Velkerri 76 S2-1

Well Completion Report
(Basic)

EP 76
Beetaloo Sub-basin
Northern Territory

Origin Energy Resources Ltd

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Glossary

Acronym	Description	Acronym	Description
BHA	Bottom Hole Assembly	ST	Sidetrack
BOP	Blow Out Preventer	Sst	Sandstone
CVT	Constant Volume Trap	TIA	Telescopic Inner Assembly
DDR	Daily Drilling Report	TD	Total Depth
DF	Drill Floor	WBM	Water based mud
DFIT	Diagnostic Fracture Injection Test	XLOT	Extended Leak Off Test
DDR	Daily Drilling Report		
DGR	Daily Geological Report		
DST	Drill Stem Test		
EMW	Estimated Mud Weight		
EP	Exploration Permit		
FIT	Formation Integrity Test		
Fm	Formation		
ft	feet		
GVR	Geo-Vision Resistivity		
HF	Hydraulic Fracturing		
ID	Inner Diameter		
JV	Joint Venture		
KB	Kelly bushing		
LOP	Leak Off Pressure		
LOT	Leak Off Test		
LWD	Logging While Drilling		
m	meter		
mbr	Member		
MD	Measured Depth		
mMD	metres, measured depth		
mRT	Meters, Rotary table		
mMDRT	Meters, measured depth, rotary table		
mTVD	Meters, True Vertical Depth		
MW	Mud Weight		
MWD	Measurement While Drilling		
OD	Outer Diameter		
PDC	Polycrystalline Diamond Compact		
POOH	Pull Out Of Hole		
ppg	Pounds per Gallon		
psi	pounds per square inch		
RCJB	Reverse Circulation Junk Basket		
RIH	Run in Hole		
RSS	Rotary Steerable System		
RT	Rotary Table		

1 INTRODUCTION

Velkerri 76 S2-1 was drilled within Exploration Permit 76(R) in the Northern Territory, Australia by the Origin Energy Resources Ltd and Falcon Oil and Gas Joint Venture ("JV"). The well is located approximately 130 km southeast of the town of Daly Waters (Figure 1). The well was spudded at 08:45 hours on 12 August 2021 and reached TD of 2128.7 mMDRT at 21:45 hours on 08 October 2021.

EP76 is one of three permits held by the JV, in which Origin Energy is the operator. The three permits are located within the Beetaloo Sub-basin ("Beetaloo") of the greater McArthur Basin. The primary objectives of the Velkerri 76 S2-1 well was the evaluation of organic rich shale intervals of the Velkerri Formation Amungee Member (Figure 6) for its potential as a producible shale resource, as well as providing depth control and assessment of the geological constraints pertaining to potential future lateral well development.

Specific objectives for the Velkerri 76 S2-1 well were:

- Fully penetrate the Velkerri Formation Amungee Member and run comprehensive wireline log suite. Provide depth control and facilitate target selection for a potential future lateral appraisal well
- Successfully recover conventional core over the Velkerri Formation Amungee Member B Shale & A-B Shale
- Complete comprehensive wireline log suite over the Kyalla Formation organic-rich intervals for complete reservoir evaluation

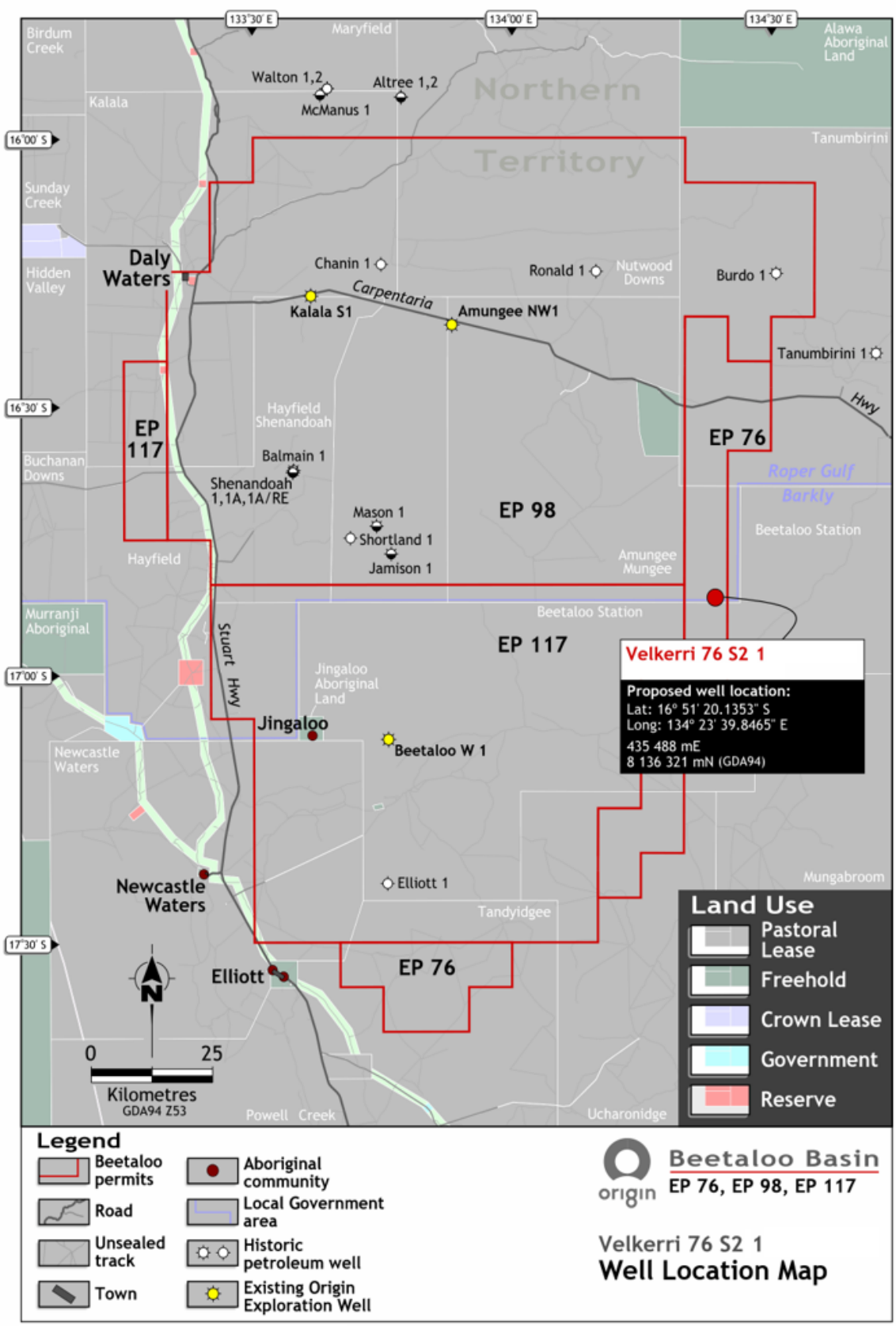

Figure 1. Velkerri 76 S2-1 Location Map

2 WELL SUMMARY SHEET

Well Name	Velkerri 76 S2-1	**Petroleum Title**	EP 76	**Basin**	McArthur Basin (Beetaloo Sub-basin)
Well Purpose	Exploration	**Status**	Suspended	**Parent Well Name, if any**	-
Spud Date	12/08/2021	**TD Date**	08/10/2021	**Rig Release Date**	15/10/2021
Primary Objective	Velkerri Formation - Amungee Member			**Rig(s) Name**	Silvercity Rig 40
Secondary Objective	Kyalla Formation			**100K Map Sheet**	Amungee Mungee (5764)

Total Depth		**mMDRT**	**mTVDSS**	**Side-Track / Kick-off Depth, if applicable**	NA
	Driller	2128.7	-1874.8		
	Logger	2129.84	-1875.84	**Drill Datum** ☐ DF ☒ RT ☐ KB	GL Elevation:245.65 m Drill Datum Elevation: 252.55m Elevation Datum: mean sea level
Location *(GDA94 Datum with GRS80 Ellipsoid using MGA94 Grid)*	**Coordinates**	**Surface**	**Bottom Hole**	**Seismic Station, if applicable**	**Survey**
	Latitude	16°51' 19.754" S	16° 51' 19.016" S		
	Longitude	134° 23' 42.91" E	134° 23' 43.175" E		
Zone	Easting	435 578.62	435 586.4		HAL2012-213 (NNW-SSE control) (shot point 1682)
UTM 53	Northing	8 136 333.00	8 136 355.71		HAL2012-232 (NNE-SSW control) (shot point 17706)

Well Summary

Velkerri 76 S2-1 was drilled primarily to evaluate the Velkerri Formation organic rich shales in a modelled hydrocarbon liquids rich gas paleo-maturity window. The secondary target of the well was to evaluate the Lower Kyalla Shale development and reservoir quality.

Velkerri 76 S2-1 achieved all technical and data acquisition aims to facilitate a full evaluation of the Velkerri and Kyalla shale targets. Data acquisition included wireline logs, conventional core and gas samples.

Velkerri 76 S2-1 confirmed the presence and reservoir quality of shale targets in the Velkerri Formation, and confirmed the Velkerri organic rich shales have reached a paleo-maturity that is conducive to hydrocarbon liquids rich gas generation and retention.

Hole and Casing Design (Drillers Depths)						Drilling Fluid	
Type	**Hole Size (in)**	**Depth (mMD)**	**Casing Size**	**Shoe mMD**	**Shoe mTVDSS**	**Hole Size**	**Type**
Conductor	22	172.22	18.625	170	82.55	22	Water Based Mud
Surface	17.5	368	13.375	364.97	-112.42	17.5	Water Based Mud
Intermediate	12.25	750	9.625	747.14	-494.59	12.25	Water Based Mud
Production	8.5	2128	5.5	2123.19	-1870.64	8.5	Water Based Mud

Stratigraphy – Formation Tops (Loggers Depths)					Formation Evaluation			
Formation	Depth				Suite/ Run	Measurement	Depth Interval	
	mMDRT	mTVDRT	mTVDGL	mTVDSS			From (mMDRT)	To (mMDRT)
Undifferentiated Cretaceous	6.9	6.9	0	245.65	**S1/R1**	PPC-GR	10	360
Anthony Lagoon Fm	61.5	61.5	54.6	191.05	**S1/R2**	USIT-CBL	4	657.7
Gum Ridge Fm	203.28	203.27	196.37	49.28	**S2/R1**	HRLA-PPC-PEX-HNGS-SP	28.94	2131.1
Antrim Plateau Volcanics	307	306.96	300.06	-54.41	**S2/R2**	SSCAN-FMI	738	2129.49
Unnamed Sst	455	454.82	447.92	-202.27	**S2/R3**	CMR-NEXT	745	2130.61
Jamison Sst	492	491.91	485.01	-239.36				
Kyalla Fm	684.5	684.39	677.49	-431.84				
Lower Kyalla Shale (TOP)	850.58	850.44	843.54	-597.89				
Lower Kyalla Shale (BASE)	873.5	873.34	866.44	-620.79				
Moroak Sst	913.6	913.42	906.52	-660.87				
Velkerri Fm – Wyworrie Mbr	1304.8	1304.44	1297.54	-1051.89				
Velkerri Fm – Amungee Mbr - C-Shale	1675.6	1674.99	1668.09	-1422.44				
Velkerri Fm – Amungee Mbr - B-C Shale	1713.2	1712.58	1705.68	-1460.03				
Velkerri Fm – Amungee Mbr - B Shale	1905.5	1904.59	1897.69	-1652.04				
Velkerri Fm – Amungee Mbr - A-B Shale	1959.5	1958.34	1951.44	-1705.79				
Velkerri Fm – Amungee Mbr - A Shale	2027	2025.64	2018.74	-1773.09				
Velkerri Fm – Kalala Mbr	2058	2056.59	2049.69	-1804.04				

Mud Logging	Formation Testing (DST)		
Standard onshore service including constant volume trap chromatograph mud gas analysis (C1-C5+, CO_2, H_2S), drill cuttings collection, drill gas sampling with Isotubes™, headspace gas sampling with Isojars™	NIL	**DFIT**	☒ Yes ☐ No
		HF	☐ Yes ☒ No

Conventional Coring	Hydrocarbon Shows
Core #1 – 1926.4-1950mMDRT Core #2 – 1950-2022mMDRT	Gas Shows – Kyalla Formation, Lower Moroak Sandstone & Velkerri Formation No Fluorescence observed

