



# **WEST TUNA W-3**

## **FINAL WELL REPORT**

Prepared by

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## CONTENTS

### SECTION 1 -- GENERAL WELL SUMMARY

WELL DATA	4
MUDLOGGING	5
WELL SUMMARY	6
WELL PROFILE	7
DAY VS DEPTH PLOT	8
BIT SUMMARY	9
CASING and CEMENTING DETAILS	9
WELL DIRECTIONAL PROFILE	10
WELL DIARY	11

### SECTION 2 -- GEOLOGICAL SUMMARY

FORMATION TOPS	15
GEOLOGICAL SUMMARY	15
GAS REPORT	16

### SECTION 3 -- GEOSERVICES WELL LOGS

West Tuna W-3	MASTERLOG --	1:500 scale from 96 to 2565 metres 1:200 scale from 2276 to 2565 metres
West Tuna W-3	DRILLING LOG --	1:1000 scale from 96 to 2565 metres
West Tuna W-3	GAS RATIO LOG --	1:200 scale from 2350 to 2565 metres

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1	15-10-2001	Geoservices Unit 95	Base Mudlogging Coordinator	

## **Section 1**

### **General Well Summary**

<b>Revision</b>	<b>Date</b>	<b>Issued by</b>	<b>Approved by</b>	<b>Remarks</b>
1	15-10-2001	Geoservices Unit 95	Base Mudlogging Coordinator	

**WELL DATA**

Operator : Esso Australia Ltd  
Platform : West Tuna  
Well name : West Tuna W-3  
Country : Australia  
Location : Gippsland Basin  
Structure : Tuna M-1  
Field : West Tuna  
Permit : Vic/ L4

Location AMG co-ordinates 5 771 796.83 mN 621 486.68 mE

Location local co-ordinates Lat: 38° 11' 36.417" S Long: 148° 23' 14.396" E

Target Local co-ordinates 1335.54 mN 1293.96 mW

Profile : Deviated  
Reference depth : Rotary Table  
RT to Seabed : 95.69 metres  
RT above M.S.L. : 34.69 metres  
Sea-water depth : 60.00 metres  
Proposed total depth : 2575 metres  
Actual total depth : 2565 metres  
True vertical depth : 1448.91 metres  
Spudded on : 25th September 2001  
Total depth reached on : 07th October 2001

**Drilling Contractor**

Drilling Contractor : NABORS ISDL  
Rig name : 453  
Rig type : Platform

**Drilling Phases**

Diameter (inch)	From (m)	To (m)	Mud Type
20"	94.7	170	Seawater
12¼"	170	833	Seawater / Gel
8½"	833	2565	KCl / glycol / PHPA

**Cased Hole**

Casing Diameter (inch)	Casing Type	Shoe Depth (m)
16"	Conductor Shoe	166.5 MDKB
9 <sup>5</sup> / <sub>8</sub> "	Surface	830 MDKB
7"	Production	2559.8 MDKB

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1	15-10-2001	Geoservices Unit 95	Base Mudlogging Coordinator	

## MUD LOGGING

Logging Unit Number: 95

Engineers: M. Smith, M. Boyd, P. McGilveray.

### Sampling Interval

Sample Type	Number of sets	Quantity per set	Sampling interval	From (m)	To (m)
Washed and Dried	3	100 grams	10 metres	2270	2410
Washed and Dried	3	100 grams	5 metres	2410	2565

### Cuttings Distribution

Company	Washed and Dried Sample Set
Esso Australia	1
Victorian Department of Energy and Minerals	1
Australian Bureau of Resources	1

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1	15-10-2001	Geoservices Unit 95	Base Mudlogging Coordinator	

## WELL SUMMARY

West Tuna W-3 is an infill well north west of the West Tuna platform, with the primary objective of optimising well spacing and to enhance recovery efficiency of the M-1 oil reservoir. The well was drilled to a total depth of 2565 mMDRT (1448.91 m TVDRT) in 8½" hole and completed with a single oil completion string of 3½" tubing in 7" production casing.

