Amungee NW-1H

Well Completion Report
(Basic)

EP 98
Beetaloo Basin
Northern Territory

21st October – 14th November 2015

Origin Energy Resources Ltd

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1 Introduction and Summary

Amungee NW-1H was drilled by Origin Energy Resources Ltd in Exploration Permit EP98 in the Beetaloo Basin (Figure 1), Northern Territory, approximately 400m south of the Carpentaria Highway and 60km east of the town of Daly Waters and the Stuart Highway (Figure 2). The well was planned as a horizontal appraisal well and side-track from the vertical well Amungee NW-1. This well is the third well drilled in the 2015 Beetaloo well drilling programme. The well was spudded on 21 October 2015 and reached TD of 3808 mMDRT (2428 mTVDRT) on 14 November 2015. The well was suspended and the rig released on 24 November 2015.

The primary aim of Amungee NW-1H was to test the potential and lateral extent of the Middle Velkerri Member organic rich mudstones within the northern Beetaloo Basin

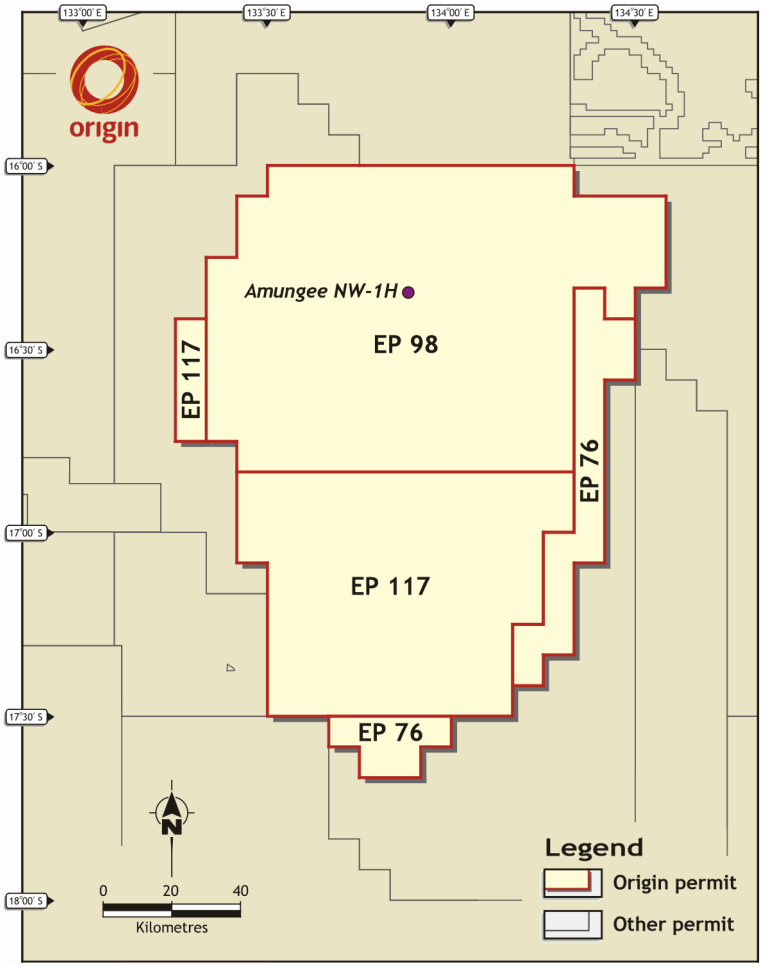

Figure 1. Amungee NW-1H Surface well Location and Permit Map

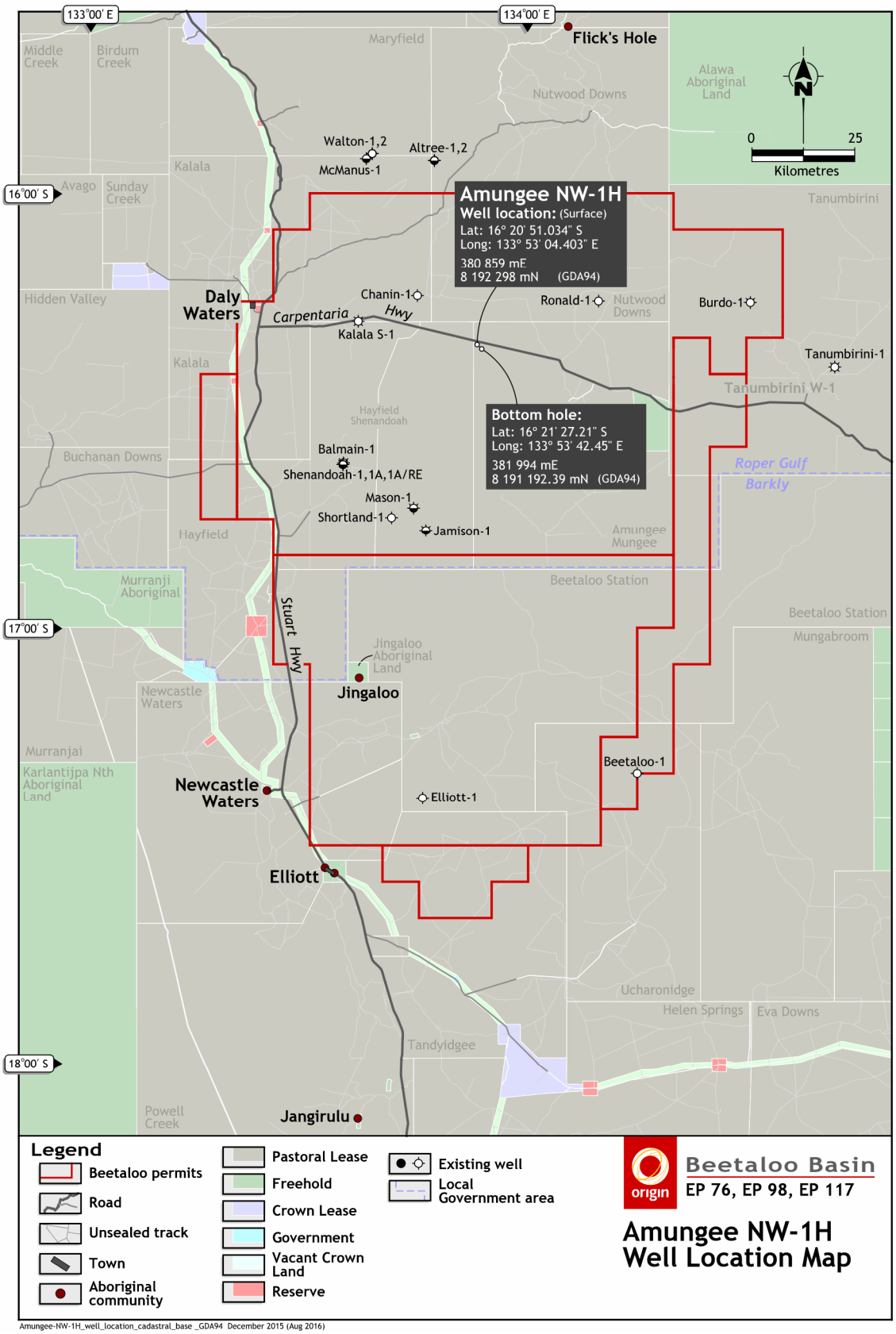

Figure 2. Amungee NW-1H Location in relation to pastoral leases in the Daly Waters/Beetaloo Basin area

2 Well Summary Sheet

Well Name:	Amungee NW-1H
Classification:	Appraisal
Permit:	EP98, Northern Territory
Well Path:	Horizontal
Location:	**Surface Hole**
	Latitude: 16° 20' 51.034" S / Longitude: 133° 53' 4.403" E