Completion
Cased and Suspended

3 DRILLING

3.1 RIG SPECIFICATIONS

SILVERCITY DRILLING

Rig 40

General Discription

Make	Schramm
Type	T500XD is a trailer mounted portable land rig designed to API 4F Standards
Hook Load	500,000 Lbs
Hoisting Speed	420,000 lbs. - 500,000 lbs. @ 64 fpm
Pull Down Capacity	80,000 lb (36.363 kg)
Pull Down Speed	0 - 180 fpm loaded, 0 - 200 fpm free head (no load)

Walking System

Walking System	Forward/Transverse/360 Degree
Speed	30 Ft/HrManual/Remote Controlled

Mast

Height	85 Ft,26M
Max R/Static Hook Load	500,000 LB,2,224 KN
Max R/Static Wind Velocity	32 Knots (37 MPH)(59 KPH)
Elevation of Mast Wind Loading	22FT (6.7M)

Sub Structure

Height	22 FT(6.71 Mt)
Clearance Under Table	19 Ft(5.79m)
Static Hook Load	250 Short Tons (2224 KN)
Rotary Capacity	250 Short Tons (2224 KN)
Max Combined R/Hook & Setback	250 Short Tons (2224 KN)
Max Combined R/RT & Setback	250 Short Tons (2224 KN)
Max Wind Velocity At 33FT (Without Pipe Max Extended)	32 Knots (59 KPH)

Top Drive (Tilting)

Power	950HP
Rotation Speed	0-140 RPM
Rotation Torque	35,000 Ft Lbs(47,454 N-m)
Swivel	3 Inch (7.6cm) Catridge style
Fluid Pressure Rating	5,000 psi (345 bar)
Wire Rope	2-7/16" (63 mm) OD wire rope
Sheaves Crown	(2)77" PD Nylatron sheaves (2) 36-1/2" Nylatron Sheaves

Stand Pipe

Stand Pipe Rating	4" 5K
Mud Ground Manifold	4" 5K

Iron Roughneck

Range	4-1/2" -13-3/8"
Clamping Force Adjustable to	61,000 Ft/Lbs @ 3000 Psi
Break/Make Torque	60,000 ft/lbs @ 3500 psi

Load Safe (Pipe Handler)

Max Lift Capacity	10,000 Lbs(4,536 Kg)
Average Trip Time	1,000Fph (305m/h)
Capacity	Range 3
Pipe/casing Dia Range	Up to 24"

Power Pack

Engine	(2) MTU 12V 2000,760 bhp (567 Kw) @ 1800 Rpm
Cooling	(2) Dual Core Exchanger,130 Deg F (54.4C)
Hydraulics	(2) Hydraulic system (w) 8 piston pump (1) Gear pump x 2 1000 Gallon Hyd Tank
Sub base Power Pack	Rig move Manual/remote application 4-cylinder Perkins ,Single fixed volume pump 750 Gallon Hyd Tank

Mud Tank System

Capacity	Skid Mounted 800 Bbls
Shaker Tank	385 Bbls
Sand Trap	35 Bbls
Trip Tank	25 Bbls
Desander Tk	100 Bbls
Disilter Tk	100 Bbls
Settling Tank	120 Bbls
Suction Tk	415 Bbls
Suction Tank 1	170 Bbl's
Premix Tank 1	170 Bbl's
Slug Tank	75 Bbls
Day Tank	500 bbls
Shale Shaker	3X DFE SCR HG
Vaccume Degasser	1X DFE
Disilter	1X DFE 8X5" Cone (600 Gpm)
Poor Boy Degasser	1XDFE

Fuel Tank System

Capacity	1X 30,00 Lt Tk (w) Pumps
Oil Storage	1X Oil Storage skid

Mud Pumps

Capacity	(2)1,000hp Detroit Diesel, MTU 12V PZ-8 triplex mud pumps 4" L 5K psi (189 GPM@ 145 strokes) 7" L 1,996 psi (580 GPM @ 145 strokes)

Well Control

BOP DBL(Intregrated)	(1) – 11" 5000# W.P. BOP
BOP SGL(Intregrated)	(1) – 11" 5000# W.P. BOP
BOP ANNULAR(Intregrated)	(1) – 11" 5000# W.P. BOP
BOP Accumulator	CPC 8 Station (5 in use), 80 Gallon One (1) air pilot operated remote panel
BOP Handlar	(1) Hydraulic/Air operated
BOP Positioner	(2) JDN Hoists 10 T Ea
Choke Manifold	3⅛" x 5,000 psi 4 way block (SARA)

Control CAB (Dog House)

Control Room	Three axle trailer mounted
Power	220V
	(3) 15" touch screen type Controls
	(1) Load Safe Touch Screen

Main Winch

Drum Capacity	547 ft (167 m) of 1/2" cable (12.7 mm)
Bare Drum Pull	9,600 lb (4,354 kg)

Survey Unit

Drum Capacity	25,000ft of 0.0092" wire

Generators Main

Capacity	(2) Rated @ 635kVA, 508kW, 3-phase, 415v, 50Hz,
	1500rpm,CAT C18 EUI Injection
	(w) MCC Interface 415/220V

Air System

Capacity	(2) only Champion CSE45 Rotary screw , 213cfm
	2 x Air Receivers 520 litre,1X Air Dryer DRDii095

Well Site Accomodation Trailer Design

Rig Site Office	1 x Trailer mounted 48ft x 10ft container
	(3) offices
Rig Site Office / Cribroom	1 x Trailer mounted 45ft x 10ft container
	site cribroom / three (3) office block
Rig Site Accommodation	2 x Trailer mounted 45ft x 10ft container
	of 4 x double bedroom with shared ensuite
Rig Site Water Storage	10,000 litre potable water tank
Rig Site Power	with 1 x 80kVA generator
Rig Site Sewage	1 x Sewage Treatment Plant

3.2 SUMMARY OF DAILY DRILLING REPORTS AND RELATED OPERATIONS

Table 1 lists a summary of the daily drilling activities on Velkerri 76 S2-1. Detailed Daily Drilling Reports (DDR) are provided in Appendix 1 and Daily Geological Reports (DGR) are provided in Appendix 2. A time versus depth curve is shown below in Figure 2.

Table 1. Summary of Daily Drilling Reports and related activities

DDR #	Report Period		Depth Progress (m)	24hr Operations Summary
	Start Date	End Date		
1	12/08/2021	13/08/2021	34.3	Rig accepted 08:00 hrs. Repaired Geoservices Mudloggers power/ UPS issue. Spudded Velkerri 76 S2 and drilled 22" Conductor hole with 18 5/8" casing from 18.7m TVDRT to 24m TVDRT. Broke out and laid out casing joint with US thread. Continued to drill 22" conductor from 24m TVDRT to 53m TVDRT
2	13/08/2021	14/08/2021	40	Continued to drill 22" conductor from 53m TVDRT to 86m TVDRT. Total losses. Drilled from 86m TVDRT to 93m TVDRT. High torque and overpull. Worked pipe. Pumped 2 x sweeps. POOH to 71 mTVDRT. RIH to 82m TVDRT. Changed out rotary hose swivel joint. Pumped 30Bbls of KCL - Sap sweep down the annulus. Continued to wash and ream down from 82m TVDRT to 90.5m TVDRT. Troubleshot rig ESD shut down. Continued to wash and ream from 89mTVDRT to 90.8m TVDRT.
3	14/08/2021	15/08/2021	73	Washed and reamed down from 90.8m TVDRT to 93m TVDRT. Drilled from 93m TVDRT to 109 m TVDRT. Trouble shot ESD shut down issues. Drilled from 109m TVDRT to 140m TVDRT. Serviced Rig. Drilled from 140m TVDRT to 155m TVDRT. Continued to drill with reduced parameters due to low water volume on location from 155m TVDRT to 166m TVDRT
4	15/08/2021	16/08/2021	1.3	Continued to drill with reduced parameters due to low water volume on location from 166m TVDRT to 167m TVDRT. POOH to 160 mTVDRT. Built water stocks. RIH to 167m TVDRT and attempted to drill ahead without success
5	16/08/2021	17/08/2021	2.05	Attempted to drill 22" conductor from 167.33m TVDRT to 167,50m TVDRT. Built water stocks. Attempted to drill from 167.50m TVDRT to 167.61m TVDRT. Observed small increase in ROP. Continued drilling ahead to 169.35m TVDRT. Picked up to 160m TVDRT and built water stocks.
6	17/08/2021	18/08/2021	2.87	Continued to build water stocks. Drilled 22" conductor from 169.35m TVDRT to 172.22 m TVDRT. Built water stocks. MOC approved. Mixed 2 x cement spacers. Commenced Conductor cementing operations at 170mTVDRT. WOC.
7	18/08/2021	19/08/2021	0	Cemented conductor. Waited on cement to reach 500psi compressive strength. Troubleshot removal of casing collar due to visible leak at surface. Made up new casing collar and test assembly. Attempted to pressure test casing with rig pressure test unit.
8	19/08/2021	20/08/2021	0	Pressure tested casing to 300psi. Performed conductor top up cement job - no returns to surface. Waited on cement. Rough cut casing. Rigged down CRT and Sampson posts. Continued with top up of annulus - no returns to surface. Waited on Schlumberger to reset hours.
9	20/08/2021	21/08/2021	0	Completed top up job on 18 5/8" casing - cement to surface. Cut and dressed conductor. Waited on transport of TDS motor for repair. Commenced installation of TDS motor.
10	21/08/2021	22/08/2021	0	Completed installation and function tested TDS motor. Installed new swivel to standpipe and pressure tested surface lines. Made up 17 1/2 BHA to 6m. Repaired ESD's. Made up BHA to 145.3m TVDRT, tagged closing plug. Drilled out float and shoe track from 145.3m TVDRT to 157m TVDRT.
11	22/08/2021	23/08/2021	27.78	Drilled out float and shoe track to 172.22m TVDRT. Encountered total losses at 172.80m TVDRT. Continued drilling 17 1/2" Surface hole pumping Hi vis LCM sweeps to 200m TVDRT. Spotted hi 35bbl hi vis LCM pill. Troubleshot rig top drive

				link tilt issues. Attempted to POOH, encountered 60k overpull and identified blocked string. POOH to surface. Laid out BHA. Cleaned out LCM between the float and the bit. RIH with 4 1/2" open end drill pipe to 160m TVDRT.
12	23/08/2021	24/08/2021	0	POOH with plugged cement stinger. RIH with the 17 1/2" Clean out BHA. Washed to bottom and circulated well bore. POOH and laid out BHA. RIH to 198m TVDRT with the 4 1/2" cement stinger. Pumped 60bbl balanced plug #1. POOH to 130m TVDRT. Circulated 1 x hole volume. Waited on cement. RIH and tagged TOC at 172.80m TVDRT. Waited on Schlumberger due to fatigue hours
13	24/08/2021	25/08/2021	0	Pumped LC Cement plug #2. WOC. Tagged TOC at 178.3 mTVDRT. Pumped LC Cement #3. POOH. Topped up well with 83 bbls. Troubleshoot Iron Roughneck communication. Made up and ran in hole with 17 1/2" surface BHA.
14	25/08/2021	26/08/2021	29	Made up 17.5" bha and RIH. Washed down from 87m to tag TOC @ 169.8 m TVDRT. Drilled 3 x cement plugs from 169.8m TVDRT to 200m TVDRT. Total losses at 173.51m TVDRT. Cavern from 173.51m to 174.60 m. Pumped Hi Vis sweeps. Pason drilling recording system down. Drilled From 200m to 262m TVD
15	26/08/2021	27/08/2021	73	Trouble shoot mud pump #3 Drill 17 1/2" hole F 262m TVD to 300m TVD Build water volume Drill 17 1/2" hole F 300m TVD to 335m TVD
16	27/08/2021	28/08/2021	33	Drill 17 1/2" hole from 335m TVD to 340m TVD Build water volume Continued to Drill 17 1/2" surface hole from 340mMD to 368mMD Section TD. Circulated hole clean. Commenced to pull out of hole to surface
17	28/08/2021	29/08/2021	0	POOH 17 1/2" BHA and lay out. Wire line caliper run Perform wiper Trip Rig up 13 3/8" casing equipment Make up and RIH 13 3/8 casing shoe track
18	29/08/2021	30/08/2021	0	Run 13 3/8" casing to TD Perform 13 3/8" 2 stage cement job Pressure test suface Equipment Install side outlet valves on well head and pressure test
19	30/08/2021	31/08/2021	0	Installed BOP to well head Pressure test choke and kill manifold Fabricate catch can and bell nipple to suit BOP and flow line. Drill and install mouse Prep new mud pump for installation Open upper and lower bonnets on BOP inspect all bonnet seals and remove preservation grease. Swap out rams blocks from upper to lower ram blocks.
20	31/08/2021	01/09/2021	0	Make up BOP test tool and attempt to land out in well head Unsuccessful Lay out test tool. Pressure test Mud pump 4" valves Trouble shoot BOP variable rams Fabricate new bell nipple Install wear bushing
21	01/09/2021	02/09/2021	0	Installed catch can, bell nipple and flow line to the top of the BOP Made up stage tool drill out assembly Drill out stage tool Rigged up wire line for CBL log
22	02/09/2021	03/09/2021	0	Continue CBL wire line log Rig down wire line Attempt to get a pressure test on BOP Change out liners on mud pumps from 6.5" to 6"

