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# **West Mereenie 28**

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Well Completion Report (Basic) – Final

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21 Jul 2021 – 05 Sep 2021

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OL4

Amadeus Basin

Northern Territory

Submission Date

20 March 2022

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## LIST OF ABBREVIATIONS

Abbreviation	Full Text	Abbreviation	Full Text
°	degrees	mRT	metres Rotary Table
AHD	Australian Height Datum	msl	metres sea level
Az	Azimuth	MU	Make Up
bbls	Barrels	mV	millivolts
bbls/hr	barrels per hour	MWD	Measurements While Drilling
Bcf	Billion cubic feet	N2	Nitrogen
BPM	barrels per minute	NA	Not Applicable
BPV	Back Pressure Valve	ND	Nipple Down
BTC	Buttress Connection	NGP	Northern Gas Pipeline
CBL	Cement Bond Log	NU	Nipple Up
CCL	Casing Collar Locator	OD	Outer Diameter
CSG	casing	OH	Open Hole
DHM	Down Hole Motor	P/U	Pick Up
DP	Drill Pipe	PCE	Pressure Control Equipment
EMW	Estimated Mud Weight	PDC	Polycrystalline Diamond Compact
FIT	Formation Integrity Test	PEX	platform express tool string
Fm	Formation	PJSM	per job safety meeting
FMI	Formation Micro Imaging Log	POOH	Pull Out Of Hole
ft <sup>3</sup> /sk	Cubic feet per sack	ppg	pounds per gallon
GL	Ground Level	psi	pounds per square inch
GOC	Gas-Oil Contact	Q	flow rate
GR	Gamma Ray	QTY	Quantity
HRLA	High Resolution Laterolog Array	RIH	Run In Hole
Hrs	hours	ROP	Rate Of Penetration
HUD	Hold Up Depth	RT	Rotary Table
In	inches	RT	Rotary Table
Inc	Inclination	SITHP	Shut-in Tubing Head Pressure
KCl	Potassium Chloride	SP	Spontaneous Potential
kg	kilogram	Sst	Sandstone
km	kilometres	TBG	Tubing
L	litres	TD	Total Depth
lb/ft	pounds per foot	TVD	True Vertical Depth
LCM	Loss Control Materials	TVD	True Vertical Depth
LIB	Lead Impression Block	TVT	True Vertical Thickness
m	metres	USIT	Ultrasonic Imaging Tool
m/hr	metres per hour	VDL	Variable Density Log
m/hr	metres per hour	WBM	Water Based Mud
M/U	Make Up	WM27	West Mereenie 27
MD	Measured Depth	WM28	West Mereenie 28
mGL	metres Ground Level	XEM	Extreme Engineering Survey Tool
mmscfd	million standard cubic feet per day		

# 1 INTRODUCTION AND SUMMARY

The Mereenie Oil and Gas Field is situated within the Amadeus Basin approximately 230 km west-southwest of Alice Springs (Figure 1). It is a doubly plunging anticline with surface expression and an anticlinal structural axis that can be traced for over 30 km. The discovery well, Mereenie 1, was drilled in 1965, and since then 70 additional wells have been drilled. The field has a gas cap and an oil rim, with a field wide gas-oil-contact (GOC) at -649.2 msl.

To date, production from the Pacoota P3 has primarily been focussed on the Pacoota P3 oil rim on the northern, southern and eastern nose of the central culmination with gas reinjected into the oil leg to maintain pressure and oil deliverability. The Pacoota P3 had an original OGIP volume of 259 BCF with a gas cap volume of 171 BCF. Gas production from the P3 to date has been 248 Bcf and with reinjection of 131 Bcf of gas there has been a net production of 117 Bcf leaving an estimated 142 Bcf remaining within the Pacoota P3.

Since construction of the Northern Gas Pipeline (NGP) was announced in 2015, focus at the Mereenie Oil and Gas Field has shifted towards gas production. Gas plant capacity at Mereenie was upgraded in 2018 to coincide with the NGP becoming operational in January 2019. Given the additional plant and pipeline capacity that is still available and a desire to counter the forecasted field-wide decline rates, West Mereenie 28 (WM28) targeted gas in the Pacoota P1 Sandstone and the Pacoota P3 Sandstone gas cap, from which there had been limited net production.

To accelerate gas production in the Pacoota P1, WM28 was programmed for completion in both the Pacoota P1 and Pacoota P3 sandstones. No cultural and environmental constraints exist within the vicinity of WM28 so that the well will be drilled as a vertical well from a surface location positioned directly above the crestal culmination at the Pacoota P3 level.

WM28 was spudded BY Easternwell Rig 27 at 03:30 hrs on July 21<sup>st</sup>, 2021 and reached a Total Depth of 1332 mMDRT on 21<sup>st</sup> of August 2021. The well terminated above the base of the Pacoota P3 to avoid flowing high nitrogen gas from the Pacoota P4. Prior to penetrating the Pacoota, P3 casing was set at 1240.7 mMDRT, near the base of the Pacoota P2, to case off the Pacoota P1 interval.

The P3 interval was completed in open hole and a production packer set inside 7" casing, below the P1 interval, before perforating the P1 for production (Table 8: Perforation Intervals). A dual-string completion was then run to produce the P1 and P3 independently. After running the completion and the Xmas tree, Easternwell Rig 27 was rigged down and released on 5<sup>th</sup> September 2021 to conduct a workover on West Mereenie 19 and then to run completion on West Mereenie 27.

