2 gas if required to lighten the hydrostatic.
 - 16.1. Once return on surface is establish, proceed to penetrate HUD/Fill as per below table to target depth **2,529m/8,298ft MDDF**. Circulate 5bbls of D801 gel after each penetration of 30m bite with 10ft/min CT speed.

No	Stage	Fluid	Liquid Rate	Total Liquid	N2 Rate (if require)	CT Speed	Duration	Depth	Remarks
			BPM	Bbl	SCF/M	ft/min	Minute	m	
1	CT at 10m above HUD	TSW	1.0	0.0	350	0	0	10m above HUD	Establish return on surface
2	Penetrating HUD/Fill	TSW	1.0	10.0	350	10	10	HUD + 30m	Monitor return & CT weight on surface
3	Circulate	Gel	1.0	5.0	350	0	10	Stationary CT	Provide suspension to the fill and lift to surface
Pull Test 10m									

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4	RIH to HUD and Penetrate HUD/Fill	TSW	1.0	10.0	350	10	10	HUD + 30m	Monitor return & CT weight on surface
5	Circulate	Gel	1.0	10.0	350	0	10	Stationary CT	Provide suspension to the fill and lift to surface
Pull Test 10m									
Repeat steps until reach CT at 2,529m/8,298 ft MDDF									
8	Circulate	Gel	1.0	54	350	0	54	CT at 2,529m/8,298 ft MDDF	Bottom up with Gel
9	Circulate	TSW	1.0	108	350	0	108	CT at 2,529m/8,298 ft MDDF	Bottom up till get clear return on surface
10	POOH	TSW	0.5	137	350	30	275	To Surface	Monitor return on surface


17. If CT encountered hard obstruction, proceed to pick up CT 10m above the obstruction and circulate at least 2x bottom up with nitrified TSW until clear return is observe on surface before proceed with the following steps.

17.1. Proceeds to mix **10 bbls of 15% HCl acid** as per the following recipe:

15% HCl (Main Treatment)				10	BBL	Description
Seq.	Product	Concentration		Volume		
1	Sea Water	419	gptg	176	gals	Base Fluid
2	ACM CORR 400	4	gptg	2	gals	Acid Corrosion Inhibitor
3	MESB NE 200	4	gptg	2	gals	Non-Emulsifier
4	ACM Surf 210	3	gptg	1	gals	Surfactant
5	Ammonium Chloride	417	pptg	175	lbs	Clay Stabilizer
6	ACM Iron 300	25	pptg	11	lbs	Iron Sequestering
7	ACM Iron 200	15	gptg	6	gals	Iron Control
8	33% HCl	419	gptg	176	gals	Raw Acid
9	MESB MS 300	100	gptg	42	gals	Mutual Solvent

Mixing Instruction:
1. Fill up tank with Sea Water.
2. Add additives as per above sequence.
3. Agitate until mixture is homogenous.

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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
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Neutralization Fluid				10	BBL	Description
Seq.	Product	Concentration		Volume		
1	Sea Water	976	Gptg	410	gal	Base fluid
2	Soda Ash	500	pptg	210	lbs	Neutralization fluid
Mixing Instruction:						
1. Prepare sea water in the mixing tank.						
2. Mix soda ash into tank and agitate until mixture is homogenous.						

- 17.2. Upon completion mixing 15% HCl acid, proceed to jet 5 bbls of 15% HCl on top of the obstruction while attempt to pass through the obstruction. If no progress consult town prior moving to next step.
- 17.3. If no success during jetting HCl acid, proceed to spot another 5 bbls of 15% HCl on top of obstruction and pick up CT at least 550m above the obstruction depth to soak the acid for 2 hours. After completed soaking, proceed to RIH to pass through the obstruction while pumping nitrified TSW. If no success consults town prior for way forward. (prepare to POOH to change BHA to Spincat/Milling)
18. Pick CT to depth **2,500m/8,202.5ft MDDF**, increase jetting rate to clean the tubing wall.
19. RIH to depth **2,529m/8,298ft MDDF**, to clean the SSD Area, wiper trip back to depth **2,500m/8,202.5ft MDDF** and repeat jetting until depth **2,529m/8,298ft MDDF**.
20. Establish circulation at surface first and perform CBU, pump 1 CT/Annulus volume of Gel and bottom ups with 2x CT/Annulus volume of TSW.
21. Once Completed CBU, POOH to surface.
22. Once CT on surface, close well and bleed off pressure in coil and stack up.
23. CT Supervisor/Operator to update pipe tracking management file and string file fatigue after each run and share the file with town.

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COILED TUBING OPERATION (LONG STRING) – RUN#2 CLOSE SSD USING 2.813” KEY SHIFTING TOOL

24. Make up 2.813” shifting tool key as per **BHA#2: 2.813” Shifting tool key** in **Appendix I**.
25. Perform function test of the impact hammer c/w shifting tool to determine at which pump rate and pressure the impact hammer c/w shifting tool start engages. Record the data in the table below, do not exceed 5,000psi. Recommended flowrate is 0.7bpm to 1.0bpm.

Flow rates (bpm)	Pressure (psi)	Remark
0.3		
0.5		
0.6		
0.7		
0.8		
0.9		
1.0		
1.1		
1.2		
1.3		
1.4		
1.5		

26. Repeat step 6 till 12 in Run#1 prior opening the well.
27. Start running in hole coil tubing to **2,529m/8,298ft MDDF** without pumping.
 - 27.1. Refer to CT Tubing Force simulation (Orpheus modelling), refer Appendix III.
 - 27.2. Conduct pull test and break circulation every 300m (1,000ft), use CT Fatigue graph as reference. **Ensure the CT Fatigue graph is available at location before RIH. Record RIH, Hanging and POOH weight in treatment report.**
 - 27.3. After performing pull test every 1,000ft, pump 2 bbls of friction reducer solution through the kill port line to lubricate through annulus of CT String.
 - 27.4. Maximum coil speed running in hole is **30-50 ft/min**.
 - 27.5. Slow down coil speed to **10 ft/min**, 50 ft before and after passing through completion accessories.
 - 27.6. Closely observe weight indicator in control cabin while running in hole.
 - 27.7. Observe return all the times.
 - 27.8. Regularly inform WSS on job status at all times.
 - 27.9. Do not exceed operating safety limits **5,000 psi**.
 - 27.10. If the well condition differs from original job design, contact appropriate personnel in charge before proceeding.
 - 27.11. At all time, while run-in hole, the injector torque control shall be set at the minimum pressure required to move the Coiled Tubing at specified speed.

28. Once CT at Flag#1, compare flag depth with mechanical/depth counter at that depth, POOH to depth **2,492m/8,176ft MDDF (10m above SSD)**,
29. Once CT at **2,492m/8,176ft MDDF (10m above SSD)**, stop coil and conduct pull test of 10m/30ft with pumping rate 0.3BPM and record the pulling weight both static and dynamic (**IMPORTANT**).

<i>Depth, ft</i>	<i>RIH weight, lbf</i>	<i>Static weight, lbf</i>	<i>Pick up weight, lbf</i>

30. Slowly RIH until 10m below SSD#2, slowly increase the pump rate to active the Shifting tool.

Shifting Tool Activation Pressure Range, psi
650 - 850

31. Slowly pickup coil and engage profile sliding sleeve with hydraulic shifting tool (observe increase in weight and circulation pressure as an indicator that the shifting tool already engage with sliding sleeve).
32. Increase weight slowly to active impact hammer (approx. 500lbs), pick up weight further to start shifting the sleeve.
33. If coiled tubing weight increases while passing SSD depth beyond maximum allowable pick-up weight, stop coiled tubing movement. RIH coiled tubing 20m and repeat attempt to close SSD.
34. Once the sleeve has been shifted fully, an increased in weight shall be observed. Stop pump and RIH back and repeat step 31 to 33 for at least 3 times.
35. After ensure that SSD#2 already close, POOH and prepare for run#3
36. CT Supervisor/Operator to update pipe tracking management file and string file fatigue after each run and share the file with town.


COILED TUBING OPERATION (LONG STRING) – RUN#3 DRIFT RUN UNTIL SSD#3

37. Make up 1-11/16” MultiJet Nozzle c/w 2.29” FC as per **BHA#3: 1.69” MultiJet Nozzle** in Appendix I.
38. Perform function test of the Multi Jet nozzle to determine pump rate and pressure Parameter. Record the data in the table below, do not exceed 5,000psi. Recommended flowrate is 0.7bpm to 1.3bpm.

Flow rates (bpm)	Pressure (psi)	Remark (Tool start to rotate)
0.3		
0.5		
0.6		
0.7		
0.8		
0.9		
1.0		
1.1		
1.2		
1.3		
1.4		
1.5		

Note: Record maximum pump rate allowable without exceeding 5,000psi.

39. Repeat step 6 till 12 in Run#1 prior opening the well.
40. Start running in hole coil tubing to **3,222m/10,571ft MDDF (20m below SSD#3)** while pumping **TSW** at minimum rate permissible.
 - 40.1. Refer to CT Tubing Force simulation (Orpheus modelling), refer Appendix III
 - 40.2. Conduct pull test as per for every 300m (1,000ft), use CT Fatigue graph as reference. **Ensure the CT Fatigue graph is available at location before RIH. Record RIH, Hanging and POOH weight in treatment report.**
 - 40.3. After performing pull test every 1,000ft, pump 1 bbls of friction reducer solution through the kill port line to lubricate through annulus of CT String.
 - 40.4. Maximum coil speed running in hole is **30-50 ft/min.**
 - 40.5. Slow down coil speed to **10 ft/min**, 50 ft before and after passing through completion accessories.
 - 40.6. Closely observe weight indicator in control cabin while running in hole.
 - 40.7. Observe return all the times.
 - 40.8. Regularly inform WSS on job status at all times.
 - 40.9. Do not exceed operating safety limits **5,000 psi.**
 - 40.10. If the well condition differs from original job design, contact appropriate personnel in charge before proceeding.
 - 40.11. At all time, while run-in hole, the injector torque control shall be set at the minimum pressure required to move the Coiled Tubing at specified speed.
 - 40.12. Once CT at flag#01 area, check mechanical/depth Counter with flag#01 depth.

DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG-A04L	ZONE SHUTOFF	


41. When CT at depth 3,180m/10,434ft MDDF, increase pump rate to jetting and clean the tubing wall where the depth proposed to set bridge plug, continue jetting until depth 3,200m/10,499ft MDDF. Cleaning tubing wall depth interval from 3,180m – 3200m MDDF.
42. Wiper trip back to depth 3,180m/10,434ft MDDF and repeat step 42. Once complete clean the tubing wall, continue RIH until SSD#3.
43. Once CT at **SSD#3, 3,222m/10,571ft MDDF**, establish circulation at surface before proceed to pump 1 CT/Annulus volume of Gel and bottom ups with 2x CT/Annulus volume of TSW.

Notes* After pump 1.5x Tubing Volume, if there is still no return on surface, possibility due to SSD#3 in open position, proceed with pump 2x CT/Annulus volume of TSW.

44. If there is HUD before reach target depth, pick up CT 30 ft above HUD and increase pump rate to establish return. Inject N2 gas if required to lighten the hydrostatic.
 - 44.1. Once return on surface is establish, proceed to penetrate HUD/Fill as per below table to 10m below SSD#3 **3,222m/10,571ft MDDF**. Circulate 5bbls of D801 gel after each penetration of 30m bite with 10ft/min CT speed.

No.	Stage	Fluid	Liquid Rate	Total Liquid	N2 Rate (if require)	CT Speed	Duration	Depth	Remarks
			BPM	Bbl	SCF/M	ft/min	Minute	m	
1	CT at 10m above HUD	TSW	1.0	0.0	350	0	0	10m above HUD	Establish return on surface
2	Penetrating HUD/Fill	TSW	1.0	10.0	350	10	10	HUD + 30m	Monitor return & CT weight on surface
3	Circulate	Gel	1.0	5.0	350	0	10	Stationary CT	Provide suspension to the fill and lift to surface
Pull Test 10m									
4	RIH to HUD and Penetrate HUD/Fill	TSW	1.0	10.0	350	10	10	HUD + 30m	Monitor return & CT weight on surface
5	Circulate	Gel	1.0	10.0	350	0	10	Stationary CT	Provide suspension to the fill and lift to surface
Pull Test 10m									
Repeat steps until reach CT at 20m below SSD#3, 3,222m/10,571ft MDDF									
8	Circulate	Gel	1.0	69	350	0	69	CT at 20m below SSD#3,	Bottom up with Gel

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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG-A04L	ZONE SHUTOFF	

								3,222m/10, 571ft MDDF	
9	Circulate	TSW	1.0	138	350	0	138	CT at 20m below SSD#3, 3,222m/10, 571ft MDDF	Bottom up till get clear return on surface
10	POOH	TSW	0.5	176	350	30	351	To Surface	Monitor return on surface

45. If CT encountered hard obstruction, proceed to pick up CT 10m above the obstruction and circulate at least 2x bottom up with nitrified TSW until clear return is observe on surface before proceed with the following steps.

45.1. Proceeds to mix **10 bbls of 15% HCl acid** as per the following recipe:

15% HCl (Main Treatment)				10	BBL	Description
Seq.	Product	Concentration		Volume		
1	Sea Water	419	gptg	176	gals	Base Fluid
2	ACM CORR 400	4	gptg	2	gals	Acid Corrosion Inhibitor
3	MESB NE 200	4	gptg	2	gals	Non-Emulsifier
4	ACM Surf 210	3	gptg	1	gals	Surfactant
5	Ammonium Chloride	417	pptg	175	lbs	Clay Stabilizer
6	ACM Iron 300	25	pptg	11	lbs	Iron Sequestering
7	ACM Iron 200	15	gptg	6	gals	Iron Control
8	33% HCl	419	gptg	176	gals	Raw Acid
9	MESB MS 300	100	gptg	42	gals	Mutual Solvent

Mixing Instruction:

1. Fill up tank with Sea Water.
2. Add additives as per above sequence.
3. Agitate until mixture is homogenous.


Neutralization Fluid				10	BBL	Description
Seq.	Product	Concentration		Volume		
1	Sea Water	976	Gptg	410	gal	Base fluid
2	Soda Ash	500	pptg	210	lbs	Neutralization fluid

Mixing Instruction:

1. Prepare sea water in the mixing tank.
2. Mix soda ash into tank and agitate until mixture is homogenous.

45.2. Upon completion mixing 15% HCl acid, proceed to jet 5 bbls of 15% HCl on top of the obstruction while attempt to pass through the obstruction. If no progress consult town prior moving to next step.

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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG-A04L	ZONE SHUTOFF	

- 45.3. If no success during jetting HCl acid, proceed to spot another 5 bbls of 15% HCl on top of obstruction and pick up CT at least 550m above the obstruction depth to soak the acid for 2 hours. After completed soaking, proceed to RIH to pass through the obstruction while pumping TSW. If no success consults town prior for way forward. (prepare to POOH to change BHA to Spincat/Milling)
46. Once Completed CBU, flag coil at SSD#3 depth and bridge plug setting depth 3,192m/10,473ft MDDF and POOH to surface.

<i>Flag Number</i>	<i>Colour</i>
Flag#2 SSD#3	
Flag#3 Bridge plug	

47. Once CT on surface, close well and bleed off pressure in coil and stack up.

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COILED TUBING OPERATION (LONG STRING) – RUN#4 DEPTH CORRELATION RUN WITH GRCCCL

48. Make up as per **BHA#4: GRCCCL** in **Appendix I** and follow as per Archer procedure
49. Repeat step 6 till 12 priors opening the well.
50. Start RIH to **3,217m/10,555ft MDDF**. Ensure break circulation at minimal of pumping rate @ 0.3 BPM and circulation pressure less than 500 psi. Pull test every 1000ft. After performing pull test every 1,000ft, pump 1 bbls of friction reducer solution through the kill port line to lubricate through annulus of CT String.
51. **Set down max is depends on Archer tool and Set down weight at TFA).**
52. RIH at speed 15m/min (Normal RIH coiled speed 30-50ft/min, Slow down coil speed to 10 ft/min, 50 ft before and after passing through completion accessories) to 3,217 m-MDDF.


Logging Interval m-MDDF
3,215 – 3,175 m-MDDF

53. Once CT at **3,217m/10,555ft MDDF**, pick up CT **3,215m/10,548ft MDDF**. (use flag#2 as reference)
54. **Record the depth.**
55. Allow the tool to remain stationary at depth for 5 minutes.
56. Record static weight of the coil and flag the coil. The depth reading at this mark is uncorrected and will be referred to as “B”.
*Note: Flagging must be made while tool string is in tension. DO NOT flag the coiled when tool string sits at bottom of the well or has been stopped after slacking off on the wire, due to wire slack. Flagging the coiled must remain consistent.

Flag Number	Colour
Flag#4 GRCCCL	

Depth, ft	Static weight, lbf

57. Log up 10 m/min from 3,215 m-MDDF to 3,175 m-MDDF. Wait for 3 minutes.
*Note: DO NOT continually adjust running speed to try to match the specified logging speed after starting. A constant speed is far more important Start RIH back to 3,212m/10,539ft MDDF and repeat logging passes. A minimum of 2 passes is required for the average calculation.
58. RIH at speed 15 m/min (or maximum speed by Coiled Tubing) from 3,175 m-MDDF to 3,217 m-MDDF.
*Note: During RIH – monitor tension/weight carefully especially when passing restrictions.
59. Repeat step 46-51 for another passes for average calculation.
60. After complete logging, begin POOH CT to surface: -
 - 60.1. Maximum coil speed while POOH is 50ft/min.
 - 60.2. Slow down coil speed to 10ft/min 50ft before and after passing through completion accessories.
 - 60.3. Do not exceed CT operating limit (refer to Appendix III: CT Force simulation)
61. Once CT reaches at surface:

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61.1. Close master and swab valve.

61.2. CT Supervisor/Operator to update pipe tracking management file and string file fatigue after each run and share the file with town.

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COILED TUBING OPERATION (LONG STRING) – RUN#5 SET BRIGE PLUG

62. Drift 0.44” ball (Bridge plug phenolic Ball) through the 1.5” coiled string and break circulate until the ball comes out below CT. This is to ensure the ball can pass through Gooseneck prior to Hydraulic Setting Tool. Record the following details below.

Pump Volume, bbls	Pump Rate, bpm

63. Make up **BHA#5: Bridge plug Hydraulic Setting Tool** in **Appendix I** and follow as per TTS procedure.

63.1. Prior making up bottomhole assembly, note on the following:-

63.1.1. Ensure that burst disk at Motor Head Assembly (MHA) is changed to 6k rating. Record the burst disk rating in BHA checklist, witnessed and verify by WSS.

63.1.2. Drift 0.375” ball through MHA to ensure it is able to pass through flapper check valve.

Note: Ensure 0.375” ball has been test drifted through MHA, witnessed by WSS to confirm that it can pass through smoothly to the required ball seat in setting tool for Bridge plug.

64. Repeat step 6 till 12 in Run#1 prior opening the well.

Note: for High pressure test instead of 5,000 psi as per step 3.10, change to 6,000 psi.

Acceptance criteria will be the same, no visible leak and pressure drop less than 10% over 15 minutes interval after the pressure stabilizes

65. Start running in hole coil tubing to **3,182m/10,440ft MDDF (10m above Bridge plug Setting Depth)** while pumping **TSW** at minimum rate permissible.

65.1. Refer to CT Tubing Force simulation (Orpheus modelling), refer Appendix III.

65.2. Conduct pull test as per for every 300m (1,000ft), use CT Fatigue graph as reference. **Ensure the CT Fatigue graph is available at location before RIH. Record RIH, Hanging and POOH weight in treatment report.**

65.3. After performing pull test every 1,000ft, pump 1 bbls of friction reducer solution through the kill port line to lubricate through annulus of CT String.

65.4. Maximum coil speed running in hole is **30-50 ft/min**.

65.5. Slow down coil speed to **10 ft/min**, 50 ft before and after passing through completion accessories.

65.6. Closely observe weight indicator in control cabin while running in hole.

65.7. Observe return all the times.

65.8. Regularly inform WSS on job status at all times.

65.9. Do not exceed operating safety limits **5,000 psi**.


65.10. If the well condition differs from original job design, contact appropriate personnel in charge before proceeding.

65.11. At all time, while run-in hole, the injector torque control shall be set at the minimum pressure required to move the Coiled Tubing at specified speed.

Note: Bridge plug setting depth depends on GRCCCL and as per agreed by town

66. Once CT reach at **3,182m/10,440ft MDDF**, stop coil and conduct pull test of 10m/30ft with pumping rate 0.3BPM and record the pulling weight both static and dynamic (**IMPORTANT**).

Depth, ft	RIH weight, lbf	Static weight, lbf	Pick up weight, lbf

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67. Once complete pull test, continue RIH slowly at 5ft/min with pumping rate 0.3BPM to **3,202m/10,506ft MDDF** (10m below bridge plug Setting Depth).
68. Then pull back up to Bridge plug setting position at **3,192m/10,473ft MDDF** and put tool string in tension mode.
69. Once CT at setting depth, perform the following step to set the bridge plug.
- Note: Refer to TTS Procedure and TTS Tool Specialist to ensure procedures are followed accordingly.**
- 69.1. Record coiled tubing pressure and Close plug valve in the reel.
- 69.2. Bleed off the pressure of the surface line and reel manifold.
- 69.2.1. Ensure ball launcher is as close to vertical position as possible when launching.
70. At depth **3,192m/10,473ft MDDF setting depth**, launch 0.375” ball to set bridge plug.
- 70.1. Pump TSW at pumping rate 1bpm to chase the ball over gooseneck.
- 70.2. Once the ball has pass through the gooseneck, shutdown the pump and allow the ball to gravitate to it seat (approximately 30 minutes).
- 70.3. Continue pumping with minimum pump rate.
- 70.4. When the ball bearing is fully seated, a pressure build up will be observed.
- 70.4.1. Slowly increase pressure to **4,200 PSI** by increment of 500 psi (hold each increment for 5 minutes) (A kick of weight will occur when shear stud)
- Note: Pressure drop will indicate the Bridge Plug is fully set**
- 70.4.2. Once the bridge plug is set, slowly pick up CT 5m above and record POOH weight.
- 70.4.3. If safe, RIH back and apply set down weight **500 – 1,000 lbf** to confirm Bridge Plug is fully set. (Do not exceed 1,500 lbf, refer to the setdown weight in tubing force analysis)

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BRIDGE PLUG INTEGRITY TEST

71. Record all parameters (THP and CHP). For positive pressure test, make sure the valves are in following position:

Valve	Position
Lower Master Valve	OPEN
Swab Valve	OPEN
Kill Line	OPEN
Wing Valve	CLOSE

72. Pressure test the Bridge plug by pumping TSW thru CT annulus, apply 500 psi and monitor the pressure.

72.1. Record all essential parameter (Pumping pressure, Pumping Rate, SITHP and CHP)

Time	Pump Rate (bpm)	Pumping Pressure (psi)	THP(psi)	CHP (psi)

73. If integrity test is satisfactory, proceed with next run contingency#1.

74. If bridge plug integrity test failed, pressure drop is more than 10% (Registered pressure = below 450 psi), proceed to perform injectivity test, fill up 1.5x Tubing volume (90 bbls) or constant return at surface (whichever comes first) before proceed with injectivity test.