23	03/09/2021	04/09/2021	0	Pressure tested BOP Pressure tested casing 1220pis/20min Made up 12.25" BHA and RIH
24	04/09/2021	05/09/2021	0	Performed BOP drawn down test Cement top up job 13 3/8" csg Waited on cement to reach 100psi compressive strength. Drilled out float collar and shoe track
25	05/09/2021	06/09/2021	0	Continue to drill shoe track to 1m above the shoe Displace well to 9.6ppg Perform FIT finger print test Install new 4.5" VBRs Pressure test upper and lower rams Wait on approval to drill out shoe track
26	06/09/2021	07/09/2021	0	Waiting on 4 1/2'' BOP pipe rams replacements parts and seals. Offline- Silver City doing PM's and rig servicing.
27	07/09/2021	08/09/2021	0	Waiting on 4 1/2'' BOP pipe rams replacements parts and seals. Offline- Silver City doing PM's and rig servicing.
28	08/09/2021	09/09/2021	0	Wait on 4 1/2'' BOP pipe rams replacements parts and seals. Install new 4.5" upper ram elements and pressure test Drill 3m of new formation and performed leak-off test Drill 12.25" intermediate section to section TD
29	09/09/2021	10/09/2021	33	Drill intermediate hole section from 371mMD to 404mMD
30	10/09/2021	11/09/2021	10	Drill intermediate hole section from 404mMD to 414mMD POOH from 414mMD to 18m Repair lower iron rough neck jaw body
31	11/09/2021	12/09/2021	0	POOH 12.25" BHA replace bit Perform junk basket round trip RIH 12.25" BHA to 414m Continue to drill intermediate hole to section TD.
32	12/09/2021	13/09/2021	268	Continue to drill intermediate hole to section TD. POOH to surface lay out BHA Run 9.625" casing
33	13/09/2021	14/09/2021	0	Continue to drill intermediate hole to section from 635m to 682mMD. POOH to surface after drill string failed. Run in hole with over shot to retrieve fish. Latched fish with overshot. TOOH to 321mMD with fish.
34	14/09/2021	15/09/2021	0	POOH with fish. Troubleshot iron roughneck breakout issues. Identified damage to multiple drill collars. Strapped and prepared 12.25" intermediate BHA. RIH 12.25" BHA to 230mMD.
35	15/09/2021	16/09/2021	68	RIH 12.25" BHA to 682mMD. Continued to drill intermediate hole to section 750mMD TD. POOH 12.25" BHA to 83mMD.
36	16/09/2021	17/09/2021	0	POOH from 83mMD to surface. Rigged up and ran 9.625" intermediate casing. Conducted intermediate cement job. Waited on cement.
37	17/09/2021	18/09/2021	0	Rigged down Schlumberger cement head and hardlines. Completed wellhead pack off operations. Performed subsequent BOP testing. Attempted intermediate casing pressure test. Made up and RIH with the 8 1/2" production hole BHA to 54mMD.
38	18/09/2021	19/09/2021	44	RIH from 54mMD to 712.46mMD tagged the top plug. Conducted a dynamic choke drill and baseline FIT.

				Pressure tested the 9.625" casing to 3500psi. Drilled out the float/shoe track and 3m of new formation to 753mMD. Conducted a LOT. Commenced drilling the 8 1/2" production hole towards core point from 753mMD to 794mMD.
39	19/09/2021	20/09/2021	132	Continued to drill 8 1/2" production hole from 794mMD to 926mMD. Maroak Sandstone intersected at 913mMD.
40	20/09/2021	21/09/2021	42	Continued to drill 8 1/2" production hole from 926mMD to 968mMD
41	21/09/2021	22/09/2021	67	Continued to drill 8 1/2" production hole from 968mMD to 1035mMD
42	22/09/2021	23/09/2021	60	Continued to drill 8 1/2" production hole from 1035mMD to 1095mMD
43	23/09/2021	24/09/2021	68	Continued to drill 8 1/2" production hole from 1095mMD to 1163mMD
44	24/09/2021	25/09/2021	90	Continued to drill 8 1/2" production hole from 1163mMD to 1253mMD. Maximum Gas 2.72% @ 1266m MD Pason LagD.
45	25/09/2021	26/09/2021	126	Continued to drill 8 1/2" production hole from 1253mMD to 1379mMD.
46	26/09/2021	27/09/2021	137	Continued to drill 8 1/2" production hole from 1379mMD to 1516mMD
47	27/09/2021	28/09/2021	130	Continued to drill 8 1/2" production hole from 1516mMD to 1646mMD
48	28/09/2021	29/09/2021	168	Continued to drill 8 1/2" production hole from 1646mMD to 1814mMD.
49	29/09/2021	30/09/2021	94	Continued to drill 8 1/2" production hole from 1814mMD to 1908mMD.
50	30/09/2021	01/10/2021	18.4	Continued to drill 8 1/2" production hole from 1908mMD to 1926mMD. Circulated B shale bottom's up and confirmed core point at 1926mMD. Circulated and conditioned mud. TOOH from 1926 to surface back reaming 2 degree doglegs between 1909mMD to 1882mMD and 1776mMD to 1737mMD
51	01/10/2021	02/10/2021	0	Laid out 8 1/2" production hole BHA. Rigged up and RIH with the 8 1/2" core assembly to 923mMD. Pumped and reamed in hole from 923mMD to 1269mMD. Continued to RIH from 1269mMD to 1600mMD.
52	02/10/2021	03/10/2021	23.6	Washed and reamed in hole with the 8 1/2" core assembly from 1600mMD to 1680mMD. Conducted daily rig service. Continued to wash and ream in hole from 1680mMD to 1926.40mMD tagged bottom. Commenced coring the Velkerri B shale from 1926.40mMD to 1950mMD. Identified fluctuation in down hole differential pressure. Consulted with OE drilling superintendent. The decision was made to conduct a pull test which showed zero overpull indicating the core was not connected to the well bore. Circulated bottom's up. Flow checked well and commenced POOH from 1950mMD to 1855mMD.
53	03/10/2021	04/10/2021	0	POOH with the 8 1/2" core assembly from 1855mMD to 101mMD. Retrieved inner core barrels. Commenced to make up coring BHA and RIH. Core drilled- 23.6m Core retrieved - 21.27m Core recovery - 90%
54	04/10/2021	05/10/2021	17	RIH to core depth 1950m. Commence coring the Velkerri B Shale. Cut core from 1950m to 1967mMD
55	05/10/2021	06/10/2021	55	Cored the Velkerri B Shale from 1967m to 2022mMD. POOH with coring assembly at a controlled rate. Core drilled- 72m Core retrieved - 72.19m Core recovery - 101%
56	06/10/2021	07/10/2021	0	POOH with coring assembly at a controlled rate Laid out inner and outer core barrels Pressure tested BOP and surface equipment
57	07/10/2021	08/10/2021	0	Pressure test BOP and surface equipment Made up 8.5" production BHA and RIH to drill to 920mMD
58	08/10/2021	09/10/2021	106	Continue to RIH from 920m to 1926mMD Re - log using LWD from 1926m to 2022mMD

				Drill 8.5" production hole to 2127mMD section TD
59	09/10/2021	10/10/2021	0	POOH with 8.5" drilling BHA F 2128mMD Rig up wireline Commence wire line logging operations Run 1: PEX-HNGS-HRLA-PCC
60	10/10/2021	11/10/2021	0	Continue wire line logging operations completed run #1 an # 2 (Run # 2 S1R2-PCC SS-FMI-HD) Continue log #3 S1R3-PPC-CMR-NEXT
61	11/10/2021	12/10/2021	0	Completed wire line logging run # 3 Rigged up to run 5.5" casing Run 5.5" casing to 481m
62	12/10/2021	13/10/2021	0	Remove damaged Volant tool Install casing bails and elevators. Continue to run 5.5" casing
63	13/10/2021	14/10/2021	0	Continue to run 5.5" casing to setting depth. Cement 5.5" casing Pressure test casing to 3500psi Installed seal assembly and pressure tested 10,000psi Commenced rig out for 3rd party and SCD equipment
64	14/10/2021	15/10/2021	0	Nipple down BOP Nipple down double gates from mud cross Nipples down mud cross from single gates Pressure wash and preserve cavities and seals. Close bonnets and torque bolts Rig down koomey unit lines clean and stow away. Install C - section of well head and pressure test Load out 3rd party equipment from location
65	15/10/2021	16/10/2021	0	SCD continue to rig down drilling equipment Cleaning out mud tanks Install lubricator and remove BPV on well head Rig Release

3.3 PLANNED AND ACTUAL TIME VERSUS DEPTH

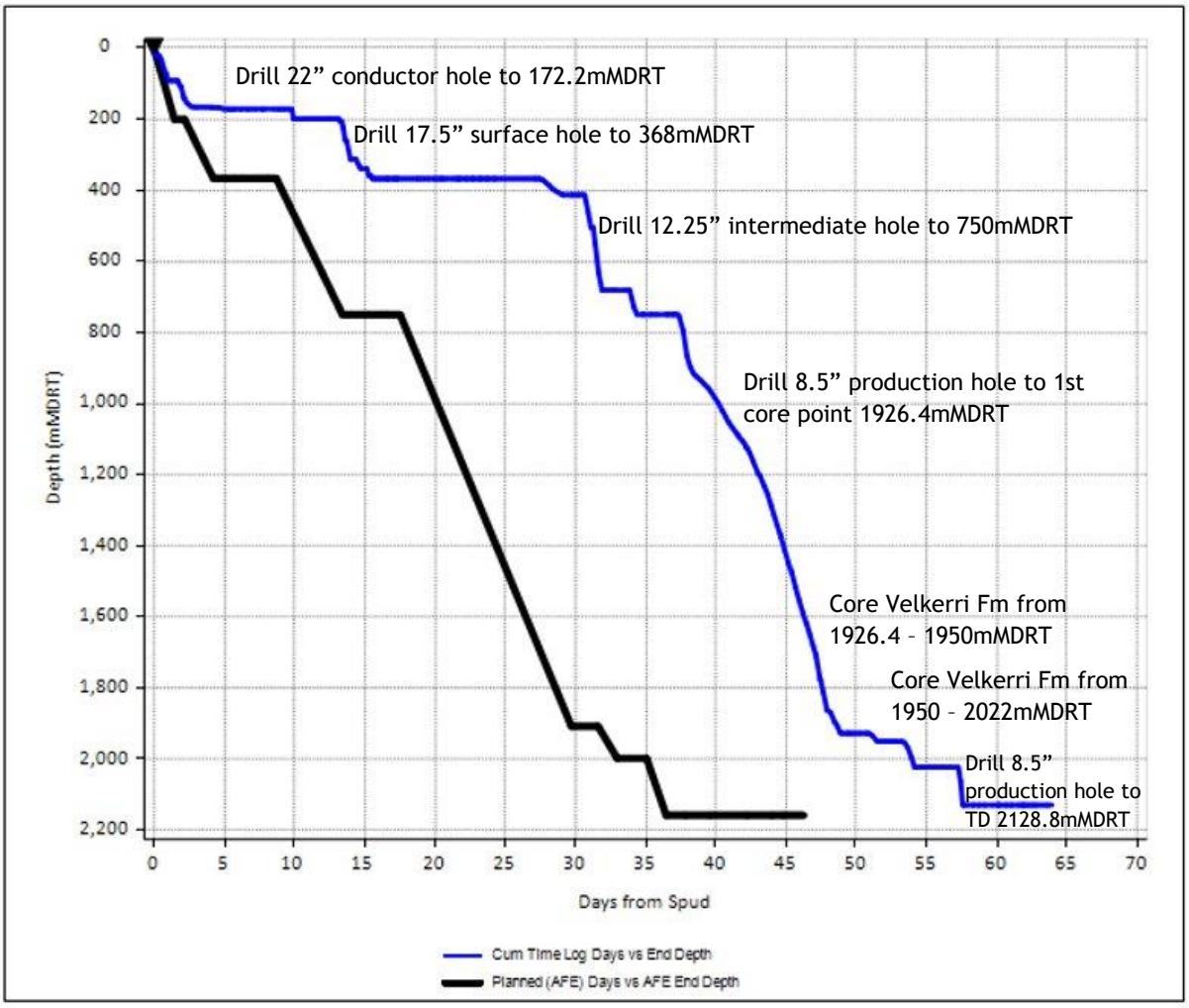

Figure 2. Velkerri 76 S2-1 Actual and planned Time vs Depth curves

3.4 HOLE SIZES AND DEPTHS

Details of hole sizes and depths are provided in Table 2. Velkerri 76 S2-1 as drilled schematics showing hole size and depths is provided in Figure 3.