	Easting: 380 859 metres / Northing: 8 192 298 metres
	Bottom Hole
	Latitude: 16° 21' 27.21" S / Longitude: 133° 53' 42.45" E
	Easting: 381 994 metres / Northing: 8 191 192.39 metres
	(GDA 94; UTM 53, Map Sheet: SE53 Newcastle Waters, Graticule Block No 311)
Offset Well:	Chanin 1 ~18.6 km (heading -51° from Amungee NW-1H Surface hole)
	Kalala S-1 ~29.6 km (heading -80° from Amungee NW-1H Surface hole)
	Shenandoah 1A ~45 km (heading -134° from Amungee NW-1H Surface hole)
	Ronald 1 ~31.6 km (heading 70° from Amungee NW-1H Surface hole)
Seismic Control:	East-West Control: 2D Seismic Line - sh90-102. Shot point 1835 – projected ~424.9 m heading 180.1° from well to 2D line (degrees from true north)
	North-South Control: 2D Seismic Line - ma91-93. Shot point 2393 – projected ~38.3 m heading 86.6° from well to 2D line (degrees from true north)
Elevation:	260.562m (GL above MSL)
RT Elevation:	265.912m (above MSL)
Kick off Depth:	1932.5 mMDRT (1932.42 mTVDRT)
Total Depth Driller:	3808 mMDRT (2428 mTVDRT)
Total Depth Logger:	3808 mMDRT (2428 mTVDRT)
Casing:	16” @ 118 mMDRT
	10.75” @ 281.45 mMDRT
	7.625” @ 1432.31 mMDRT
Spud:	21-October-2015 @ 00:00 hrs
Reached TD:	14-November-2015 @ 01:00 hrs
Rig Released:	24-November-2015 @ 12:00 hrs
Well Status:	Open-hole Suspended
Suspended:	24-November-2015 @ 12:00 hrs
PBTD:	1328 mMDRT (tagged top of suspension plug)
Permit Interests:	Origin Energy Resources Ltd (Operator - 35%)
	Sasol Petroleum International (35%)
	Falcon Oil & Gas (30%)