75. Begin injectivity test, fill up and include table below in daily report.

Rate (bpm)	Pumping Pressure (psi)	Time (min)	Volume (bbl)	THP-SS (psi)	THP-LS (psi)	CHP (psi)	MASTP (psi)
0.5							590 psi
0.7							
1.0							
1.2							
1.5							
2.0							

76. Once complete injectivity test, perform leak off test to determine the volume of losses inside CT String.

77. POOH CT to surface and prepare for WLD run.

78. Once CT reaches at surface:

79. Close master and swab valve.

80. CT Supervisor/Operator to update pipe tracking management file and string file fatigue after each run and share the file with town.

COILED TUBING OPERATION (LONG STRING) – RUN#6 WLD BASELINE RUN

81. Make up **BHA#6: WLD Tool** in **Appendix I** and **follow as per Archer procedure**.
82. Repeat step 6 till 12 in Run#1 prior opening the well.
83. Ensure the logging string in active mode for 55 min inside lubricator
84. Start running in hole coil tubing to **2,450m/8,038ft MDDF**, break circulation and pull test every 1,000ft
 - 84.1. Refer to CT Tubing Force simulation (Orpheus modelling), refer Appendix III.
 - 84.2. Conduct pull test as per for every 300m (1,000ft), use CT Fatigue graph as reference. **Ensure the CT Fatigue graph is available at location before RIH. Record RIH, Hanging and POOH weight in treatment report.**
 - 84.3. After performing pull test every 1,000ft, pump 1 bbls of friction reducer solution through the kill port line to lubricate through annulus of CT String.
 - 84.4. Normal coil speed running in hole is **30-50 ft/min, as per archer job program suggested to run 15m/min or 49 ft/min.**
 - 84.5. Slow down coil speed to **10 ft/min**, 50 ft before and after passing through completion accessories.
 - 84.6. Closely observe weight indicator in control cabin while running in hole.
 - 84.7. Regularly inform WSS on job status at all times.
 - 84.8. Do not exceed operating safety limits **5,000 psi**.
 - 84.9. If the well condition differs from original job design, contact appropriate personnel in charge before proceeding.
 - 84.10. At all time, while run-in hole, the injector torque control shall be set at the minimum pressure required to move the Coiled Tubing at specified speed.
 - 84.11. RIH VIVID (in record mode) at speed 15 m/min (if possible) from surface to 2,450 mMDDF (above the 9-5/8" Dual Packer).

Note from archer procedure: During RIH – monitor tension/weight carefully. Refer to the attached TFA for max setback and overpull.

85. Once CT reach at **2,450m/8,038ft MDDF**, stop coil for 5 min and conduct pull test of 10m/30ft with pumping rate 0.3BPM and record the pulling weight both static and dynamic.

<i>Depth, ft</i>	<i>RIH weight, lbf</i>	<i>Static weight, lbf</i>	<i>Pick up weight, lbf</i>


86. Log down at speed 10m/min from 2,450m-MDDF to target depth at 3,190m-MDDF (2m above top of bridge plug) (Notes** during log down monitor tension weight and no pumping during baseline pass)
87. Once CT at 3,190m-MDDF, stop for 5 min.
88. Log up in stationary mode from 3,190m-MDDF to 2,450m-MDDF, station stop every 2 meter for 40 seconds. (Notes** station stop every 1 meter for 40 seconds between interval 3,100 – 3,115m MDDF.
89. Once CT at 2,450m-MDDF stop for 5 minutes before proceed to PPOH
90. Once CT reaches at surface:
 - 90.1. Close master and swab valve.

COILED TUBING OPERATION (LONG STRING) – RUN#7 WLD (OPEN SS TUBING AND PRESSURIZE LS TUBING)

91. Make up **BHA#6: WLD Tool** in **Appendix I** and **follow as per Archer procedure**.
92. Repeat step 6 till 12 in Run#1 prior opening the well.
93. Ensure the logging string in active mode for 55 min inside lubricator
94. Start running in hole coil tubing to **2,450m/8,038ft MDDF**, break circulation and pull test every 1,000ft
 - 94.1. Refer to CT Tubing Force simulation (Orpheus modelling), refer Appendix III.
 - 94.2. Conduct pull test as per for every 300m (1,000ft), use CT Fatigue graph as reference. **Ensure the CT Fatigue graph is available at location before RIH. Record RIH, Hanging and POOH weight in treatment report.**
 - 94.3. After performing pull test every 1,000ft, pump 1 bbls of friction reducer solution through the kill port line to lubricate through annulus of CT String.
 - 94.4. Normal coil speed running in hole is **30-50 ft/min, as per archer job program suggested to run 15m/min or 49 ft/min.**
 - 94.5. Slow down coil speed to **10 ft/min**, 50 ft before and after passing through completion accessories.
 - 94.6. Closely observe weight indicator in control cabin while running in hole.
 - 94.7. Regularly inform WSS on job status at all times.
 - 94.8. Do not exceed operating safety limits **5,000 psi**.
 - 94.9. If the well condition differs from original job design, contact appropriate personnel in charge before proceeding.
 - 94.10. At all time, while run-in hole, the injector torque control shall be set at the minimum pressure required to move the Coiled Tubing at specified speed.
95. Once CT reach at **2,450m/8,038ft MDDF**, stop coil for 5 min and conduct pull test of 10m/30ft and record the pulling weight both static and dynamic.

Depth, ft	RIH weight, lbf	Static weight, lbf	Pick up weight, lbf

96. Fill up CT string until full of TSW, closed plug valve at the reel before proceed to create logging condition as per below.
97. Create “logging condition “ prior to logging – Active downhole leak as below :-
 - 97.1. Open SS Tubing.
 - 97.2. Pressurize LS tubing with fluid and maintain pressure at 1000psi (or higher if possible / ref MAWOP) on surface all times. Note: discuss with PCSB representative onsite the max allowable pressure (but must be below MAWOP).Monitor if any fluid or gas return via SS tubing.
 - 97.3. Monitor if any fluid or gas return to surface via the SS tubing.
 - 97.4. Wait for 15 min prior logging down
 - 97.5. During logging: continuous pressurizing the LS tubing at 1000 psi (or higher if possible / ref MAWOP) on surface all time while SS tubing kept open.
98. **Main Pass:** Log down at speed 10m/min from 2,450 m-MDDF to target depth (TD) at 3,190 m-MDDF (~2m above top tubing plug).
Notes: (1) During log down – monitor tension/weight carefully; (2) If possible, no pumping chemical, fluid or gas is allowed while logging down VIVID.
99. Stop at 3,190 m-MDDF for 5 minutes.

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100. Log up in stationary mode from 3,190 m-MDDF to 2,450 m-MDDF – stations stop every 2 meter for 40 seconds.
Notes: (1) station stop every 1 m for 40 sec between interval 3,100 – 3,115 m-MDDF (around tubing seal assembly area); (2) Monitor tension/ weight during logging up.
101. Stop at 2,450 m-MDDF for 5 minutes.
102. Repeat pass from as per step 98 – 101. Once complete, proceed to POOH(in record mode).
103. Once CT reaches at surface:
103.1. Close master and swab valve.

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COILED TUBING OPERATION (LONG STRING) – RUN#8 CT CEMENTING

- 104. Depends on the WLD result. If the leak spotted below seal assembly, proceed to set the bridge plug above the leak area and spot 5 bbl of cement above the bridge plug. Follow procedure as per run#5 in this procedure, the new setting depth for bridge plug no.2 depends on the leak area and agree by all party.
- 105. If the leak above the seal assembly to seal bore area proceed with as per below
- 106. Make up BHA Single bore nozzle as per **BHA#7: Single bore nozzle**
- 107. Perform function test of the Single bore nozzle to determine pump rate and pressure Parameter. Record the data in the table below, do not exceed 5,000psi. Recommended flowrate is 0.7bpm to 1.3bpm.

Flow rates (bpm)	Pressure (psi)	Remark (Tool start to rotate)
0.3		
0.5		
0.6		
0.7		
0.8		
0.9		
1.0		
1.1		
1.2		
1.3		
1.4		
1.5		

Note: Record maximum pump rate allowable without exceeding 5,000psi.

- 108. Repeat step 6 till 12 in Run#1 prior opening the well.
- 109. Start running in hole coil tubing to 3,192m/10,473ft MDDF while pumping TSW at minimum rate permissible.
 - 109.1. Refer to CT Tubing Force simulation (Orpheus modelling), refer Appendix III.
 - 109.2. Conduct pull test as per for every 300m (1,000ft), use CT Fatigue graph as reference. **Ensure the CT Fatigue graph is available at location before RIH. Record RIH, Hanging and POOH weight in treatment report.**
 - 109.3. After performing pull test every 1,000ft, pump 1 bbls of friction reducer solution through the kill port line to lubricate through annulus of CT String.
 - 109.4. Normal coil speed running in hole is **30-50 ft/min.**
 - 109.5. Slow down coil speed to **10 ft/min**, 50 ft before and after passing through completion accessories.
 - 109.6. Closely observe weight indicator in control cabin while running in hole.
 - 109.7. Observe return all the times.
 - 109.8. Regularly inform WSS on job status at all times.
 - 109.9. Do not exceed operating safety limits **5,000 psi.**
 - 109.10. If the well condition differs from original job design, contact appropriate personnel in charge before proceeding.

109.11. At all time, while run-in hole, the injector torque control shall be set at the minimum pressure required to move the Coiled Tubing at specified speed.

110. Slow the coil speed when near the bridge plug setting depth, soft tag bridge plug twice. Do not exceed set down weight 500 lbf. Perform pull test and record the pulling weight as per below table.

<i>Depth, ft</i>	<i>RIH weight, lbf</i>	<i>Static weight, lbf</i>	<i>Pick up weight, lbf</i>

111. Pick up CT to 3,097m/10,191ft MDDF (depth cover depends on the discussion with every party, this suggest depth 1m below bottom perforation zone) and flag coil (Cement expected to cover until this depth)

112. RIH CT to top of bridge plug 3,192m/10,473ft MDDF.

113. Proceed to mix 15 bbls of 15 ppg Class G Cement according as per below recipe.

114. Maximum mixing time 2 hours

115. Mix cement slurry as quickly as possible and take a regular density check. Once density check to confirm the relevant slurry properties (density and rheology), keep the slurry sample at surface and water bath

116. Start counting the cement thickening time from the first addition of cement into the mix fluid.

117. Perform compatibility test between cement and spacer at surface to make sure it will not create premature set of cement

118. Keep pumping seawater at idle rate during mixing to ensure the well keep full at all time.

Cement Slurry Properties	
Yield, cu ft/sk:	1.214
Water Requirement, gal/sk:	4.014
Thickening Time, HH:MM:	9:45
Mixing Cut-Off Time, HH:MM:	2:00

15ppg Cement		630	gals	15	bbls
Products	Concentration		Volume		
Sea Water	4.014	gps	279	gals	6.6
SFP 0006 (Foam Preventer)	0.05	gps	3.47	gals	0.083
SBA 0016 (Bonding Agent)	1.2	gps	83.3	gals	1.98
SFL 0016 (Fluid Loss)	0.20	gps	13.9	gals	0.33
SCD 0003 (Cement Dispersant)	0.20	gps	13.9	gals	0.33
SCR 0024 (Cement Retarder)	0.05	gps	3.5	gals	0.1
Blended G-Cement	1.214	cuft/sk	5,112.7	lbs	Based on 73.67 lb/sk

1. Fill up batch mixer with sea water
2. Add additives as per above sequence
3. Note the time when 1st cement sack is added into mixed water mixture. Thickening time starts once 1st cement jumbo is added into mixed water.
4. Refer to **Appendix VI** for cement lab test results

Note:

1. **Record and inform Engineer in Charge when the first sack of cement is added to mixed water mixture.**
2. **Cement Thickening Time is 9 hours 45 minutes from first sack of cement added.**
3. **Cement Mixing Time is 2 hours**
4. **Total Cement Mixing Cut-Off Time is 3 hours.**
5. **After complete mixing, take cement sample from Batch Mixer and CT Reel Manifold and keep sample for monitoring. Label sample properly.**

119. Upon complete mixing, begin to pump cement according to the following steps: -
120. Record coil pressure and close in reel valve.
121. Open overboard valve and flush surface lines with cement slurry until the correct density and consistency are obtained.
122. Close overboard valve and equalize pressure across reel valve.
123. Ensure wellhead valves are configured according to table below: -

Valve	Position
Reel Manifold	OPEN
Flow Cross Return Valve (Cetco lines)	OPEN
Wing Valve – Long String	CLOSE

124. Start to pump 5 bbls of seawater spacer follow with 1.8 bbls of cement slurry and displace with 1 CT volume of TSW to push the cement into tip of nozzle (ensure that wellhead pressure at least 100-200 psi during the pumping).
- 124.1. Open overboard line and pump cement. Flush surface treating line with cement slurry until good return is observed (correct cement density).
 - 124.2. Close overboard line and equalize pressure across reel manifold valve.
 - 124.3. Launch bottom cement dart (2,500 psi rating).
 - 124.4. Reset volume at data acquisition system.
 - 124.5. Open reel manifold valve and pump the required volume of cement slurry (1.8 bbls) into coiled tubing. Monitor fluid level in tank to compare with data acquisition recording.
 - 124.6. Record coiled tubing pressure and close the reel manifold valve once 1.8 bbls cement is in reel.
 - 124.7. Open overboard line and flush surface line with clean treatment fluid until clean return is observed and cement is flushed out.
 - 124.8. Close overboard line and equalize pressure across the reel manifold valve.
 - 124.9. Reset volume at data acquisition system.
 - 124.10. Pump 1 CT volume Seawater to displace cement out of coil
 - 124.11. Cement dart burst rating (2,500 psi) – Hydrostatic pressure (2096.2 psi)
 - 124.12. Bottom cement dart will bump on BHA. Increase pressure to 403.8 psi to burst it.
 - 124.13. Displace cement out of coiled tubing

Notes :-

1.8 bbls inside CT = 659ft,

TVD at depth 10,473ft = 1,396.4m/4,582ft.

TVD at depth 9,814ft = 1,354m/4,442.5ft

Pressure Cement inside tubing, 0.052*15*140 = 109.2 psi

Pressure above cement, 0.052*8.6*4,42.5 = 1,987


Pressure inside tubing = 1,987 + 109.2 psi (hydrostatic), pressure need to be apply to burst the cement dart 2500, pressure apply by pump = 403.8 psi

125. After pumping 0.2 bbls cement (35 ft cement outside the tip of nozzle) on the volume counter, pick up CT at 59 ft/min to spot the cement until expected TOC at 3,097m/10,161ft MDDF. Refer to the below table:

No.	Stage	Fluid Used	Time, hh:mm			Fluids		Tripping			Totals	
			Start	End	Stage	BPM	SCFM	From	To	ft/min	BBLS	GAL N2
1	Mix 15 ppg Cement 15 bbls		0:00	2:36	2:36			10,473	10,473			
2	Pump Lead Sea Water 5bbls	FLUID 1 - SW	2:36	2:52	0:16	0.3		10,473	10,473	0.0	5.0	
3	Pump 1.8 bbls of Cement	FLUID 2 - Cement	2:52	2:58	0:06	0.3		10,473	10,473	0.0	1.8	
4	Displace cement 1 CT volume with 0.2 bbls cement exit nozzle	FLUID 1 - SW	2:58	4:12	1:13	0.3		10,473	10,473	0.0	22.1	
5	Pick up CT while spot cement	FLUID 1 - SW	4:12	4:17	0:05	0.3		10,473	10,161	58.3	1.6	
6	Pick-up CT 50ft above TOC		4:17	4:22	0:05			10,161	10,111	10.0		
7	Circulate 30bbls gel	FLUID 3 - Gel	4:22	4:52	0:30	1.0		10,111	10,111	0.0	30.0	
8	B/U with Sea Water	FLUID 1 - SW	4:52	6:04	1:12	1.0		10,111	10,111	0.0	72.0	
9	Pump SW to Squeeze Cement	FLUID 1 - SW	6:04	6:05	0:01	0.2		10,111	10,111	0.0	0.2	
10	Safety Margin		6:05	8:05	2:00			10,111	0			

#	Start Depth (ft)	End Depth (ft)	Fluid at Reel Manifold	Fluid Entry Volume (bbl)	Total Fluid Pumped (bbl)	Pump Rate (bpm)	CT Speed (ft/min)	Fluid at Nozzle	Valves Config.	Remarks
									LS	
1	10,473	10,473	Sea Water	5	5	0.3	-	SW	Close	
2	10,473	10,473	Cement	1.8	1.8	0.3	-	SW	Close	
3	10,473	10,473	Sea water	22.1	23.9	0.3	-	Cement	Close	Cement at tip of nozzle
4	10,473	10,161	Sea water	1.6	25.5	0.3	58.3	Cement	Close	1.6 bbls outside of cement nozzle
6	10,161	10,151	Sea Water		25.5		10	TSW	Open	Pick up CT 50ft above TOC
7	10,151	10,151	D801 Gel	30	55.5	1	-	TSW	Open	Circulate out excess cement in Coil and Tubing. Reciprocate CT during circulate gel.
8	10,151	10,151	Sea Water	72	127.5	1.0	-	TSW	Open	Bottom Up until clear return. Reciprocate CT during bottoms up.
10	10,151	10,151	Sea Water	0.2	127.7	0.2	-	TSW	Open	Pump SW to squeeze cementing

1. Actual CT string volume will be confirmed during rig up.
2. (-) refers to CT moving upward / pick up coil
3. **DO NOT EXCEED** pumping pressure of **5,500psi**.
4. **Shut in well with 100psi during wait on cement.**

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126. When squeezing 0.2 bbl cement into the leak area, ensure that Flow cross return valve in close position (with wellhead pressure initial around 100-200 psi). TOC expected to be at 3,106m/10,191ft MDDF (1m below bottom of perforation E34A).
127. Proceed to POOH CT to surface.
- 127.1. Wait for Cement to harden, once achieve 1000 psi strength as per compressive strength graph (20:43 Hours to achieve 1000 psi strength),
- 127.2. perform Cement Integrity test.
- 127.3. Fill up tubing and pressure up to 500 psi, monitor the pressure for 15 minutes
- Notes: -
- Acceptance criteria: If the pressure drops less than 50 psi (above 450 psi), proceed to rig down and skid to next well.
- Acceptance criteria: If the pressure drops more than 50 psi (less than 450 psi), contact town for further instruction.
128. CT Supervisor/Operator to update pipe tracking management file and string file fatigue after each run and share the file with town.

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CONTINGENCY#1 SPOT 5 BBL OF 15 PPG CEMENT.

129. Discuss with WIS and Town, if agreed by all party (No WLD required) prepare to POOH and change BHA to Single bore nozzle as per BHA#8: Single bore Cement nozzle

129.1. Perform function test of the Single bore nozzle to determine pump rate and pressure Parameter. Record the data in the table below, do not exceed 5,000psi. Recommended flowrate is 0.7bpm to 1.3bpm.

Flow rates (bpm)	Pressure (psi)	Remark (Tool start to rotate)
0.3		
0.5		
0.6		
0.7		
0.8		
0.9		
1.0		
1.1		
1.2		
1.3		
1.4		
1.5		

Note: Record maximum pump rate allowable without exceeding 5,000psi.

129.2. Repeat step 6 till 12 in Run#1 prior opening the well.

129.3. Start running in hole coil tubing to 3,192m/10,473ft MDDF while pumping TSW at minimum rate permissible.

129.4. Refer to CT Tubing Force simulation (Orpheus modelling), refer Appendix III.

129.5. Conduct pull test as per for every 300m (1,000ft), use CT Fatigue graph as reference. **Ensure the CT Fatigue graph is available at location before RIH. Record RIH, Hanging and POOH weight in treatment report.**

129.6. After performing pull test every 1,000ft, pump 1 bbls of friction reducer solution through the kill port line to lubricate through annulus of CT String.

129.7. Maximum coil speed running in hole is **30-50 ft/min**.

129.8. Slow down coil speed to **10 ft/min**, 50 ft before and after passing through completion accessories.

129.9. Closely observe weight indicator in control cabin while running in hole.

129.10. Observe return all the times.

129.11. Regularly inform WSS on job status at all times.

129.12. Do not exceed operating safety limits **5,000 psi**.

129.13. If the well condition differs from original job design, contact appropriate personnel in charge before proceeding.

129.14. At all time, while run-in hole, the injector torque control shall be set at the minimum pressure required to move the Coiled Tubing at specified speed.

129.15. Slow the coil speed when near the bridge plug setting depth, soft tag bridge plug twice. Do not exceed set down weight 500 lbf. Perform pull test and record the pulling weight as per below table.

<i>Depth, ft</i>	<i>RIH weight, lbf</i>	<i>Static weight, lbf</i>	<i>Pick up weight, lbf</i>

- 130. Pick up CT to **2,929m/9,609ft MDDF** and flag coil (Cement expected to cover until this depth)
- 131. RIH CT to top of bridge plug **3,192m/10,473ft MDDF**.
- 132. Proceed to mix 15 bbls of 15 ppg Class G Cement according as per below recipe.
- 133. Maximum mixing time 2 hours
- 134. Mix cement slurry as quickly as possible and take a regular density check. Once density check to confirm the relevant slurry properties (density and rheology), keep the slurry sample at surface and water bath
- 135. Start counting the cement thickening time from the first addition of cement into the mix fluid.
- 136. Perform compatibility test between cement and spacer at surface to make sure it will not create premature set of cement
- 137. Keep pumping seawater at idle rate during mixing to ensure the well keep full at all time.