Table 2. Velkerri 76 S2-1 hole size and depth details

Type	Hole Size (inches)	Depth From (mMDRT)	Depth To (mMDRT)	Rig
Conductor	22	18.7	172.22	Silver City Rig 40
Surface	17 ½	172.22	368	Silver City Rig 40
Intermediate	12 ¼	368	750	Silver City Rig 40
Production	8 ½	750	2128	Silver City Rig 40

3.5 CASING AND EQUIPMENT INSTALLED IN OR ON THE WELL

Table 3 summarizes the casing and equipment installed in or on Velkerri 76 S2-1. Velkerri 76 S2-1 as drilled schematics showing the casing and equipment dimension is provided in Figure 3 & Figure 4. Detailed Casing information is attached in Appendix 3.

Table 3. Velkerri 76 S2-1 casing details

Type	Hole Size (“)	Casing Size OD (”)	Casing Size ID (“)	Weight (lb/ft)	Grade	Thread	Shoe Depth (mMDRT)
Conductor	22	18.625	17.831	87.5	K-55	BTC	170
Surface Casing	17 ½	13.375	12.415	68	L-80	BTC	364.97
Intermediate	12 ¼	9.625	8.681	47	P-110	JFE BEAR	747.14
Production	8 ½	5.5	4.67	23	P-110	JFE BEAR	2123.19

3.6 CEMENTING OPERATIONS CARRIED OUT

Detailed cementing operations can be found in the Daily Drilling Reports (Appendix 1) and the cementing reports (Appendix 4).

3.7 DRILLING FLUIDS

M-I SWACO (Schlumberger) was contracted to supply and maintain drilling fluids in Velkerri 76 S2-1. A summary of drilling fluids operations can be found in Appendix 6.

3.8 WELL SCHEMATIC AND WELL HEAD SPECIFICATIONS

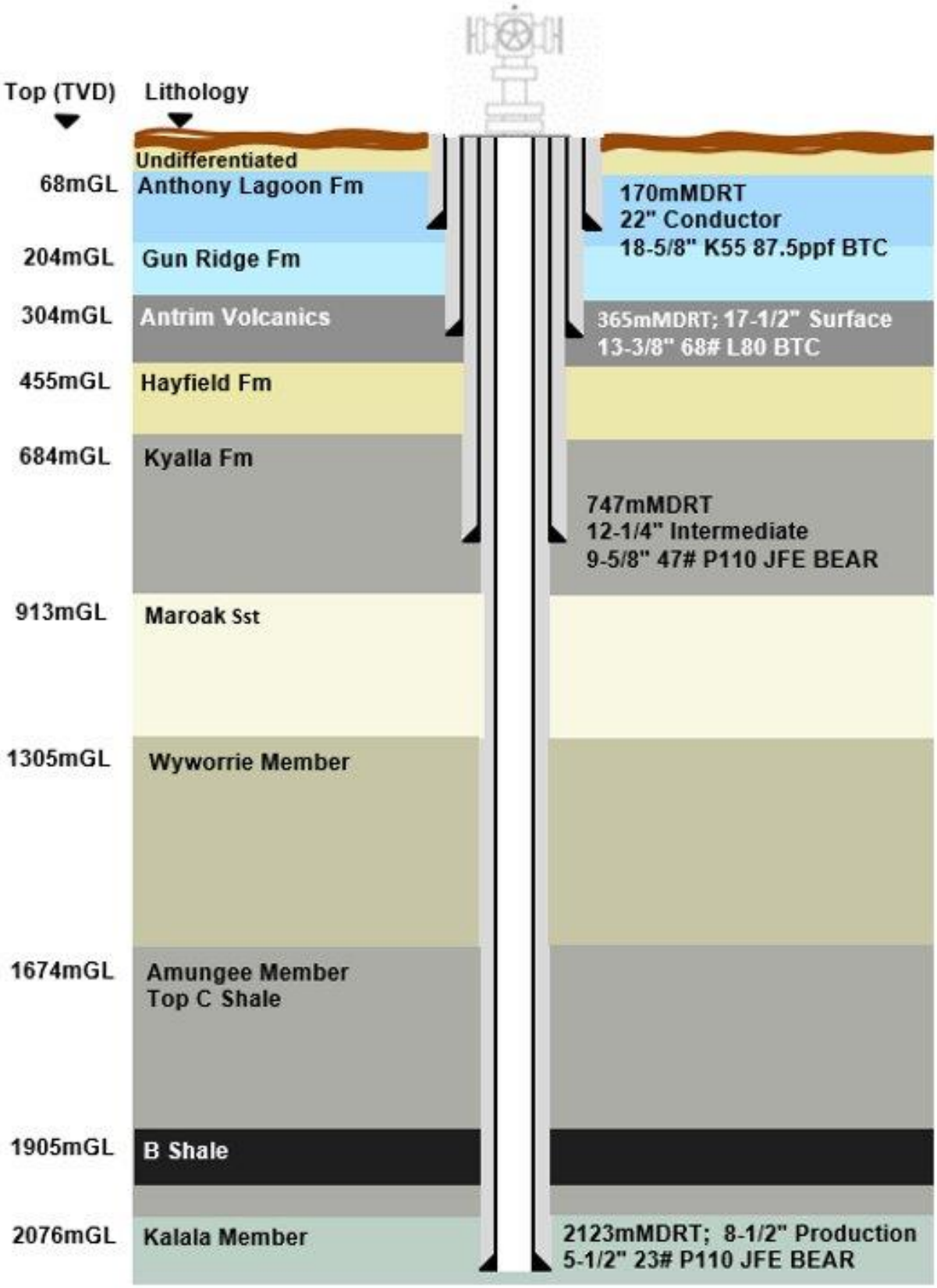

Figure 3. Velkerri 76 S2-1 as drilled schematic

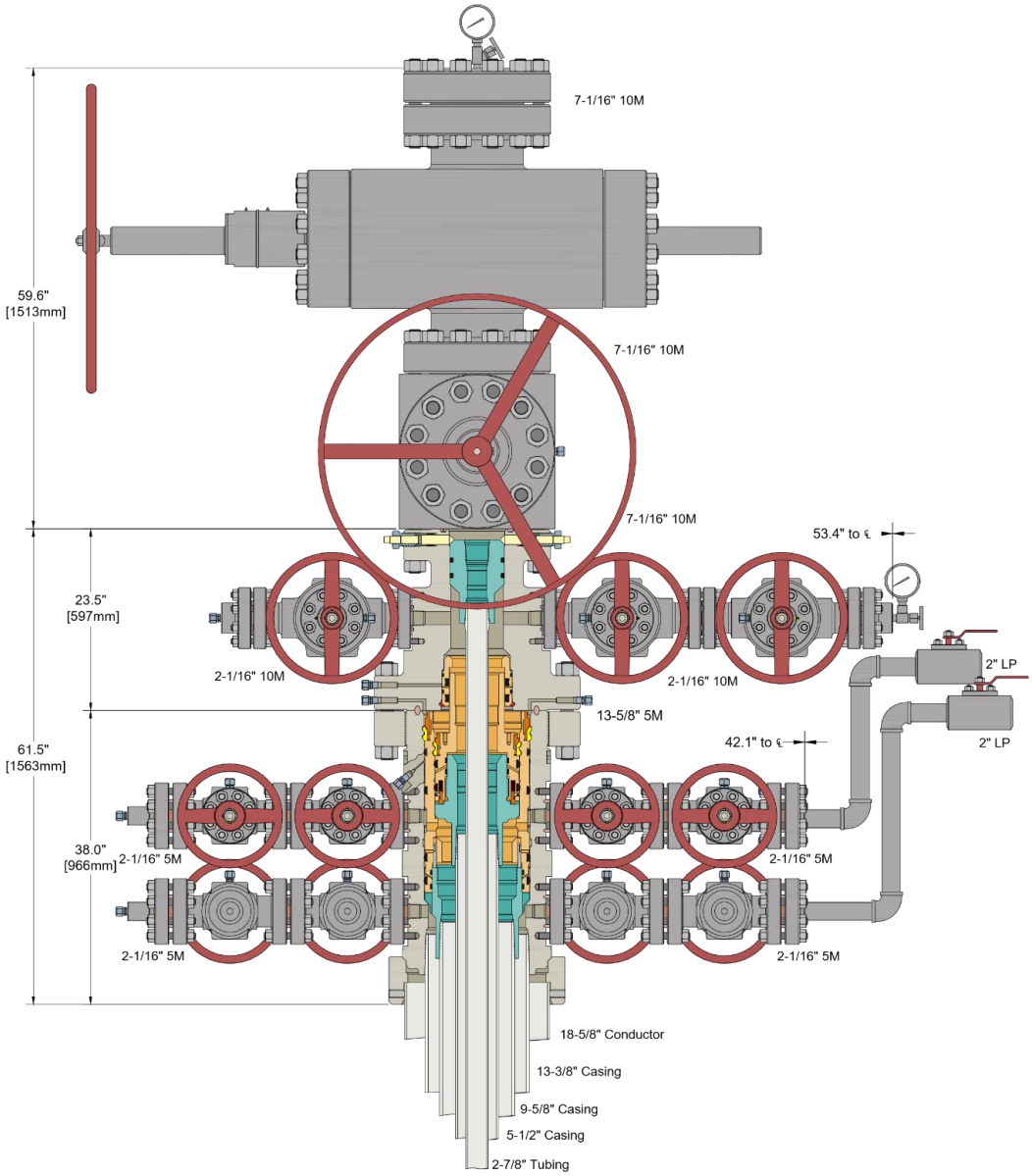

Figure 4. Velkerri 76 S2-1 installed wellhead equipment schematic (13-5/8" 5M RSH-2 well head assembly with 7-1/16 10M tree)

Figure 5. Velkerri 76 S2-1 installed wellhead equipment photo

Table 4. Velkerri 76 S2-1 installed wellhead equipment specifications

D SECTION				
Des	Model	SN	WP (psi)	Make
Upper Master Valve	7-1/16" 10M			CACTUS
C SECTION				
Des	Model	SN	WP (psi)	Make
Master Valve	7-1/16" 10M			GE OIL & GAS
B SECTION				
Des	Model	SN	WP (psi)	Make
Wing Valve	2-1/16" 10M, API FLG			VAULT
Wing Valve	2-1/16" 10M, API FLG			VAULT
Wing Valve	2-1/16" 10M, API FLG			VAULT
Wing Valve	2-1/16" 10M, API FLG			VAULT
Tubing Head	13-3/8" 5M x 7-1/16" 10M w/ 2-1/16" 10M SO			VAULT
Blind Flange	2-1/6" 10M x 1/2" LP			VAULT
A SECTION				
Des	Model	SN	WP (psi)	Make
Landing Ring	RSH, 18-5/8 SLIP-ON X 22.62 OD, 18.25 TOP RSH LANDING PROFILE, C/W 6 SET SCREWS, W/O O-RING SEAL, 1			VAULT
Casing Head	13-5/8 5M X 13-3/8 BC BTM, W/4 x 2-1/16 5M FP		5,000.0	VAULT
Wing Valve	2-1/16" 5M, API FLG			VAULT
Wing Valve	2-1/16" 5M, API FLG			VAULT
Wing Valve	2-1/16" 5M, API FLG			VAULT
Wing Valve	2-1/16" 5M, API FLG			VAULT
Casing Hanger	R221931-1 RSH-2,FLUTED, 13-5/8 X 9-5/8 47 PPF JFE BEAR BOX BTM, W/10.250-4TPI STUB ACME-2G-LH BO		5,000.0	VAULT
9-5/8" Packoff	H371578-1 RSH-2-N, FLUTED, 13-5/8, 11 BOWL, F/MANDREL HGR, W/11.375-4 STUB ACME-2G LH		5,000.0	VAULT
Wing Valve	2-1/16" 5M, API FLG			VAULT
Wing Valve	2-1/16" 5M, API FLG			VAULT
Wing Valve	2-1/16" 5M, API FLG			VAULT
Wing Valve	2-1/16" 5M, API FLG			VAULT
Casing Hanger	CSGHGR, BHGE, RSH-UPR-RT, 7-5/8, 11 X 5-1/2 23 PPF JFE BEAR BOX BTM X 8.125-4TPI ACME-2G PIN TOP			VAULT
5-1/2" Packoff	RSH-2-N-UPR-SN, 7, 15M, 11 X 7-5/8, W/ 5.500-4 STUB ACME-2G LH THD			VAULT