Rig Name/Type: Saxon 185 / Land-Onshore

Drilling Contractor: Saxon

3 Drilling

3.1 Summary of drilling and related operations

#	Start Date	End Date	Last 24hr Summary
1	20/10/2015	21/10/2015	• Operations on Amungee NW-1H commenced on 21-October-2015 at 00:00 hrs. • Retrieved wear bushing and flushed stack. • Tested BOP and performed accumulator closing unit and closing unit pump test. • Conducted pre spud inspections and prepared directional BHA.
2	21/10/2015	22/10/2015	• Performed hazard hunt, pre spud checklist and maintenance. • Slipped and cut drill line.
3	22/10/2015	23/10/2015	• Waited for Origin review of updated well plan and approval to drill. • Held pre spud safety meeting. • Made up and RIH with 6-3/4" directional BHA.
4	23/10/2015	24/10/2015	• RIH to 1857 mRT. Washed and reamed down to 1876 mRT. Tagged TOC. • Troubleshot TDS slide function. • Washed and reamed from 1876 to 2016 mRT whilst attempting to locate suitable cement for sidetracking. • Pulled out of hole from 2016 to 40 mRT. • Picked up and made up cement stinger. • RIH with 2-7/8" cement stinger on 4" drill pipe.
5	24/10/2015	25/10/2015	• RIH and pumped kick-off plug. • WOC. • Picked up 6-3/4" directional BHA. • RIH to 1845 mRT. Washed and reamed down to 1857 mRT. Tagged TOC. • Drilled and dressed cement plug for kick-off to 1890 mRT.
6	25/10/2015	26/10/2015	• Controlled time drilled from 1890 to 1917.6 mMDRT at 0.5m/hr. • Slid from 1917.6 to 1920 mMDRT to confirm hardness of cement plug. • Reciprocated string in an attempt to create ledge for kick-off. • Controlled time drilled from 1920 to 1923 mMDRT at 0.5 m/hr.
7	26/10/2015	27/10/2015	• Controlled time drilled from 1923 to 1926 mMDRT. • Round trip to change bit and motor deflection. • Controlled time drilled from 1926 to 1927 mMDRT.
8	27/10/2015	28/10/2015	• Kicked-off Amungee NW-1H at 1932.5 mMDRT • Pulled out of hole to change BHA.
9	28/10/2015	29/10/2015	• POOH to surface and laid out directional BHA. • Changed out Telepacer and DPS, set deflection to 1.5 deg. • RIH 6-3/4" directional BHA to 1867 mMDRT. • Washed down to 1932.5 mMDRT. • Directionally drilled 6-3/4" build section from 1932.5 to 1967 mMDRT, average ROP = 5.2 m/hr.