Cement Slurry Properties	
Yield, cu ft/sk:	1.214
Water Requirement, gal/sk:	4.014
Thickening Time, HH:MM:	9:45
Mixing Cut-Off Time, HH:MM:	2:00

15ppg Cement			630	gals	15	bbls
Products	Concentration		Volume			
Sea Water	4.014	gps	279	gals	6.6	bbl
SFP 0006 (Foam Preventer)	0.05	gps	3.47	gals	0.083	bbl
SBA 0016 (Bonding Agent)	1.2	gps	83.3	gals	1.98	bbl
SFL 0016 (Fluid Loss)	0.20	gps	13.9	gals	0.33	bbl
SCD 0003 (Cement Dispersant)	0.20	gps	13.9	gals	0.33	bbl
SCR 0024 (Cement Retarder)	0.05	gps	3.5	gals	0.1	bbl
Blended G-Cement	1.214	cuft/sk	5,112.7	lbs	Based on 73.67 lb/sk	
5. Fill up batch mixer with sea water						
6. Add additives as per above sequence						

7. Note the time when 1st cement sack is added into mixed water mixture. Thickening time starts once 1st cement jumbo is added into mixed water.
8. Refer to **Appendix VI** for cement lab test results

Note:

6. **Record and inform Engineer in Charge when the first sack of cement is added to mixed water mixture.**
7. **Cement Thickening Time is 9 hours 45 minutes from first sack of cement added.**
8. **Cement Mixing Time is 2 hours**
9. **Total Cement Mixing Cut-Off Time is 3 hours.**
10. **After complete mixing, take cement sample from Batch Mixer and CT Reel Manifold and keep sample for monitoring. Label sample properly.**

138. Upon complete mixing, begin to pump cement according to the following steps: -
139. Record coil pressure and close in reel valve.
140. Open overboard valve and flush surface lines with cement slurry until the correct density and consistency are obtained.
141. Close overboard valve and equalize pressure across reel valve.
142. Ensure wellhead valves are configured according to table below: -

Valve	Position
Reel Manifold	OPEN
Flow Cross Return Valve (Cetco lines)	OPEN
Wing Valve – Long String	CLOSE

143. Start to pump 5 bbls of seawater spacer follow with 5 bbls of cement slurry and displace with 1 CT volume of SW to push the cement into tip of nozzle (ensure that wellhead pressure at least 100-200 psi during the pumping).
 - 143.1. Open overboard line and pump cement. Flush surface treating line with cement slurry until good return is observed (correct cement density).
 - 143.2. Close overboard line and equalize pressure across reel manifold valve.
 - 143.3. Launch bottom cement dart (2,500 psi rating).
 - 143.4. Reset volume at data acquisition system.
 - 143.5. Open reel manifold valve and pump the required volume of cement slurry (5 bbls) into coiled tubing. Monitor fluid level in tank to compare with data acquisition recording.
 - 143.6. Record coiled tubing pressure and close the reel manifold valve once 5 bbls cement is in reel.
 - 143.7. Open overboard line and flush surface line with clean treatment fluid until clean return is observed and cement is flushed out.
 - 143.8. Close overboard line and equalize pressure across the reel manifold valve.
 - 143.9. Reset volume at data acquisition system.
 - 143.10. Pump 1 CT volume Seawater to displace cement out of coil
 - 143.11. Cement dart burst rating (2,500 psi) – Hydrostatic pressure (2270.3 psi)
 - 143.12. Bottom cement dart will bump on BHA. Increase pressure to 550 psi to burst it.
 - 143.13. Displace cement out of coiled tubing


Notes :-

5 bbls inside CT = 3,294 ft

TVD at depth 10,473ft = 1,396.4m/4,582ft.

TVD at depth 7,178.92ft = 1,194m /3,917.5ft

Pressure Cement inside tubing, $0.052 \times 15 \times 664.5 = 518.3$ psi

DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG-A04L	ZONE SHUTOFF	

Pressure above cement, $0.052 \times 8.6 \times 3,917.5 = 1,752$ psi

Pressure inside tubing = 1,752 + 518.3 psi (hydrostatic), pressure need to be apply to burst the cement dart 2500, pressure apply by pump = 230 psi

144. After 0.5 bbls cement (86 ft cement cover outside the tip of nozzle) on the volume counter, pick up CT at 58 ft/min to spot the cement until expected TOC at 2,929m/9,609ft MDDF. Refer to the below table

No.	Stage	Fluid Used	Time, hh:mm			Fluids		Tripping			Totals	
			Start	End	Stage	BPM	SCFM	From	To	ft/min	BBLs	GAL N2
1	Mix 15 ppg Cement 15 bbls		0:00	2:33	2:33			10,473	10,473			
2	Pump Lead Sea Water 5bbls	FLUID 1 - SW	2:33	2:49	0:16	0.3		10,473	10,473	0.0	5.0	
3	Pump 5 bbls of Cement	FLUID 2 - Cement	2:49	3:06	0:16	0.3		10,473	10,473	0.0	5.0	
4	Displace cement 1 CT volume with 0.5 bbls cement exit nozzle	FLUID 1 - SW	3:06	4:09	1:03	0.3		10,473	10,473	0.0	18.9	
5	Pick up CT while spot cement	FLUID 1 - SW	4:09	4:24	0:15	0.3		10,473	9,609	57.6	4.5	
6	Pick-up CT 50ft above TOC		4:24	4:29	0:05			9,609	9,559	10.0		
7	Circulate 30bbls gel	FLUID 3 - Gel	4:29	4:59	0:30	1.0		9,559	9,559	0.0	30.0	
8	BU with Sea Water	FLUID 1 - SW	4:59	6:09	1:10	1.0		9,559	9,559	0.0	70.0	
9	Safety Margin	FLUID 1 - SW	6:09	8:09	2:00			9,559	0			

#	Start Depth (ft)	End Depth (ft)	Fluid at Reel Manifold	Fluid Entry Volume (bbl)	Total Fluid Pumped (bbl)	Pump Rate (bpm)	CT Speed (ft/min)	Fluid at Nozzle	Valves Config.	Remarks
									LS	
1	10,473	10,473	Sea Water	5	5	0.3	-	SW	Close	
2	10,473	10,473	Cement	5	5	0.3	-	SW	Close	
3	10,473	10,473	Sea water	18.9	23.9	0.3	-	Cement	Close	Cement at tip of nozzle
4	10,473	9609	Sea water	4.5	28.4	0.3	57.6	Cement	Close	1.6 bbls outside of cement nozzle
6	9609	9559	Sea Water		28.4		10	TSW	Open	Pick up CT 50ft above TOC
7	9559	9559	D801 Gel	30	58.4	1	-	TSW	Open	Circulate out excess cement in Coil and Tubing. Reciprocate CT during circulate gel.
8	9559	9559	Sea Water	70	128.4	1.0	-	TSW	Open	Bottom Up until clear return. Reciprocate CT during bottoms up.

5. Actual CT string volume will be confirmed during rig up.

6. (-) refers to CT moving upward / pick up coil

7. **DO NOT EXCEED** pumping pressure of **5,500psi**.

8. **Shut in well with 100psi during wait on cement.**


144.1. Proceed to POOH CT to surface.

144.2. Wait for Cement to harden, once achieve 1000 psi strength as per compressive strength graph (20:43 Hours to achieve 1000 psi strength),

144.3. perform Cement Integrity test.

144.4. Fill up tubing and pressure up to 500 psi, monitor the pressure for 15 minutes

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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG-A04L	ZONE SHUTOFF	

Notes: -

Acceptance criteria: If the pressure drops less than 50 psi (above 450 psi), proceed to rig down and skid to next well.

Acceptance criteria: If the pressure drops more than 50 psi (less than 450 psi), contact town for further instruction.

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CONTINGENCY#2 WLD CONTINGENCY


- 145. Make up **BHA#6: WLD Tool** in **Appendix I** and **follow as per Archer procedure**.
- 146. Repeat step 6 till 12 in Run#1 prior opening the well.
- 147. Ensure the logging string in active mode for 5 min inside riser.
- 148. Start running in hole coil tubing to **2,450m/8,038ft MDDF**, break circulation and pull test every 1,000ft
 - 148.1. Refer to CT Tubing Force simulation (Orpheus modelling), refer Appendix III.
 - 148.2. Conduct pull test as per for every 300m (1,000ft), use CT Fatigue graph as reference. **Ensure the CT Fatigue graph is available at location before RIH. Record RIH, Hanging and POOH weight in treatment report.**
 - 148.3. After performing pull test every 1,000ft, pump 1 bbls of friction reducer solution through the kill port line to lubricate through annulus of CT String.
 - 148.4. Normal coil speed running in hole is **30-50 ft/min, as per archer job program suggested to run 15m/min or 49 ft/min.**
 - 148.5. Slow down coil speed to **10 ft/min**, 50 ft before and after passing through completion accessories.
 - 148.6. Closely observe weight indicator in control cabin while running in hole.
 - 148.7. Regularly inform WSS on job status at all times.
 - 148.8. Do not exceed operating safety limits **5,000 psi**.
 - 148.9. If the well condition differs from original job design, contact appropriate personnel in charge before proceeding.
 - 148.10. At all time, while run-in hole, the injector torque control shall be set at the minimum pressure required to move the Coiled Tubing at specified speed.
- 149. Once CT reach at **2,450m/8,038ft MDDF**, stop coil for 5 min and conduct pull test of 10m/30ft and record the pulling weight both static and dynamic.

<i>Depth, ft</i>	<i>RIH weight, lbf</i>	<i>Static weight, lbf</i>	<i>Pick up weight, lbf</i>

- 150. Fill up CT string until full of TSW, closed plug valve at the reel before proceed to create logging condition as per below.
- 151. Create “logging condition “ prior to logging – Active downhole leak as below :-
 - 151.1. Flow well via the SS tubing
 - 151.2. Pressurize LS tubing with fluid and maintain pressure at 1000psi (or higher if possible / ref MAWOP) on surface all times.

Note: discuss with PCSB representative onsite the max allowable pressure (but must be below MAWOP).
 - 151.3. Wait until stabilize flowing pressure/condition prior to RIH
- 152. Log down at speed 10m/min from 2,450 m-MDDF to target depth (TD) at 3,190 mMDDF (~2m above top tubing plug).
Notes: (1) During log down – monitor tension/weight carefully; (2) If possible, no pumping chemical, fluid or gas is allowed while logging down VIVID.
- 153. Once CT at 3,190m-MDDF, stop for 5 min.
- 154. Log up in stationary mode from 3,190m-MDDF to 2,450m-MDDF, station stop every 2 meter for 40 seconds.

Notes** station stop every 1 meter for 40 seconds between interval 3,100 – 3,115m MDDF.

DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG-A04L	ZONE SHUTOFF	

155. Stop CT at 2,450m-MDDF stop for 5 minutes before proceed to PPOH

156. Once CT reaches at surface:

156.1. Close master and swab valve.

156.2. CT Supervisor/Operator to update pipe tracking management file and string file fatigue after each run and share the file with town.

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CONTINGENCY#3 SPINCAT NOZZLE OPERATION

- 157. Depends on the discussion with client and town, if decided to go through with spincat contingency run, follow step as per below :-
- 158. Make up BHA SpinCat as per **BHA#9: SpinCat in appendix 1**
- 159. Perform function test of the SpinCat Nozzle to determine at pumping parameter. Record the data in the table below, do not exceed 5,000psi. Recommended flowrate is 0.7bpm to 1.3bpm.

Flow rates (bpm)	Pressure (psi)	Remark (Tool start to rotate)
0.3		
0.5		
0.6		
0.7		
0.8		
0.9		
1.0		
1.1		
1.2		
1.3		
1.4		
1.5		

Note: Record maximum pump rate allowable without exceeding 5,000psi.

- 160. Repeat step 6 till 12 in Run#1 prior opening the well.
- 161. Start running in hole coil tubing to last HUD depth while pumping TSW at minimum rate permissible.
 - 161.1. Refer to CT Tubing Force simulation (Orpheus modelling), refer Appendix III.
 - 161.2. Conduct pull test as per for every 300m (1,000ft), use CT Fatigue graph as reference. **Ensure the CT Fatigue graph is available at location before RIH. Record RIH, Hanging and POOH weight in treatment report.**
 - 161.3. After performing pull test every 1,000ft, pump 1 bbls of friction reducer solution through the kill port line to lubricate through annulus of CT String.
 - 161.4. Maximum coil speed running in hole is **30-50 ft/min**.
 - 161.5. Slow down coil speed to **10 ft/min**, 50 ft before and after passing through completion accessories.
 - 161.6. Closely observe weight indicator in control cabin while running in hole.
 - 161.7. Observe return all the times.
 - 161.8. Regularly inform WSS on job status at all times.
 - 161.9. Do not exceed operating safety limits **5,000 psi**.
 - 161.10. If the well condition differs from original job design, contact appropriate personnel in charge before proceeding.
 - 161.11. At all time, while run-in hole, the injector torque control shall be set at the minimum pressure required to move the Coiled Tubing at specified speed.

162. At depth HUD, pick up 10m above HUD, start to clean out, ensure that return establish first at surface before start cleanout (0.7 bpm for spincat to rotate).
163. Once return establish, start to penetrate 10ft/min, circulate with 5 bbls gel every 100 ft penetration.
164. Once CT at target depth, pick up CT 10m and pump 1x Annulus volume of Gel and bottom up with 2x CT/Tubing annulus volume with TSW.

Note: Pump rate can be increase to max 1.3bpm or until reach maximum circulating pressure of 5,000 psi.

CONTINGENCY#4 MILLING OPERATION

165. Depends on the discussion with client and town, if decided to go through with Milling contingency run, follow step as per below :-
166. Make up BHA milling as per **BHA#10: Milling in appendix 1**
167. Perform function test of the mill bit to determine pump rate and pressure parameter. Record the data in the table below, do not exceed 5,000psi. Recommended flowrate is 0.7bpm to 1.3bpm. (refer to the motor performance data)

Flow rates (bpm)	Pressure (psi)	Remark (Tool start to rotate)
0.3		
0.5		
0.6		
0.7		
0.8		
0.9		
1.0		
1.1		
1.2		
1.3		
1.4		
1.5		

168. Repeat step 6 till 12 in Run#1 prior opening the well.
169. Start running in hole coil tubing to the last HUD with minimum pumping rate.
- 169.1. Refer to CT Tubing Force simulation (Orpheus modelling), refer III.
- 169.2. Conduct pull test as per for every 300m (1,000ft), use CT Fatigue graph as reference. **Ensure the CT Fatigue graph is available at location before RIH. Record RIH, Hanging and POOH weight in treatment report.** After performing pull test every 1,000ft, pump 1 bbls of friction reducer solution through the kill port line to lubricate through annulus of CT String.
- 169.3. After pull test for every 300m RIH, perform break circulation by pump TSW at minimum pump rate permissible.
- 169.4. Maximum coil speed running in hole is **30-50 ft/min**.
- 169.5. Slow down coil speed to **10 ft/min**, 50 ft before and after passing through completion accessories.

- 169.6. Closely observe weight indicator in control cabin while running in hole.
- 169.7. Observe return all the times.
- 169.8. Regularly inform WSS on job status at all times.
- 169.9. Do not exceed operating safety limits **5,000 psi**.
- 169.10. If the well condition differs from original job design, contact appropriate personnel in charge before proceeding.
- 169.11. At all time, while run-in hole, the injector torque control shall be set at the minimum pressure required to move the Coiled Tubing at specified speed.

170. Once CT reach at 30 m above HUD, slow down the speed to 10ft/min and record the weight as per below

<i>Depth, ft</i>	<i>RIH weight, lbf</i>	<i>Static weight, lbf</i>	<i>Pick up weight, lbf</i>

- 171. Once complete pull test, continue RIH slowly at 10 ft/min and Tag the HUD without pumping (Do Not Slack off more than 700-800 lbf).
- 172. Once HUD is tagged, pick up CT 10m above HUD and proceed to record off bottom parameter.
- 173. Start to pumping TSW to active the motor as per motor performance data. Record the pressure as no load pressure (P no load). No load pressure will increase as milling in progress.
 - 173.1. Once off bottom parameter have been recorded, maintain 0.5 bpm pumping rate and continue to RIH until loss weight is observed approx. 500lbf. (refer to motor performance data for flowrate to active motor)
 - 173.2. Start milling operation while maintaining -500 lbf to -1000lbf WOB and DP around 300-700 psi until CT reach TD.
- 174. After CT reach Target depth, establish return at surface proceed to perform pump 1x CT/Tubing Annulus volume with gel and follow up 2x Bottom up TSW till clear return observe on surface
- 175. After return is clear, proceed to POOH CT to surface and secure the well

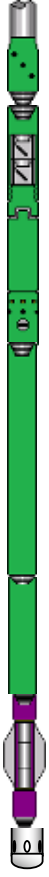
APPENDIX I – BOTTOM HOLE ASSEMBLY SCHEMATIC
BHA #1: 2.125” MultiJet Nozzle



BHA DIAGRAM #1- 2.125" MULTIJET NOZZLE

Client	Petronas Carigali
Field	Dulang A
Job Type	Zone shut-off
Job No.	

Well	A-04L
Min Restriction	2.205"
BHP	2100 psia
BHT	208 deg F

BHA DRAWING	DESCRIPTION	CONNECTION		ID	OD	TOOL LENGTH	CUMULATIVE LENGTH
		UPHOLE	DOWNHOLE				
	Dimple CT Connector	1.5" CT	1.5 AMMT		2.125	0.6	0.6
	MHA Disconnect drop ball 3/4" Shear pressure 5,456 psi	1.5 AMMT BOX	1.5 AMMT PIN		2.125	2.5	3.1
	Circulating drop ball 5/8" Shear pressure 2,520 psi Burst Disc 5000 psi						
	5 ft Straight Bar	1.5 AMMT BOX	1.5 AMMT PIN		2.125	5.0	8.10
	3 ft Straight Bar	1.5 AMMT BOX	1.5 AMMT PIN		2.125	3.0	11.1
	Fluted Centralizer	1.5 AMMT BOX	1.5 AMMT PIN		2.790	0.6	11.70
	Multijet Nozzle	1.5 AMMT Box			2.125	0.80	12.5

BHA LENGTH	12.50
MAXIMUM OD	2.79"
MINIMUM ID	

Prepared by:	Muhammad Hafiz
Review by:	
Revision:	
Date:	24/03/2022

ADDITIONAL INFORMATION:

BHA #2: Shifting Tool 2.813"



BHA DIAGRAM #2 - Shifting Tool 2.813"

Client	Petronas Carigali
Field	Dulang A
Job Type	Zone shut-off
Job No.	

Well	A-04L
Min Restriction	2.205"
BHP	2100 psia
BHT	208 deg F

BHA DRAWING	DESCRIPTION	CONNECTION		ID	OD	TOOL LENGTH	CUMULATIVE LENGTH
		UPHOLE	DOWNHOLE				
	External Dimple CT Connector	1.5" CT	1.5" AMMT PIN		2.125	0.6	0.6
	2 1/8 MHA Disconnect drop ball 3/4" Shear pressure 5,456 psi	1.5" AMMT BOX	1.5" AMMT PIN		2.125	2.5	3.1
	Circulating drop ball 5/8" Shear pressure 2,520 psi Burst Disc 5,000 psi						
	Impact Hammer Accelerator	1.5" AMMT BOX	1.5" AMMT PIN		2.250	6.34	6.34
	Impact Hammer	1.5" AMMT BOX	1.5" AMMT PIN		2.250	3.39	9.73
	Crossover	1.5" AMMT BOX	2-3/8" PAC Pin			0.65	10.38
	Bi-Directional Shifting Tools (2.813 Key)	2-3/8" PAC Box	2-3/8" PAC Pin		2.625	2.20	12.58
Jetting Nozzle	2-3/8" PAC Box				0.60	13.18	

BHA LENGTH	13.18
MAXIMUM OD	2.63
MINIMUM ID	

Prepared by:	Muhammad Hafiz
Review by:	
Revision:	
Date:	24/03/2022

ADDITIONAL INFORMATION:

BHA #3: 1.6875" MultiJet Nozzle

DIMENSION BID
WELL INTERVENTION | PERFORATION SERVICES
BHA DIAGRAM #3- 1.6875" MULTIJET NOZZLE

Client Petronas Carigali	Well A-04L
Field Dulang A	Min Restriction 2.205"
Job Type Zone shut-off	BHP 2100 psia
Job No.	BHT 208 deg F

BHA DRAWING	DESCRIPTION	CONNECTION		ID INCH	OD INCH	TOOL LENGTH FT	CUMULATIVE LENGTH FT
		UPHOLE	DOWNHOLE				
	Internal Dimple CT Connector	1.5" CT	1.0 AMMT		1.688	0.6	0.6
	MHA Disconnect drop ball 5/8" Shear pressure 5,456 psi	1.0 AMMT BOX	1.0 AMMT PIN		1.688	2.5	3.1
	Circulating drop ball 0.5" Shear pressure 2,520 psi Burst Disc 5000 psi						
	5 ft Straight Bar	1.0 AMMT BOX	1.0 AMMT PIN		1.688	5.0	8.10
	3 ft Straight Bar	1.0 AMMT BOX	1.0 AMMT PIN		1.688	3.0	11.1
	Fluted Centralizer	1.0" AMMT BOX	1.0" AMMT PIN		2.290	0.6	11.70
	Multijet Nozzle	1.5 AMMT Box			1.688	0.80	12.5

BHA LENGTH	12.50
MAXIMUM OD	2.290
MINIMUM ID	

Prepared by:	Muhammad Hafiz
Review by:	
Revision:	
Date:	24/03/2022

ADDITIONAL INFORMATION:


BHA #4: GRCCCL Correlation



BHA DIAGRAM #4 GRCCCL CORRELATION

Client	Petronas Carigali
Field	Dulang A
Job Type	Zone shut-off
Job No.	