3.9 BHA RECORDS

Table 5. Velkerri 76 S2-1 BHA summary (pg 1 / 2 – see Table 6 for 2 / 2)

Bit Run	BHA #	String Name	BHA	Drill Bit	Bit Dull	Depth In (mKB)	Depth Out (mKB)	Drilled (m)	Drill Time (hr)	BHA ROP (m/hr)
1	1	Slick	Weatherford DPA8619X, 22" Casing Drilling Bit, 18-5/8" Casing, Dual Float Collar, 18-5/8" Casing	22in, Weatherford, DPA8619X, 94631380-2	-------LIH	18.70	172.22	153.52	71.50	2.1
2	2	Packed Hole	Hughes Christensen VM-28GDX1, Bit Sub, Shock Sub, 9.5" Drill Collar, 17-3/8" IB Stab, Cross Over, XEM800+ Gap Sub with Gamma, Cross Over, 9.5" Drill Collar, 17-3/8" IB Stab, Cross Over, 8" Drill Collar, Bottle Neck XO, 6.5" Drill Collar, XO Sub, Heavy Weight Drill Pipe, Drill Pipe	17 1/2in, Hughes Christensen, VM-28GDX1, 5310037	0-0-NO-A-1-0-PN-HP	172.22	200.00	27.78	4.00	6.9
3R R1	3	Cleanout Assembly	Hughes Christensen VM-28GDX1, Bit Sub, Shock Sub, 9.5" Drill Collar, 9.5" Drill Collar, Cross Over, 8" Drill Collar, Bottle Neck XO, 6.5" Drill Collar, XO Sub, Heavy Weight Drill Pipe	17 1/2in, Hughes Christensen, VM-28GDX1, 5310037	0-0-NO-A-1-0-NO-BHA					
4R R2	4	Packed Hole	Hughes Christensen VM-28GDX1, Bit Sub, Shock Sub, 9.5" Drill Collar, 17-3/8" IB Stab, Cross Over, XEM800+ Gap Sub with Gamma, Cross Over, 9.5" Drill Collar, 17-3/8" IB Stab, Cross Over, 8" Drill Collar, Bottle Neck XO, 6.5" Drill Collar, XO Sub, Heavy Weight Drill Pipe, Drill Pipe	17 1/2in, Hughes Christensen, VM-28GDX1, 5310037	1-1-NO-A-E-1-NO-TD	200.00	368.00	168.00	29.50	5.7
5R R3	5	Slick	Hughes Christensen VM-28GDX1, Bit Sub, Cross Over, Cross Over, 8" Drill Collar, Bottle Neck XO, 6.5" Drill Collar, XO Sub, Heavy Weight Drill Pipe, Drill Pipe	17 1/2in, Hughes Christensen, VM-28GDX1, 5310037	1-1-NO-A-E-1-NO-TD					
6	6	Slick	Baker Hughes Used bit ST drillout, Bit Sub, 8" Drill Collar, Bottle Neck XO, 6.5" Drill Collar, XO Sub, Heavy Weight Drill Pipe, Drill Pipe	12 1/4in, Baker Hughes, Used bit ST drillout, JH9637	2-2-CT-A-X-2-BT-TD					
7	7	Packed Hole	Hughes Christensen DD506TX, 12 1/8" NB stab, Float Sub, Non Mag Pong, TelePacer 8' LF, Filter Sub, 12 1/8' String Stab, 8" Drill Collar, 12-1/8" String Stab, 8" Drill Collar, Hydra-Jar, 8" Drill Collar, Bottle Neck Crossover, 6.5" Drill Collar, Misc Sub, Heavy Weight Drill Pipe, Drill Pipe	12 1/4in, Hughes Christensen, DD506TX, 5311544	8-4-BT-A-X-1-RO-PR	368.00	414.00	46.00	37.25	1.2
	8	Fishing assembly	reversing circulating sub, 8" Drill Collar, Bottle Neck Crossover, Drill Pipe		-------					
8	9	Packed Hole	Baker Hughes DD506TX, 12 1/8" NB stab, Float Sub, Non Mag Pong, TelePacer 8' LF, Filter Sub, 12 1/8' String Stab, 8" Drill Collar, 12-1/8" String Stab, 8" Drill Collar, Hydra-Jar, 8" Drill Collar, Bottle Neck Crossover, 6.5" Drill Collar, Misc Sub, Heavy Weight Drill Pipe, Drill Pipe	12 1/4in, Baker Hughes, DD506TX, 5311266	1-1-CT-N-X-0-BT-TW	414.00	682.00	268.00	25.50	10.5
	10	Fishing assembly	Overshot, Bottle Neck Crossover, Drilling Jars - Hydraulic, 6.25" Drill Collar, HWDP, Drill Pipe		-------					
9R R1	11	Packed Hole	Baker Hughes DD506TX, 12 1/8" NB stab, Float Sub, Non Mag Pong, TelePacer 8' LF, Filter Sub, 8" Drill Collar, 12-1/8" String Stab, 8" Drill Collar, Bottle Neck Crossover, 6.5" Drill Collar, Hydra -Jar, 6.5" Drill Collar, XO Sub, Heavy Weight Drill Pipe, Drill Pipe	12 1/4in, Baker Hughes, DD506TX, 5311266	1-1-CT-N-X-0-BT-TD	682.00	750.00	68.00	12.25	5.6
10	12	Packed Hole	Baker Hughes DD407TX, Mud Motor (GG002), 8 3/8" String Stab, Float Sub, NMDC Pony, TelePacer 8' LF, XO Sub, Filter Sub, 8 3/8" String Stab, XO Sub, 6.5" Drill Collar, Hydra-Jar, 6.5" Drill Collar, XO Sub, Heavy Weight Drill Pipe, Drill Pipe	8 1/2in, Baker Hughes, DD407TX, 5319244	1-1-BT-N-X-0-CT-CP	750.00	1,926.40	1,176.40	237.5 5	5.0

Table 6. Velkerri 76 S2-1 BHA summary (pg 2 / 2 - see Table 5 for 1 / 2)

Bit Run	BHA #	String Name	BHA	Drill Bit	Bit Dull	Depth In (mKB)	Depth Out (mKB)	Drilled (m)	Drill Time (hr)	BHA ROP (m/hr)
11	13	Coring Assembly	Halliburton FC3043i, Stabiliser, Outer Tube, Stabiliser, Outer Tube, Stabiliser, Outer Tube, Stabiliser, Outer Tube, Stabiliser, Outer Tube, Stabiliser, Outer Tube, Stabiliser, Outer Tube, Stabiliser, Outer Tube, Stabiliser, Outer Tube, Stabiliser, Outer Tube, Stabiliser, Outer Tube, Stabiliser, Lower Coupling, Upper Coupling, Circulation Sub, Float Sub, XO Sub, Drill Collar, Hydra-Jar, Drill Collar, XO Sub, Heavy Weight Drill Pipe, Drill Pipe, Drill Pipe Pup, Drill Pipe Pup, Drill Pipe	8 1/2in, Halliburton, FC3043i, 13508636	1-1-CT-S-X-0-NO-HP	1,926.40	1,950.00	23.60	16.25	1.5
12 RR 1	14	Coring Assembly	Halliburton FC3043i, Stabiliser, Outer Tube, Stabiliser, Outer Tube, Stabiliser, Outer Tube, Stabiliser, Outer Tube, Stabiliser, Outer Tube, Stabiliser, Outer Tube, Stabiliser, Outer Tube, Stabiliser, Outer Tube, Stabiliser, Outer Tube, Stabiliser, Outer Tube, Stabiliser, Lower Coupling, Upper Coupling, Circulation Sub, Float Sub, XO Sub, Drill Collar, Hydra-Jar, Drill Collar, XO Sub, Heavy Weight Drill Pipe, Drill Pipe, Drill Pipe Pup, Drill Pipe Pup, Drill Pipe	8 1/2in, Halliburton, FC3043i, 13508636	1-1-BT-A-X-0-CT-TD	1,950.00	2,022.00	72.00	22.00	3.3
13	15	Packed Hole	NOV TKC66, Mud Motor (GG001), 8 3/8" String Stab, Float Sub, NMDC Pony, TelePacer 8' LF, XO Sub, Filter Sub, 8 3/8" String Stab, XO Sub, 6.5" Drill Collar, Hydra-Jar, 6.5" Drill Collar, XO Sub, Heavy Weight Drill Pipe, Drill Pipe	8 1/2in, NOV, TKC66, E264057	1-2-BT-S-X-0-CT-TD	2,022.00	2,128.00	106.00	7.50	14.1

3.10 BIT RECORDS

Bit records and drilling parameters are summarised in Table 7 below and detailed in Appendix 5.

Table 7. Velkerri 76 S2-1 Bit records summary

BHA #	Bit Run	Size (in)	Make	Model	SN	IADC Codes	TFA (incl Noz) (in²)	Nozzles (1/32")	Depth In (mKB)	Depth Out (mKB)	Drilled (m)	Drill Time (hr)	BHA ROP (m/hr)	WOB Max (1000 lbf)	WOB Min (1000 bf)	Max RPM (rpm)	Min RPM (rpm)	Bit Dull
1	1	22	Weatherford	DPA8619X	94631380-2	S223	0	14/14/14/14/14/14/14/14/14/14/14/14/14	18.7	172.22	153.52	94.75	1.6	35	4	60	40	--------LIH
2	2	17 ½	Hughes Christensen	VM-28GDX1	5310037	_525	1.31	16/22/22/22	172.22	200	27.78	4	6.9	25	1	70	60	0-0-NO-A-1-0-PN-HP
3	3RR1	17 ½	Hughes Christensen	VM-28GDX1	5310037	_525	1.31	16/22/22/22										0-0-NO-A-1-0-NO-BHA
4	4RR2	17 ½	Hughes Christensen	VM-28GDX1	5310037	_525	1.31	16/22/22/22	200	368	168	29.5	5.7	46	15	80	70	1-1-NO-A-E-1-NO-TD
5	5RR3	17 ½	Hughes Christensen	VM-28GDX1	5310037	_525	1.31	16/22/22/22										1-1-NO-A-E-1-NO-TD
6	6	12 ¼	Baker Hughes	Used bit ST drillout	JH9637	—												2-2-CT-A-X-2-BT-TD
7	7	12 ¼	Hughes Christensen	DD506TX	5311544	M323	0.9	14/14/14/14/14/14	368	414	46	37.25	1.2	40	10	140	80	8-4-BT-A-X-1-RO-PR
8	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
9	8	12 ¼	Baker Hughes	DD506TX	5311266	M323	0.9	14/14/14/14/14/14	414	682	268	25.5	10.5	25	15	130	100	1-1-CT-N-X-0-BT-TW
10	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
11	9RR1	12 ¼	Baker Hughes	DD506TX	5311266	M323	0.9	14/14/14/14/14/14	682	750	68	12.25	5.6	25	25	150	150	1-1-CT-N-X-0-BT-TD
12	10	8 ½	Baker Hughes	DD407TX	5319244	M333	0.77	12/12/12/12/12/12/12	750	1,926.40	1,176.4	237.6	5	38	6	166	93	1-1-BT-N-X-0-CT-CP
13	11	8 ½	Halliburton	FC3043i	13508636	M433	1.99	18/18/18/18/18/18/18/18	1,926.40	1,950.00	23.6	16.25	1.5	14	14	70	70	1-1-CT-S-X-0-NO-HP
14	12RR1	8 ½	Halliburton	FC3043i	13508636	M433	1.99	18/18/18/18/18/18/18/18	1,950.00	2,022.00	72	22	3.3	15	15	63	63	1-1-BT-A-X-0-CT-TD
15	13	8 ½	NOV	TKC66	E264057	—	0.78	13/13/13/13/13/13	2,022.00	2,128.00	106	7.5	14.1	0	0	50	50	1-2-BT-S-X-0-CT-TD