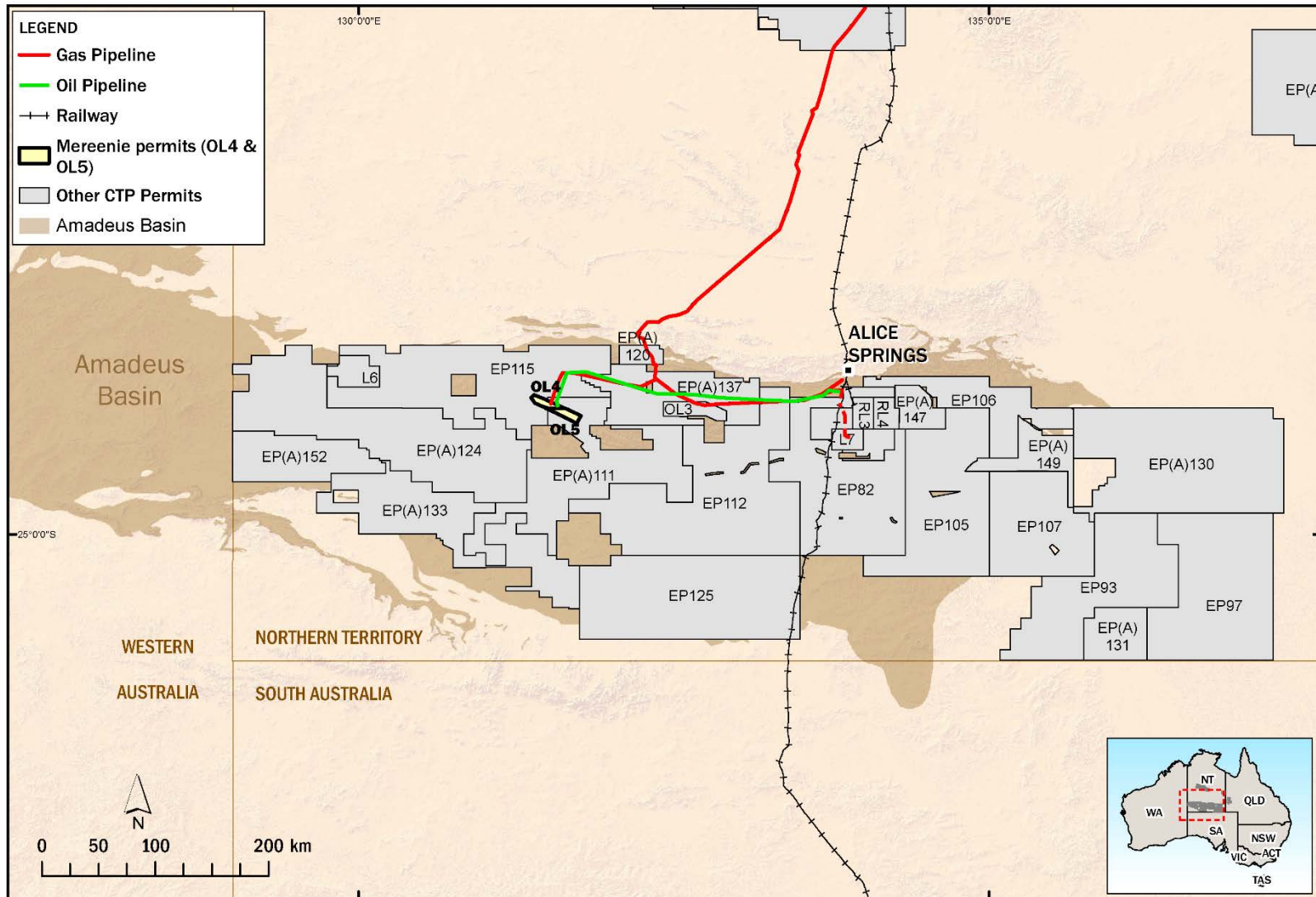


Figure 1 — Mereenie locality map

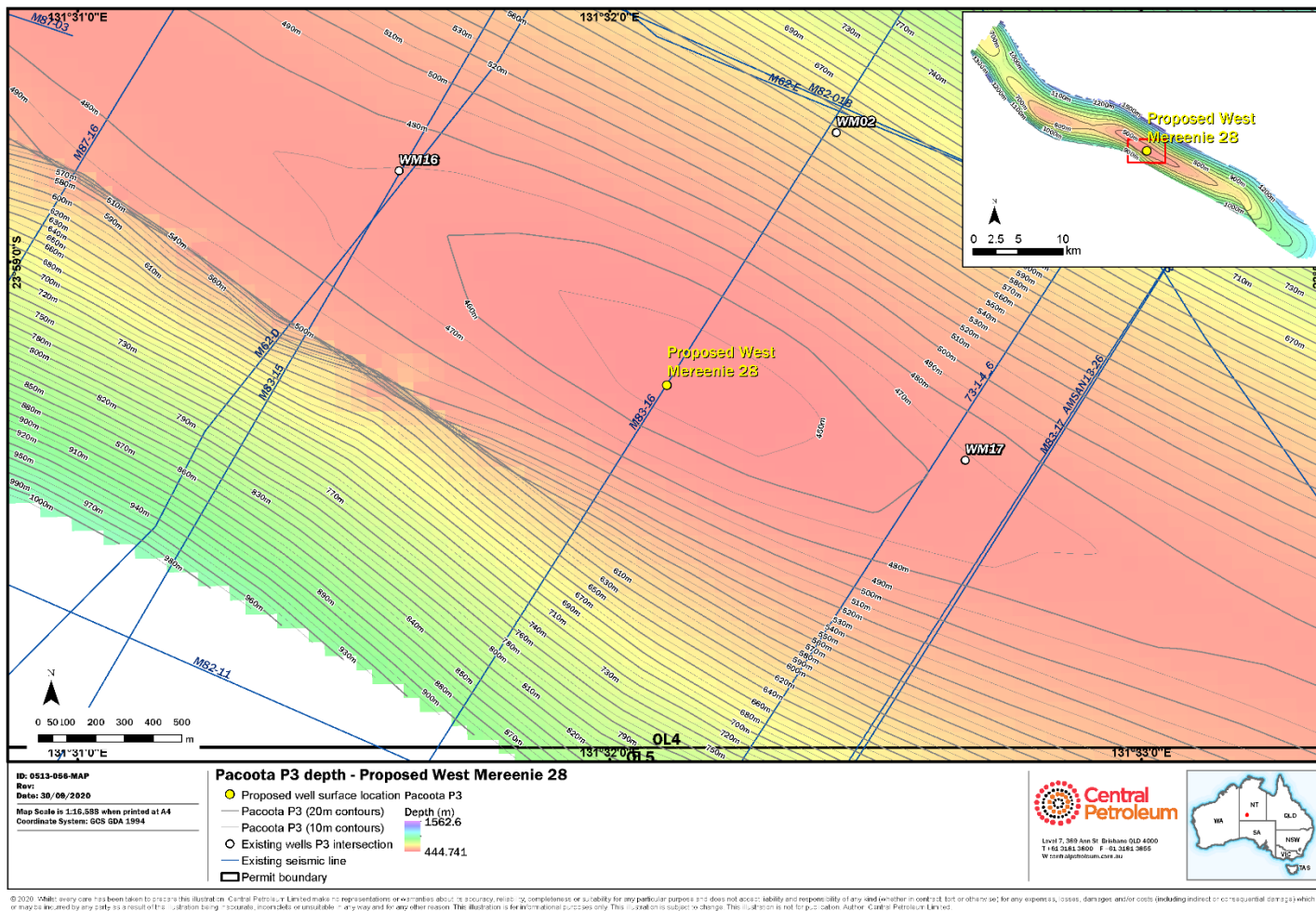
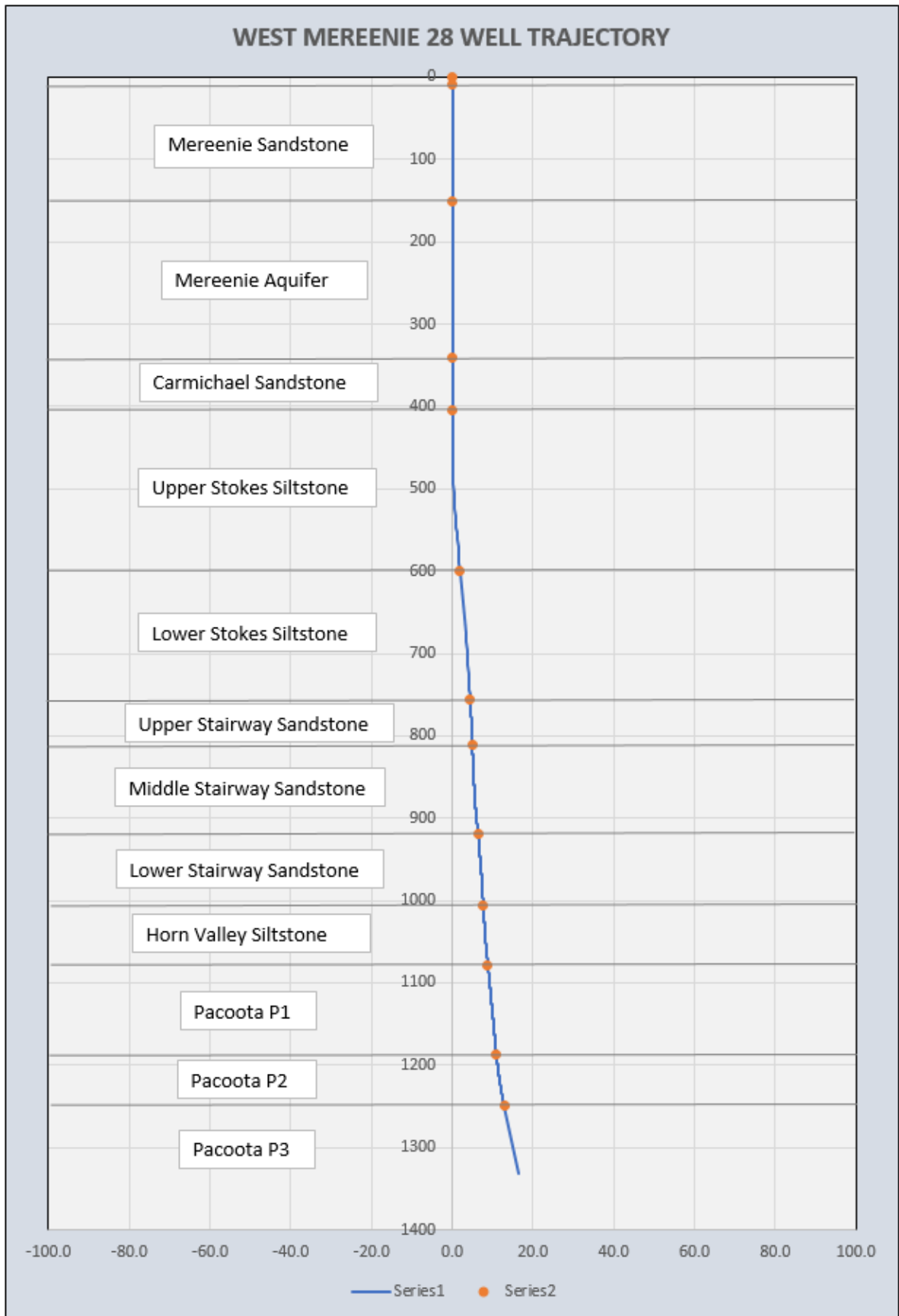


Figure 2 — WM28 targets the Pacoota P3 gas cap along the anticlinal axis at the central culmination of the Merenie field.