Well	A-04L
Min Restriction	2.205"
BHP	2100 psia
BHT	208 deg F

BHA DRAWING	DESCRIPTION	CONNECTION		ID INCH	OD INCH	TOOL LENGTH FT	CUMULATIVE LENGTH FT
		UPHOLE	DOWNHOLE				
	Internal Dimple CT Connector	1.5" CT	1.0 AMMT PIN		1.688	0.6	0.6
	1 11/16 MHA Disconnect drop ball 5/8" Shear pressure 5,456 psi	1.0 AMMT BOX	1.0 AMMT PIN		1.688	2.5	3.1
	Circulating drop ball 1/2" Shear pressure 2,520 psi Burst Disc 5,000 psi						
	Crossover	1.0 AMMT BOX	15/16" Sucker Rod Box		1.688	0.37	3.5
	GR/CCL	15/16" SR			1.69	2.21	5.68
	Bull Nose						

BHA LENGTH	5.68
MAXIMUM OD	1.690
MINIMUM ID	

Prepared by:	Muhammad Hafiz
Review by:	
Revision:	
Date:	24/03/2022

ADDITIONAL INFORMATION:	

BHA #5: Bridge Plug hydraulic setting tool



BHA DIAGRAM #5- BRIDGE PLUG HYDRAULIC SETTING TOOL

Client	Petronas Carigali
Field	Dulang A
Job Type	Zone shut-off
Job No.	

Well	A-04L
Min Restriction	2.205"
BHP	2100 psia
BHT	208 deg F

BHA DRAWING	DESCRIPTION	CONNECTION		ID	OD	TOOL LENGTH	CUMULATIVE LENGTH
		UPHOLE	DOWNHOLE				
	Internal Dimple CT Connector	1.5" CT	1.0" AMMT PIN		1.688	0.6	0.6
	1 -11/16" MHA Disconnect drop ball 0.625" Shear pressure 5,456 psi	1" AMMT BOX	1" AMMT PIN		1.688	2.5	2.5
	Circulating drop ball 0.5" Shear pressure 2,520 psi Burst Disc 6000 psi						
	Crossover	1" AMMT BOX	2.25 Cs Hydril			0.83	3.3
	Hydraulic setting tools Burse collapse pressure 10 k psi Shear pressure : 4,200 psi 0.44 - 0.5" Phenolic Ball	2.25 Cs Hydril box			1.75	7.80	11.13
2 7/8 Bridge plug 4.5" 9.5-16.6# Setting Range Minimum: 2.125" Setting Range Maximum: 2.563" Pressure Rating: 10,000 psi Temperature Rating: 300 degF	11/16 UN Pin	Bull nose		2.090	1.18	12.31	

BHA LENGTH	12.31
MAXIMUM OD	2.090
MINIMUM ID	

Prepared by:	Muhammad Hafiz
Review by:	
Revision:	
Date:	24/03/2022

ADDITIONAL INFORMATION:

BHA #6: WLD Baseline Run



BHA DIAGRAM #6- WLD Baseline

Client	Petronas Carigali
Field	Dulang A
Job Type	Zone shut-off
Job No.	

Well	A-04L
Min Restriction	2.205"
BHP	2100 psia
BHT	208 deg F

BHA DRAWING	DESCRIPTION	CONNECTION		ID	OD	TOOL LENGTH	CUMULATIVE LENGTH
		UPHOLE	DOWNHOLE				
	External Dimple CT Connector	1.5" CT	1.0" AMMT PIN		1.69	0.6	0.6
	1 -11/16" MHA Disconnect drop ball 0.625" Shear pressure 5,456 psi	1.0" AMMT BOX	1.0" AMMT PIN		1.69	2.5	3.1
	Circulating drop ball 0.5" Shear pressure 2,520 psi Burst Disc 6000 psi						
	Crossover	1.0" AMMT Box	15/16" Sucker Rod Box		1.69	0.37	3.5
	Archer WLD Tool string				1.69	12.60	16.07

BHA LENGTH	16.07
MAXIMUM OD	1.690
MINIMUM ID	

Prepared by:	Muhammad Hafiz
Review by:	
Revision:	
Date:	24/03/2022

ADDITIONAL INFORMATION:	

BHA #7: Single Bore Nozzle

DIMENSION BID
WELL INTERVENTION | PERFORATION SERVICES
BHA DIAGRAM #7 SINGLE BORE NOZZLE

Client Petronas Carigali	Well A-04L
Field Dulang A	Min Restriction 2.205"
Job Type Zone shut-off	BHP 2100 psia
Job No.	BHT 208 deg F

BHA DRAWING	DESCRIPTION	CONNECTION		ID INCH	OD INCH	TOOL LENGTH FT	CUMULATIVE LENGTH FT
		UPHOLE	DOWNHOLE				
	Internal Dimple CT Connector	1.5" CT	1.0 AMMT		1.688	0.6	0.6
	MHA Disconnect drop ball 5/8" Shear pressure 5,456 psi Circulating drop ball 0.5" Shear pressure 2,520 psi Burst Disc 5000 psi	1.0 AMMT BOX	1.0 AMMT PIN		1.688	2.5	3.1
	5 ft Straight Bar	1.0 AMMT BOX	1.0 AMMT PIN		1.688	5.0	8.10
	3 ft Straight Bar	1.0 AMMT BOX	1.0 AMMT PIN		1.688	3.0	11.1
	Single bore nozzle	1.0 AMMT BOX			1.688	0.80	11.9

BHA LENGTH	11.90
MAXIMUM OD	1.688
MINIMUM ID	

Prepared by:	Muhammad Hafiz
Review by:	
Revision:	
Date:	24/03/2022

ADDITIONAL INFORMATION:

BHA #8: Spincat

DIMENSION BID
WELL INTERVENTION | PERFORATION SERVICES
BHA DIAGRAM #8- 1.69" SPINCAT NOZZLE

Client Petronas Carigali	Well A-04L
Field Dulang A	Min Restriction 2.205"
Job Type Zone shut-off	BHP 2100 psia
Job No.	BHT 208 deg F

BHA DRAWING	DESCRIPTION	CONNECTION		ID INCH	OD INCH	TOOL LENGTH FT	CUMULATIVE LENGTH FT
		UPHOLE	DOWNHOLE				
	External Dimple CT Connector	1.5" CT	1.0" AMMT PIN		1.690	0.3	0.3
	MHA Disconnect drop ball 5/8" Shear pressure 5,456 psi	1.0" AMMT BOX	1.0" AMMT PIN		1.690	2.3	2.6
	Circulating drop ball 1/2" Shear pressure 2,520 psi Burst Disc 5000 psi						
	5 ft Straight Bar	1.0" AMMT BOX	1.0" AMMT PIN		1.690	5.0	7.6
	3 ft Straight Bar	1.0" AMMT BOX	1.0" AMMT PIN		1.690	3.00	10.6
	Downhole Filter	1.0" AMMT BOX	1.0" AMMT PIN		1.690	3.2	13.80
SpinCat	1.0" AMMT BOX			1.690	1.0	14.8	

BHA LENGTH	14.80
MAXIMUM OD	1.69"
MINIMUM ID	

Prepared by:	Muhammad Hafiz
Review by:	
Revision:	
Date:	

ADDITIONAL INFORMATION:

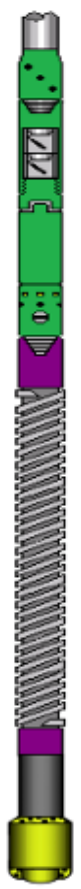
BHA #9: Milling



BHA DIAGRAM #9 MILLING

Client	Petronas Carigali
Field	Dulang A
Job Type	Zone shut-off
Job No.	

Well	A-04L
Min Restriction	2.205"
BHP	2100 psia
BHT	208 deg F

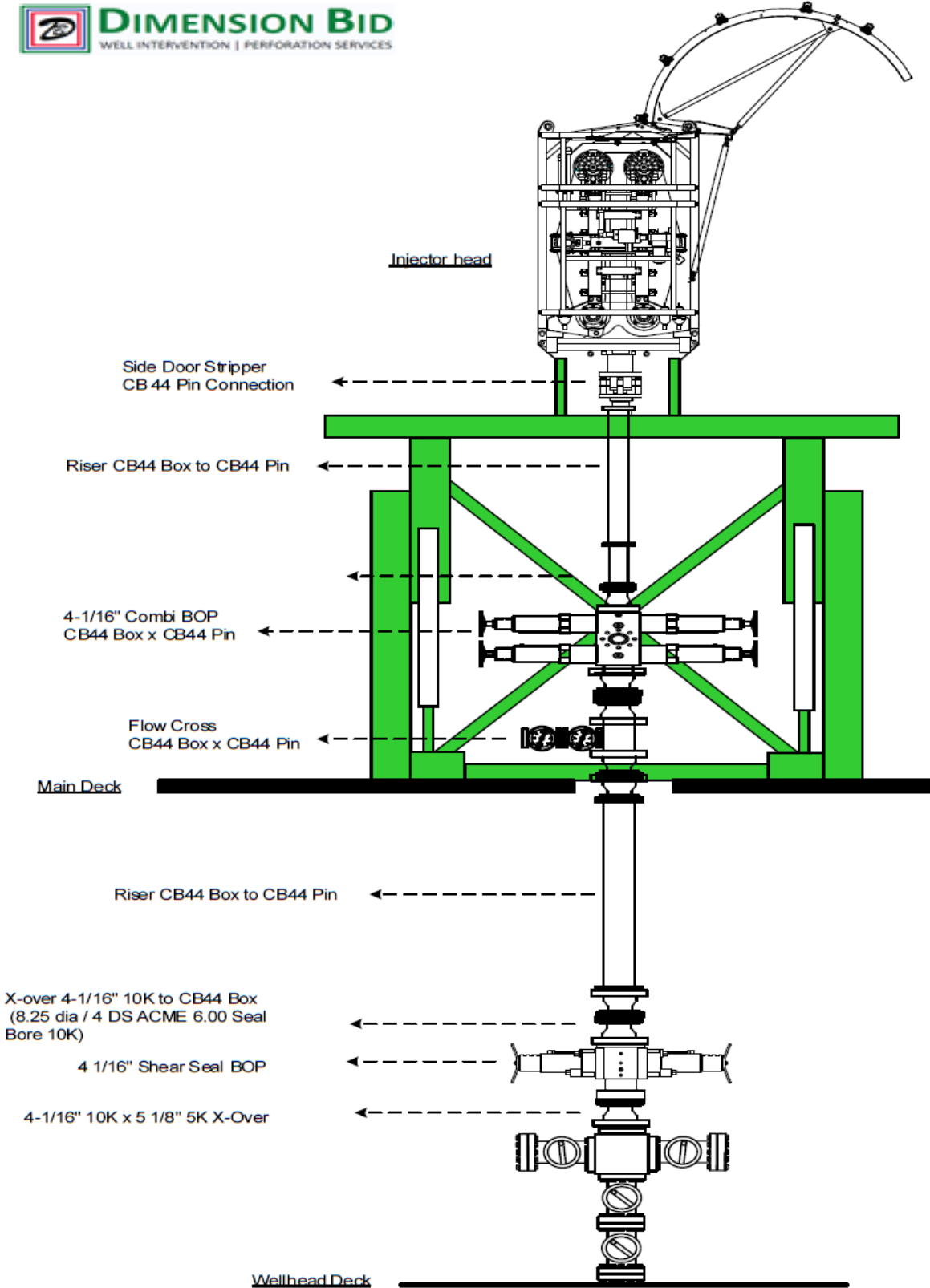
BHA DRAWING	DESCRIPTION	CONNECTION		ID	OD	TOOL LENGTH	CUMULATIVE LENGTH
		UPHOLE	DOWNHOLE				
	Internal CT Connector	1.5" CT	1 AMMT		1.500	0.3	0.3
	MHA Disconnect drop ball 5/8" Shear pressure 5,456 psi	1 AMMT BOX	1 AMMT PIN		1.690	2.3	2.6
	Circulating drop ball 1/2" Shear pressure 2,520 psi Burst Disc 5000 psi						
	Positive displacement motor	1 AMMT BOX	1 AMMT PIN		1.690	8.60	11.20
Junk Mill Bit	1 AMMT BOX				2.281	1.0	12.2

BHA LENGTH	12.20
MAXIMUM OD	2.28
MINIMUM ID	

Prepared by:	Muhammad Hafiz
Review by:	
Revision:	
Date:	24/03/2022

ADDITIONAL INFORMATION:

APPENDIX II – COILED TUBING STACK UP

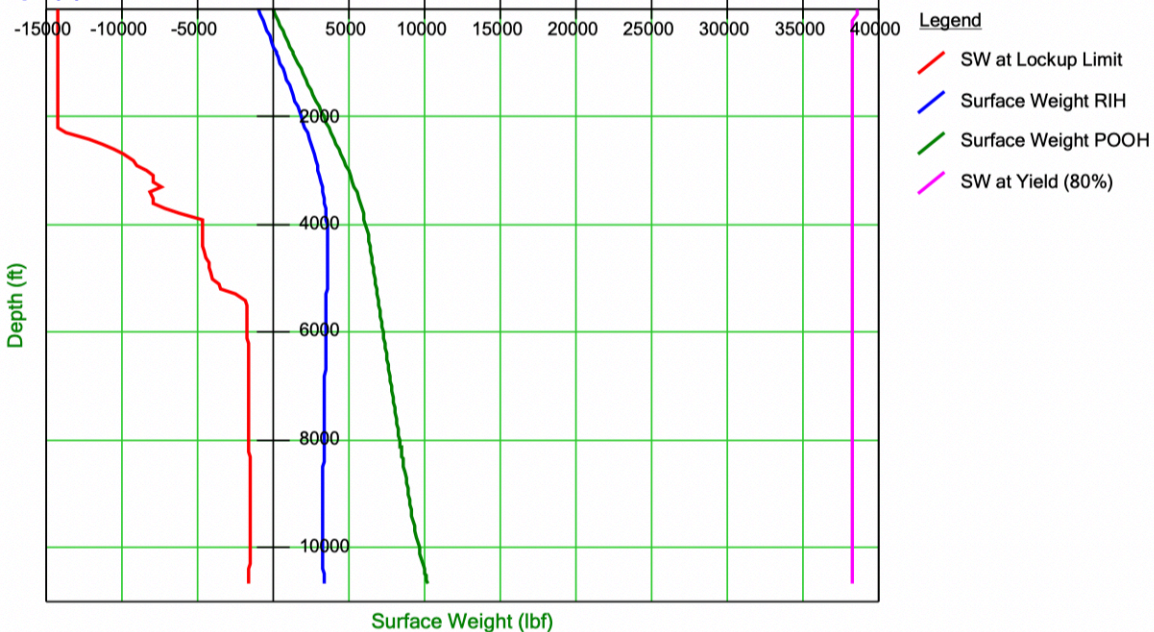


APPENDIX III – ORPHEUS SIMULATIONS

DULANG-A04L

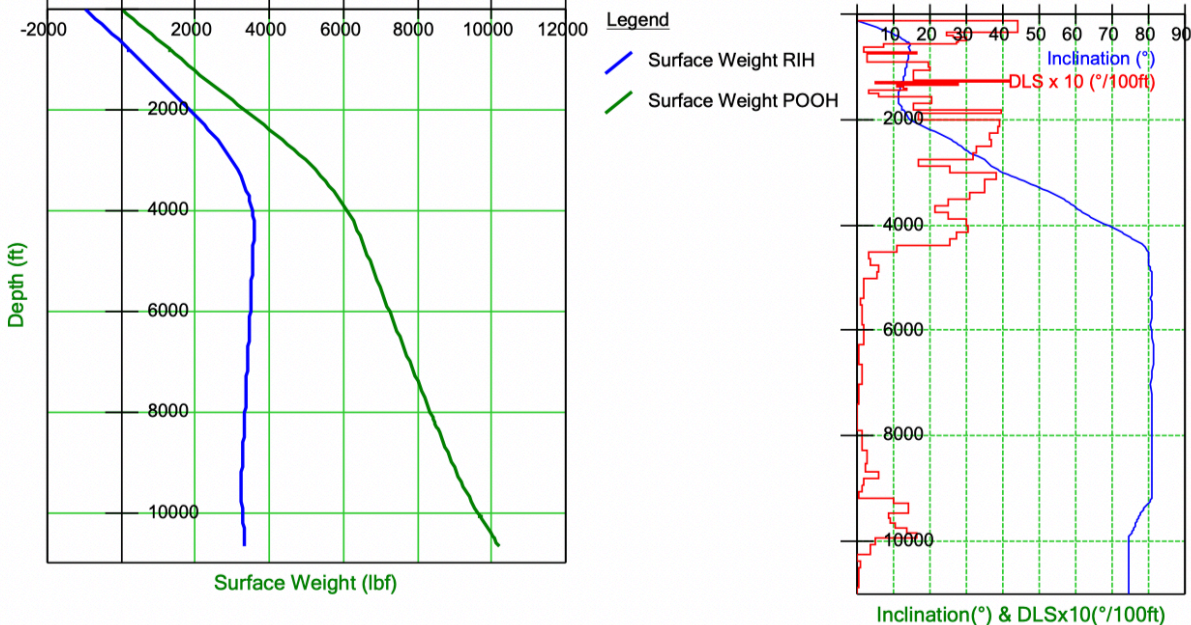
TUBING FORCE ANALYSIS

Graph(1)

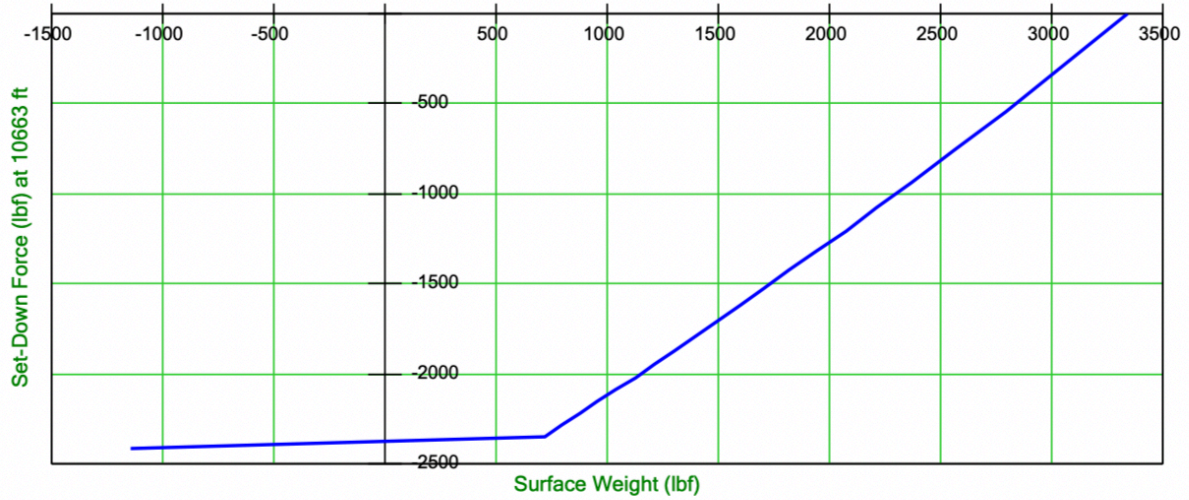


RIH & POOH WEIGHT

RIH and POOH
between 0 ft and 10663 ft



MAXIMUM STRING SET DOWN LIMIT



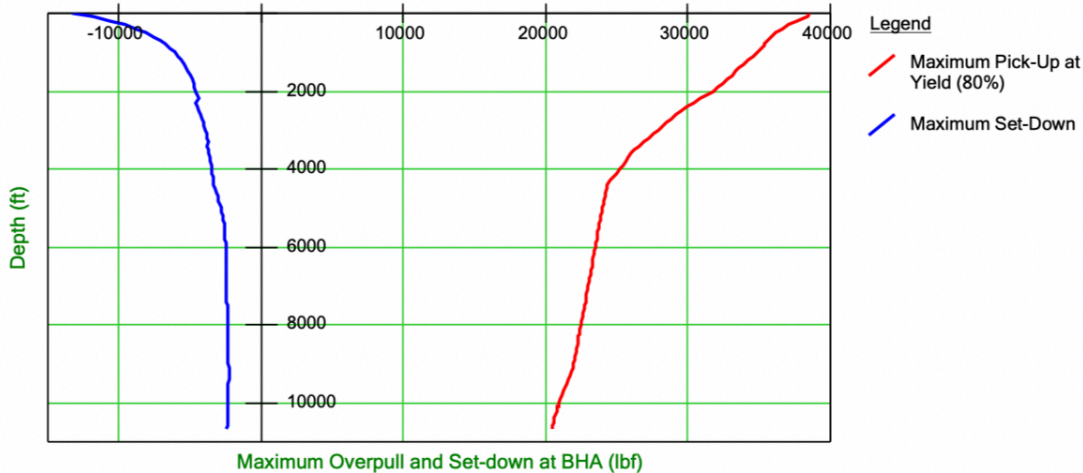
- MD4 CT stretch during steady RIH at 10663 ft is 4.21 ft.
 CT stretch during steady POOH at 10663 ft is 7.13 ft.