10	29/10/2015	30/10/2015	• Directionally drilled 6-3/4" production build section from 1997 to 2082 mMDRT (2079.6 mTVDRT).
11	30/10/2015	31/10/2015	• Directionally drilled 6-3/4" production build section from 2082 to 2164 mMDRT (2156.1 mTVDRT).
12	31/10/2015	01/11/2015	• Directionally drilled 6-3/4" production build section from 2164 to 2237 mMDRT (2216.7 mTVDRT).
13	01/11/2015	02/11/2015	• Directionally drilled 6-3/4" production build section from 2237 to 2354 mMDRT (2299 mTVDRT).
14	02/11/2015	03/11/2015	• Directionally drilled 6-3/4" production build section from 2354 to 2544 mMDRT (2399 mTVDRT).
15	03/11/2015	04/11/2015	• Directionally drilled 6-3/4" production build section from 2544 to 2677 mMDRT (2434 mTVDRT).
16	04/11/2015	05/11/2015	• Directionally drilled 6-3/4" production build section from 2677 to 2798 mMDRT (2449 mTVDRT). • Circulated hole clean as per program.
17	05/11/2015	06/11/2015	• Pull out of hole. • Pressure tested BOPs.
18	06/11/2015	07/11/2015	• Pressure tested BOPs. • RIH 6-3/4" RSS steering BHA. (6-3/4", Smith, MDSIR516) from surface to 2600 mMDRT.
19	07/11/2015	08/11/2015	• RIH from 2600 to 2798 mMDRT. • Directionally drilled 6-3/4" production lateral section from 2798 to 2900 mMDRT (2450.4 mTVDRT).
20	08/11/2015	09/11/2015	• Directionally drilled 6-3/4" production lateral section from 2900 to 3041 mMDRT (2451.04 mTVDRT).
21	09/11/2015	10/11/2015	• Directionally drilled 6-3/4" production lateral section from 3041 to 3257 mMDRT (2444.86 mTVDRT).
22	10/11/2015	11/11/2015	• Directionally drilled 6-3/4" production lateral section from 3257 to 3460 mMDRT (2442.4 mTVDRT).
23	11/11/2015	12/11/2015	• Directionally drilled 6-3/4" production lateral section from 3460 to 3646 mMDRT (2438.2 mTVDRT).
24	12/11/2015	13/11/2015	• Directionally drilled 6-3/4" production lateral section from 3646 to 3804 mMDRT (2428 mTVDRT).
25	13/11/2015	14/11/2015	• Drilled from 3804 to 3808 mMDRT - well TD. • Pulled out of hole to 2935 mMDRT. • Washed and reamed from 2528 to 2548 mMDRT. Backreamed to 2367 mMDRT. • Pulled out of hole to 1276 mMDRT.
26	14/11/2015	15/11/2015	• Pulled out hole and laid down directional BHA. • Performed wiper trip to 2648 mMDRT.
27	15/11/2015	16/11/2015	• Backreamed and pulled out of hole for wiper trip. • Rigged up to and ran production casing.
28	16/11/2015	17/11/2015	• Ran production casing to 3202 mMDRT.
29	17/11/2015	18/11/2015	• Ran 4-1/2" production casing. • Worked stuck / packed off casing string at 3208 mMDRT. • Pulled out of hole with 4-1/2" production casing.
30	18/11/2015	19/11/2015	• Pulled out of hole with casing from 1100 mMDRT to surface. • Laid out casing running equipment. • Made up and RIH 6-3/4" wiper trip BHA from surface to 1410 mMDRT.

			• Slipped and cut 48' drilling line and serviced rig. • RIH 6-3/4" wiper trip BHA from 1410 to 2559 mMDRT. • Washed down from 2559 to 2595 mMDRT. • RIH from 2595 to 2875 mMDRT.
31	19/11/2015	20/11/2015	• RIH 6-3/4" wiper trip BHA from 2875 to 2962 mMDRT, tight hole. • Washed and reamed from 2962 to 3808 mMDRT. • Circulated hole clean. • Backreamed out of hole from 3808 to 3637 mMDRT. • POOH from 3637 to 2660 mMDRT.
32	20/11/2015	21/11/2015	• POOH 6-3/4" wiper trip BHA from 2660 to 2555 mMDRT. • BAckreamed out of hole from 2555 to 2550 mMDRT, hole packed off, stuck pipe. • Worked stuck pipe from 2550 to 2509 mMDRT. • POOH from 2509 mMDRT to surface. • Picked up and RIH 2-7/8" cement stinger on 4" drill pipe from surface to 1630 mMDRT for suspension cement plugs.
33	21/11/2015	22/11/2015	• RIH with 2-7/8" cement stinger on 4" drill pipe from 1630 to 1894 mMDRT. • Spotted hi-vis pill from 1894 to 1700 mMDRT. • POOH to 1698 mMDRT. • Pumped suspension plug #1 from 1700 to 1550 mMDRT. • POOH to 1400 mMDRT. • Circulated and WOC. • RIH tagged cement at 1534.39 mMDRT. • Spotted hi-vis pill and POOH to 1460 mMDRT • Pumped suspension plug #2 from 1460 to 1310 mMDRT. • POOH to 1160 mMDRT. • Circulated and WOC.
34	22/11/2015	23/11/2015	• Pumped suspension plug #3. • Tagged and pressure tested plug. • Pulled out of hole.
35	23/11/2015	24/11/2015	• Nippled down BOP and all associated equipment. • Installed tubing spool and pressure tested flange connection. • Rig released from Amungee NW-1H at 12:00hrs on 24-November-2015