**Figure 3 — Cross Section of WM28 well trajectory and Horizons**



## 2 GENERAL DATA

**Table 1: West Mereenie 28 Well Index Sheet**

Well Name	WEST MEREENIE 28		Petroleum Title	OL 4		Basin	AMADEUS			
Well Purpose	Development		Status	Pacoota P1 & P3 Producer		Parent Well Name, if any	N.A.			
Spud Date	21/07/2021		TD Date	21/08/2021		Rig Release Date	5/09/2021			
Primary Objective	Pacoota P3 Sandstone		Rig(s) Name		Easternwell 27					
Secondary Objective	Pacoota P1 Sandstone		100K Map Sheet		Idirriki 5250					
Total Depth		mMD	mTVD		Side-Track Kick-off Depth, if applicable			N.A.		
	Driller	1332	1331.6							
	Logger	1332	1331.6							
Location	Coordinates	Surface	Bottom Hole		Drill Datum <input type="checkbox"/> DF <input checked="" type="checkbox"/> RT <input type="checkbox"/> KB	Elevation Datum: AHD				
	(GDA94 Datum with GRS80 Ellipsoid using MGA94 Grid)	Latitude	23° 59' 13.93" S	23° 59' 13.199" S		GL Elevation: 772.5m RT Elevation: 777.0m				
Zone	Longitude	131° 32' 06.46"	131° 32' 6.952" E		Seismic Station, if applicable	Survey	Line	SP		
	Easting	757,932.9 mE	757,947.11 mE			M83	16	311		
52	Northing	7,344,869.4 mN	7,344,891.73 mN							
Well Summary										
<p>The West Mereenie 28 well was spudded on 21st July 2021, targeting gas in the Pacoota P3 Sand (primary target) and Pacoota P1 Sand (secondary target). The well was drilled with water-based mud from surface, through the Mereenie and Carmichael Formations into the Upper Stokes Siltstone. Significant fluid losses were experienced while drilling the Mereenie Aquifer and the Carmichael Formation, requiring LCM to be pumped and 4 cement plugs set over the Carmichael Formation. After setting the 9 5/8" casing the well was air drilled through to the base of the Pacoota P2 Unit and 7" casing set. Gas shows were observed in the Upper and Lower Stairway Sandstones and in the Pacoota P1 Unit while drilling the 8 1/2" hole section. A flow test of 0.6 mmscfd was obtained over the full Stairway Formation and a maximum flow test of 2.9 mmscfd over the combined Stairway and Pacoota P1 sequences.</p> <p>The P3 interval was completed in open hole and a production packer set inside 7" casing, below the P1 interval, before perforating the P1 for production. A dual-string completion was then run to produce the P1 and P3 independently. After running the completion and the Xmas tree, Easternwell Rig 27 was rigged down and released on 5th September 2021 to conduct a workover on West Mereenie 19 and then to run completion on West Mereenie 27.</p>										
Hole and Casing Design (Drillers Depths)						Drilling Fluid				
Type	Hole Size	Depth (mMD)	Casing Size	Shoe mMD	Shoe mTVD	Hole Size	Type			
Conductor	17 1/2"	26.0	13 3/8"	26.0	26.0	17 1/2"	Gel Polymer			
Surface Casing	12 1/4"	463.5	9 5/8"	459.4	459.4	12 1/4"	Air/ Foam			
Intermediate Casing	8 3/4"	1243.0	7"	1240.2	1240.2	8 3/4"	Air/ Foam			
Target Section	6"	1332.0	NA	NA	NA	6"	N2/ Foam			
Stratigraphy – Formation Tops (Loggers)				Formation Evaluation						
Formation	Depth			Run	Measurement	Depth Interval				
	mMD	mTVD	mTVDGL			From (mMD)	To (mMD)			
Mereenie Sandstone	9.5	9.5	5.0		Wireline					
Mereenie Aquifer	150.0	150.0	145.5	\$1R1	FMI-DSI-HRLA-PEX-GR	1244.5	459.7			
Carmichael Sandstone	340.0	340.0	335.5		GR	1244.5	GL			
Upper Stokes Siltstone	404.0	404.0	399.5		FMI	1244.5	750.0			
Lower Stokes Siltstone	646.0	645.9	641.4	\$1R2	CBL-VDL-GR-CCL	459.7	GL			
Upper Stairway Sandstone	756.0	755.9	751.4							
Middle Stairway Sandstone	811.0	810.8	806.3	\$2R1	CBL-VDL-GR-CCL	1209.0	GL			
Lower Stairway Sandstone	920.0	919.8	915.3	\$2R2	USIT-CCL-GR	1209.0	GL			
Horn Valley Siltstone	1007.0	1006.8	1002.3							
Pacoota P1	1079.0	1078.8	1074.3							
Pacoota P2	1187.0	1186.7	1182.2							
Pacoota P3	1250.0	1249.6	1245.1							
Total Depth	1332.0	1331.5	1327.0							
Mud Logging			Formation Testing (DST)				DFT	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
Total Gas and C1-C5 chromatograph from 0m MD to 1332 mMD (TD)			No DST's were run, however, 7 flow tests were conducted over the Stairway and Pacoota P1 and P3 formations:				HF	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
Coring	Hydrocarbon Shows									
NA	No hydrocarbon fluorescence was noted while drilling West Mereenie 28. However, numerous hydrocarbon gas peaks were recorded throughout the Stairway and Pacoota formations									
Completion										

The well was completed as a Pacoota P1 and P3 producer with a dual string completion. The P1 intervals were perforated through 7" casing and the P3 sequence was completed in 6" open hole

## 3 Drilling

### 3.1 DRILLING SUMMARY

(All depths Driller's MDRT unless otherwise stated)

#### **Well spudded with 17-1/2" hole and 13-3/8" Conductor**

West Mereenie 28 was spudded at 03:30 hours on the 21<sup>st</sup> of July 2021 with the Easternwell 27 drilling rig. The 17-1/2" conductor hole was drilled to 26.0 m with Gel spud mud and the 13-3/8" conductor casing run and cemented with the shoe at 26.0 m. The riser and flowline were then installed while preparing 12-1/4" BHA.

#### **12-1/4 Surface hole and 9-5/8" casing**

The 12-1/4" bit and BHA were RIH and top of cement was tagged at 9.5 m. The cement was drilled out to 26 mMDRT and new hole to 29 mMDRT. The BHA was pulled back and a circulating sub installed. The 12-1/4" hole was then drilled ahead, intersecting the Mereenie Aquifer at 140.0 mMDRT. Drilling continued to 201.0 mMDRT where a bit trip was made due to poor ROP. Drilling continued to 334.0 mMDRT where total downhole losses were observed in the basal Mereenie Aquifer section. An LCM pill was mixed and pumped and allowed to permeate the loss zone. The 12-1/4" hole then drilled ahead with an LCM pill being pumped to cure losses at 338.5 mMDRT in the basal Mereenie Aquifer.

The top of the Carmichael Sandstone was intersected at 340 mMDRT and further LCM pills were pumped to combat fluid losses down to 353.5 mMDRT with further lost circulation and a total of 6 LCM pills being pumped (Section 3.9 Downhole Fluid Losses). At 356m circulation was again lost and additional LCM was mixed and pumped and the down-hole motor plugged. The BHA was tripped out and a new Motor and BHA RIH.

After drilling only 2m circulation was lost, LCM pills pumped and the circulation-sub blocked. Drilling BHA#4 was made up, RIH and drilled ahead blind to 413.16m, at which depth the decision was taken to spot a cement plug. POOH, made up cement stinger and RIH with same. Rigged up cementers and pumped 48 bbl cement plug#1. Well bore fluid losses were observed while waiting on cement and a further cement plug was spotted. Upon drilling ahead from 413m to 426m, total losses were experienced again, necessitating a third 48 bbl cement plug to be pumped. Top of cement was tagged at 257 mMDRT and drilled out to 426m. Drilling continued to 462m with total losses from 431m and a further cement plug was pumped. After drilling the cement plug the well was deepened to section TD 463.5 mMDRT. Having determined that losses had been cured, the well was circulated and a wiper trip conducted prior to pulling out of hole to run casing.

Rigged up and ran 9 5/8" casing, as per programme. Circulated and cemented casing, including a 15bbl top-up Job (Section 3.6). Nippled up, function tested and pressure tested BOP's and well head,

### **8-1/2" Air-Foam drilled hole section and 7" Casing**

Made up drill-out BHA and RIH. Drilled cement, shoe track and new formation to 467 mMDRT, Conducted LOT with Halliburton to 12.8ppg EMW. POOH with clean out assembly. Made up Air hammer BHA, RIH and unloaded fluid from the well. Drilled ahead with Air/mist system from 467 mMDRT to 684 mMDRT with average ROP 10.2m/hr. Drilled ahead with Polymer/Foam-Air to 818 mMDRT with average ROP 6.23m/hr. Gas to surface and a flare were observed from 800 mMDRT. Continued to drill ahead with Polymer/Foam-Air to 876 mMDRT, Flow tested Middle Stairway, drilled to 1021 mMDRT and flow tested the Upper and Lower Stairway Q=0.6 mmscfd (see Appendix D: Flow Test Data).

Drilling continued with Foam-Air from 1021 mMDRT to 1169 mMDRT, with flow tests of the Upper Pacoota P1 at 1117 mMDRT (1.2 mmscfd) and Lower Pacoota P1 at 1167.5 mMDRT (2.9 mmscfd). Continued drilling to 1182 mMDRT, where a bit change was required. Killed well with 10.1 ppg Kill mud, pulled out of hole and changed the bit. RIH with New 8-1/2" PDC Bit and downhole motor and unloaded wellbore fluids. Drilled ahead with Polymer/Foam-N2 from 1182 mMDRT to casing point at 1243 mMDRT, just above the P3 Sandstone. Performed Flow Test#3 over the Pacoota P1 and P2 at that depth and recorded 2.7 mmscfd. Conducted a 100 m wiper trip.

Attempts were made to kill the well but the well continued to flow Gas. Decided to unload well and POOH under-balanced to retrieve XEM tool and downhole motor (DHM) to allow higher weight LCM pill to be run without tool plugging. POOH and retrieved XEM tool and DHM. Made up new BHA and ran in hole. Mixed 420 bbl of 12.0 ppg kill mud. Ran in hole to TD (1243 mMDRT) Mixed and spotted LCM pill. Proceeded to kill well with 12.2 ppg mud weight. Pulled out of hole for Wireline Logging.

Rigged up Schlumberger and ran Run #1: FMI-DSI-HRLA-PEX-SP-GR over open hole section and Run #2: CBL-VDL-GR-CCL over 9 5/8" casing. Schlumberger was then rigged down with no hole or equipment issues being encountered.

The wellhead was flushed and the rig was rigged to run 7" casing. The 7" casing was run and cemented as per programme. The casing spool was jetted and the packing assembly was installed and energised. The BOP was nipped down and the tubing head installed and tested. The BOP was nipped up and pressure tested.