MAXIMUM STRING PICK UP LIMIT

Working At Depth

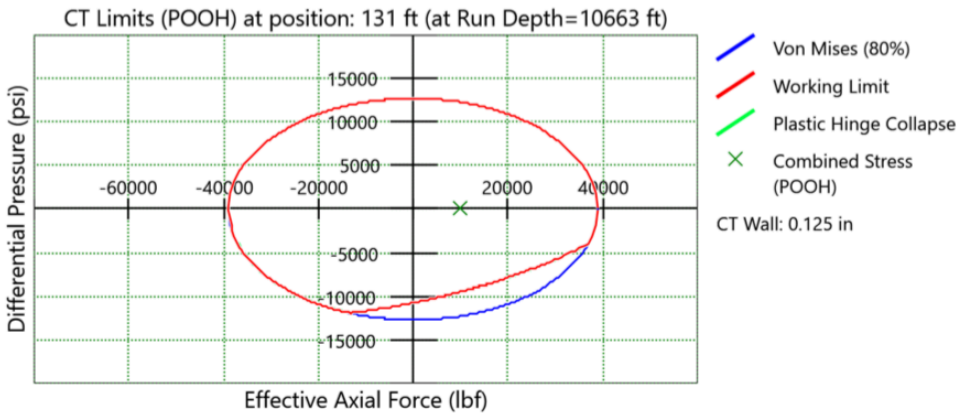
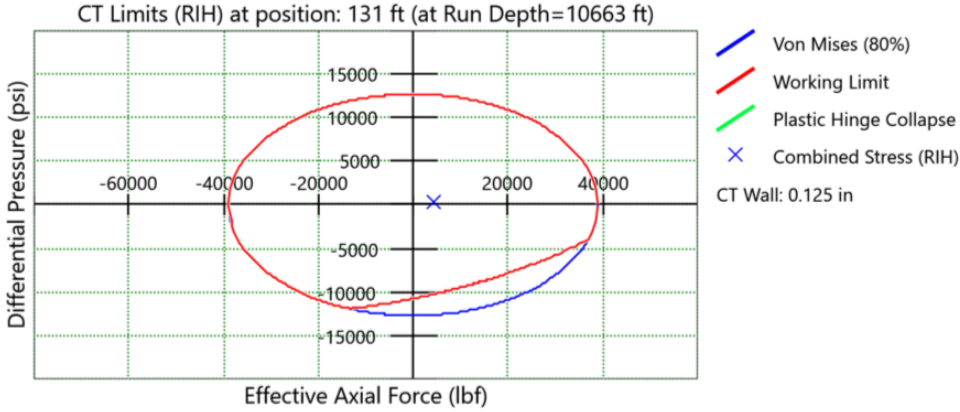
Calculations at 10663 ft


- MD1 The available pick-up at 10663 ft based on 80% of yield strength is 20449 lbf.
The weight indicator reading will then be 38237 lbf.



- MD3 The available set-down force at 10663 ft is -2412 lbf at the end of the string.
The weight indicator reading will be -1598 lbf on surface.
The minimum available set-down force is -2279 lbf at 9200 ft.

STRING LIMIT
CT Limits



DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG-A04L	ZONE SHUTOFF	

APPENDIX IV – EMERGENCY PROCEDURE

EMERGENCY BOP OPERATIONS

In the event of an emergency arising and the well having to be secured, the following steps should be taken:

1. Stop Coiled Tubing movement, close the Slip and Pipe rams and slack off string weight to ensure slips are holding. If time permits, review all options with the client representative. (Ensure that rams with guides are activated first to avoid damaging the Coiled Tubing).

Note: The decision to proceed past the above step should normally be made after consultation with the client representative unless there is an immediate and serious danger to personnel and/or equipment and the client representative is not immediately available to be involved in the decision.

2. Stop pumping.
3. Close the upper Shear Seal rams to cut the Coiled Tubing.
4. Set up to circulate well to kill fluid through the Coiled Tubing remaining in the well.
5. Make arrangements necessary to fish the Coiled Tubing from the BOP.

Note: When actuating any ram in the BOP system, the corresponding manual lock should be closed behind it to prevent accidental release in the event of total loss of hydraulic power. The force required to close the rams manually against pressure cannot be supplied by turning in the locks. Use of a pipe wrench, cheater bars or snipes will damage the internal workings of the ram actuators. Some form of hydraulic power is required to operate the actuators. This pressure can be supplied via a hand pump or a hydraulic pump from any other piece of equipment on location, including a fluid pumper.


Actuating the BOP System Hydraulic Controls

1. Remove locks on control panel
2. Move the control lever to the desired position.
3. Push the BOP activate button supplying pressure to the circuit.
4. Observe the pressure drop in the hydraulic circuit and subsequent pressuring back up to system pressure as ram opens or closes completely.
5. Observe the ram indicator pins to verify the operation of the ram.
6. Close in the manual locks if required. (Flag system to indicate position of rams.)

The connections below the coiled tubing BOP must be all flanged. Should one of these connections start leaking, the following steps should be taken in consultation with the client representative:

1. Call local alert and ensure all personnel are removed from the wellhead area.
2. Notify the client representative of the problem and determine the best method to make the area safe.
3. If the leak is minor, it may be possible to continue to pull the coiled tubing to surface. Assess the scenario and consider all the risks associated then proceed to pull the coiled tubing to surface. Once at surface, close available valves below the leak point.
4. If the leak is more severe, initiate a well kill through the well kill line and continue to pull the coiled tubing to surface.
5. If the leak is catastrophic, run the coiled tubing to HUD; pick up sufficient so that after the coiled tubing is cut at surface by CT BOP shear; the top of the coiled tubing falls below the X-mass Tree. Once the end of the coiled tubing is off bottom, proceed to cut the coiled tubing with the shear RAM then close the available valves below the leak point. A well kill operation can be started through the kill line if requested by the client representative.

Prepared By: Muhammad Hafiz	Reviewed By: Aliff Adenan	Date: 18/6/2022	Rev. Rev1	Controlled Document DB-CT-MHS-22004	Pg. 66
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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG-A04L	ZONE SHUTOFF	

LEAK IN COILED TUBING AT SURFACE

In the event of a leak in the Coiled Tubing occurring at surface, the following steps should be taken:

1. Call local alert and ensure all personnel are removed from the operational area. In particular make sure all personnel remain clear of the area between the Injector Head and the Coiled Tubing reel.
2. If the leak is small or a pinhole leak, POOH and position the leak on the lower part of the Coiled Tubing reel as soon as possible. Be careful when area of leak is bent onto the reel as failure may occur. Make arrangements to have a water hose present to wash away any fluid from the reel which may be hazardous. Make arrangements to start pumping water through the Coiled Tubing reel. Depressurize reel as much as conditions allow without exceeding collapse limitations of Coiled Tubing.
3. Notify client representative of problem and determine best method to make area safe. If leak is minor and water can be displaced to leak, continue to POOH and change reel.
4. If leak is considered to be too serious to displace to water and POOH, or serious and uncontrolled leakage of hydrocarbon or hazardous materials prevents this, (i.e. check valves not holding, lost BHA, parted Coiled Tubing) set the Coiled Tubing slips and pipe rams. Activate the upper Shear Seal rams on either the triple or quad BOP and manually lock in place.
5. Depressurize the Coiled Tubing reel and flush through the reel. If hydrocarbons are present in the reel, displace the reel with water and empty the contents to specified safe disposal area.

LEAK IN COILED TUBING BELOW SURFACE


If a leak occurs in the Coiled Tubing below the Stuffing Box during down hole operations (usually indicated by a drop in pump pressure or loss of string weight), suspend Coiled Tubing operations and alert the client representative.

Note:

If indications are that the BHA has been lost in hole then revert to section 0.

1. Once the client representative has been alerted, clear all personnel from the immediate area of the Coiled Tubing around the Injector Head and between the Injector Head and the Coiled Tubing reel.
2. Displace the Coiled Tubing to water and commence to POOH at not more than 20 ft per minute (5 meters/min). Ensure at all times that all personnel are clear of the immediate area as the possibility exists to pull the Coiled Tubing out of the Stuffing Box. Continue pumping water at a slow rate through the Coiled Tubing.
3. When the leak in the Coiled Tubing appears above the Stuffing Box, stop the injector and hold the leaking section of Coiled Tubing between the chains and the Stuffing Box.
4. Inspect leak. If leak is minor continue to POOH.
5. If leak is major, or Coiled Tubing is actually severed or well bore fluids are escaping through the Coiled Tubing, continue as per Section 09.2.

Prepared By: Muhammad Hafiz	Reviewed By: Aliff Adenan	Date: 18/6/2022	Rev. Rev1	Controlled Document DB-CT-MHS-22004	Pg. 67
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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG-A04L	ZONE SHUTOFF	

LEAK IN SURFACE PRESSURE CONTROL EQUIPMENT

Stuffing Box

1. **Stop** Coiled Tubing movement and close both sets of pipe rams to seal Coiled Tubing annulus. Set manual lock.
2. On semi submersible operations this will be a set of pipe rams and pipe/slip rams.
3. Notify Client representative.
4. Ensure the injector is in neutral and that the brake is engaged.
5. Bleed off pressure above pipe rams
6. Set reel brake. On Semi Submersible jobs the Coiled Tubing should be clamped at the level wind and Coiled Tubing run out of hole until enough slack between the injector and reel is obtained to cope with the heave from the rig, prior to setting reel brake.
7. Bleed off closing pressure on Stuffing Box. Open side doors and apply pressure to retract piston. Replace packer elements and then re-apply pressure to Stuffing Box. Close side doors.

Note: 3" side door Stuffing Boxes first bleed off closing pressure. Remove hoses from pack and retract piston and connect to open and close on side door. Open door and replace packer element. Close door, bleed off pressure and connect to pack and retract piston.

8. Slowly open both equalizing valve on pipe rams and check that stripper is holding pressure.
9. If stripper is holding pressure, undo manual locks and open pipe rams or pipe slip rams. When using pipe/slip rams the depth that they were set on the Coiled Tubing must be recorded. Release reel brake and continue operations.


Surface Leaks Other Than Stuffing Box

1. If leak is minor and a relatively short length of Coiled Tubing is in the hole and the Shear Seal safety head is **below the leak**:
2. Call local alert and notify the client representative.
3. Clear all non-essential personnel away from the area
4. Continue POOH and monitor situation closely
5. Hook up kill line to BOP and pump water slowly down annulus.

Note: Avoid collapse situation

1. Close swab valve and Shear Seal once Coiled Tubing is in riser and repair leak
2. Perform reinstatement test on surface equipment after leak has been repaired
3. If Coiled Tubing is in the well to a considerable depth and leak is considered serious:
4. Call local alert and notify Client representative.
5. Ensure all non-essential personnel are removed from the area.
6. Ensure that Coiled Tubing is sufficiently off bottom so that when the Shear Seal safety head is activated the pipe will drop below the Xmas tree manual master valve. If the Coiled Tubing is stuck down hole, pull to 80% of operating limit before activating Shear Seal BOP, thus allowing the Coiled Tubing to drop below the Xmas tree manual master valve. If the Coiled Tubing is attached to a fish, packer etc pull to 80% of operating limit (if possible) or maximum weight possible before activating Shear Seal BOP, thus allowing the Coiled Tubing to drop below the Xmas tree manual master valve. **If at all possible**, the decision to cut the Coiled Tubing and activate the system will be taken by the Client representative in charge of the operation. This may not always be possible. If the situation is extremely dangerous and requires a fast decision, the Supervisor in charge will take this decision.

Prepared By: Muhammad Hafiz	Reviewed By: Aliff Adenan	Date: 18/6/2022	Rev. Rev1	Controlled Document DB-CT-MHS-22004	Pg. 68
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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG-A04L	ZONE SHUTOFF	

7. Close the Shear Seal rams in the safety head to cut the pipe and allow it to drop. (If the safety head has separate shear and blind rams, close the shear rams to cut the pipe, pull up the Coiled Tubing and close the blind rams).
8. Close the swab valve on the Xmas tree.
9. Close the master valve on the Xmas tree
10. Repair leak and pressure test riser.
11. Plan for fishing operations.

Rotating Joint Leak

Eliminate the potential for reel movement by securing the reel with turnbuckles and set reel brake. On Semi-Submersible jobs the Coiled Tubing should be clamped at the level wind and Coiled Tubing run out of hole until enough slack between the injector and reel is obtained to cope with the heave from the rig. Close the reel isolation valve inside the reel and repair or replace the rotating joint as required. Re-test and resume operations.

COILED TUBING RUNS AWAY INTO WELL


If the inside chain tension system on the Injector Head should fail for any reason, and Coiled Tubing is pulled into the well under its own weight with no control, the procedure should be as per the following:

1. Call a local alert.
2. Attempt to speed the injector up to match the speed of the descending Coiled Tubing.
3. Increase inside chain tension to increase friction on Coiled Tubing.
4. Increase stripper pressure to exert more friction on Coiled Tubing.
5. If these actions fail to make any difference, reduce injector hydraulic pressure to zero.
6. In the event that there is insufficient Coiled Tubing on the reel to reach bottom close Coiled Tubing slips. This action may damage or break the Coiled Tubing. This is the preferred option to using the pipe rams as these will become damaged and a primary well control system will be lost.
7. If the Coiled Tubing is not too far off bottom it may be practical to let it fall to bottom then investigate the causes and repair. This can only be done if there is sufficient Coiled Tubing on the reel to reach bottom.

Note: Coiled Tubing may helix when hitting bottom making it difficult to pull into tail pipe.

8. Once Coiled Tubing has been controlled, examine Injector Head for damage including chains and POOH.
9. The Coiled Tubing run away may be caused by the injector becoming overloaded with the weight of the Coiled Tubing and fluid in the Coiled Tubing. This situation should not occur if proper pre job planning is done. Correct selection of Injector Head or ensuring Coiled Tubing is full of Nitrogen would prevent this situation from occurring.
10. If a run away situation occurs, reduce the injector hydraulic pressure to zero. This may cause the safety brake in the motors to actuate and counter balance valves to close, stopping the injector.
11. Under certain circumstances if the run away Coiled Tubing is at a speed above the critical speed, the back pressure created by the circulating hydraulic fluid may prevent the injector motor brakes from actuating. If this situation occurs, select the pull mode for the injector and increase system hydraulic pressure until the Coiled Tubing comes to a standstill.

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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	DULANG-A04L	ZONE SHUTOFF	

COILED TUBING IS PULLED OUT OF STUFFING BOX

This situation is most likely to occur when the Coiled Tubing is being pulled into the riser section. If the BHA is lost including the End Connector there will be no external upset to prevent the Coiled Tubing from passing through the Stuffing Box. If this situation occurs, stop injector before Coiled Tubing passes through the chains and shut in Shear Seal rams on upper BOP's.

If it is thought that the BHA may be lost while down hole, stop the Coiled Tubing at 300ft from surface. Slowly close in the swab valve counting the number of turns. If the Coiled Tubing is still deemed to be across the wellhead, POOH the Coiled Tubing no more than the distance between the top of the wellhead and the top of the Coiled Tubing BOP's. Repeat this step until the swab valve can be fully shut. Once the swab valve is shut, bleed off the pressure in riser.

COILED TUBING COLLAPSED AT SURFACE


Collapsed Coiled Tubing at surface will be obvious by escape of well bore fluids from the Stuffing Box, as the strippers will no longer seal round the deformed pipe. In addition to this the collapsed pipe will not allow the Injector Head to grip the Coiled Tubing due to its change in shape. Usually collapsed Coiled Tubing will not pull through the bottom brass bushings on the Stuffing Box.

1. If POOH, immediately run Coiled Tubing back in well a sufficient distance to make sure round pipe is in contact with the Stuffing Box.
2. Call alert and notify client representative.
3. Ensure that all non-essential personnel are cleared from the immediate area.
4. Immediately reduce well head pressure by all safe means possible; either flow well through choke at a higher rate or stop annular fluid injection if reverse circulating.
5. Increase Coiled Tubing internal pressure by circulating.
6. Once pressure conditions inside and outside the Coiled Tubing have been optimized, a decision can be taken on how to proceed. If it is not possible to position uncollapsed pipe across the stripper rubbers, i.e. well contents are escaping from stripper rubbers:
7. Call alert and notify client representative.
8. Close pipe rams in an effort to reduce flow of fluid/gas around Coiled Tubing.

Note: If it is not possible to control the well, the slips will have to be set, and the Coiled Tubing cut using the Shear Seal rams.

9. Arrange for clamps to be fitted to Coiled Tubing above Injector Head.
10. Remove all non-essential personnel from immediate area
11. Under authority from client representative, kill well.
12. Release pressure from Stuffing Box and remove bushings.
13. Open pipe rams.
14. Attempt to pull Coiled Tubing from the well using the Injector Head.
15. Cut Coiled Tubing at the gooseneck and use the rig or a crane to pull the Coiled Tubing through the injector. Re-clamp the Coiled Tubing above the Injector Head and cut off in thirty foot sections (or as appropriate to the crane or rig)
16. Continue pulling and cutting Coiled Tubing until the Coiled Tubing pulled to surface can be pulled by the Injector Head.
17. Once Coiled Tubing in good condition (i.e. not collapsed) is at surface, set Coiled Tubing slips and pipe rams and make up roll-on connector to Coiled Tubing on reel.

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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG-A04L	ZONE SHUTOFF	

18. Continue POOH.

If the leak is too serious and cannot be controlled and well fluids are escaping, continue as per Section 9.2.

COILED TUBING BREAKS AT SURFACE

If Coiled Tubing breaks at surface into two separate sections:

1. Stop the injector and set the slips.
2. Stop pumping operations.
3. Call alert and notify client representative. Ensure all non-essential personnel are cleared from the area and that the area is secure.
4. Secure Coiled Tubing reel.
5. If the reel capacity is insufficient to hold all of the Coiled Tubing remaining in the well due to uneven spooling resulting from the Coiled Tubing failure, it may be necessary to obtain another reel with sufficient capacity to hold the Coiled Tubing remaining in the well.
6. After consulting with client representative, remove damaged section of Coiled Tubing and insert in line roll-on connector and continue to POOH.
7. If this course of action is considered inappropriate or dangerous due to well conditions or condition of Coiled Tubing still in the well, continue as per Section 0.

BUCKLED TUBING

Should the Coiled Tubing hit an obstruction down hole while RIH with the thrust pressure set too high or running speed too fast, the Coiled Tubing will buckle in a 'Z' shape (plastically hinged).

Coiled Tubing being run inside Coiled Tubing and through small ID BOP's/lubricators will normally buckle between the Stuffing Box and the chains.

Coiled Tubing being run through casing or open hole will normally break below the BOP, usually somewhere around the largest ID.

- The Coiled Tubing will generally buckle several times.
- This type of failure is a little more difficult to detect.

If the Coiled Tubing is being run into casing and a large amount of weight is lost suddenly, there is a very good possibility that the Coiled Tubing is buckled somewhere down hole. Indications of this could be:


- An increase in pump pressure as fluid or gas is now being pushed through an additional restriction created by a hinge.
- A decrease in pump pressure as the Coiled Tubing may have broken removing a restriction such as a BHA.
- A loss of string weight due to the Coiled Tubing breaking and falling off.
- An increase in string weight while pulling out of the hole as the buckled portion of Coiled Tubing creates additional drag or needs to be straightened to get through a restricted ID.

In the event Coiled Tubing buckling is suspected, the Coiled Tubing movement should be stopped and the pump pressure kept within operating limits allowing the situation to be analyzed and determine the correct action to be taken for existing conditions.

If there is an increase in pump pressure or an increase in string weight:

1. Stop the pumps and pick up slowly.
2. POOH slowly (10 to 20 feet per minute) watching the weight indicator carefully.
3. If the Coiled Tubing is buckled close to surface, the buckled Coiled Tubing will pull into the bottom of the Stuffing Box and stop.

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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG-A04L	ZONE SHUTOFF	

4. Close and lock the slip and pipe rams.
5. If the ram indicators show that the rams are not completely closed, there may be more than one piece of Coiled Tubing inside the BOP. In this event, open the rams and try to put undamaged Coiled Tubing across the pipe and slip rams.
6. Make arrangements to kill the well and retrieve the remaining Coiled Tubing from the well.
7. If the buckled Coiled Tubing is down hole and cannot be pulled free, consult the client representative as he may want the Coiled Tubing left at TD prior to being hung off in the slip and Coiled Tubing rams.
8. Arrangements should be made to run Coiled Tubing cutter on wireline to retrieve the Coiled Tubing above stuck point.


If there is a decrease in pump pressure or a loss of string weight:

1. It must be assumed that the Coiled Tubing has parted somewhere down hole.
2. Calculate from the remaining string weight approximately how much Coiled Tubing is left in the well.
3. Stop the pumps and POOH slowly.
4. Should the Coiled Tubing come out of the Stuffing Box, the blind rams should also be closed in.

If the Coiled Tubing is buckled above the Stuffing Box, the following steps should be taken:

1. Stop the injector as quickly as possible.
2. Close the slip and pipe rams and manually lock them.
3. If the down hole check valves are holding, bleed the pressure in the Coiled Tubing down to zero and monitor for 15 minutes for pressure build up.
4. Consider at this stage whether to kill the well.
5. Use a hacksaw to start the cut until you are sure there is no trapped pressure in the Coiled Tubing.
6. Cut the Coiled Tubing
7. Remove as much of the buckled Coiled Tubing as possible leaving any undamaged Coiled Tubing showing above the Stuffing Box intact so that it may be rejoined later.
8. Bleed the pressure from above the Coiled Tubing rams and undo the connection below the injector.
9. Slowly raise the injector until it is clear of the damaged Coiled Tubing.
10. Cut away any damaged Coiled Tubing, dress the Coiled Tubing and install an inline connector.
11. Run some fresh Coiled Tubing down through the injector until it is just out of the Stuffing Box.
12. Lower the injector until immediately over the pipe sticking out of the BOP.
13. Attach the pipe to the inline connection attached to the pipe sticking up out of BOP.
14. Pump off the inside chain tension and rotate the chains slowly in the OOH direction, while lowering the injector until the connection below the injector can be fastened.
15. Pump up the inside chain tension and pull weight equal to the weight of the Coiled Tubing suspended below the slips plus 2,000 lbf for friction or CERBERUS prediction, whichever is greatest.
16. Equalize the pressure across the Coiled Tubing rams.
17. Unlock the pipe and slip rams.
18. Open the slip and pipe rams and POOH.
19. If the down hole check valves do not hold then the Coiled Tubing will have to be cut.

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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG-A04L	ZONE SHUTOFF	

COILED TUBING STUCK IN HOLE PROCEDURES

There are various scenarios by which Coiled Tubing can be deemed as a stuck in hole situation. The following procedures are to be used as generic guidelines prior to the compilation of a signed off chemical cutting program applicable to the current situation.

In the event of being stuck in hole, several factors would have to be taken into consideration, the first of which would be whether the Coiled Tubing is stuck in hole on a platform, or a semi-submersible, as the procedures to be followed may vary greatly between the two options.

Other factors to be considered are:

- Type of well, i.e. flowing oil or gas well, water injector etc.
- The type of BHA being used, i.e. perforating guns, milling assembly, plug etc.
- The type of operation being carried out when the Coiled Tubing became stuck.