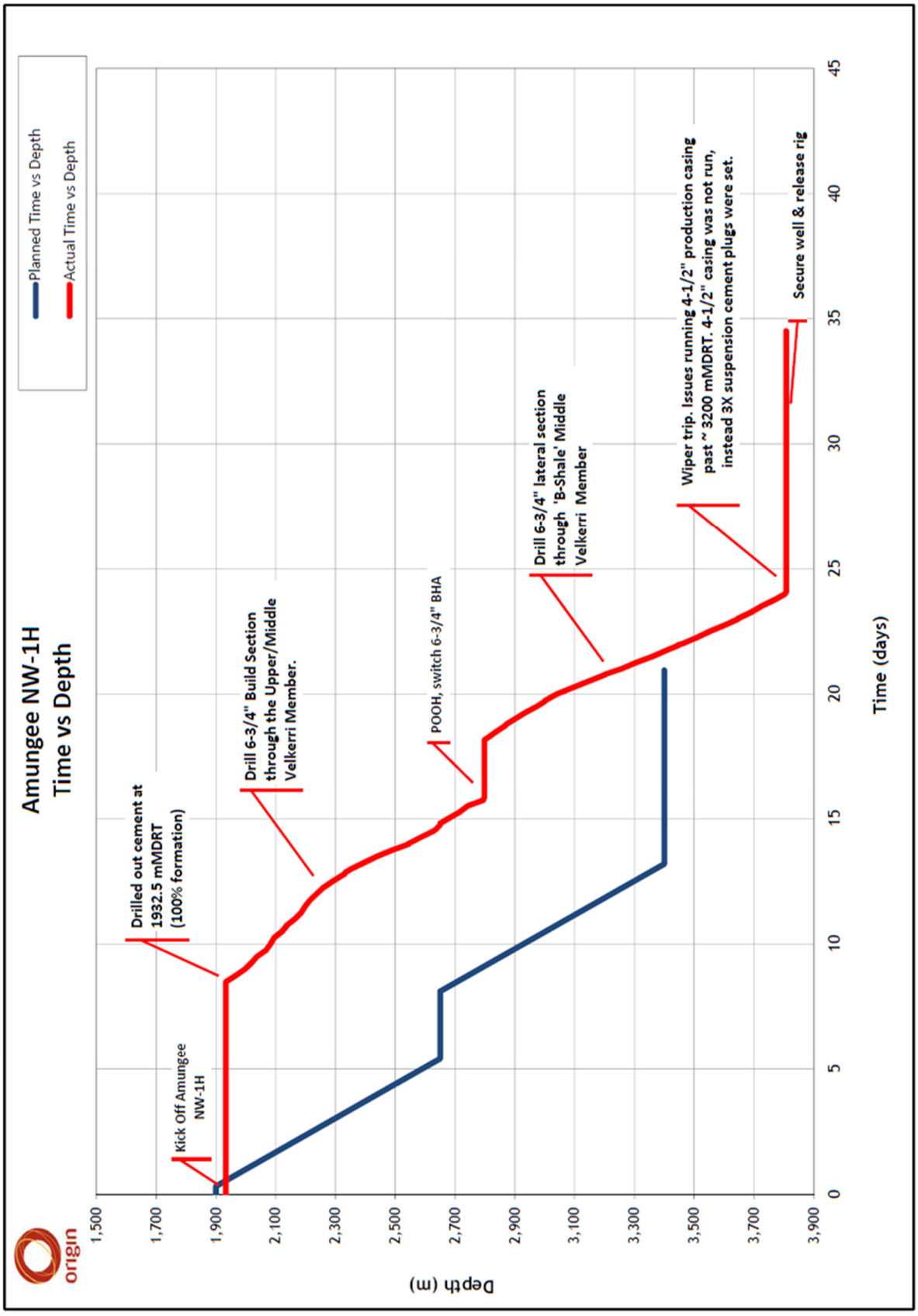

Figure 3. Amungee NW-1H Time vs Depth Chart

3.2 Drilling equipment installed in or on the well

The Saxon Energy Services Australia Rig 185 was used to drill Amungee NW-1H. This rig is a 1200 hp AC hydraulic drive rig with a 178,000 daN (400,000 lbf) pull capacity. The rig pumps are 2 x AC/VFD HongHua HHF-1000 triplex pumps powered by AmeriMex Dominator 1150 hp AC electric motors. An air package consists of 2 x screw compressors rated for 1400 CFM at 350psi and 1 x booster unit capable of 2800 CFM at 1600psi. The mud system consists of three trailer mounted mud tank units rated for 767 bbl capacity complete with 2 x Derrick FLC 504 shale shakers, 1 x Derrick Vac-Flo 500 vacuum degasser and 1 x Derrick DE-1000 FHD centrifuge. The BOP system comprises 1 x 2M Drill Master Elite RFCD-2000, 1 x 5M T3-Energy 11" Annular, 1 x 5M T3-Energy Double Gate Ram (Blind & VBR), 1 x 5M Drilling Spool with 3-1/8" Choke Line and 2-1/16" Kill Line, 1 x 5M Cameron Choke Manifold, 1 x Control Technology 7 Station 14 Bottle Accumulator.

3.3 Casing and equipment installed in or on the well

Prior to commencing casing operations the risk that installing the production casing would encounter challenges was identified and discussed, ultimately there were substantial difficulties running the casing into the wellbore. Although torque and drag modelling assessed whilst drilling indicated that the wellbore friction factors (FF) were quite low (<0.25FF) and appropriate for the casing run, modelled hook loads during the casing run were outside of the bounds generated based on this FF. Due to the risk of helical buckling, which can result in serious physical deformation of the casing (wrinkling), the casing run was stopped at 3217mMD (~600mMDRT short of total depth 3808mMDRT). At this point, when slacking off to 75klbs hook load (helical buckling limit), the casing string would not move further into the wellbore. Although rotation was possible, which theoretically would assist with continued running of the casing string, with a relatively low torque limit of 5kft-lb (JFE FOX connection), it was not deemed appropriate to continue. At this point the casing string was pulled from the wellbore and temporary suspension plans developed and executed. A second attempt to install casing in Amungee NW-1H will take place in Permit Year 3 (2016).