### **6" Nitrogen-Foam drilled hole section**

A 6" PDC bit and drilling BHA #7 was made up and run in hole to 1214.0 mMDRT. The shoe track and 3.0 m of new formation were drilled to 1246.0 mMDRT and an FIT to 21.6 ppg EMD was carried out.

The wellbore fluids were unloaded and the 6" hole was drilled to 1332.0 mMDRT using nitrogen and foam. A wiper trip to the shoe was run and the drill string pulled out of hole to the BHA. The BHA was hung off and a BPV installed. The snubbing unit was installed and the BHA was then snubbed out of the hole. A 6-1/8" bit and casing scraper assembly was made

up and run in the hole to scrape production packer depths of 1073 mMDRT and 1210 mMDRT. The scraper assembly was then tripped out of hole and the Snubbing Unit was rigged down.

EXPRO then rigged up with a lubricator to convey and set the production packer in hole at a depth of 1209 m. The hole was then filled with 2% brine and Schlumberger wireline were rigged up to conduct Suite#2, Run #1: CBL-VDL-CCL-GR inside the 7" casing.

The perforation and completion programmes were then performed as detailed in Section 3.10.

## 3.2 WELLHEAD AND DOWNHOLE DIAGRAM

For the well schematic and wellhead equipment, see Appendix A.

## 3.3 CASING DETAILS

**Table 2: WM28 casing details**

FINAL WELL CONSTRUCTION									
Interval	Hole Specifications			Casing Specifications					
	Hole Size	From	To	OD	Weight	Grade	Thread	Casing Top	Shoe Depth
	[in]	[mMDRT]	[mMDRT]	[in]	[lb/ft]			[mMDRT]	[mMDRT]
Conductor	17-1/2	4.5	26.0	13-3/8	54.5	K-55	BTC	4.5	26.0
Surface	12-1/4	26.0	463.5	9-5/8	36.0	K-55	BTC	4.5	459.4
Intermediate	8-1/2	463.5	1243.0	7	29.0	P-110	BTC	4.5	1240.17
Production	6	1243.0	1332.0	Open Hole: 1243.0 – 1332.0 mMDRT					

### 3.4 WEST MEREENIE 28 TIME DEPTH CURVE

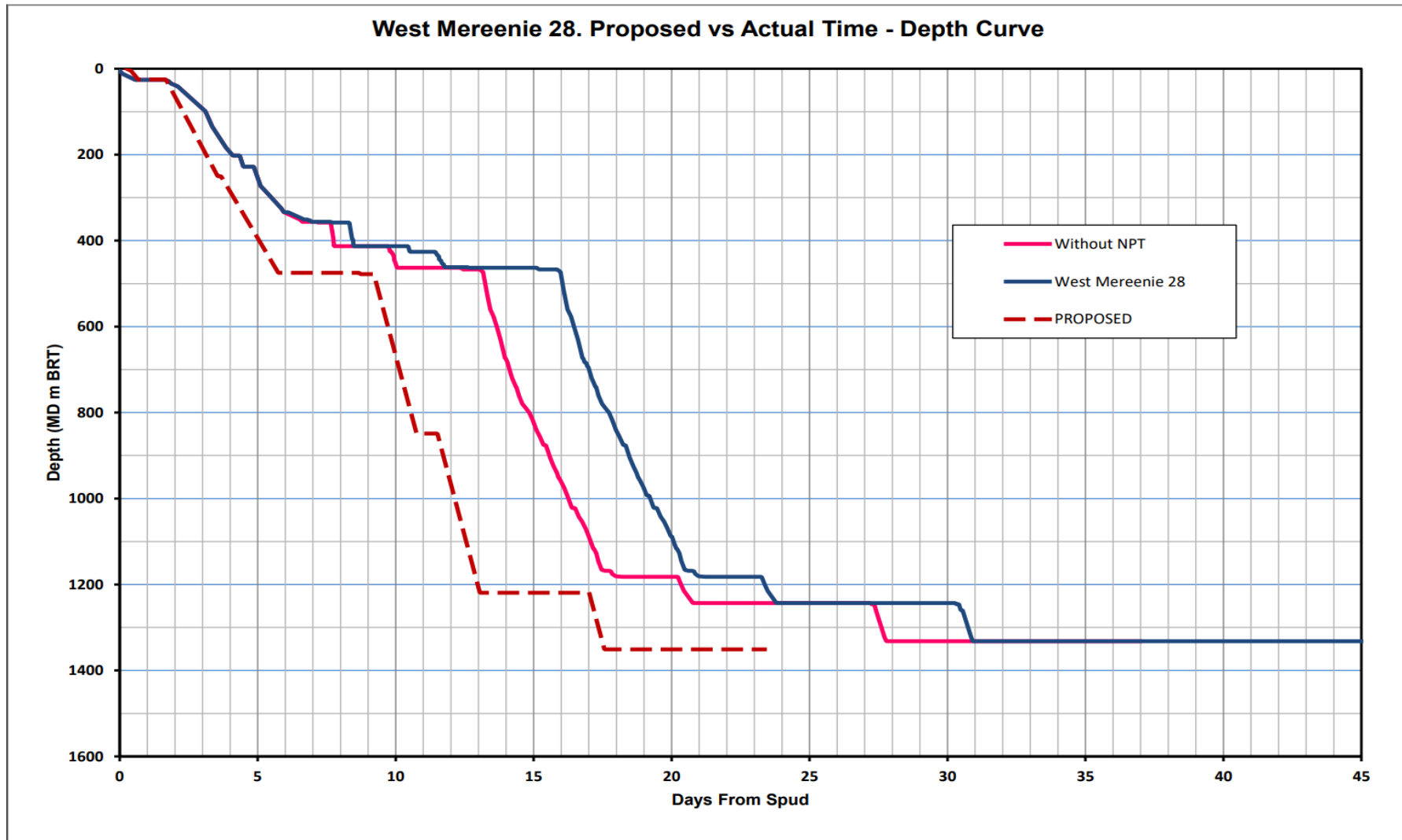


Figure 4 — West Mereenie 28 Time Depth curve

### 3.5 DEVIATION SURVEYS

Table 3: West Mereenie 28 Deviation Surveys

Directional Survey			
MD	INC.	AZ.	TVD
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
456.00	0.50	0.00	455.99
465.00	0.67	30.03	464.99
485.00	1.00	35.20	484.99
494.00	1.28	28.75	493.99
504.00	1.44	32.79	503.99
514.00	1.53	33.52	513.98
523.00	1.63	30.80	522.98
533.00	1.83	27.77	532.98
542.00	1.92	32.75	541.97
552.00	2.21	28.02	551.96
562.00	1.98	28.61	561.96
571.00	2.12	27.81	570.95
580.00	2.19	29.69	579.95
590.00	1.77	32.14	589.94
600.00	1.95	30.10	599.93
610.00	1.81	32.37	609.93
619.00	1.80	26.95	618.92
628.00	2.09	25.53	627.92
648.00	2.22	28.55	647.91
658.00	1.97	29.33	657.90
667.00	1.92	29.05	666.89
676.00	2.29	27.46	675.89
686.00	2.19	25.59	685.88
696.00	1.79	27.45	695.87
706.00	1.82	28.80	705.87
715.00	1.60	33.33	714.86
725.00	1.59	28.72	724.86
734.00	1.28	29.17	733.86
744.00	1.40	28.59	743.86
754.00	1.19	36.30	753.85
763.00	0.97	24.26	762.85
773.00	1.00	30.56	772.85
782.00	0.66	21.78	781.85
792.00	0.54	23.77	791.85

Directional Survey			
MD	INC.	AZ.	TVD
802.00	0.58	20.47	801.85
811.00	0.86	36.62	810.85
821.00	0.69	37.73	820.85
830.00	1.14	35.76	829.84
840.00	1.24	26.06	839.84
850.00	1.08	41.11	849.84
860.00	1.22	25.13	859.84
869.00	1.38	38.91	868.84
879.00	1.43	29.19	878.83
888.00	1.42	39.56	887.83
898.00	1.91	36.45	897.83
907.00	1.62	41.69	906.82
1014.00	0.91	44.88	1013.80
1024.00	1.32	35.10	1023.79
1034.00	1.27	27.30	1033.79
1043.00	1.73	39.72	1042.79
1053.00	1.53	29.31	1052.78
1063.00	1.64	35.10	1062.78
1072.00	2.07	38.90	1071.78
1081.00	1.66	39.41	1080.77
1091.00	1.54	33.91	1090.77
1101.00	1.73	40.07	1100.76
1110.00	1.91	33.92	1109.76
1120.00	2.02	30.99	1119.75
1129.00	1.98	38.57	1128.75
1139.00	1.49	27.72	1138.74
1149.00	1.61	37.82	1148.74
1156.00	1.69	38.21	1155.74
1165.00	1.43	37.68	1164.73
1184.00	1.68	37.56	1183.72
1203.00	2.23	37.56	1202.71
1204.00	2.39	31.51	1203.71
1205.00	2.52	37.73	1204.71
1206.00	2.34	41.20	1205.71
1240.17	2.34	41.20	1239.85
1332.00	2.34	41.20	1331.61

## **3.6 CEMENTING OPERATIONS**

### **13 3/8" Conductor**

Nippled down Sub Base and walked out. Ran 21.3m of flared 13 3/8" Conductor with 1" cement stinger attached to outside.