In all of the above cases, the Coiled Tubing would be defined as being “stuck” when the pipe cannot be retrieved from the well bore without the pipe exceeding its 80% minimum yield rating, or without exceeding 80% stress of the weak link release rating. The lower of these two factors should always be used when attempting large pulls.


Regardless of the specifics involved, the following procedures should be adopted:

1. Inform the client representative of the situation.
2. Inform the Onshore Engineer.
3. From the information available, and taking into account the well conditions, try to determine the reason for the pipe/BHA being stuck.
4. Attempt to pull free by applying a steady pull to a maximum of 80% of the Coiled Tubing yield. If in doubt as to what this figure is, consult Engineering Department before proceeding.
5. When applying the maximum pull, hold the maximum value for a minimum of 10 minutes and observe the trend (if any) on the weight indicator and chart. Measure the amount of pipe extension that is required when this pull is applied. The figure can be used to determine where the Coiled Tubing is stuck. As a rule of thumb, the depth that the pipe is held at will be the extension of the Coiled Tubing (in feet) when pulled to 80% of yield divided by 0.002. This can be determined using CERBERUS.

The following are options that may be appropriate depending on the particular circumstances:

1. If possible, flow the well, or increase well flow in an effort to remove debris in the well bore that may be holding the Coiled Tubing/BHA. Maintain maximum circulation through the Coiled Tubing at the same time. This is particularly relevant if well cleanout or drilling operations have been performed.
2. Circulate acid across the BHA in an attempt to remove any acid soluble material that may be holding the Coiled Tubing.
3. Pump fluid down the backside of the Coiled Tubing to the formation in an attempt to dislodge debris from around the BHA. Potential Coiled Tubing collapse must be considered if engineering this scenario.
4. Displace Coiled Tubing contents to a lighter fluid (base oil) or gas (Nitrogen) to increase buoyancy and allow greater end force to be applied at BHA.
5. Underbalance the well in the case of differentially stuck Coiled Tubing.
6. Cool the well if the Coiled Tubing is helically stuck in corkscrewed Production Tubing.
7. Pump down the Coiled Tubing / completion annulus to try and move the source of hold-up.
8. Displace slugs of Nitrogen with water to create a surge effect at the BHA.
9. Pump friction reducer, IM Lube in seawater at 2-3% by volume, down the Coiled Tubing and into the well. Ideally, one well volume will be pumped.

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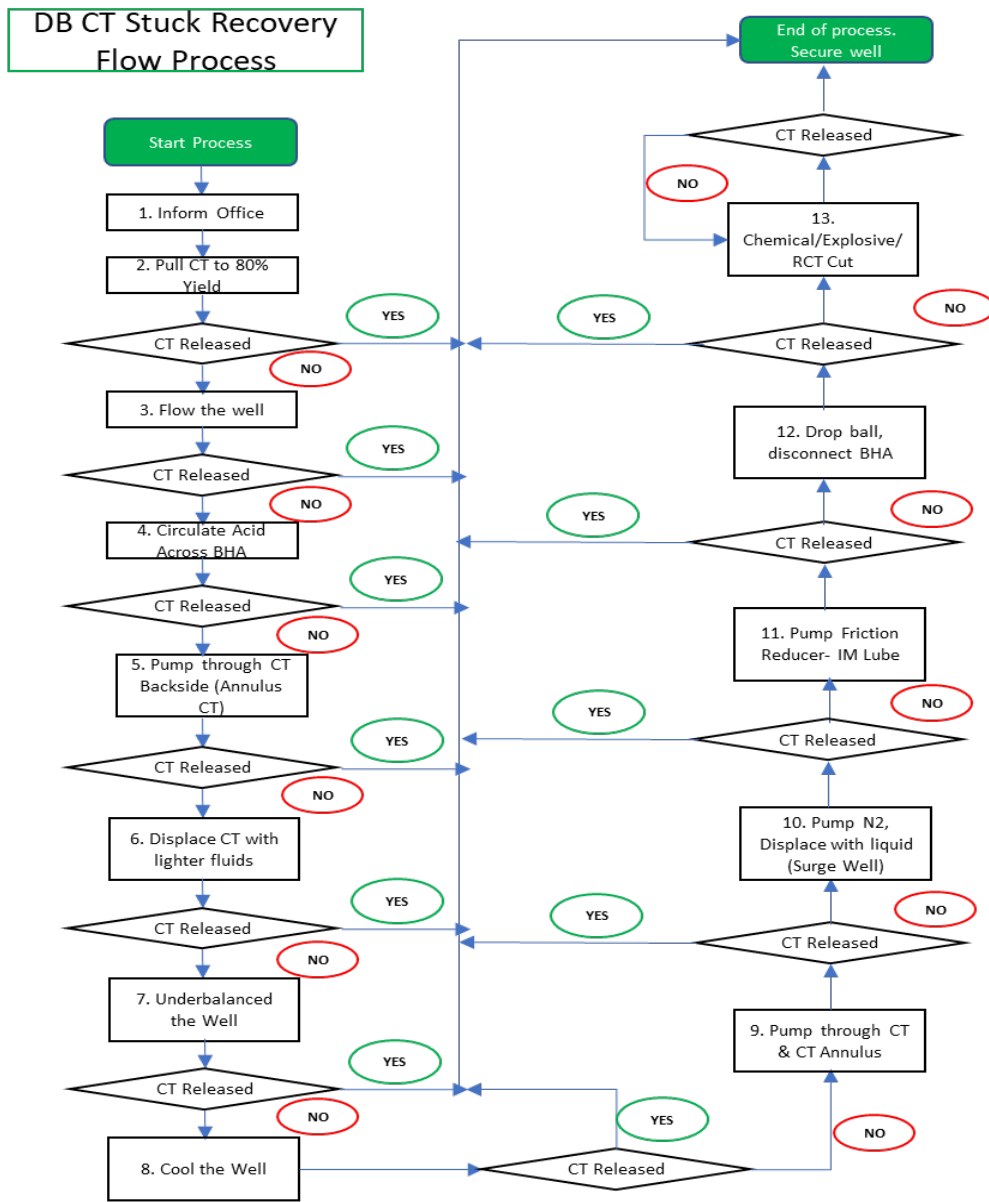
DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG-A04L	ZONE SHUTOFF	

10. After consultation with the client representative and the on call Engineer, activate the emergency disconnect mechanism in the BHA to allow the Coiled Tubing to be released. The release mechanism should only be implemented after all avenues have been explored.
11. When attempting maximum pull, do not work the Coiled Tubing violently across the gooseneck by frequent intervals.
12. The amount of cycles across the gooseneck must be logged, and if in doubt of the Coiled Tubing fatigue condition, the Engineer must be consulted and the cycles entered into the CERBERUS FATIGUE program, to determine the amount of cycles left available.

After consultation with the client representative, kill the well and commence preparations for chemical cutting operations.

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STUCK CT COIL RECOVERY PROCESS



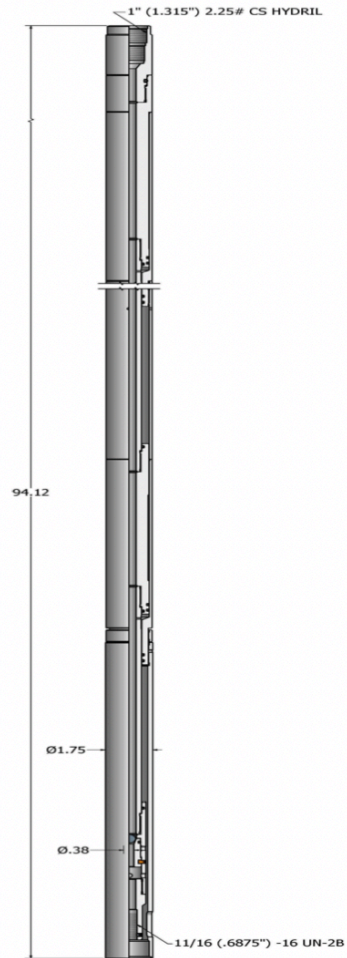
Precautionary Steps to avoid Stuck while Cleanout in Dual string Completion:

- 1) To monitor pressure trending all the times during operation and record for any abnormalities. If there is continue pressure increasing trend during cleanout, proceed to pick up coil to the previous pull test depth and perform flow rate test.
- 2) In the event of coil entangle on the Long string, proceed to pick up coil and simulate pumping lost prime scenario to create vibration and tip of coil wobble to release from entanglement.

APPENDIX V – TTS TECHNICAL PROCEDURE FOR BRIDGE PLUG SETTING TOOL


	TECH UNIT		2.38" HYDRAULIC SETTING TOOL W/ BLOW OUT PISTON		
	Tool Part Number	Revision	Document #	Version	Date
	5003-238-A-003 / 5003-238-A-013	A	5003-238-A-003 RevA V2	1	2/1/2012

Tool Specifications	Part Number	5003-238-A-003 / 5003-238-A-013	
	Max OD	1.75 in	44.45 mm
	Min. ID	.38 in	9.652 mm
	O.A.L	94.12 in	2390.65mm
	Operating Temp.	-20 - 400 F	-29 - 204 C
	Material	4130/4145	
	Elastomers	Viton	
	Burst/Collapse (psi)	10,000 psi / 10,000 psi	
	Tensile Strength	25,000 lbs	
	Shear Pressure	4,200psi	
	Setting Tool Area	4.30 in ²	2774.188 mm ²
Total Stroke	8.0 in	203.2 mm	



Tool Specifications


OD	1.71"
ID	.53"
Length (OAL)	86.85"
Stages (standard)	4 (total area – 4.30 in²)
Area/stage	1.075 in²
Tool Stroke	8.00"
Maximum Setting Load	25,000 lbf
Maximum Applied Pressure	6000 psi
Top Thread	1" (1.315) 2.25# CS Hydril

DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
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4.0 Attachment of Blow Out Piston Assembly and Bridge Plug

1. Verify the Blow Out Piston Assembly is assembled correctly per Tech Unit 5003-238-A-013 and the proper number of shear screws is installed for the application. Make a note of the shear screws for future reference.
2. Apply a thin coat of grease to the lower thread of the Lower Connecting Rod. Install the Blow Out Piston Assembly onto the Lower Connecting Rod and tighten.
3. Install proper Setting Sleeve onto Hydraulic Setting Tool for the Bridge Plug or tool device being run (see chart in appendix A). The Setting Sleeve contains a set screw which must be loosened to avoid damage to the setting tool when installing. Thread the Setting Sleeve completely onto the Lower Cylinder of the Hydraulic Setting Tool.
4. Install the Bridge Plug by threading the tension bolt of the plug into the Crossover Adapter of the Blow Out Piston Assembly.
5. Install Set Screw into the Crossover Adapter to secure plugs tension bolt.
6. Adjust the position of the Setting Sleeve by screwing it down to the top of the plug body. It should be hand tight against the plug. (Excess force could start the plug setting sequence). Adjust the position of the Setting Sleeve to allow the installation of a set screw into one of the slots cut into the threads of the Lower Cylinder of the Hydraulic Setting Tool. (This should not require more than 1/4 turn to properly position). Tighten Lock Nut on Lower Cylinder against Setting Sleeve.
7. The Hydraulic Setting Tool and Bridge Plug are now ready to be attached to the workstring or coil unit.

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5.0 Operational Procedure

These procedures are not intending to replace any existing procedures and/or customer requirements. Where a conflict occurs between these procedures and standard operating procedures occurs, contact TTS prior to proceeding.


1. The drop balls required must be able to drift through all components above setting tool.
2. Attach the Hydraulic Setting Tool to the workstring or CT BHA.
3. Go in the hole to desired setting depth. Do not exceed 50 feet/minute. Do not pump fluid through the workstring or CT until positioned at setting depth. (If fluid must be pumped, contact TTS for instruction).
4. Insert a (.44" - .50") ball in the workstring or CT. If using CT, pump the ball over the gooseneck, then shut down pump and allow it to gravitate to the Ball Seat.
5. Apply pressure as required to set the bridge plug and shear out the Ball Seat. *Each plug has a set value shear stud or tension bolt, the total applied pressure is equal to the shear stud value (lbf) divided by the piston area of the setting tool (in²) less the hydrostatic pressure of any added fluids (psi). Apply the setting pressure in 500 psi increments and hold for a minute until 4,200 psi is reached setting the plug.*

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	PRODUCT DATA SHEET (PER API SPECIFICATION 11D1)		2.09" Cast Iron Bridge Plug w/ 5/8" Sucker Rod Bottom		
	Product Number	Revision	Document #	Version	Date
	2105-209-AC-001SR	A	2105-209-AC-001SR(PDS)	1	7/22/2016

Tool Specifications	Manufacturer	Thru Tubing Systems, LLC. 4102 Highway 90 West New Iberia, LA 70560	
	Product Number	2105-209-AC-001SR	
	Product Name	2.09" Cast Iron Bridge Plug w/ 5/8" Sucker Rod Bottom	
	Product Type	Tubing Plug	
	Product Characteristics	Millable, Multi-Durometer Element	
	Service Provided	Temporary or Permanent Plugging	
	Metallic Materials	G2 Durabar, 1018, 1215, Ductile Iron	
	Non-Metallic Materials	NBR Elastomer	
	Drift Diameter	N/A	
	Gauge OD	2.09 in	53.09 mm
	Overall Length	14.11 in	358.39 mm
	Temperature Range	300F	148C
	Temperature Cycle Range for V3, V1, and V0	N/A	
	Rated Performance Envelope for V4 to V0	N/A	
	Pressure Rating for V6 and V5	10,000 psi Above / Below	689.48 bar Above / Below
	Top Connection	11/16" UN Pin	
	Bottom Connection	Bull Nose	
	Setting ID Range	2.125 – 2.563 in	56.26 – 65.10 mm
	Conveyance Method	Electric Line, Wireline, C/T, Pipe	
	Maximum Conveyance OD	2.09 in	53.09 mm
	Setting Method, Min/Max Setting Force	Power Charge, Hydraulic Pressure, 13,000#	
	Retrieval Method	N/A	
	Repositioning Method	N/A	
	Quality Grade	Q3	
	Design Validation Grade	V5	
	Operating Manual Ref. #	2105-209-AC-001SR(MAN)	
	Setting Tool - Wireline	4010-169-A-001, 1.69" LS WPST	
	Setting Sleeve	4200-219-A-060	
Setting Tool - Wireline	4020-169-A-001, 1.69" HSST (Hydrostatic)		
Setting Sleeve	4200-219-A-060		
Setting Tool - Wireline	5003-238-A-003, 1.71" HST (Hydraulic)		
Setting Sleeve	4200-219-A-061		



DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG-A04L	ZONE SHUTOFF	

APPENDIX VI – CEMENT LAB TEST REPORT

Client Name	Dimension Bid			District	Kemaman
Well Name	A-04L	MD	10492 ft	Date Requested	28.04.2022
Well Type	Production	TVD	ft	Date Result Needed	22.05.2022
Well Location	DULANG	TG	-	Tubing Size	-
Job Type	Plug And Abandon	WD	m	Casing Size	2-7/8" & 4-/12"
Job Description	-	BHST	208 degF	Mud Type	Seawater
Rig	DULANG-A	Surface Temp	90 degF	Mud Density	8.7 ppg
Platform	-	BHsqT	-	PG	-

SLURRY DESIGN

Slurry ID	SVP-CMT-LAB-KMM-C0236	Slurry Type	Plug	Slurry Description	DULANG A-04L
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SLURRY PROPERTIES

Slurry Density	15.0 ppg	Liquid Volume	71.6 %
Slurry Yield	1.214 cu.ft/sk	Total Mix Fluid	5.714 gal/sk
Mix Water	4.014 gal/sk		

SLURRY COMPOSITION

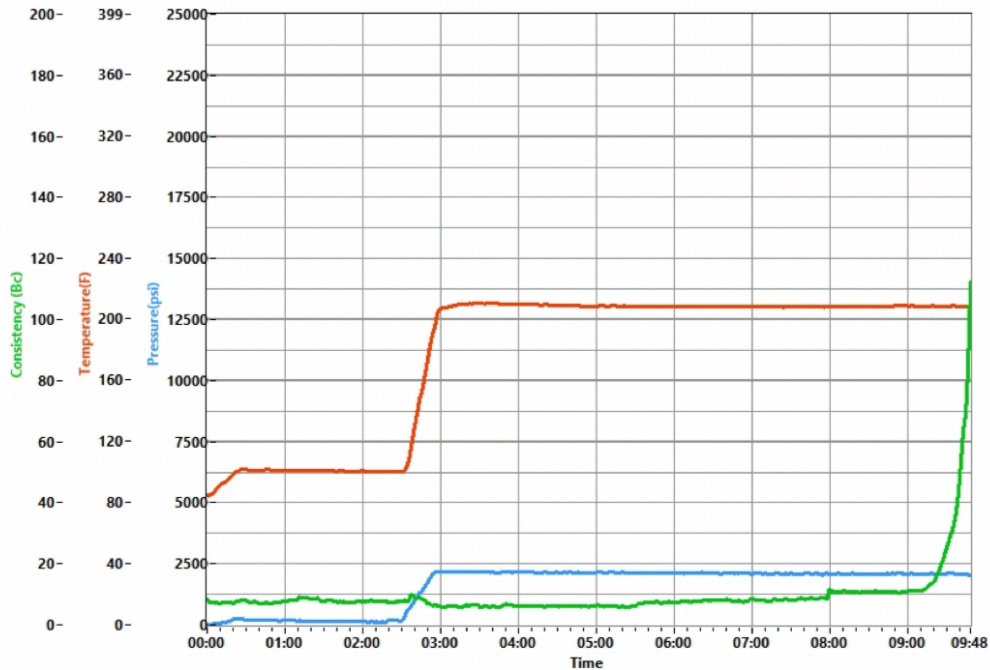
Component Type	Component	Concentration	Lot/Batch	Source
Cement	BLENDED SLAGMENT	100.00% BWOC	240422	CLIENT
Anti-Foam Additive	SFP 0006	0.05 GPS	11BCA05026	KMM
Fluid Loss Additive	SFL 0016	0.20 GPS	CY90291003	KMM
Cement Dispersant Additive	SCD 0003	0.20 GPS	190402	KMM
Bonding Agent Additive	SBA 0016	1.20 GPS	0403/22-3	KMM
Cement Retarder Additive	SCR 0024	0.05 GPS	1712/21	KMM
Water	Seawater	4.014 GPS	230322	DULANG

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TEMPERATURE – PRESSURE PROFILES AND RESULTS

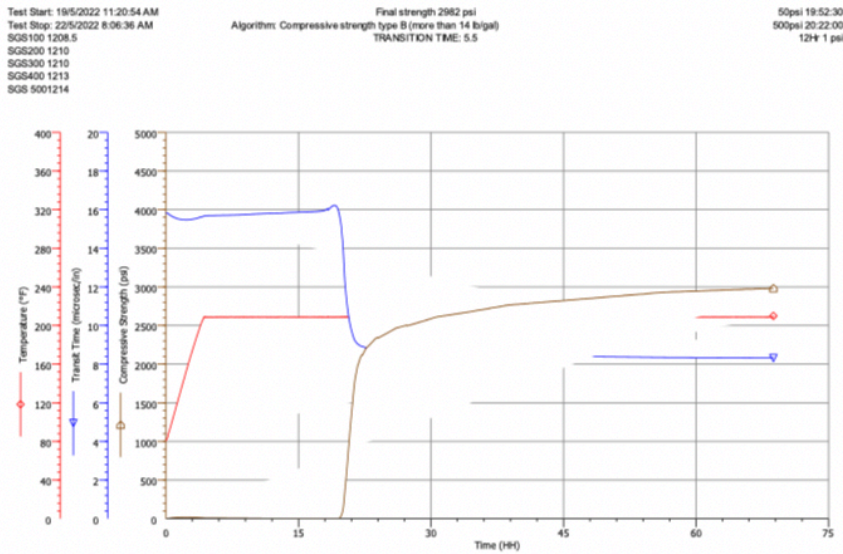
Results:	Thickening Time	Start Time	09:00 AM
		Stop Time	12:00 PM
Start ID Analyst	HAZIM	Start Date	18.05.2022
Stop ID Analyst	HAZIM	Stop Date	18.05.2022
		Equipment ID	CON368
Test Temperature	208 degF		
Test Pressure	2100 psi		
40BC	9:38 HH:MM		
70BC	9:45 HH:MM		
100BC	9:48 HH:MM		
Batch Mixing Simulation	150 min		
Ramp time to BHST	25min		

Profile:	Thickening Time	Description:	Batch mix time-150min (motor on) Ramp up to BHST (208f)-25min (motor on) Ramp up to end of test 208f.
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Results:	Compressive Strength – Non-Destructive	Start Time	02:42 PM
Start ID Analyst	HAZIM	Stop Time	09:55 AM
Stop ID Analyst	HAZIM	Start Date	19.05.2022
Equipment ID	SGSA	Stop Date	22.05.2022
12 hr		0 Psi	
24 hr		2338 Psi	
Final Strength		2982 Psi	
50 psi		19:52 HH:MM	
500 psi		20:22 HH:MM	
1000 psi		20:43 HH:MM	
Final Time		68:35 HH:MM	
Test Temperature		208 deg F	
Test Pressure		2100 psi	
Surface Temperature Sample		2 days	
Water Bath Sample		24hrs	

Profile:	Compressive Strength – Non-Destructive	Description:	BHST of 208F
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Test File Name: 190522sgsa
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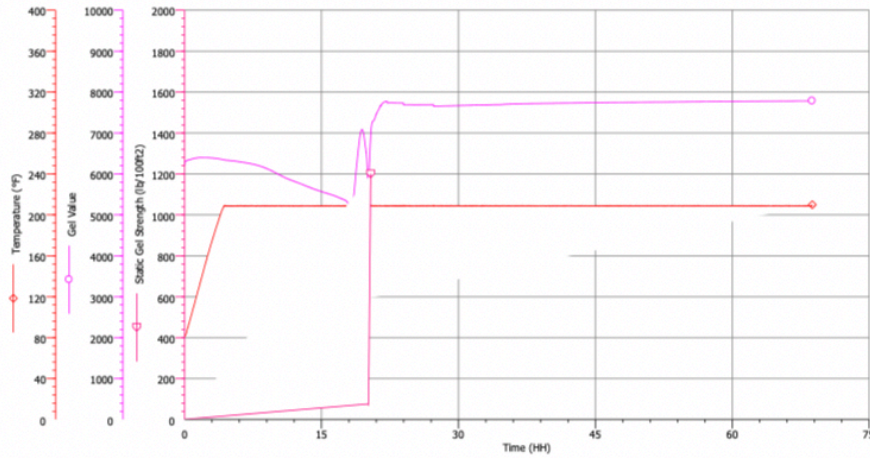
Results:	Static Gel-Strength Analyzer	Start Time	02:42 PM
Start ID Analyst	HAZIM	Stop Time	09:55 AM
Stop ID Analyst	HAZIM	Start Date	19.05.2022
Equipment ID	SGSA	Stop Date	22.05.2022
100 lbf/100ft2		20:09 HH:MM	
500 lbf/100ft2		20:14 HH:MM	
Transit Time		00:05 HH:MM	
Test Temperature		208 degF	
Test Pressure		2100 psi	

Profile:	Static Gel-Strength Analyzer- Non-Destructive	Description:	BHST of 208F
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Test Start: 19/5/2022 11:20:54 AM
 Test Stop: 22/5/2022 8:06:36 AM
 SGS100 1206.5
 SGS200 1210
 SGS300 1210
 SGS400 1213
 SGS 5001214

Final strength 2982 psi
 Algorithm: Compressive strength type B (more than 14 lb/gal)
 TRANSITION TIME: 5.5


50psi 19:52:30
 500psi 20:22:00
 12Hr 1 psi



CHANDLER
ENGINEERING

Test File Name: 190522sgsa
Printed: 22/5/2022 12:27:42 PM

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	DULANG-A04L	ZONE SHUTOFF	

DISCUSSION

1. Water Temperature = 28degC
2. Cement Blend Temperature = 28degC
3. Time to Mix (Time to wet) = 18sec
4. Yield Calculation Based on 74 lbs/sack
5. Chemical sequences mixing order as per below;
 - a. SFP 0006
 - b. SBA 0016
 - c. SFL 0016
 - d. SCD 0003
 - e. SCR 0024
6. Averages speed mixing was at 12115 rpm for 35 Second.