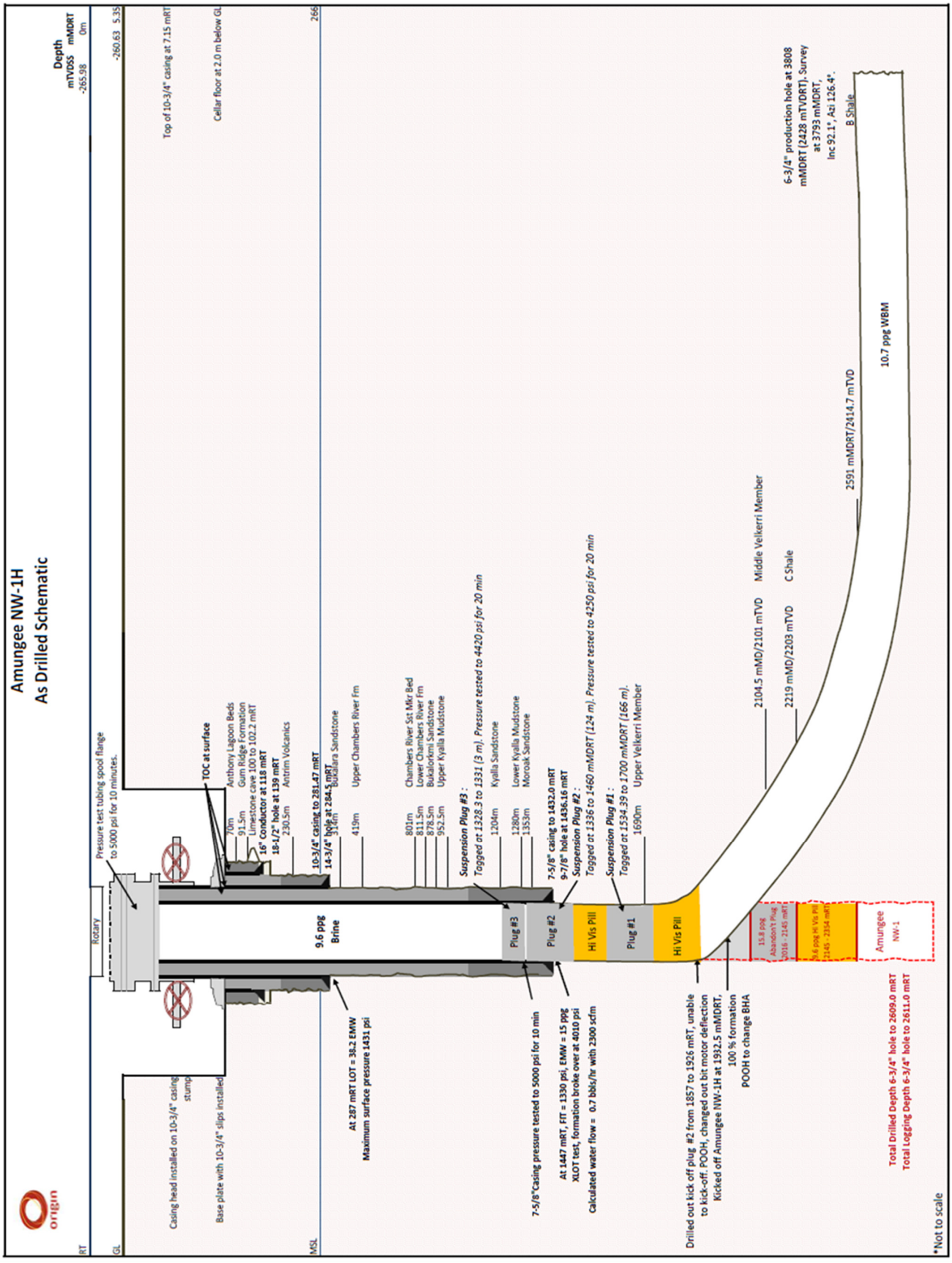

Figure 4. Amungee NW-1H as drilled schematic

3.4 Cementing operations carried out

String (") / Plug	Cement Type	Cement Additives	Slurry Vol (bbls)	Slurry Density (ppg)	Cmt to / from (mMDRT)	Test Press (psi)
Suspension Plug #1	Class G	CFR-3 D-Air 3000L Halad-413L HR-5 SSA-1	27	15.8	1700-1550	-
Suspension Plug #2	Class G	CFR-3 D-Air 3000L Halad-413L HR-5 SSA-1	24	15.8	1460-1310	4250psi/20min
Suspension Plug #3	Class G	CFR-3 D-Air 3000L Halad-413L HR-5 SSA-1	10.5	15.8	1331-1261	4220psi/20min

Table 1. Amungee NW-1H cementing operations

3.5 Bit Records

Bit records and drilling parameters are summarise in Appendix 1

3.6 Drilling Fluids

Newpark Drilling Fluids were contracted to supply and maintain drilling fluids. After receiving 626bbl of 9.6ppg recycled mud (from previous well Amungee NW-1) the mud was centrifuged to lower the solid content and its fluid properties tightened with 0.4ppb Citric Acid, 0.5ppb Xanthan Gum, 0.3ppb JK-161 as PHPA agent. A total of 0.5ppb Rheopac LV was also added to enhance fluid loss control as well as a light treatment of Sodium Sulphite as primary O_2 scavenger. A total of 140bbls of 9.6ppg NaCl Polymer fresh mud was made up. The rig's 2 Derrick Super G shaker units were dressed with 4 x PMD API 230 mesh screens and the Derrick DE 1000 centrifuge was serviced in preparation to spud Amungee NW-1H.

Commenced drilling and kicked off well took place at 1,932.5m. The 6.75" section was deviated from 1,932mMD to 2,591mMD/2,414mTVD using 1.5% by volume of Evolution (HTHP lubricant blend). A 2% by volume of Evolution mud system was utilized for the remainder of the 6.75" lateral section from 2,591mMD/ 2,414mTVD down to well TD at 3,808mMD (2,428mTVD).