Rigged up for cementing operations. Held PJSM, pressure tested surface lines and cemented 13 3/8" conductor as per programme. Pumped 19.6bbls of 15.8ppg cement slurry with cement to surface after 19.1bbls. Flushed surface lines, completed cementing operations and rigged down Halliburton. Halliburton conducted post cement job cleaned-up operations. Rig crew placed/levelled cement on the cellar floor.

Walked Sub-Base back in, prepared 12 1/4" BHA, cut conductor, installed riser and flow line while waiting on cement to cure

### **9 5/8" Surface Casing**

Nippled down and laid out riser, cut conductor at cellar floor and rigged up to run 9 5/8" casing (CSG). Ran 39 joints of 9 5/8" CSG, CSG taking weight at 411m and washed down to bottom. Casing seat at 459.4 mMDRT.

Loaded plugs in cement head and nipped up cement head and surface lines. Held PJSM with Halliburton to cover: High pressure, Mixing chemicals for cementing operations, Chemical burns and PPE. Cemented 9 5/8" CSG. Pumped 5bbls and pressure tested surface lines: low 790psi for 5min and high 3000psi for 5min. Pumped 20bbls of Econolite spacer and 30bbl Hi-Vis gelled spacer. Dropped bottom plug.

Mixed and pumped 112bbls of 12.5ppg lead slurry at 4BPM and 160psi; with lost circulation from 93bbls. Mixed and pumped 54.3bbls of 15.8ppg tail slurry at 4BPM, with returns back at 116bbls total pumped. Dropped top plug and displaced at 4BPM with 8.4ppg mud. Pumped 25bbls and encountered lost circulation. Regained Circ at 87bbls into displacement, experienced lost circulation again at 93bbls, with circulation regained at 96bbls; with 3bbls cement to surface before finally losing circulation. Reduced pump rate to 2BPM and bumped plug with 350psi at 113.2bbls.

Pressured up CSG to 2046psi and tested for 10min, ok. Bleed off 1.5bbls returned, floats holding. Lost a total of 102bbls during cement job. Mixed 20bbls of 15ppg cement slurry for top-up job and pumped into cellar, top filled annulus through circ ports with 15bbls, estimated cement had dropped 82m, Annulus static, discard 5bbls of excess cement. Rigged down cement head and surface lines and cementing equipment from rig floor. Backed out running tool and landing joint and laid out.



## 7" Intermediate Casing

Rigged up jetting tool and flushed wellhead internal components. Held PJSM. Rigged up to run casing, installing casing running equipment. Made up shoe track. Tested floats. Ran in hole with 7" CSG and circulated bottoms up at 600m. Continued running in hole with 7" CSG to 1184m, working tight spots from 1163m to 1170m and continued RIH to 1232 mMDRT

**Table 4: Cementing details**

<b>CEMENTING DETAILS</b>			
	<b>Conductor</b>	<b>Surface</b>	<b>Intermediate</b>
<b>Hole Size</b>	17-1/2"	12-1/4"	8-1/2"
<b>Casing Size</b>	13-3/8"	9-5/8"	7"
<b>Setting Depth</b>	26.0 mMDRT	459.4 mMDRT	1240.17 mMDRT
<b>Cement Type</b>	Class G	Class G	Class G
<b>Cement Top</b>	Lead - Surface	Lead - Surface Tail – 323.0mRT	Lead - Surface Tail – 720.0mRT
<b>Yield</b>	Lead – 1.17 ft <sup>3</sup> /sk	Lead - 2.15 ft <sup>3</sup> /sk Tail – 1.16 ft <sup>3</sup> /sk	Lead – 2.19 ft <sup>3</sup> /sk Tail – 1.16 ft <sup>3</sup> /sk
<b>Volume</b>	Lead – 19.6bbls	Lead – 114.4bbls Tail – 58.0bbls	Lead – 74.0bbls Tail – 82.4bbls
<b>Slurry Density</b>	Lead – 15.8 ppg	Lead - 12.5 ppg Tail – 15.8 ppg	Lead - 12.5 ppg Tail – 15.8 ppg
<b>Bump Plug</b>	-	350psi	2,304psi
<b>Casing Pressure Test</b>	-	2,044psi	2,003psi
<b>Additives</b>	D-Air 3000L	D-Air 3000L Versaset Halad-344 Econolite Liquid WellLife 734	D-Air 3000L Versaset Halad-344 Halad-567 CFR-3

### 3.7 BIT RECORD AND BHA DETAILS

For the bit record and BHA Details, see Appendix B.

### 3.8 DRILLING FLUIDS

*Table 5: Drilling fluids*

DRILLING FLUIDS				
Interval	Hole Size	From	To	Fluid System
	[in]	[mMDRT]	[mMDRT]	
Conductor	17-1/2	4.5	26.0	WBM – Gel Polymer
Surface	12-1/4	26.0	463.5	WBM – Gel Polymer
Intermediate	8-1/2	463.5	1243.0	AIR/N2/Foam
Production	6	1243.0	1332.0	AIR/N2/Foam

### 3.9 DOWNHOLE FLUID LOSSES

Total lost circulation was first encountered at 334 mMDRT in the 12-1/4” hole section in the basal Mereenie Aquifer, with extensive fluid losses continuing throughout the underlying Carmichael Sandstone and finally being cured by pumping 20+ LCM pills and running 4 cement plugs over the entire depth interval from 252 mMDRT (top of solid cement) to 462.0 mMDRT; covering the lower half of the Mereenie Aquifer and the full Carmichael Sandstone to section TD within the Upper Stokes Siltstone.

Upon encountering total lost circulation at 334 mMDRT, LCM pill #1 was mixed and pumped and allowed to permeate the loss zone. Circulation was restored, additional mud volume was built and the 12-1/4” hole was then drilled to 338.5 mMDRT where circulation was again lost. LCM pill #2 was pumped and allowed to soak.

This pattern of drilling ahead and combatting partial to full losses by pumping LCM pills continued from 338.5 mMDRT to 413.16 mMDRT with LCM pills being pumped at numerous depths, as detailed in Table 7. At that depth the losses could no longer be controlled by LCM pills and the decision was taken to pump cement plugs.

At 413.16 mMDRT the drillstring was tripped out to pick up a cement stinger; which was then run in hole and 48 bbl cement plug #1 pumped. Well bore fluid losses were recorded while waiting for the cement to cure and a second 48 bbl cement plug was pumped.

Subsequently, the hole was drilled ahead from 413m to 426m, where total lost circulation was again experienced and 48bbbls LCM cement plug #3 pumped. Upon running back in hole with the drilling BHA, the top of solid cement was encountered at 257 mMDRT and drilled to 426 mMDRT. The well drilled ahead from 426m to 462m with total lost circulation from 431m.

At 462 mMDRT two further LCM pills were pumped prior to POOH with BHA to pick up and RIH with cement stinger. Cement plug #4 (48 bbl) was pumped to finally cure losses prior to section TD. The drill bit was picked up, RIH and tagged cement at 293 mMDRT. Cement was drilled to 462m and the hole deepened to 463.5m to ensure that losses had been cured prior to calling section TD.

Total Fluid losses are detailed in Table 6.

Table 6: Fluid losses

**Fluid Losses in Mud-Drilled Hole: 12-1/4" to 463.5 mMDRT (Section TD)**

Date	DMR#	Losses (bbl)					Daily Drilling Progress:	
		Previous	Daily Downhole	Daily Surface	Daily Total	Accum Int:	00:00hr Depth:	24:00hr Depth:
<b>Losses Associated with Mereenie Aquifer</b>								
27-Jul	7	532.5	250.0	25.0	275.0	807.5	325.0	353.0
<b>Losses to Mereenie Aquifer:</b>			<b>250.0</b>	<b>bbl</b>				
<b>Losses Associated with Carmichael Sandstone</b>								
28-Jul	8	807.5	49.4	25.4	74.8	882.3	353.0	358.0
29-Jul	9	882.3	5,417.5	0.0	5,417.5	6,299.8	358.0	413.0
30-Jul	10	6,299.8	120.0	0.0	120.0	6,419.8	413.0	413.0
31-Jul	11	6,419.8	1,720.0	13.7	1,733.7	8,153.5	413.0	426.0
1-Aug	12	8,153.5	2,200.0	87.5	2,287.5	10,441.0	426.0	462.0
2-Aug	13	10,441.0	850.0	34.3	884.3	11,325.3	462.0	463.5
3-Aug	14	11,325.3	630.0	26.7	656.7	11,982.0	463.5	463.5
4-Aug	15	11,982.0	280.0	21.7	301.7	12,283.7	463.5	463.5
<b>Losses to Carmichael Sst:</b>			<b>11,266.9</b>	<b>bbl</b>				