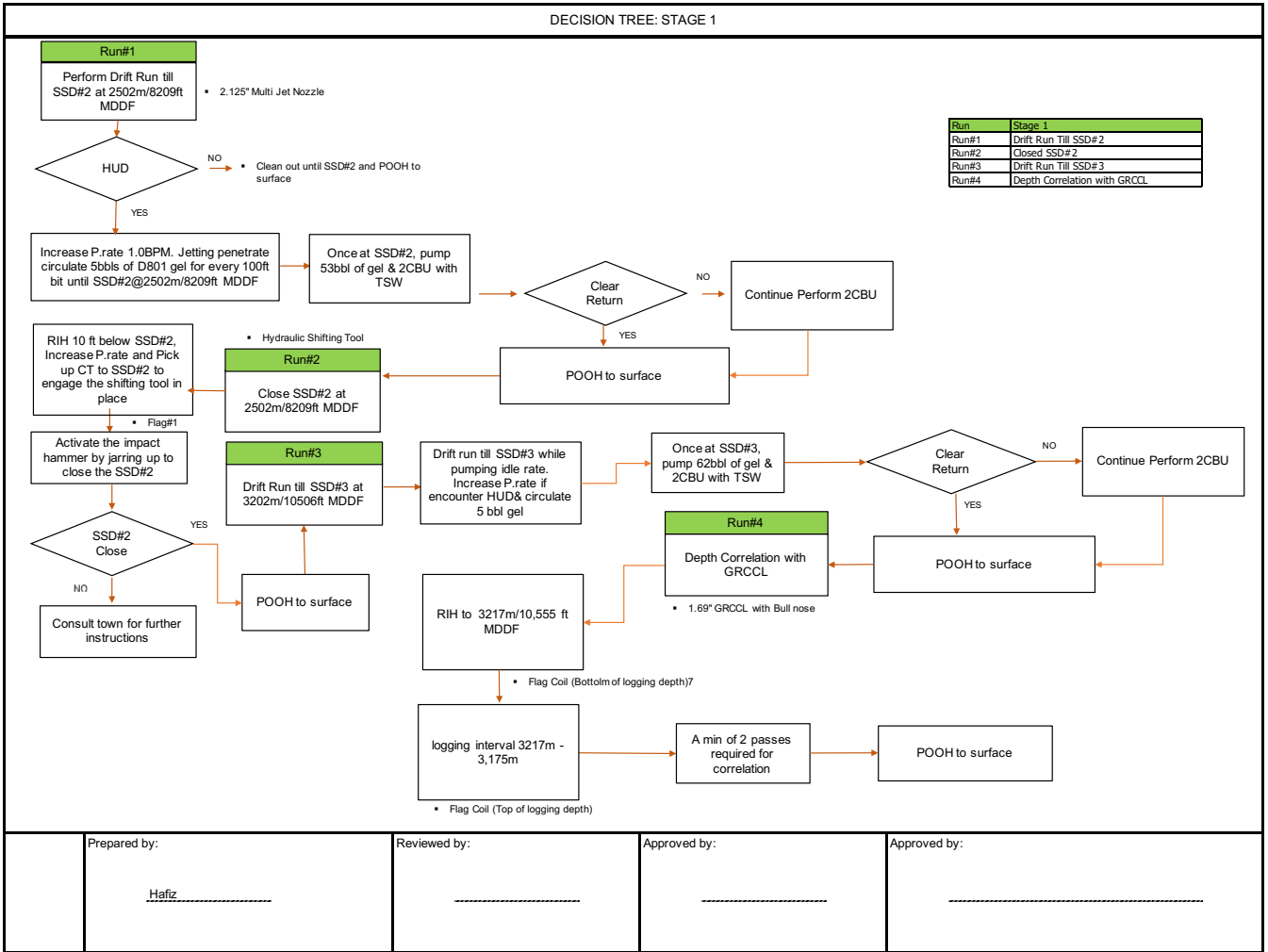
APPENDIX

ACRONYMS AND DEFINATIONS

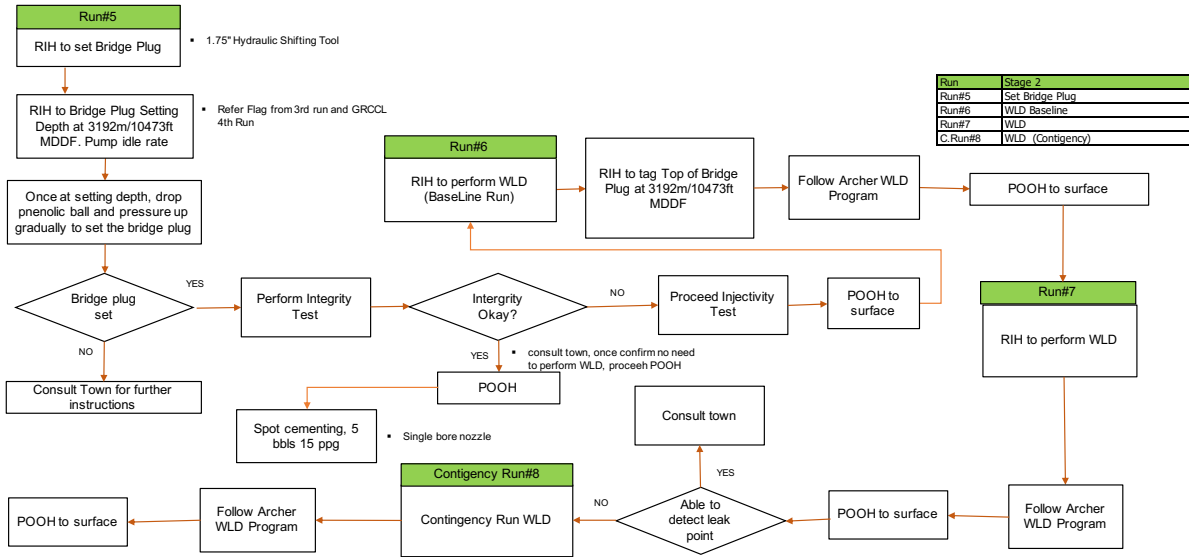
GG	GEOHERMAL GRADIENT
PG	PRESSURE GRADIENT
WD	WATER DEPTH
TVD	TRUE VERTICAL DEPTH
MD	MEASURED DEPTH
BHST	BOTTOM HOLE STATIC TEMPERATURE

APPENDIX VII – DECISION TREE

DECISION TREE: STAGE 1



DECISION TREE: STAGE 2

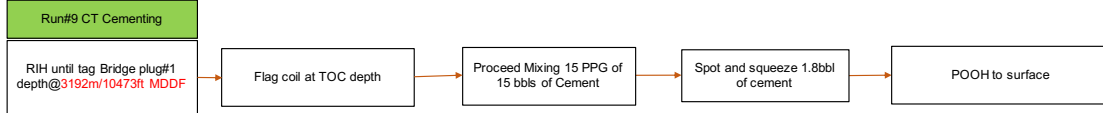


Prepared by: <u>hafiz</u>	Reviewed by: _____	Approved by: _____	Approved by: _____
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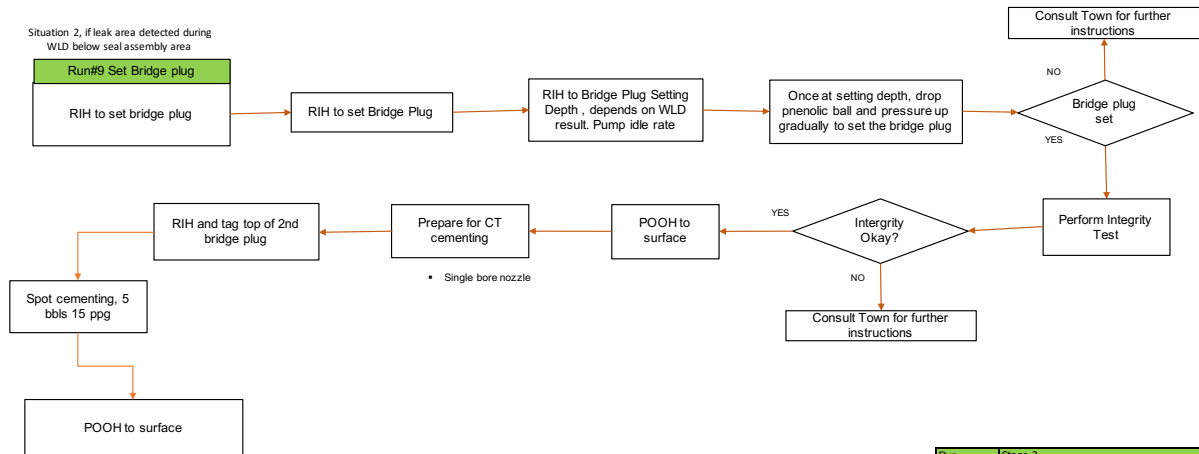


DECISION TREE: STAGE 3

Situation 1, if leak area detected during WLD from seal assembly and above



Situation 2, if leak area detected during WLD below seal assembly area



Run	Stage 3
Run#9	CT Cementing
Run#9	Set Bridge plug and 5 bbl spot cement

Prepared by:

hafiz

Reviewed by:


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Approved by:

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Approved by:

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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG-A04L	ZONE SHUTOFF	

APPENDIX VIII – ARCHER PROCEDURE, WLD AND GRCC

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GR-CCL Logging Program (CT-Memory)

Client: *Petronas Carigali Sdn Bhd – PMA*
Well: *Dulang A4ST1*
Field: *Dulang*
Country: *Malaysia*
Revision: *1*
Date: *31 May 2022*



Archer

Logging Program GR-CCL (CT-Memory)

Client *Petronas Carigali Sdn Bhd-PMA*
Well: *Dulang A4ST1*
Field: *Dulang*
Country: *Malaysia*
Job number: *GRCCL-2022-06-073*
Submitted by: *Zaiyinul Ain*
Reviewed by: *Mohd Hairizad*
Approved by: *Iwan Sunarko*
Acknowledged by: *Nik M Qusyairi*
Revision: *1*
Date: *31 May 2022*

Submitted by (sign)

Approved by (sign)

Zaiyinul Ain (Snr Technical Sales Engineer)

Iwan Sunarko (Technical Manager)

Job number GRCCL-2022-06-073
Service GR-CCL
Revision number 1
Date 31 May 2022
Page 2 of 11

Client Petronas Carigali Sdn Bhd – PMA
Well Dulang A4ST1
Field Dulang
Country Malaysia

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		Page
1	Introduction	4
2	Logging objective	4
3	Safety	4
4	Logging procedure	4
5	Deployment summary	7
Appendix 1 – Well schematic		8
Appendix 2 – Toolstring configuration		9

1 Introduction

Well Dulang A4ST1 was completed as an oil producer well with 2 7/8" (6.4#, 13CR-L80) lower completion, 7" stack pack assembly in the middle completion and 3 1/2" (9.2#, 13CR-L80) dual string upper completion inside the 9-5/8" x 7" production casing targeting E34, E40 and E47 oil zones as primary zones. The initial plan was to produce oil from E34 zone through the Short String (SS) tubing and from E40 and E47 zones through the Long String (LS) tubing.

During the installation of the 2 7/8" lower completion, two production packers in the lower completion string were unable to be set since the POP ball unable to properly seat on the ball seat due to high angle.

After completing the installation of middle completion, completion operation continued with the installation of dual upper completion. There was leaking observed in the LS and DIAL units in the LS were not functional. Despite the issues encountered, it was decided to proceed with well handover since minimum barrier requirement has been achieved. However, due to the unforeseen events as stated above, the production strategy has been changed to commingle all the zones (E34, E40 and E47) and produce thru the SS.

The VIVID logging on CT is planned with the objective to locate primary barrier leak at LS tubing within interval of interest between 2,500 m-MDDF – 3,110 m-mDDF (between SSD #2 and end of LS upper completion tubing).

Prior to VIVID logging, a bridge plug to be set at depth 3,192 m-MDDF above SSD#3 (3,202.34 m-MDDF), hence GR-CCL run is required prior setting the bridge plug.

All depth in this procedure is measured depth in meters reference to MDDF and well diagram Dulang-A4ST1 dated 5 May 2020.

2 Logging objective

GR-CCL logging on CT is planned with the objective is:

- To produce a GR/CCL correlation log as a reference depth prior to set a bridge plug at 3,192 m-MDDF on CT.

3 Safety

Discuss the operation and point out any safety hazards that may be related to it and how to deal with them. Special attention will be made on lifting operations, pressurized systems and importance of good communication among crews throughout the operation. Archer's personnel are to give a short briefing on the objectives of the logging operation and the requirements for constant logging speed.

4 Logging procedure

1. Prior to commencing the logging operation, conduct a toolbox safety talk onsite with all parties that will be involved in the logging operations.
2. Make up CT deployment stack up as per procedure.
3. Make up the logging string assembly (Archer tool and CTU). Ref appendix 2 for each tool sensors measurement points from tool bull nose.
4. Physically measure the distance "A" - from top of rope socket to the bottom CCL sensor.

Job reference	GRCCCL-2022-06-073	Client	Petronas Carigali Sdn Bhd – PMA
Revision	GR-CCL	Well name	Dulang A4ST1
Responsible analyst	1	Field name	Dulang
Survey date	31 May 2022	Report date	Malaysia
Page	4 of 11		

5. Rig up the logging string and zero at the depth reference for the well. Position CCL sensor (or tool bull nose) at the reference elevation specified in the completion schematic. Reset both mechanic and DTR at wireline unit to read corresponding to reference elevation to Drilling Floor “m-MDDF”.
6. Pull the tools into the lubricator and pressure test as per procedure.
7. Open the swab valve slowly until the pressure is equalized. Continue to fully open the valve, count the number of turns.
8. Ensure the logging string in “active mode” for 5 min inside the lubricator before starting RIH (in record mode).
9. RIH GR/CCL (in record mode) at speed 15m/min (or maximum speed by Coiled Tubing) to 3,217 m-MDDF.

Note: During RIH – monitor tension/weight carefully especially when passing restrictions. CT may need to perform pull test or pump CT on regular basis every ~300m or ~500 meter to ensure CT string is free.

10. Pull up to get the string in tension and stop at 3,215 m-MDDF (or depth with wire tension).
11. Record the depth. Do twice to confirm the depth. Wait for 5 minutes.
12. Record tool string weight and flag wire at the front of counter wheel. The depth reading at this mark is uncorrected and will be referred to as “B”.

Note: Flagging must be made while tool string is in tension. DO NOT flag the wire when tool string sits at bottom of the well or has been stopped after slacking off on the wire, due to wire slack. Flagging the wire must remain consistent at the front of counter wheel throughout the operation.

13. **Main Pass:** Log up 10 m/min from 3,215 m-MDDF to 3,175 m-MDDF. Wait for 3 minutes.

Note: DO NOT continually adjust running speed to try to match the specified logging speed after starting. A constant speed is far more important

14. RIH at speed 15 m/min (or maximum speed by Coiled Tubing) from 3,175 m-MDDF to 3,217 m-MDDF.

Note: During RIH – monitor tension/weight carefully especially when passing restrictions. CT may need to perform pull test or pump CT on regular basis every ~300m or ~500 meter to ensure CT string is free.

15. Repeat steps# 10 to #12.

16. **Repeat pass** - Log up 15 m/min from 3,215 m-MDDF to 3,175 m-MDDF. Wait for 3 minutes.

Note: DO NOT continually adjust running speed to try to match the specified logging speed after starting. A constant speed is far more important

17. POOH at speed 15 m/min (or maximum speed by Coiled Tubing) from 3,175 m-MDDF to surface.

18. Rig down logging string

19. Download, QC and validate the logging data – Archer engineer will advise the data quality, compare GR-CCL log with the reference log and determine the “offset” before both logs correspond.

-
20. Send the data to Archer onshore support and PCSB for verification and approval.
 21. Archer support will notify PCSB Representative in town for the data quality and discuss if any additional run is required. Otherwise finish logging operation.
 22. Finish logging operation – handover well to customer.

5 Deployment summary

Total operating hours (inc RU/RD/calibration) estimated: ~8 hours

Rev0	Run 1					
	Baseline: Shut-in all					
	1	2	3	4	5	6
All depth referred to m-MDDF						
Programme Step						
Tubing Long string 3-1/2" x 2-7/8"	SI	SI	SI	SI	SI	SI
Tubing Short string 3-1/2"	SI	SI	SI	SI	SI	SI
PCP - 9-5/8" csg	SI	SI	SI	SI	SI	SI
	<p>Logging Condition: Shut all annuli and tubing</p> <p>RIH (record mode) at 15 m/min</p> <p>RIH (record mode) at 15 m/min</p> <p>POOH (record mode) at 15 m/min</p> <p>Log up at 10 m/min</p> <p>3175m-MDDF</p> <p>3215m-MDDF</p> <p>Log up at 15 m/min</p>					
	30	3215	3175	3215	3175	3175
m-MDDF	3215	3175	3215	3175	30	
m/min	15	10	15	15	15	
second	0	0	0	0	0	
m	0	0	0	0	0	
Hours	6.00					
Cumulative Operation Time per run	3.54	0.07	0.04	0.04	3.49	7.19

Job reference GRCC-2022-06-073
 Revision GR-CCL
 Responsible analyst 1
 Survey date 31 May 2022
 Page 7 of 11

Client
 Well name
 Field name
 Report date

Petronas Carigali Sdn Bhd – PMA
 Dulag A4ST1
 Dulang
 Malaysia

Appendix 2 – Toolstring configuration

Sensor	Offset (ft)	Schematic	Description	Length (ft)	O.D. (in)	Weight (lb)	
			MBH-030 (10011311) Memory Battery Housing	1.47	1.69	8.00	
			UMT-007 (10008088) Ultrawire Memory Tool (1GB)	1.04	1.69	6.60	
			PGR-020 (000001) Production Gamma Ray	1.92	1.69	9.50	
GR	2.31						
CCL	0.93			QPC-003 (10006987) Quartz Pressure/Collar Locator	1.59	1.69	9.00
QP QTMP	0.53 0.53		BUL-006 (10010508) Bullnose Terminator	0.22	1.69	1.20	
			Dataset: Archer Ultrawire Memory SCT POINT Total length: 6.25 ft Total weight: 34.30 lb O.D.: 1.69 in				

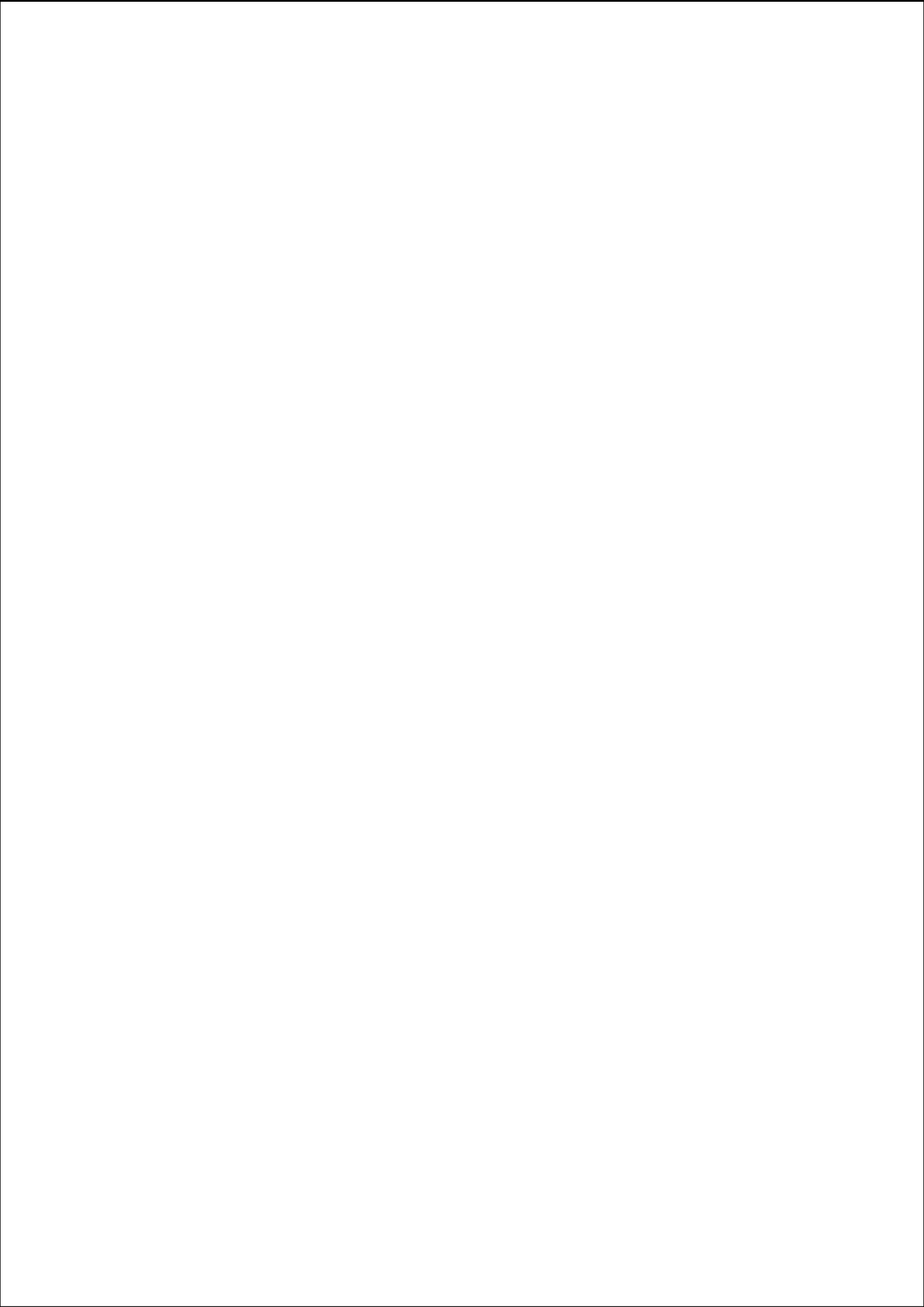
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VIVID logging program (CT-Memory mode)