4 GEOLOGY

4.1 BEETALOO SUB-BASIN STRATIGRAPHY

The Mesoproterozoic Roper Group (Figure 6) comprises progradational cycles of mudstone and sandstone units reaching a thickness greater than 3000 m, with averages of 1500 m away from major depocenters (Abbott and Sweet, 2000). Even though the succession has yet to be fully penetrated in the deepest depocenters, individual formations can be traced across the basin showing remarkable thickness consistency and lateral continuity in seismic profiles (Munson, 2014). The first detailed stratigraphic study of the Roper Group was presented by Jackson et al. (1988) and furthered by detailed investigations from Jackson and Raiswell (1991) and Warren et al. (1998) who supplemented the pre-existing framework with additional regional and local stratigraphic, sedimentological and geochemical information. The Roper Group succession was deposited in a variety of settings within shallow-marine, and nearshore to shelf environments (Powell et al., 1987; Jackson et al., 1988; Abbott and Sweet, 2000) with organic enrichment in mudstone units confined to the Velkerri and Kyalla Formations. The sequence has been recognised as having excellent exploration potential. Within the area of the Beetaloo JV permits (EP117, EP98 and EP76) thick intervals of organically enriched Velkerri (4-8% ave. TOC %wt) and Kyalla (2-5% ave. TOC %wt) Formations source rocks are present and are currently being appraised for unconventional hydrocarbon resource's in the form of shale plays by a number of operator groups.

Within the Velkerri Formation the thickest and most prospective source rock intervals are located within the Amungee Member and can be subdivided into the A, B and C Shales (Close et al, 2016, Munson and Revie 2018). Of these of these subdivided source rock intervals the B shale has been shown from core calibrated petrophysical analysis to broadly contain the densest hydrocarbon storage. In addition, the B shale has been shown to possess the greatest known regional lateral consistency in favourable thickness and reservoir quality based on current well penetrations within the Beetaloo Sub-Basin. In place hydrocarbon phase within the A, B and C shales ranges from dry gas to volatile oil, dependent on paleo-burial history and thus geographical location within the Beetaloo Basin.

MMscf/day a IP57 of 1.1 MMscf/day and a final rate of 1.07 MMscf/day (Close et al, 2017). More recently fracture stimulation and production testing of the A, A-B, B and C shales at Tanumbirini 1, Tanumbirini-2H, Tanumbrinin-3H (2020-22) and Carpentaria-1 (2021), further proves the mobility of hydrocarbons from the Velkerri Formation, with the Carpentaria well in particular proving the mobility of liquids rich gas.

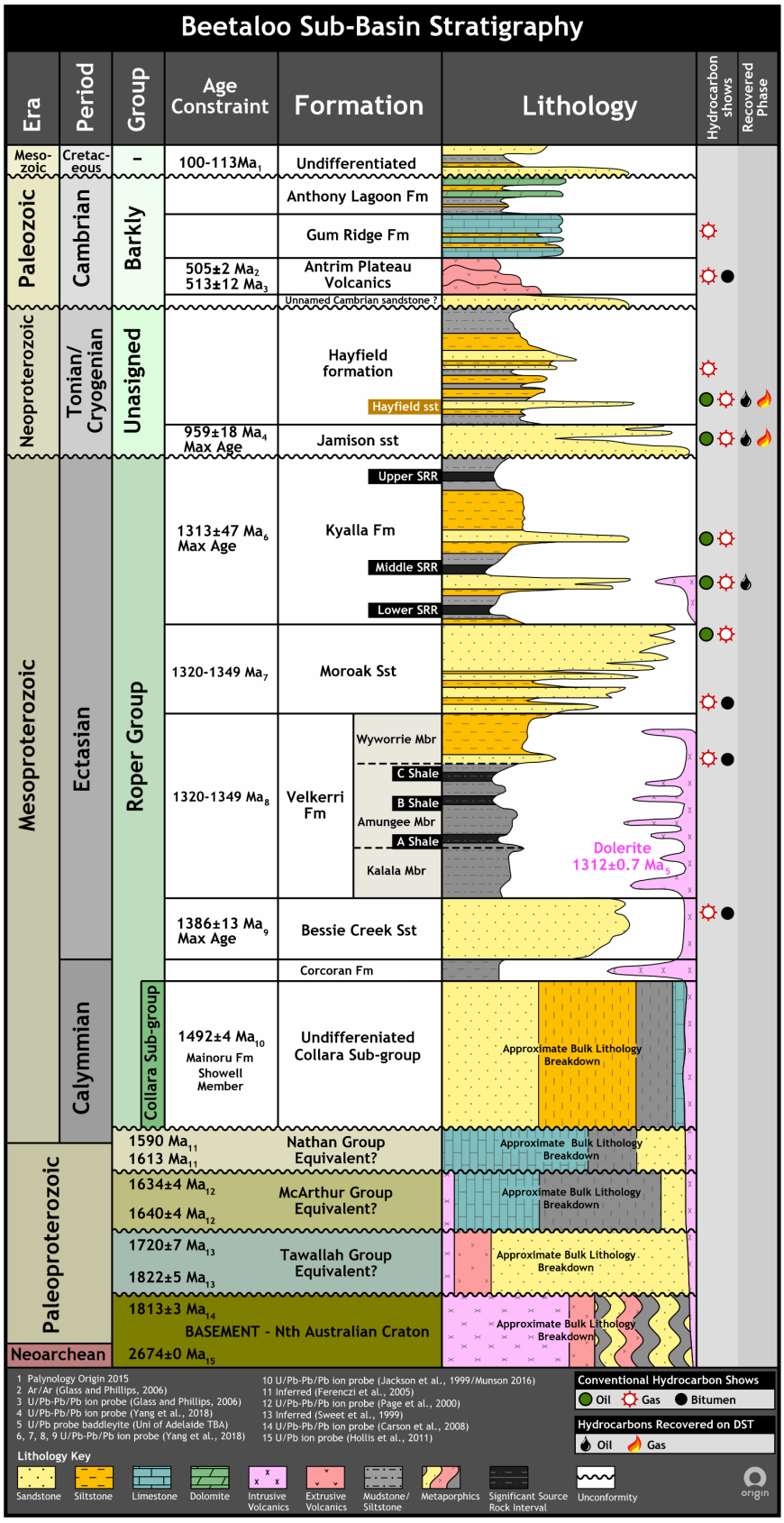

Figure 6. Generalised Beetaloo Sub-Basin Stratigraphy

The B Shale was technically appraised and proven as a viable shale play by the Amungee NW-1H lateral well which in 2016 underwent fracture stimulation and 57 day production test with a IP57 of 1.1mmscf/day. Retesting of Amungee NW-1H in 2021 over the first 23 days averaged 1.23 mmscf/day, with a Production Testing Log (PLT) demonstrated that 85-95% of the flow was originating from a 200m section of the wellbore spanning stages 8-11. This indicated a normalised flow rate of between 5.2- and 5.8 mmscf/day per 100m of horizontal section.

Within the Kyalla Formation there are three known and identified intervals of organically enriched mudstone which have been historically (Karajas & Flavelle 1995) and more recently (Altmann et at 2018) considered as potential reservoir targets shale plays. These three intervals have been named informally by Origin Energy as the lower, middle and upper Kyalla Shales, from deepest to shallowest (Altmann et al 2018). Of these three intervals, based on the current data the lower Kyalla Shale has been identified as having the greatest initial prospectivity and the greatest regional thickness and reservoir quality consistency (Altmann et al 2018). In-place hydrocarbon phase for the lower and middle Kyalla shales range from a 'wet' of condensate containing gas phase to a volatile oil phase dependant on paleo-burial history and location within the Beetaloo Basin. The upper Kyalla shale is restricted to a likely volatile oil phase in the basin centre where the base Neoproterozoic unconformity has not removed the upper Kyalla SRR hydrocarbon containing source beds. Drilling and stimulation at Kyalla 117 N2 1H ST2 (2019-2021) has proven mobility of liquids rich gas from the Lower Kyalla shale.