**Table 7: LCM Pills & Cement Plugs to Combat Losses**

**Mereenie Aquifer & Carmichael Formation: LCM Pills & Cement Plugs to Combat Losses**

DATE	DESCRIPTION	Depth	LCM		CEMENT	
			Mix	Pump	Mix	Pump
27/07/2021	Lost circulation at 319.16m. Mixed & Pumped 40 bbl LCM pill #1. Drill ahead to 351m. Lost circulation at 338.42m & 342.84m. Pumped LCM pills as required.	334	40	40		
		338.5		Pill #2		
		343		Pill #3		
		348		Pill #4		
		349.7		Pill #5		
28/07/2021	Lost circulation. Mixed 40 bbl LCM pill. Pumped 20 bbl LCM pill #6. Allowed LCM Pill to soak into loss zones. Drill ahead to 356.22m. Lost circulation. Pumped LCM pill as required. Prepared additional 40 bbl LCM pill. Pumped 10 bbls LCM pill. Allowed to soak. Drill ahead to 358.24m. Lost circulation. Pumped 3 x LCM pills (totalling 34bbl of LCM). Mixed and Pumped 3 x 40 Lb concentration LCM Pills . Failed to achieve circulation. Pumped 1 x 50 lb concentration LCM pill. Pumped 01 x 60 lb concentration LCM pill. Received returns on the 60 lb concentration pill.	353	40			
		353		20		
		356	(as required)			
		356	40	10		
		358		34		
		358	3 x 40lb conc			
		358	1 x 50lb conc 1 x 60lb conc			
29/07/2021	Pumped LCM pill, RIH and wash down to 397.41m Pumped LCM pill, POOH with 12.25" Bit and BHA#4.	413		1 pill		
		413		1 pill		
30/07/2021	pumped LC Cement plug #1. 47.8 bbls of 15.8 ppg cement for 100m plug. pumped LC Cement plug #2. 47.8 bbls of 15.8 ppg cement for 100m plug.	413			47.8	47.8
		413			47.8	47.8
31/07/2021	Drilled ahead 12 1/4" hole from 413m to 426m (TLC), Transfer 20bbls of 40ppb LCM pill into active system. Transfer 40bbls of 60ppb LCM pill into active system. Pumped 48bbls of 15.8ppg cement slurry. Plug #3	426	20	20		
			40	40		
		426			48	48
1/08/2021	Work pipe partial returns, added 20bbl of 40ppb LCM into active. Drill ahead from 454m to 462.5m, (TLC), Add 30bbls 40ppb LCM pill to suction system, (no surface volume) Pumped 30bbl of 40ppb LCM pill and spotted 390m to 328m	462	20	20		
		462	30	30		
		462				
2/08/2021	Pumped 48bbls of 15.8ppg cement slurry. Plug #4	462			48	48

### 3.10 WELL COMPLETION

Rigged up Expro & PCE. Identified running tool adaptor component was missing. Expro crew explored alternate methods to run packer and received confirmation to proceed with running the Packer and correlating to the CCL. MU Lower production Packer on E-line running tools. RIH with Permanent Packer - 7" x 2-3/8" (NS-CT) lower completion assembly. Correlated packer setting depth to the CCL and placed Top of Packer at 1210.90m POOH with running tool. Rigged aside lubricator and laid down running tools.

Picked up slick-line running tools. Conducted an inflow test. Well bore pressures remained stable, indicating 7" packer was set. Filled 7" casing annulus with 2% KCL brine. Pressure tested 7" casing against the 7" lower production packer 250psi low 5min and 2000psi high 10min ok.

Held PJSM with SLB logging crew, Rigged up for Run#1 CBL-VDL-GR-CCL. Ran and analysed CBL log. Decision made to run a USIT log. Schlumberger Run #2 USIT log. Completed logging operations. RD Schlumberger logging unit.

RU Expro Slick-line unit. RIH with Junk catcher and placed in the top of the 7" lower production packer at 1210.90m. RD Expro Slick-line and RU Expro E-line unit. Prepare E-line equipment for Correlating and Perforating Gun runs. Trouble-shoot difficulties with logging tools.

- RIH with Perforation gun run #1 3.5m, correlate to OH logs GR, Fired guns and perforated 1183.70m to 1187.20m.
- RIH 2nd gun run. 4.9m of Perforation guns, correlate to OH logs GR, Detonated guns and perforated the Lower section of the P1-310 formation at 1176.10m to 1181.00m.
- RIH 3rd gun run. 4.9m of Perforation guns, correlate to OH logs GR, attempted to detonated guns, detonation failed.

POOH with 3rd gun run to recover the non-detonated guns. Found fault with the shock absorber component of the running tool. Repaired and re-assembled running tools. RIH 3rd gun run. 4.9m of Perforation guns, correlate to OH logs GR, multiple attempts to detonate guns, Detonation failed. Followed Expro miss-fire protocols. POOH with 3rd gun run (2nd mis-fire run) to recover the non-detonated guns. Found fault with the GR shock absorber. Expro organized replacement tools and 2 x additional Expro operators.

RIH to recover junk sub from the P3 Isolation packer at 1210.90m. Emptied junk sub, ran back in hole and re-installed the Junk basket. POOH and recovered running tools. RD Slick-line unit and RU E-line equipment for Correlating and Perforating Gun runs.

- MU and RIH 3rd gun run. 4.9m of Perforation guns, correlate to OH logs GR, Detonated guns and perforated the Lower section of the P1-310 formation at 1172.2m to 1176.10m.
- MU and RIH 4th gun run. 5.1m of Perforation guns, correlate to OH logs GR, Detonated guns and perforated the P1-280 formation at 1162.90m to 1168.00m.
- MU and RIH 5th gun run. 2.7m of Perforation guns, correlate to OH logs GR, Detonated guns and perforated the P1-240 formation at 1155.50m to 1158.20m.

- MU and RIH 6th gun run. 3.2m of Perforation guns, correlate to OH logs GR, Detonated guns and perforated the P1-240 Upper formation at 1150.40m to 1153.60m.

RIH slick line retrieve junk catcher, cleaned out sludge and metal debris from perforating, Run and set Junk catcher.

- RIH guns for run #7. 4.3m RIH correlate to OH logs GR, Detonated guns and perforated the P1-210 Pacoota formation at 1141.30m to 1145.60m.
- RIH guns for run #8. 3.2m RIH correlate to OH logs GR, Guns didn't fire, POOH to inspect tools, GR tool failed. Decision to correlate to CCL, Detonated guns and perforated the P1-200 Pacoota formation at 1136.50m to 1139.70m.
- RIH guns for run #9. 5.1m RIH correlate to CCL, Detonated guns and perforated the P1-120/130 Pacoota formation at 1118.40m to 1123.50m.
- RIH guns for run #10. 3.1m RIH correlate to CCL, Detonated guns and perforated the P1-110 Pacoota formation at 1112.0m to 1115.10m.

RIH slick line retrieve junk catcher, cleaned out sludge and metal debris from perforating, Cleaned junk catcher. Ran and re-set junk catcher.

Expro have damaged E-line due to line coming off spool sheeve. Cut and re-splice E-line cable. While connecting lubricator to connection at rig floor, Expro safety connector on E-line cable parted & dropped 6m gun (Run #11) into BOPs; landing on blind rams. Guns not re-runnable. Re-string E-line through lubricator and re-splice cable head, P/U Lubricator.

RIH guns for run #12 4.6m RIH correlate to CCL. Attempted to detonated guns, Failed to detonate. Miss-fire. Suspected issue with computer panel inside logging truck. POOH and laid down guns. Expro crew repaired the computer firing panel inside logging truck. RIH guns for run #12 4.6m RIH correlate to CCL. Attempted to detonated guns. Failed to detonate. POOH and laid down guns. Suspected detonator sub component malfunctioning.

- RIH guns for run #12. 4.6m RIH correlate to CCL, Detonated guns and perforated the P1-60 Pacoota formation at 1096.4m to 1101.0m.
- RIH guns for run #11. 5.3m RIH correlate to CCL, Detonated guns and perforated the P1-80 Pacoota formation at 1102.70m to 1108mm.
- RIH guns for run #13. 5.6m RIH correlate to CCL, Detonated guns and perforated the P1-40 Pacoota formation at 1087.50m to 1093.10mm.

Change over to Slick Line, R/U Lubricator RIH retrieve Junk Catcher. Rigged down Expro PCE from BOPs.

M/U 7 1/16" Hanger, land out. Rigged up to run 2 3/8" TBG long string. Made up completion BHA and RIH from surface to ~1210m. (Tagged lower packer on joint # 114 of the 2-3/8" NS-CT tubing, above the production BHA). Located long string lower packer seal assembly into the Permanent packer at 1210.90m. Spaced-out Long string and landed the tubing hanger with Long string. Pressured up to 500psi and confirmed Seal assembly had located into the permanent packer.

RIH with plug and prong to Long String upper X-Nipple at ~1087.82m and set in 'X' nipple. Pressure tested 2-3/8" NS-CT tubing string and BHA to 1000 psi. Set the D&L Hydroset 11-

A Dual Packer. Conducted Annulus pressure test to confirm the Dual production had set. Retrieve the plug and prong from X-nipple at 1087.82m.

MU Short String BHA and short string Dual string tubing hanger. Landed tubing hanger onto the landed seal assembly. Confirmed Short string tubing hanger had landed in tubing spool. Pressure tested the Short string tubing. RIH to open Short String SSD at 1054.95m. Pressure test landed tubing hanger to 250 psi and 3000 psi. 5x5 minutes.

Nipple down and removed BOPs. N/U and Pressure tested Dual Well-head assembly. Pressure tested surface lines to 2000 psi. Off-load brine from tubing string with Nitrogen to trip tank, Shut annulus in. Bleed down surface lines from the Nitrogen tanks and Lubricator. RIH retrieved junk catcher from on top of Prong and Plug at 1070.86m.