4 Geology

4.1 Formation Tops

Table 2 summarizes the prognosed vs. actual Formation Top depths for Amungee NW-1 and side-track Amungee NW-1H

FORMATION	Prognosed Depth		Actual Depth		Difference	COMMENTS
	(mMDRT)	(mTVDSS)	(mMDRT)	(mTVDSS)	(+/- mTVDSS)	
AMUNGEE NW-1						
Undifferentiated Cretaceous	0	265.91	5.35	265.91	-	
Anthony Lagoon Beds	77	189	70	196	7 H	
Gum Ridge Formation	114	152	91.5	174	22 H	
Antrim Volcanics	239	27	**230.5	35.5	8.5 H	**No returns to surface
Bukalara Sandstone	392	-126	314	-48	78 H	
Chambers River Fm	397	-131	419	-153	22 L	
Bukalorkmi Sandstone	869	-603	878.5	-612.5	9.5 L	
Kyalla Formation	957	-691	952.5	-686.5	4.5 H	
Moroak Sandstone	1395	-1129	1353	-1087	42 H	
Velkerri Formation	1870	-1604	1690	-1424	180 H	
Upper Velkerri Member	1870	-1604	1690	-1424	180 H	
AMUNGEE NW-1H						
Middle Velkerri Member	2108	-1838.5	2104.8	-1835.4	3.1 H	
“C” SHALE	2212.5	-1931.9	2212.5	-1931.7	0.2 H	
“B” SHALE	2548	-2152.1	2591.1	-2148.8	3.3 H	Primary Target
Total Depth	**3770.9**	**-2226.5**	**3808**	**-2162**	**-**	

Table 2. Amungee NW-1 and Amungee NW-1H prognosed vs. actual Formation Top depths

4.2 Reservoir and Prospective Horizons

The primary geological objective of horizontal well Amungee NW-1H was the "B" Shale of the Middle Velkerri Member of the Velkerri Formation.

The "B" shale is one of three organic-rich mudstone/siltstone intervals within the Middle Velkerri Member separated by organically poor finely interbedded, variable mud, silt and sand rich intervals. The "B" shale stratigraphically sits between the "A" (youngest) and "C" (oldest) shale units respectively. In Amungee NW-1H, the top of the B Shale was intersected at 2591.1mMD/2414.7mTVD, and horizontally drilled for 1216.9m to a total depth of 3808mMD/2428mTVD.

The lithological description of the Middle Velkerri Member is are summarized in Appendix 2

5 Formation Sampling

5.1 Drill Cuttings

Drill cuttings samples were collected at a sampling rate of 3m over the interval from 1929 to 3808mMDRT (Driller TD).

Detailed drill cuttings lithological descriptions are enclosed in Appendix 2.

5.2 Mud gas

A total of 53 Isojars and 53 Isotubes were collected for Amungee NW-1H. Sampling intervals are summarized in Table 3. A detailed summary of mud gas depths is enclosed in Appendix 3

Depth Interval (mMDRT)	Sample type	Background Gas Sampling	Peak Gas Sampling
1932.5 - 3808	Isotubes / Isojars	1 sample collected every 50m	At gas peaks over 10%

Table 3. Mudgas Sampling Summary

6 Formation Evaluation

6.1 Mudlogging

Geoservices (Schlumberger) provided mudlogging services for the drilling of Amungee NW-1H. This included conventional mudlogging, formation evaluation, real time data monitoring, drilling analysis, as well as high resolution imaging and X-Ray fluorescence (XRF) on drilling cuttings over the interval from 1932.5 to 3808 mMDRT. Mudlogging data, XRF raw values, HDRM cuttings photography, log displays and Geoservices End of Well Report are enclosed in Appendix 4.

6.2 MWD/LWD Logging

MWD/LWD logging was performed by Pathfinder in Amungee NW-1H (Table 4). All real-time and recorded data was recovered.

Depth (m)		Description	Remarks
From	To		
1845	3808	OD-Telepacer – Spectral and AzGR	
2780	3808	MWD SAWR	Resistivity run in memory mode

Table 4. Summary of MWD/LWD Logs

Field data, log displays and deviation survey are enclosed in Appendix 5. Full details of the operations are contained in Pathfinder End of Well Report (Appendix 5).

6.3 Hydrocarbon Indications

6.3.1 Gas detection whilst drilling

Continuous Mud Gas monitoring (percentage) and C_{1-n} – C_5 analysis was perform by Geoservices in Amungee NW-1H. A summary of Gas detection whilst drilling is enclosed in Appendix 6