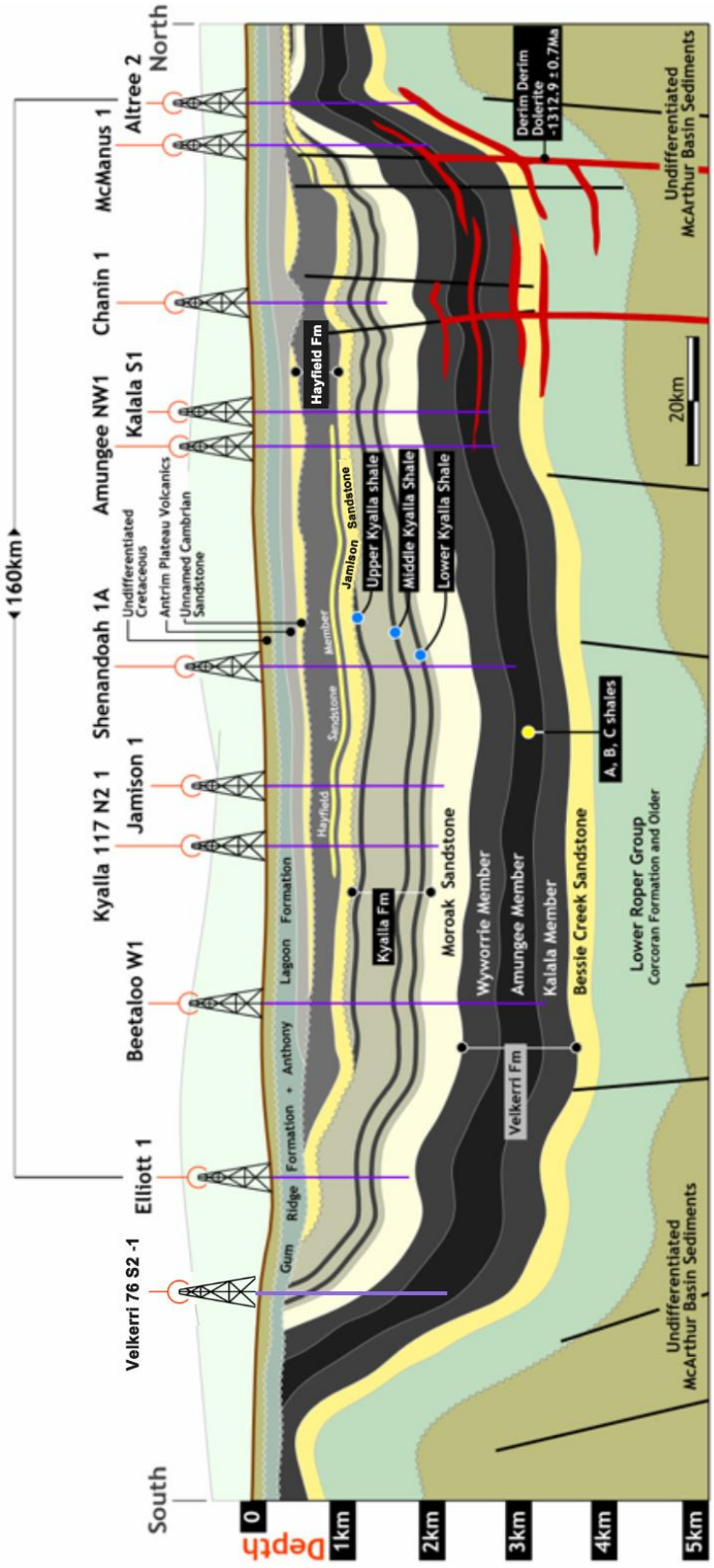

Figure 7. Beetaloo Basin Schematic North to South Cross Section

4.2 Prognosed vs Actual Stratigraphy

Table 8 - Prognosed vs Actual Stratigraphy for Velkerri 76 S2-1

Stratigraphy – Prognosed vs Actual						
Formation	Prognosed Depth		Actual Depth		Difference (-/+)	
	mTVDRT	mTVDSS	mTVDRT	mTVDSS	mTVDRT	mTVDSS
Undifferentiated Cretaceous	6.9	245.65	6.9	245.65	0	0
Anthony Lagoon Fm	68.4	184.2	61.5	191.05	-6.9	-6.85
Gum Ridge Fm	206.4	46.2	203.27	49.28	-3.13	-3.08
Antrim Plateau Volcanics	310.9	-58.4	306.96	-54.41	-3.94	-3.99
Unnamed Sst	Not Prognosed		454.82	-202.27	Not Prognosed	
Jamison Sst	441.9	-189.4	491.91	-239.36	+ 50.01	+ 49.96
Kyalla Fm	581.9	-329.4	684.39	-431.84	+ 102.49	+ 102.44
Lower Kyalla Shale (TOP)	803.9	-551.4	850.44	-597.89	+ 46.54	+ 46.49
Lower Kyalla Shale (BASE)	844.9	-592.4	873.34	-620.79	+ 28.44	+ 28.39
Moroak Sst	884.9	-632.4	913.42	-660.87	+ 28.52	+ 28.47
Velkerri Fm – Wyworrie Mbr	1164.9	-912.4	1304.4	-1051.9	+ 139.54	+ 139.49
Velkerri Fm – Amungee Mbr - C-Shale	1560.9	-	1675	-1422.4	+ 114.09	+ 114.04
Velkerri Fm – Amungee Mbr - B-C	1596.9	-	1712.6	-1460	+ 115.68	+ 115.63
Velkerri Fm – Amungee Mbr - B Shale	1888.9	-	1904.6	-1652	+ 15.69	+ 15.64
Velkerri Fm – Amungee Mbr - A-B	1956.9	-	1958.3	-1705.8	+ 1.44	+ 1.39
Velkerri Fm – Amungee Mbr - A Shale	2046.9	-	2025.6	-1773.1	-21.26	-21.31
Velkerri Fm – Kalala Mbr	2082.9	-	2056.6	-1804	-26.31	-26.36

4.3 RESERVOIR AND PROSPECTIVE HORIZONS

The geological objectives for Velkerri 76 S2-1 included the collection of core and wireline logs over the Velkerri Formation Amungee Member (primary target) and assess the thickness and organic richness of the Kyalla Formation (Secondary Target). Complete lithological descriptions of the intersected stratigraphy within Velkerri 76 S2-1 are summarized in Appendix 7.

4.3.1 Kyalla Formation

Regional Summary Description

The Kyalla Formation is a silty mudstone with thin planar interbeds of siltstone and sandstone. Intervals of fine to medium grained sandstone, up to 70 m thick have also been recorded in the lower half of the formation (Lanigan et al, 1994) with southern and eastern well penetrations (Beetaloo W-1, Elliott-1, Tanumbirini-1) to date indicating better developed intra-formational sands. This variation has been hypothesised to be associated to differences in well proximity to the paleo-sediment source

at the time of Kyalla Formation deposition. Prospective horizons within the Kyalla Formation consist of organically enriched shale intervals, with three identified prospective intervals informally referred to by Origin as the lower, middle and upper Kyalla shales.

The Kyalla Formation is extensive across the Beetaloo Sub-Basin but has been variably eroded by the base Jamison Sandstone (Base Neoproterozoic) unconformity across the broad anticlinal Arnold Arch structure and towards the edges of the Beetaloo Sub-basin. The formation is shown from 2D seismic lines and well penetrations to be best preserved within current day Beetaloo Sub-basin deeps where the least base Neoproterozoic erosion has taken place. The thickest penetrations to date within these Basin deeps have been intersected at Tanumbirini-1 (835 m) and Beetaloo W-1 (796.6 m). The Kyalla Formation was 229 m thick at Velkerri 76 S2-1. The Kyalla Formation conformably overlies the Moroak Sandstone.

Preliminary Assessment

The Kyalla Formation at Velkerri 76 S2-1 was not expected to be a commercially prospective target at the well location given the shallow depth, and maximum thermal maturity of the Lower Kyalla Shale. However, it was expected to yield information on the stratigraphic continuality and reservoir properties of the Lower Kyalla Shale which is a prospective target in the centre of EP 98 and 117.

The Lower Kyalla Shale was penetrated slightly deep to prognosis (~47m). But was found to be thinner than expected (~18m thinner). Preliminary interpretation of the wireline logs and drilling data indicates that the Lower Kyalla Shale is a moderate to poor source rock at the Velkerri 76 S2-1 location, and does not have petrophysical properties which would make it a viable shale play target in the local area. Low mud gas during drilling, and no obvious cuttings direct of crush cut fluorescence also supports this interpretation.

Maximum Thermal maturity of the Lower Kyalla Shale at Velkerri 76 S2-1 appears to be within the early oil window, although further analyses of cuttings and gas samples will be used to confirm this preliminary interpretation.

Similar to results shown at wells Ronald-1 and Burdo-1 in the north of the Beetaloo (Figure 1), the Lower Kyalla Shale appears to become thinner and organically leaner from West to East.

4.3.2 Velkerri Formation

Regional Summary Description

The Velkerri Formation, comprising green, grey and black mudstone and siltstone sits conformably on the Bessie Creek Sandstone, and often showing a gradational contact with the overlying Moroak Sandstone. The formation is subdivided into three units – Kalala, Amungee and Wyworrie Members oldest to youngest based on a combination of organic richness, lithological composition, and chemostratigraphic character (Munson and Revie 2018). The shale resource play prospectivity of the Formation is greatest in the organic-rich mudstones of the Amungee Member –subdivided into 'A', 'A-B', 'B', and 'C' shales (from oldest to youngest). Detailed sedimentological analysis describes the unit as marine facies displaying superimposed laminated black-grey, organic-rich (TOC ~4–10%) and grey-green, organic-lean (TOC <2%) mudstone and siltstone with minor fine glauconitic sandstone that transition up-section to the planar to cross-bedded sandstones of the Moroak Sandstone (Abbott et al. 2001, Jackson and Raiswell 1991, Warren et al. 1998). The penetrated Velkerri Formation was 823.95m thick in Velkerri 76 S2-1, however the Velkerri Formation was not fully penetrated at Velkerri 76 S2-1 as the well terminated in the Formation.

Preliminary Assessment

The Velkerri Formation was the primary target at Velkerri 76 S2-1, being interpreted to be within a gas maturity window, with associated and elevated C2+ components.

The Amungee Member C shale (the top of the prospective Amungee Member), was penetrated 114m deep to prognosis, with the base of the Amungee Member penetrated 21m low to prognosis.

Four target shale intervals were identified within the Amungee Member from preliminary interpretation of the wireline logs and drilling data. These were the A, A-B, B and C shales. The A shale was 36m thick, and was composed of black, organically enriched siliceous mudstone. Mudgas and preliminary log analysis suggests moderate to good reservoir properties. The A-B Shale was 90m thick, and was composed of dark grey, organically enriched siliceous mudstone. Mudgas and preliminary log analysis suggests moderate reservoir properties. The B Shale was 68m thick, and was composed of black, organically enriched siliceous mudstone. Mudgas and preliminary log analysis suggests excellent reservoir properties. The C Shale was 36m thick, and was composed of black, organically enriched siliceous mudstone. Mudgas and preliminary log analysis suggests fair to moderate reservoir properties.

Thicknesses of the B shale A-B shales at Velkerri 76 S2-1 were similar to those known across the Beetaloo Basin, and the penetrated section at Velkerri 76 S2-1 suggests a continuous thickness profile from offsets Beetaloo W-1, Amungee NW-1 and Tanumbirini to Velkerri 76 S2-1, with no yet obvious macro trends. The A Shale thickness was an intermediate thickness between penetrations Amungee NW-1 and Beetaloo W-1 and that of Tanumbrini-1. Given the location of Velkerri 76 S2-1 there appears to be a west to east thickening of the A Shale. The C Shale thickness and wireline log character is simar to that of Shenandoah-1A and Beetaloo W-1. Given other penetration in the Basin is appears there is a north to south thinning trend for the C Shale thickness.

5 FORMATION SAMPLING

5.1 DRILL CUTTINGS

Drill cutting samples were collected over the interval from 18.7 to 2128.7 mMDRT (Driller's TD). Sampling intervals are summarised in Table 9 below:

Detailed drill cuttings lithological descriptions are enclosed in Appendix 7.

Table 9. Velkerri 76 S2-1 Drill Cuttings Interval and Sampling Rate Summary

Cuttings Interval		Sample Rate (m)	Comments
From (mMDRT)	To (mMDRT)		
18.7	200	5	22" hole section No returns from 80 to 200mMDRT
200	368	-	17.5" hole section Drilled section with no returns
368	370	2	12.25" hole section
370	750	5	12.25" hole section
750	900	3	8.5" hole section
900	1925	5	8.5" hole section
1925	1949	3	8.5" hole section
1949	1990	1	8.5" hole section - coring
1990	2025	3	8.5" hole section
2025	2128.7	5	8.5" hole section

5.2 CONVENTIONAL CORE

One 90m conventional core was planned for Velkerri 76 S2-1 as a single core run through the Amungee Member (B-Shale and A-B Shale) of the Velkerri Formation, however due to a jam the conventional core at Velkerri 76 S2-1 was collected over 2 runs (Table 10).

Coring commenced from 1926.4mMDRT and continued to 1950mMDRT where drilling parameters suggested the core may have jammed off. The core and coring BHA was tripped to surface where it was observed that the core had jammed off below the Telescopic Inner Assembly (TIA) in the inner sleeve and the last 1.7m of core had been milled downhole. This resulted in 90% recovery of the 21.27m of core that was cut. After extracting the core the coring BHA was run back down hole and an additional 72.19m of core was cut from 1950 to 2022mMDRT with 100.2% recovery. A full coring report is included in Appendix 8.

Table 10. Velkerri 76 S2-1 Coring Summary

Core Number	Core Diameter (inches)	Interval (mMDRT)		Ave. ROP (m/hr)	Core Cut (m)	Core Recovery (%)	Comments
		From	To				
1	3.5	1926.4	1950	1.4	21.27	90.1	Core Jammed off below TIA in inner sleeve, last 1.7m of core milled downhole.
2	3.5	1950	2022	2.4	72.19	100.2	Good recovery

5.3 SIDEWALL CORES

No Sidewall cores were acquired in Velkerri 76 S2-1

5.4 MUD GAS

A total of 83 drill cutting headspace gas samples sampled in Isojars™ and 84 drill gas samples taken in Isotubes™ were collected for Velkerri 76 S2-1. A detailed summary of gas sample collection depths is enclosed in the Geoservices End of Well Report in Appendix 9.

6 FORMATION EVALUATION

6.1 MUDLOGGING

Geoservices (Schlumberger) provided mudlogging services for the drilling of Velkerri 76 S2-1. These included standard onshore mud logging service, constant volume trap (CVT) mud gas chromatographic analysis (C_1-C_5, CO_2, H_2S), real time and lagged data acquisition and live streaming from wellsite, data storage and transmission and digital imaging of cuttings over the interval from 20 to 1865.2 mMDRT.

Mudlogging data, log displays, and the Geoservices End of Well Report are enclosed in Appendix 9.

6.2 WIRELINE LOGGING

Table 11 summarizes the wireline logs that were run by Schlumberger (SLB) at Velkerri 76 S2-1.

Field data, processed data, deviation survey and log displays for all wireline logs are provided in Appendix 10.

Table 11. Velkerri 76 S2-1 Summary of Wireline Logs

WIRELINE LOGGING					
SUITE/ RUN #	Depth (mMDRT)		Description	Operator	Remarks
	From	To			
S1/R1	10	360	PPC-GR	SLB	
S1/R2	4	657.7	USIT-CBL	SLB	
S2/R1	28.94	2131.1	HRLA-PPC-PEX-NHGS-SP	SLB	
S2/R2	738	2129.49	SSCAN-FMI-PPC-GR	SLB	
S2/R3	745	2130.61	CMR-NEXT	SLB	

6.3 LOGGING WHILE DRILLING (LWD) / MEASUREMENTS WHILE DRILLING (MWD)

Table 12. summarises LWD / MWD data collected at Velkerri 76 S2-1.
Field data, processed data and log displays for all LWD / MWD logs are provided in Appendix 11. The Final Geodetic Survey Report is also attached in Appendix 11.