RIH to retrieve prong. Pull prong. Pressure slowly building up while POOH with slick line, Lost weight on way out, slick line parted. M/U LIB (Lead Impression Block) tools, R/U Lubricator. RIH with LIB. RIH with overshot. Latched Over-shot and worked jars, failed to release Prong and SL fish. POOH with slick-line fishing tool string. Found shear pin had not sheared. Numerous subsequent runs with the LIB, Blind Box Slick-line tool, Wire-grabber fishing tool and Over-shot failed to recover the fish. RIH and attempt to pull junk catcher. Noted overpull as the Junk catcher past through the Upper X-Nipple and SSD's. Running tools arrived at surface, found NO Junk catcher on running tools.

RIH and located Junk Catcher at ~1210m. Engaged GS pulling tool and worked span jars to free the Junk Catcher. Pulled junk catcher running tools and found the running tools to be full of well bore debris. Decision made to RIH with Slick-line bailer. Conducted 3x slickline bailer runs. Silt and debris recovered from each run.

As there was no progress in recovering the fish, it was decided to cut WL down hole at top of rope socket at 1202m. POOH with wire line. Cut 20m of line off, re-tie rope socket, Pin tools for retrieving SL cutter. RIH with overshot to retrieve SL cutting tool. Conduct LIB run - no indication of wire in hole. RIH and tagged TOF at ~1203m, engaged latching tool and worked hydraulic jars. Fish became free. POOH and recovered running tools and Fish.

Short String opened up to flare at 17:00 hours on 3<sup>rd</sup> August. Initial pressure 1230 psi. Flowing pressure bled down quickly and stabilised at 20 psi on a 12/64in Choke. RIH with 1.75in Bailer assembly. Tagged HUD at 1208m Bailed down to 1211m. POOH and recovered bailer. Found Bailer was full of debris. Re-ran bailer a further 2 times.

MU and RIH with 1.86in Gauge Cutter. Located an obstruction at 1204m, reciprocated Gauge cutter and continued to RIH to ~1211m. POOH and recovered the Gauge cutter.

RIH with 1.75in Bailer assembly. Tagged HUD at 1211m Bailed down to 1211.75m. POOH and recovered bailer with small amount of debris. Re-ran bailer and recovered debris. Dropped soap sticks down short string side, shut well and let sit for 2 hrs then opened quickly to try & unload fluid. M/U sucker rod spear to RIH and attempt to free up packed debris in junk catcher at 1211.7m. Conducted 3 Bailer runs, finding small amounts of fill on each run.

RIH with GS running tool, Located HUD at ~1210.75m. Jarred down 50 times. POOH and recovered the GS pulling tool. Found the GS tool had indents on the shear pin but had not



sheared. Decision made to Suspend Slick-line operations. Planned to order in additional Slick-line tools. Rigged down work floor, cleaned Wellhead and prepared for Rig move. Released Rig at 06:00 hrs on 5<sup>th</sup> August.

**Table 8: Pacoota P1 Perforation intervals**

### West Mereenie 28 Pacoota P1 Perforation Intervals

Reservoir	Gun-Run #	Top Shot mMDRT	Bottom Shot mMDRT	Interval m
P1-40	Gun Run #13	1087.5	1093.1	5.6
P1-60	Gun Run #12	1096.4	1101.0	4.6
P1-80	Gun Run #11	1102.7	1108.0	5.3
P1-110	Gun Run #10	1112.1	1115.1	3.0
P1-120/130	Gun Run #9	1118.4	1123.5	5.1
P1-200	Gun Run #8	1136.6	1139.6	3.0
P1-210	Gun Run #7	1141.3	1145.6	4.3
P1-240	Gun Run #6	1150.5	1153.5	3.0
P1-240	Gun Run #5	1155.5	1158.2	2.7
P1-280	Gun Run #4	1162.9	1168.0	5.1
P1-310	Gun Run #3	1171.2	1176.1	4.9
	Gun-Run #2	1176.1	1181.0	4.9
P1-350	Gun-Run #1	1183.7	1187.2	3.5
<b>Total Perforations:</b>				55.0

## 4 FORMATION EVALUATION

### 4.1 WELL EVALUATION LOGS

For wireline logging data, see appendix C

**Table 9: WM28 Well evaluation logs**

MUDLOGGING	Geoservices		
Log	Hole Size	Top Depth (m)	Bottom Depth (m)
Drill Log	17 1/2", 12 1/4", 8 1/2", 6"	6	1332
Gas Ratio Log		6	1332
Mudlog		6	1332
Time Log		Date 22/07/2021	Date 22/08/2021

WIRELINE LOGGING	Schlumberger
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Log	Suite/ Run	Hole/Casing Size	Top Depth (m)	Bottom Depth (m)
GR (Gamma Ray)	S1/R1	8 1/2" OH	5	1244
SP (Spontaneous Potential)	S1/R1	8 1/2" OH	5	1244
PEX (NPHI Neutron)	S1/R1	8 1/2" OH	5	1244
PEX (RHOB Density)	S1/R1	8 1/2" OH	430	1244
HRLA (Resistivity)	S1/R1	8 1/2" OH	430	1244
BHC (Sonic)	S1/R1	8 1/2" OH	430	1244
FMI (Formation Imager)	S1/R1	8 1/2" OH	750	1244
CBL (Cement Bond Log)	S1/R2	9 5/8" CH	5	455
VDL (Variable Density Log)	S1/R2	9 5/8" CH	5	455
GR (Gamma Ray)	S1/R2	9 5/8" CH	5	455
CCL (Casing Collar Locator)	S1/R2	9 5/8" CH	5	455
CBL (Cement Bond Log)	S2/R1	7" CH	5	1209
VDL (Variable Density Log)	S2/R1	7" CH	5	1209
CCL (Casing Collar Locator)	S2/R1	7" CH	5	1209
USIT	S2/R2	7" CH	5	1209
GR (Gamma Ray)	S2/R2	7" CH	5	1209
CCL (Casing Collar Locator)	S2/R2	7" CH	5	1209

## 4.2 CORES AND SAMPLE DETAILS

No cores were cut in WM28.

Cuttings samples were collected as follows:

- Surface to 650 mMDRT: 10m interval
- 650 mMDRT to 1322 mMDRT: 5m interval

11 gas samples were retrieved in Isotubes from the Blooie line while Flow Testing and an additional 2 Isotube gas samples collected upon circulation after killing the well at 1182.5 mMDRT.

The isotube samples were analysed by ALS Laboratories and the Air & Helium corrected results are presented in Table 10.

## 4.3 PRODUCTION TEST DETAILS

The well programme called for clean-up flow and production test after running the dual completion. However, due to the problems associated with clearing out the production string and recovering the junk catcher, the decision was made to Suspend operations and return with additional Slick-line tools. Consequently, the rig was released at 06:00 hrs on 5<sup>th</sup> August without conducting production testing.

Table 10: WM28 Flow Test Isotube Gas Samples

Sample ID	Date Sampled	Depth From	AIR & HELIUM CORRECTED														
			Nitrogen	CO2	Methane	Ethane	Propane	i-Butane	n-Butane	i-Pentane	n-Pentane	Hexane	Hydrogen	n-Octane	n-Heptane	Total	
			mol %	mol %	mol %	mol %	mol %	mol %	mol %	mol %	mol %	mol %	mol %	mol %	mol %	mol %	
1 Flow Test #1a @ 875m	8/08/2021	875	3.73	0.05	76.70	12.70	4.31	0.49	1.15	0.27	0.32	0.25	ND	ND	0.07	100	
2 Flow Test #1b @ 875m	8/08/2021	875	3.56	0.05	76.50	12.80	4.38	0.50	1.19	0.30	0.32	0.27	ND	ND	0.07	100	
3 Flow Test #2 @ 1019m	9/08/2021	1019	0.00	0.13	82.70	12.60	3.25	0.39	0.78	ND	0.26	0.26	ND	ND	ND	100	
4 Flow Test #3 @ 1109m	10/08/2021	1109	0.42	0.09	79.10	13.90	4.33	0.42	1.12	0.23	0.33	0.23	ND	ND	ND	100	
5 Flow Test #3 @ 1112m	10/08/2021	1112	1.22	0.09	78.40	13.70	4.32	0.41	1.17	0.23	0.32	0.23	ND	ND	0.05	100	
6 Flow Test #4a @ 1167m	10/08/2021	1167	6.59	0.06	73.10	13.10	4.43	0.46	1.21	0.28	0.34	0.28	ND	ND	0.09	100	
7 Flow Test #4b @ 1167m	10/08/2021	1167	5.74	0.06	73.70	13.30	4.51	0.47	1.22	0.28	0.38	0.28	ND	ND	0.09	100	
8 Circulating @ 1182m	13/08/2021	1182	0.00	ND	81.00	13.50	3.10	0.30	0.89	0.30	0.30	0.42	ND	ND	0.18	100	
9 Circulating @ 1182m	13/08/2021	1182	0.79	ND	78.00	13.20	3.83	0.48	1.50	0.57	0.70	0.84	ND	ND	0.26	100	
10 Flow Test #5a @ 1243m	13/08/2021	1243	23.90	0.05	59.40	10.70	3.63	0.38	0.99	0.20	0.30	0.23	ND	0.03	0.08	100	
11 Flow Test #5b @ 1243m	13/08/2021	1243	23.90	0.05	59.50	10.70	3.63	0.39	0.98	0.21	0.28	0.23	ND	ND	0.08	100	
12 Flow Test #7 @ 1330m	21/08/2021	1330	23.20	ND	60.90	9.83	3.55	0.42	1.08	0.27	0.32	0.27	ND	0.02	0.07	100	
13 Flow Test #7 @ 1332m	21/08/2021	1332	19.60	ND	64.40	9.81	3.59	0.46	1.11	0.31	0.34	0.22	ND	ND	0.06	100	

## 4.4 HYDROCARBON INDICATORS

The following table (Table 11) details the cuttings gas peaks analysed during air/mist drilling of the sequence from top Upper Stairway Sandstone to base Pacoota P2 in 8 ½” hole, along with the gas peaks encountered while Air/N<sub>2</sub>/mist drilling Pacoota P1 sequence in 6” hole.