Locate all barrier leaks and multiple flowpaths

Client: *Petronas Carigali Sdh Bhd - PMA*
Well: *Dulang-A4ST1*
Field: *Dulang*
Country: *Malaysia*
Revision: *3*
Date: *31 May 2022*



Logging Program VIVID™ (CT-Memory mode)

Client: *Petronas Carigali Sdn Bhd – PMA*
Well: *Dulang A4ST1*
Field: *Dulang*
Country: *Malaysia*
Job number: *VIVID-2022-03-040*
Submitted by: *Mohd Hairizad Mohd Yunos*
Reviewed by: *Alexander Khlustikov*
Approved by: *Iwan Sunarko*
Endorsed by: *Nik M Qusyairi B M Zulkifli*
(Well Engineer – PCSB)
Revision: *3*

Submitted by		Approved by	
Name	Mohd Hairizad	Name	Iwan Sunarko (Tech Mgr Archer)
Revision number	3	Document title	VIVID Logging Program
Job No.	VIVID-2022-03-040	Well name	Dulang A4ST1
Service	VIVID	Field name	Dulang
Page	3 of 17	Date	31 May 2022

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1 Introduction

Well Dulang A4ST1 was completed as an oil producer well with 2 7/8" (6.4#, 13CR-L80) lower completion, 7" stack pack assembly in the middle completion and 3 1/2" (9.2#, 13CR-L80) dual string upper completion inside the 9-5/8" x 7" production casing targeting E34, E40 and E47 oil zones as primary zones. The initial plan was to produce oil from E34 zone through the Short String (SS) tubing and from E40 and E47 zones through the Long String (LS) tubing.

During the installation of the 2 7/8" lower completion, two production packers in the lower completion string were unable to be set since the POP ball unable to properly seat on the ball seat due to high angle.

After completing the installation of middle completion, completion operation continued with the installation of dual upper completion. There was leaking observed in the LS and DIAL units in the LS were not functional. Despite the issues encountered, it was decided to proceed with well handover since minimum barrier requirement has been achieved. However, due to the unforeseen events as stated above, the production strategy has been changed to commingle all the zones (E34, E40 and E47) and produce thru the SS.

All depth in this procedure are measured depth in meters reference to MDDF and well diagram Dulang-A4ST1 dated 5 May 2020.

2 Logging objectives

Prior to VIVID logging, a bridge plug will be set at depth 3,192 m-MDDF (slightly above SSD#3. The VIVID logging on CT is planned with the objective:

- To locate primary barrier leak at LS tubing within interval of interest between 2,450 m-MDDF – 3,190 m-MDDF (~2 m above the bridge plug setting depth)

3 Safety

Prior to commencing the logging operation, conduct onsite safety meeting to discuss the operation and point out any safety hazards. Review precautionary measures for any of the identified hazards. Special attention should be given to lifting operations, pressurized systems and importance of good communication between different crews throughout the operations. Archer logging personnel are to give a short briefing on the objectives of the logging operations and the requirements for pressure manipulation during the operations.

4 Well preparation

Pressures should be recorded using digital recording gauges or the customer recording system if possible. If using digital recording gauges – set to take one sample per minute throughout the survey. Record shut in tubing, annuli pressure, and the volumes/rates and types of any fluids entering or leaving the production casing and annuli.

Prior to commencing the logging operations:

- **Shut in tubing and annuli for minimum 6 hours** – well shut in prior VIVID logging to allow the well to reach temperature equilibrium with the wellbore and adjacent formation (for temperature profile logging).
- **Perform CT run as per PCSB procedure:**
 - a Drift Run until SSD#2 depth at 2,502 m-MDDF
 - close SSD#2
 - a Drift Run until SSD#3 depth at 3,202 m-MDDF
- **Perform a GR/CCL run** – Run Archer GR/CCL logging on CT, logging interval 3,175 m-MDDF – 3,217 m-MDDF as per Archer GR/CCL logging program.
- **Set tubing plug** - Run CT to set a tubing plug at 3,192 m-MDDF (slightly above SSD #3) as per PCSB program.
- **Pressure test tubing #1 (while CT inside LS tubing)** - pressurize LS tubing at 1000psi (or gradually higher based on allowable limit) on surface by pumping fluid into the annulus between CT and LS tubing. Hold the surface pressure for 15 minutes while observing any pressure drop in the LS tubing. Repeat this steps and estimate the pressure drop rate.
- **Pressure test tubing #2 (without CT inside the LS tubing)** – apply pressure into tubing as per pressure test #1, repeat the pressure test and estimate the pressure drop rate.

5 Logging procedure

Prior to commencing operations conduct a toolbox safety talk onsite with all parties that will be involved in the logging operations.

Safety notes on CT VIVID logging run:

During RIH – if the running weight drops around 1,500 lbs, it can be considered as “Hung Up Depth”, stop RIH, work on CT up/down to pass the obstruction. If no success, notify Archer Support in town. Upon approval from town, it may proceed to consider 4,000lbs as max allowable force on logging string

During POOH – if the POOH weight increase around 4,000 lbs, it can be considered as “Stuck Depth”, stop POOH, work on CT up/down to pass the obstruction. If no success, notify Archer Support in town to proceed to pull with higher force.

Run 1: Shut in all tubing (SS/LS) and all annuli (Baseline pass)

1. **Create “LOGGING CONDITION I”**: ensure the well has been shut in for minimum 6 hours.
2. Make up CT deployment stack up as per procedure.
3. Make up the logging string assembly (Archer tool and CTU).
4. Ensure the logging string in “sleep mode” during rig up time and creating logging condition prior to RIH.

5. Rig up the logging string and zero at the depth reference for the well. Pull the tools into the lubricator and pressure test as per procedure.
6. Open swab valves slowly until the pressure is equalized. Continue to fully open the valve, count the number of turns.
7. Ensure the logging string in "active mode" for 5 min inside the lubricator before starting RIH (in record mode).
8. RIH VIVID (in record mode) at speed 15 m/min (if possible) from surface to 2,450 m-MDDF (above the 9-5/8" Dual Packer).

Note: During RIH – monitor tension/weight carefully. CT may need to perform pull test or pump CT on regular basis every ~300m or ~500 meter to ensure CT string is free.

9. Stop at 2,450 m-MDDF for 5 min before proceeding logging down.
10. Log down at speed 10m/min from 2,450 m-MDDF to target depth (TD) at 3,190 m-MDDF (~2m above top tubing plug).

Notes: (1) During log down – monitor tension/weight carefully; (2) If possible, no pumping chemical, fluid or gas is allowed while logging down VIVID during baseline pass.

11. Stop at 3,190 m-MDDF for 5 minutes.
12. Log up in stationary mode from 3,190 m-MDDF to 2,450 m-MDDF – stations stop every 2 meter for 40 seconds.

Notes: (1) station stop every 1 m for 40 sec between interval 3,100 – 3,115 m-MDDF (around tubing seal assembly area); (2) Monitor tension/ weight during logging up.

13. Stop at 2,450 m-MDDF for 5 minutes.
14. POOH VIVID (in record mode)
15. Rig down logging string.
16. Download the memory and QC the data. Once the data has been validated – send them to Archer support in town.
17. The PCSB representative at wellsite and in town must be consulted when the data has been QC'd and verified.
18. Archer engineers to change out to new battery to allow for subsequent run.

Run 2: pressurize LS tubing – open SS tubing

19. Make up the logging string assembly (Archer tool and CTU).
20. Ensure the logging string in "sleep mode" during rig up time and creating logging condition prior to RIH.
21. Rig up the logging string and zero at the depth reference for the well. Pull the tools into the lubricator and pressure test as per procedure.

22. Open swab valves slowly until the pressure is equalized. Continue to fully open the valve, count the number of turns.
23. Ensure the logging string in "active mode" for 5 min inside the lubricator before starting RIH (in record mode).
24. RIH VIVID (in record mode) on CT at speed 15 m/min (if possible) from surface to 2,450 m-MDDF (above the 9-5/8" Dual Packer).

Note: During RIH – monitor tension/weight carefully. CT may need to perform pull test or pump CT on regular basis every ~300m or ~500 meter to ensure CT string is free.
25. **Create "LOGGING CONDITION II"**: Prior to logging – activate the downhole leak as below:
 - a. Open SS tubing
 - b. Pressurize LS tubing with fluid and maintain pressure at 1000psi (or higher if possible / ref MAWOP) on surface all times. **Note: discuss with PCSB representative onsite the max allowable pressure (but must be below MAWOP).**
 - c. Monitor if any fluid or gas return to surface via the SS tubing.
 - d. Wait for 15 min prior logging down.
 - e. During logging: continuous pressurizing the LS tubing at 1000 psi (or higher if possible / ref MAWOP) on surface all time while SS tubing kept open.
26. **Main Pass**: Log down at speed 10m/min from 2,450 m-MDDF to target depth (TD) at 3,190 m-MDDF (~2m above top tubing plug).

Notes: (1) During log down – monitor tension/weight carefully; (2) If possible, no pumping chemical, fluid or gas is allowed while logging down VIVID.
27. Stop at 3,190 m-MDDF for 5 minutes.
28. Log up in stationary mode from 3,190 m-MDDF to 2,450 m-MDDF – stations stop every 2 meter for 40 seconds.

Notes: (1) station stop every 1 m for 40 sec between interval 3,100 – 3,115 m-MDDF (around tubing seal assembly area); (2) Monitor tension/ weight during logging up.
29. Stop at 2,450 m-MDDF for 5 minutes.
30. **Repeat Pass**: Repeat from step #26 to step #29 as above.
31. POOH VIVID (in record mode)
32. Rig down logging string.
33. Download the memory and QC the data. Once the data has been validated – send them to Archer support in town.
34. The PCSB representative at wellsite and in town must be consulted when the data has been QC'd and verified.
35. Archer engineers to change out to new battery to allow for subsequent run.

36. Archer support will notify PCSB Representative in town for the data quality and discuss if any additional run is required with different logging condition (contingency run #3). Otherwise continue to rig down.
37. The PCSB Wellsite Manager must be consulted when the data has been QC'd and verified, and will give the order to proceed to rig down.
38. Rig down PCE/CTU
39. Finish logging operations – handover well to customer.

Run #3: Contingency run (if required): pending on log result from run run #1 and #2.

40. Kept the tubing plug in the LS as per PCSB plan to isolate E40 and E47 zones in LS.
41. Make up the logging string assembly (Archer tool and CTU).
42. Ensure the logging string in “sleep mode” during rig up time and creating logging condition prior to RIH.
43. Rig up the logging string and zero at the depth reference for the well. Pull the tools into the lubricator and pressure test as per procedure.
44. Open swab valves slowly until the pressure is equalized. Continue to fully open the valve, count the number of turns.
45. Ensure the logging string in “active mode” for 5 min inside the lubricator before starting RIH (in record mode).
46. RIH VIVID (in record mode) on CT at speed 15 m/min (if possible) from surface to 2,450 m-MDDF (above the 9-5/8” Dual Packer).

Note: During RIH – monitor tension/weight carefully. CT may need to perform pull test or pump CT on regular basis every ~300m or ~500 meter to ensure CT string is free.

47. **Create “LOGGING CONDITION 3” as below:**
 - a. Flow well via the SS tubing
 - b. Pressurize LS tubing with fluid and maintain pressure at 1000psi (or higher if possible / ref MAWOP) on surface all times. [Note: discuss with PCSB representative onsite the max allowable pressure \(but must be below MAWOP\).](#)
 - c. Wait until stabilize flowing pressure/condition prior to RIH
48. Log down at speed 10m/min from 2,450 m-MDDF to target depth (TD) at 3,190 m-MDDF (~2m above top tubing plug).

Notes: (1) During log down – monitor tension/weight carefully; (2) If possible, no pumping chemical, fluid or gas is allowed while logging down VIVID.
49. Stop at 3,190 m-MDDF for 5 minutes.
50. Log up in stationary mode from 3,190 m-MDDF to 2,450 m-MDDF – stations stop every 2 meter for 40 seconds.

Notes: (1) station stop every 1 m for 40 sec between interval 3,100 – 3,115 m-MDDF (around tubing seal assembly area); (2) Monitor tension/ weight during logging up.

51. Stop at 2,450 m-MDDF for 5 minutes.
52. POOH VIVID (in record mode)
53. Rig down logging string.
54. Archer support will notify PCSB Representative in town for the data quality and discuss if any additional run is required with different logging condition. Otherwise continue to rig down.
55. The PCSB Wellsite Manager must be consulted when the data has been QC'd and verified, and will give the order to proceed to rig down.
56. Rig down PCE/CTU
57. Finish logging operations – handover well to customer.

7.2 Logging toolstring diagram

Sensor	Offset (m)	Schematic	Description	Length (m)	O.D. (in)	Weight (lb)	
			MBH-030 (10016537) Memory Battery Housing	0.45	1.69	8.00	
			UMT-007 (10012565) Ultrawire Memory Tool (1GB)	0.32	1.69	6.60	
CCL	2.80			QPC-003 (10007342) Quartz Pressure/Collar Locator	0.48	1.69	9.00
QTMP	2.68						
QP	2.68						
QTMP	2.68						
				PGR-020 (10009680) Production Gamma Ray	0.59	1.69	9.50
GR	2.15						
S3W1	1.35						
STMP1	1.35						
S3U1	1.35						
S3T1	1.35						
S3S1	1.35			S300-1-003 (10012975) #61 S300 Ultrasound (150 degC) ULP	0.67	1.69	11.02
S3R1	1.35						
S3Q1	1.35						
S3P1	1.35						
S3O1	1.35						
S3N1	1.35						
S3M1	1.35			PIA-004 (10010534) Production Inclinator/Accelerometer	0.27	1.69	5.00
S3L1	1.35						
S3K1	1.35						
S3J1	1.35						
S3I1	1.35						
S3H1	1.35						
S3G1	1.35			VIVID-002 (051002) Acoustic Listening Platform	0.67	1.69	11.02
S3F1	1.35						
S3E1	1.35						
S3D1	1.35						
S3C1	1.35						
S3B1	1.35						
S3A1	1.35						
ACCE	1.21		PRT-016 (10005894) Platinum Resistance Thermometer	0.32	1.69	6.00	
ALP	0.39						
TEMP	0.11		BUL-006 (10010871) Bullnose Terminator	0.07	1.69	1.20	
Dataset: Archer Ultrawire Memory SCT POINT Total length: 3.84 m Total weight: 67.34 lb O.D.: 1.69 in							

7.3 Battery Life Estimation

MEMORY TOOL POWER AND BATTERY LIFE ESTIMATION for Run #1 and Run#3

SECTION A: LOGGING TOOLS IN THE STRING

Tool Type	Tool Current, mA	No. of Tools in string	Current used
UMT	15	1	15
QPC	22	1	22
PGR	33	1	33
PRT	21	1	21
PIA	30	1	30
S300	65	1	65
VIVID	158	1	158
Total current of tools			344

SECTION B: BATTERY SELECTION

Lithium Battery Information	
Max temp, C	165
Sondex Battery Code	BAT010
Sondex Battery Housing Code (UMT003/UMT007)	MBH025/MBH032
Min Temp, C	-20
Max temp, C	165
Min Temp, F	-4
Max Temp, F	329
Nominal Voltage, V	19.5
Construction	5 x CC cells
Original power, mAh	13000
Maximum current at room temp, mA	1000
Maximum current at downhole temp, mA	1000
INFORMATION FOR SELECTED BATTERY	
ORIGINAL POWER, mAh	13000
Battery Capacity Factor, %	90
Safety Margin (re-used batteries only), %	0
Available power, mAh	11700

SECTION C: TOOL MODE CURRENT

Toolstring current while motoring, mA	0
Toolstring current while sleeping, mA	5
Toolstring current while logging, mA	344

SECTION D: JOB LENGTH

Total Run Time, hrs	15.11
Time in Sleep Mode, hrs	0.0
Toolstring powered up time, hrs	15.11

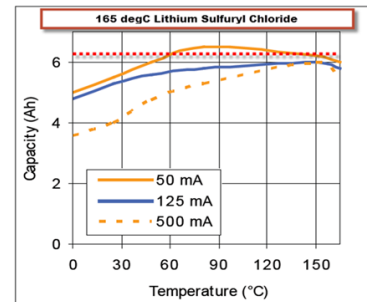
SECTION E: POWER REQUIRED

Power Used by toolstring during logging, mAH	5198
Power Used by toolstring during sleeping, mAH	0
Power Used during motoring, mAH	0

SECTION F: RESULT

	mAh	%
Total Power Available	11700	100.0%
Total Power Used	5198	44.4%
TOTAL LEFT	6502	55.6%

Point job run time calculator, Hrs.	
Rig Up time	15
Rig up time before RIH, hrs	2.0
RIH / LIH time	
Top depth	0
Bottom depth	2450
RIH / Logging speed	15
RIH / LIH time, hrs	2.72
LOG DOWN time	
Top depth	2450
Bottom depth	3200
RIH / Logging speed	10
RIH / LIH time, hrs	1.25
Time for logging stations	
Bottom depth	3200
Top depth	2450
Speed between stations	10
Average depth step between stations	2
Station time, secs	40
Station time, hrs	6.42
POOH / LOOH time	
Bottom depth	2450
Top depth	0
POOH / LOOH speed	15
POOH / LOOH time, hrs	2.72
Total run time, hrs	15.11



MEMORY TOOL POWER AND BATTERY LIFE ESTIMATION for Run #2

SECTION A: LOGGING TOOLS IN THE STRING

Tool Type	Tool Current, mA	No. of Tools in string	Current used
UMT	15	1	15
QPC	22	1	22
PGR	33	1	33
PRT	21	1	21
PIA	30	1	30
S300	65	1	65
VIVID	158	1	158
Total current of tools			344

SECTION B: BATTERY SELECTION

Lithium Battery Information	
Max Temp, C	165
Sondex Battery Code	BAT010
Sondex Battery Housing Code (UMT003/UMT007)	MBH025/MBH032
Min Temp, C	-20
Max temp, C	165
Min Temp, F	-4
Max Temp, F	329
Nominal Voltage, V	19.5
Construction	5 x CC cells
Original power, mAh	13000
Maximum current at room temp, mA	1000
Maximum current at downhole temp, mA	1000
INFORMATION FOR SELECTED BATTERY	
ORIGINAL POWER, mAh	13000
Battery Capacity Factor, %	90
Safety Margin (re-used batteries only), %	0
Available power, mAh	11700

SECTION C: TOOL MODE CURRENT

Toolstring current while motoring, mA	0
Toolstring current while sleeping, mA	5
Toolstring current while logging, mA	344

SECTION D: JOB LENGTH

Total Run Time, hrs	22.78
Time in Sleep Mode, hrs	0.0
Toolstring powered up time, hrs	22.78

SECTION E: POWER REQUIRED

Power Used by toolstring during logging, mAH	7836
Power Used by toolstring during sleeping, mAH	0
Power Used during motoring, mAH	0

SECTION F: RESULT

	mAh	%
Total Power Available	11700	100.0%
Total Power Used	7836	67.0%
TOTAL LEFT	3864	33.0%

Point job run time calculator, Hrs.	
Rig Up time	
Rig up time before RIH, hrs	2.0
RIH / LIH time	
Top depth	0
Bottom depth	2450
RIH / Logging speed	15
RIH / LIH time, hrs	2.72
LOG DOWN time (main pass)	
Top depth	2450
Bottom depth	3200
RIH / Logging speed	10
RIH / LIH time, hrs	1.25
Time for logging stations (main pass)	
Bottom depth	3200
Top depth	2450
Speed between stations	10
Average depth step between stations	2
Station time, secs	40
Station time, hrs	6.42
LOG DOWN time (repeat pass)	
Top depth	2450
Bottom depth	3200
RIH / Logging speed	10
RIH / LIH time, hrs	1.25
Time for logging stations (repeat pass)	
Bottom depth	3200
Top depth	2450
Speed between stations	10
Average depth step between stations	2
Station time, secs	40
Station time, hrs	6.42
POOH / LOOH time	
Bottom depth	2450
Top depth	0
POOH / LOOH speed	15
POOH / LOOH time, hrs	2.72
Total run time, hrs	22.78

End of logging program

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Archer is a global oil services company with a heritage in drilling and well services spanning over 40 years. Employing more than 5,000 people in 17 countries, Archer specialises in providing technology and services for drilling, well intervention and well integrity, with the prime objective of helping our customers deliver better wells.