Table 12. Velkerri 76 S2-1 Summary of LWD / MWD logs.

Run	Depth (mMDRT)		Hole Size (inches)	Description	Logging Company	Remarks
#	From	To				
1	172	200	17.5	ROTARY BHA WITH EXTREME TOOL - DIRECTIONAL AND GAMMA.	SLB	
2	172	368	17.5	ROTARY BHA / XEM / GAMMA-RAY LOGGING RUN	SLB	GAMMA-RAY LOGGED THROUGH CASING FROM 359.8m -364.97m MD
3	368	414	12.25	ROTARY BHA / TELEPACER / GAMMA-RAY LOGGING RUN	SLB	
4	-	-	12.25	JUNK BASKET BHA RUN	SLB	
5	414	682	12.25	ROTARY BHA / TELEPACER / GAMMA-RAY LOGGING RUN	SLB	GAMMA-RAY RELOGGED FROM 510.1m - 534.3m MD DUE TO PASON COMMS ISSUE
6	-	-	12.25	FISHING RUN BHA	SLB	
7	682	750	12.25	ROTARY BHA / TELEPACER / GAMMA-RAY LOGGING RUN	SLB	GAMMA VALUES FROM 747.8m - 1011.0m MD ARE REAL TIME DUE TO DATA WRAPPING
8	750	1926	8.5	MOTOR BHA / TELEPACER / GAMMA-RAY LOGGING RUN	SLB	GAMMA VALUES FROM 747.8m - 1011.0m MD ARE REAL TIME DUE TO DATA WRAPPING / GAMMA-RAY LOGGED ON CORED SECTION FROM 1910.0m - 2006.6m MD
9	1926	1950	8.5	CORING RUN1 BHA	SLB	GAMMA-RAY LOGGED ON CORED SECTION FROM 1910.0m - 2006.6m MD
10	1950	2022	8.5	CORING RUN2 BHA	SLB	GAMMA-RAY LOGGED ON CORED SECTION FROM 1910.0m - 2006.6m MD
11	1950	2022	8.5	MOTOR BHA / TELEPACER / GAMMA-RAY LOGGING RUN	SLB	

6.4 HYDROCARBON INDICATIONS

6.4.1 GAS DETECTION WHILST DRILLING

Continuous Mud Gas monitoring and chromatographic breakdown of hydrocarbon gases ($C_1 – C_5$, CO_2 H_2S) were performed by Geoservices in Velkerri 76 S2-1. A summary of gas data collected whilst drilling is enclosed in Appendix 9.

6.4.2 FLUORESCENCE

No fluorescence was noted during the drilling of Velkerri 76 S2-1 in lithological cutting samples. Drill cuttings were examined on-site by the wellsite geologist for fluorescence under an ultraviolet (UV) light. Comprehensive fluorescence descriptions are included in the “Lithological Cuttings Descriptions” in Appendix 7.

6.5 FORMATION TESTING

6.5.1 FIT #1 – 13.375" Surface Casing Casing Shoe:

See Table 13 for key test data summary, and Figure 8 and Figure 9 for graphical summary of test data. See Appendix 12 for raw test data.

Table 13. FIT #1 summary data

Test Date	Test Type	Test Depth (mRT)	Tested Formation	Fluid Density (ppg)	Fluid Type
08/09/2021	FIT	370.93	Antrim Plateau Volcanics	9.6	WBM
Formation Integrity Test		**Equivalent Fluid Density (ppg)**		**Surface Pressure (psi)**	
4113.9		65.9		3507.0	

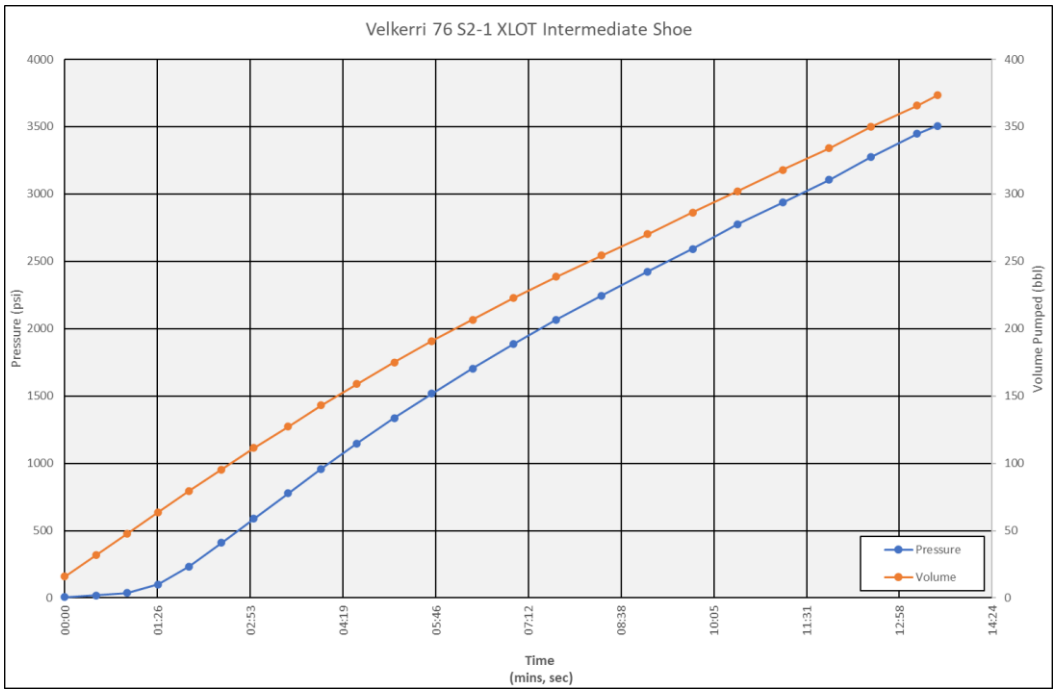

Figure 8. FIT #1 - Pressure vs Time Plot

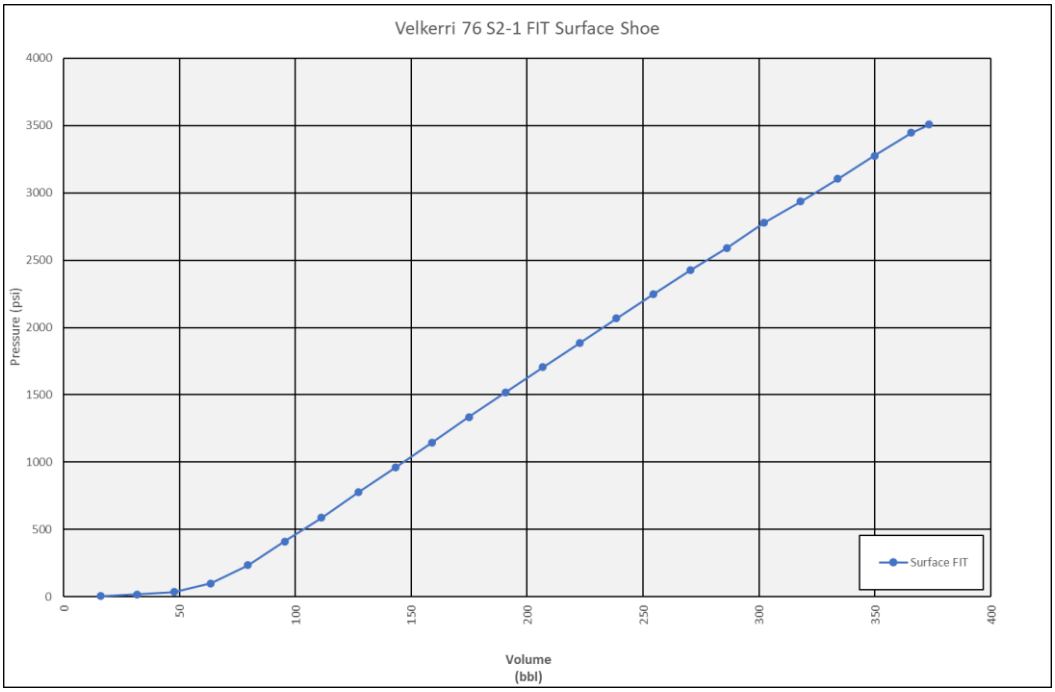

Figure 9. FIT #1 -Pressure vs Volume

6.5.2 XLOT #1 – 9.625" Intermediate Casing Casing Shoe:

See Table 14 for key test data summary, and Figure 10 and Figure 11 for graphical summary of test data. See Appendix 12 for raw test data.

Table 14. XLOT #1 Summary data

Test Date	Test Type	Test Depth (mRT)	Tested Formation	Fluid Density (ppg)	Fluid Type
18/09/2021	XLOT	752.88	Kyalla Formation	9.6	WBM KCL Polymer
Leak Off Pressure (psi)		**Leak Off Equivalent Fluid Density (ppg)**		**Surface Pressure (psi)**	
3448.8		26.88		2217	

Figure 10. XLOT #1 - Pressure vs Time Plot

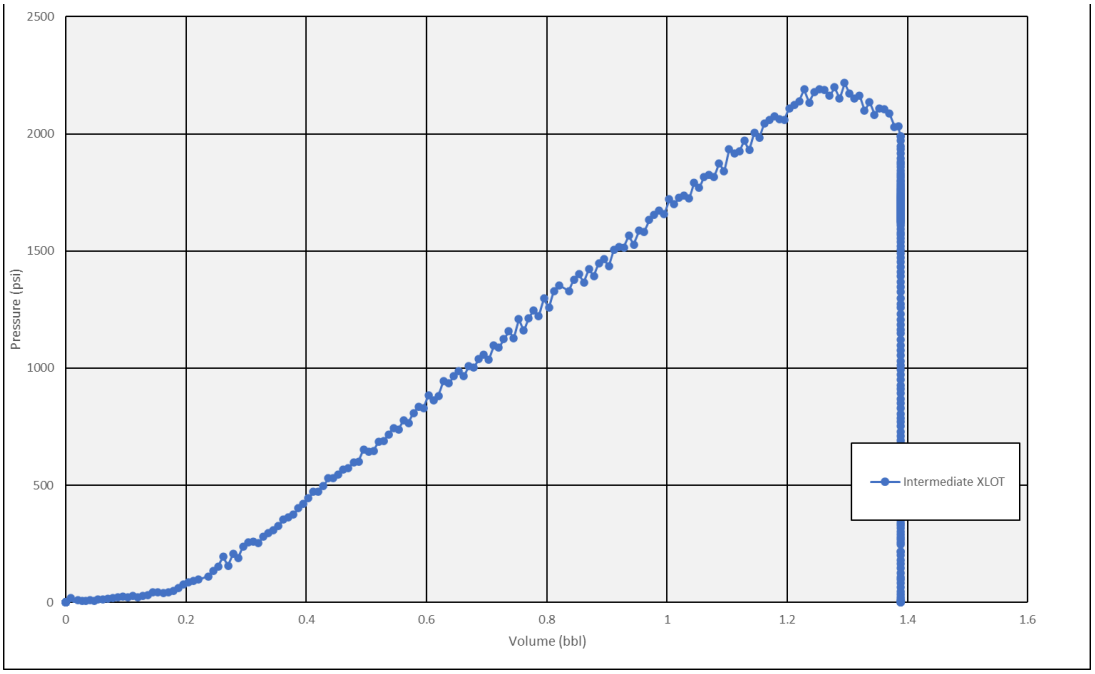

Figure 11. XLOT #1 - Volume (bbl) vs Pressure (psi)

APPENDICES

Appendix 1: Daily Drilling Reports (DDR)
Appendix 2: Daily Geological Reports (DGR)
Appendix 3: Casing Reports
Appendix 4: Cementing Reports
Appendix 5: Bit Records
Appendix 6: Drilling Fluids Report
Appendix 7: Lithological Cuttings Descriptions
Appendix 8: Coring End of Well Report
Appendix 9: Geoservices End of Well Report
Appendix 10: Wireline Log Displays
Appendix 11: Logging While Drilling (LWD) / Measurements While Drilling (MWD) Data
Appendix 12: FIT and DFIT Data
Appendix 13: Wellbore Survey

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