No visual hydrocarbon stain or fluorescence were observed in cuttings from this well.

### **Stairway Sandstone**

Above the Top Upper Stairway Formation (756 mMDRT) the total gas values are below the detectable limit but increase dramatically to 17% below 785 mMDRT, with the onset of significant porosity. While drilling the Stairway Formation the total gas (TG) values are relatively constant (~11 to 24%) and remained consistently at this level while drilling the Horn Valley Siltstone.

### **Pacoota P1**

Upon drilling into the Pacoota P1 (1079 mMDRT) total gas gradually and consistently increased from 29% at 1079 mMDRT to 72% at the base of the unit. While drilling the Pacoota P2, total gas levels continued to increase steadily to 88% at TD of the 8 ½” hole section (1243 mMDRT) as gas from the combined Stairway and Pacoota P1 formations continued to flow into the wellbore.

### **Pacoota P3**

Upon drilling ahead in 6” hole, after setting 7” casing, the total gas level dropped dramatically to 16% while drilling the base of the Pacoota P2. Once the Pacoota P3 was encountered total gas climbed quickly to 63% by 1260 mMDRT and remained at this elevated level (54 – 73%) throughout the drilling of the Pacoota P3. This is slightly lower than the total gas recorded towards the base of the 8 ½” hole, due to the smaller borehole size and the fact that all gas in the 6” hole is solely produced by the P3 unit. In the 8 ½” hole the Upper Stairway, Lower Stairway and Paacoota P1 units were all contributing to the total gas percentage.

**Table 11: WM28 Hydrocarbon indicators**

<b>Depth (m)</b>	<b>Hole Size (inch)</b>	<b>TG (C1 - C5) %</b>	<b>BG %</b>	<b>C1 ppm</b>	<b>C2 ppm</b>	<b>C3 ppm</b>	<b>IC4 ppm</b>	<b>NC4 ppm</b>	<b>iC5 ppm</b>	<b>nC5 ppm</b>
756-785	8.5	0.2	12.0	1145	216	68	32	16	14	14
785-815	8.5	17.2	13.7	137716	22244	7837	763	2173	524	625
815-825	8.5	17.6	14.1	141303	22847	7904	812	2193	548	644
825-845	8.5	15.6	12.5	124759	20488	7083	745	2002	488	586
845-876	8.5	15.6	19.6	124759	20488	7083	745	2002	488	586
876-925	8.5	13.4	18.0	107507	17359	5960	610	1685	410	490
925-965	8.5	11.6	15.5	93189	14764	5101	518	1425	336	485
965- 985	8.5	13.6	16.5	111187	17652	4677	432	1189	280	302
985- 995	8.5	13.6	16.5	111187	17652	4677	432	1189	280	302
995-1021	8.5	24.0	26.0	26000	176984	26716	7296	681	1864	430
1021-1085	8.5	25.1	25.0	25000	186400	28315	7808	723	1996	466
1085-1095	8.5	29.6	31.0	31000	219316	32763	9250	853	2370	542
1095-1117	8.5	42.9	48.3	340164	59913	19035	1713	5416	1143	1541
1117-1163	8.5	42.0	52.2	335373	57201	18167	1649	5072	1151	1566
1163-1175	8.5	68.2	80.0	530911	98911	34081	3311	9720	2103	2727
1175-1182	8.5	63.9	41.5	497711	92713	31448	3039	9065	1991	2588
1182.5-1190	8.5	72.3	88.0	557258	109538	36719	3566	10402	2242	2905
1190-1195	8.5	86.9	90.0	672522	129523	44121	4324	12238	2634	3416
1195-1230	8.5	87.6	89.9	679978	129170	43807	4288	12191	2717	3538
1230-1243	8.5	88.3	90.0	680400	134595	44869	4398	12545	2697	3543
1243-1250	6	16.0	4.7	125724	22367	8036	736	2228	497	672
1250-1260	6	63.5	50.5	494707	91071	31883	3129	9461	2159	2814
1260-1295	6	54.3	73.4	420322	79221	28556	2942	8636	1581	2065
1295-1332	6	73.8	92.0	586151	94933	35660	4091	11258	2712	3442

## 5 GEOLOGY

### 5.1 ALONG HOLE AND TRUE VERTICAL DEPTH OF SEISMIC MARKERS

Table 12: WM28 Formation Tops

Prognosed Formation	PROGNOSED		ACTUAL - Post Petrophysics			
	Depth (mMDRT)	Depth (mSS TVD)	Depth (mMDRT)	Depth (mSS TVD)	Thick (m)	Diff to Prog (m)
Mereenie Sandstone	9.53	-767.5	9.5	767.5	140.5	0.0
Mereenie Aquifer	144.83	-632.2	150.0	627.0	190.0	5.1
Carmichael Sandstone	351.23	-425.8	340.0	437.0	64.0	-11.2
Upper Stokes Siltstone	406.23	-370.8	404.0	373.0	242.0	-2.2
Lower Stokes Siltstone	650.93	-126.1	646.0	131.0	110.0	-5.0
Upper Stairway Sandstone	721.83	-55.2	756.0	21.0	55.0	34.2
Middle Stairway Sandstone	787.83	10.8	811.0	-34.0	109.0	23.2
Lower Stairway Sandstone 2	885.33	108.3	920.0	-143.0	56.0	34.6
Lower Stairway Sandstone 1			976.0	-199.0	31.0	NP
Horn Valley Siltstone	976.73	199.7	1,007.0	-230.0	72.0	30.3
Pacoota P1	1048.63	271.6	1,079.0	-302.0	108.0	30.4
Pacoota P2	1166.73	389.7	1,187.0	-410.0	63.0	20.3
Pacoota P3	1223.73	446.7	1,250.0	-473.0	82.0	26.2
Total Depth	1305.73	528.7	1,332.0	-555.0		

### 5.2 PRELIMINARY ASSESSMENT OF RESERVOIR AND PROSPECTIVE HORIZONS

The net sand was interpreted to be intervals where the volume of wet clay is less than 40% and the permeability is greater than 0.2 mD.

Net pay was interpreted to be in intervals of net sand where the water saturation is less than 60%.

#### 5.2.1 Upper Stairway Sandstone

The Upper Stairway Sandstone (756 – 811 mMDRT) was tested whilst drilling with air and failed to flow gas to surface and so is not an attractive production target. The interpretation does calculate 7.9 metres of net pay, but with an average permeability of only 0.297 mD, the flow potential is limited.

#### 5.2.2 Lower Stairway Sandstone

The Lower Stairway Sandstone in WM28 is divided into the

- Lower 2 (920 – 976 mMDRT)
- Lower 1 (976 – 1007 mMDRT)

tested 0.6 mmscf/d from a test in the uppermost Horn Valley. 3.6 metres of net sand is interpreted to be present in the shallower interval, but with only 0.253 mD permeability. The caliper and FMI show fractures at 943.0 mMDRT and 950.4mRT which probably contributed to the test rate. The Stairway is interpreted to have 20.4 metres of net sand with an average porosity of 6.8% and a permeability of 0.27 mD. 12.1 metres of this is interpreted to be net pay with an average porosity of 7.0%, permeability of 0.28 mD and water saturation of 43%.

### **5.2.3 Pacoota 1**

The Pacoota P1 was encountered between 1079 – 1187 mMDRT and is divided into 11 sandstone sequences based on correlation to the rest of the field wells. The Pacoota P1 flowed at 1.2 mmscf/d at 1117 mMDRT (encompassing the intervals down to and including the P1-110), 2.9 mmscf/d at 1167.5 mMDRT where the P1-120/180 to P1-280 sections had also been penetrated and 2.7 mmscf/d and 2.5 mmscf/d at section TD with the entire P1 and most of the P2 open. The P1 is interpreted to have 60.1 metres of net sand with an average porosity of 3.8% and a permeability of 1.377 mD. 29.4 metres of this is interpreted to be net pay with an average porosity of 3.9%, permeability of 1.383 mD and water saturation of 35%. 1 Averages were calculated without the P1-120/180 and P1-280 due to poor log quality in these intervals

### **5.2.4 Pacoota P2**

The Pacoota P2 was penetrated between 1187-1243 mMDRT, with the current section TD being approximately 10 metres above base P2. The interval is characterised by a higher gamma ray profile. Borehole quality is good with no significant washout observed. The full log suite extends only to 1210 mMDRT and so conclusions can only be drawn on this upper interval. No net pay was calculated to be present in this interval.

#### **Please see the following Geological Appendices:**

- **Appendix C** for the Wireline Logs & Survey Data
- **Appendix E** for the Flow Test Data
- **Appendix F** for the WM28 Index Sheet
- **Appendix H** for the WM28 Daily Geological Reports
- **Appendix I** for the WM28 Formation Evaluation Log