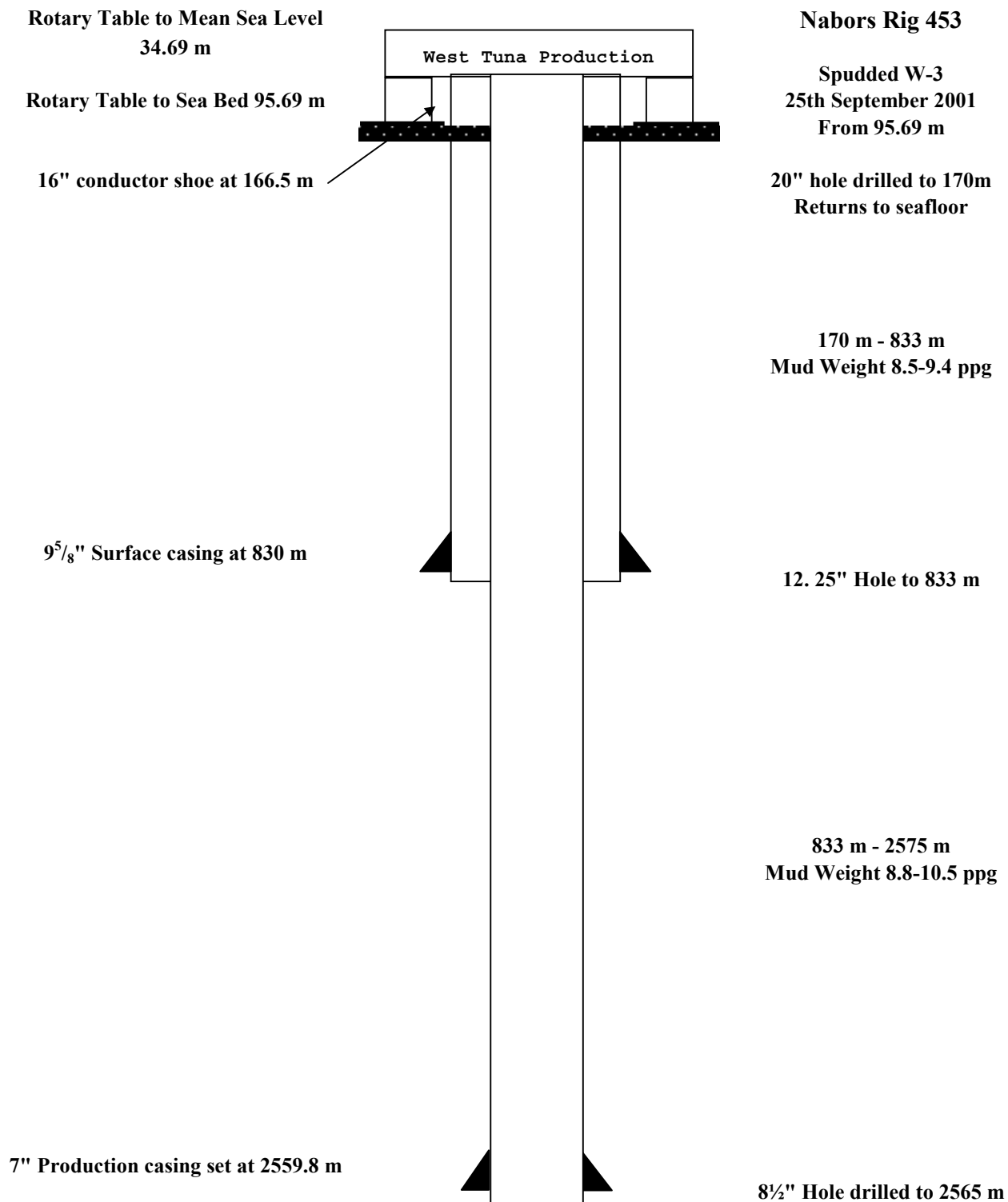
**West Tuna W-3 was spudded at 00:30 hours on the 25th of September 2001.**

After skidding the rig across from West Tuna W-9, a 20" bit was made up and lowered to the seafloor at 96.7 m. 20" hole was drilled to 170 m with minimal RPM and WOB using seawater and high viscosity gel sweeps. 16" conductor was run and cemented at 166.5 m.

A 12¼" steerable assembly, with a Reed-Hycalog DS195 bit was made up and used to drill this hole section with a Gel/Seawater mud system. A mud weight of 9.4 ppg was maintained by dilution with water and prehydrated Gel. The final depth for this section was 833 m. Static losses prior to casing, 6 bbl/hr. The 9<sup>5</sup>/<sub>8</sub>" casing was run and cemented at 830 m. An 8½" LWD/MWD steerable assembly with a Geodiamond S75BHPX bit was made up and run. This was pulled after drilling 1 m of cement due to tool failure. It was found that there was junk on the bottom of the hole. A rotary assembly, with a Hughes MX-20 bit, was used to drill the shoe track and 5 m of new formation to 838 m. The well was displaced to a 9.0 ppg KCl/PHPA/Polymer mud, prior to the required P.I.T. being performed (12.5 ppg EMW at 460 psi). The well was then drilled to 2348 m, where a wiper trip was conducted as per program. The well was then drilled to the final depth of 2565 m. Baracarb-25 and Baracarb-100 were added to the mud system prior to entering the Latrobe Formation to bridge the pore throats and reduce the likelihood of differential sticking and seepage losses.

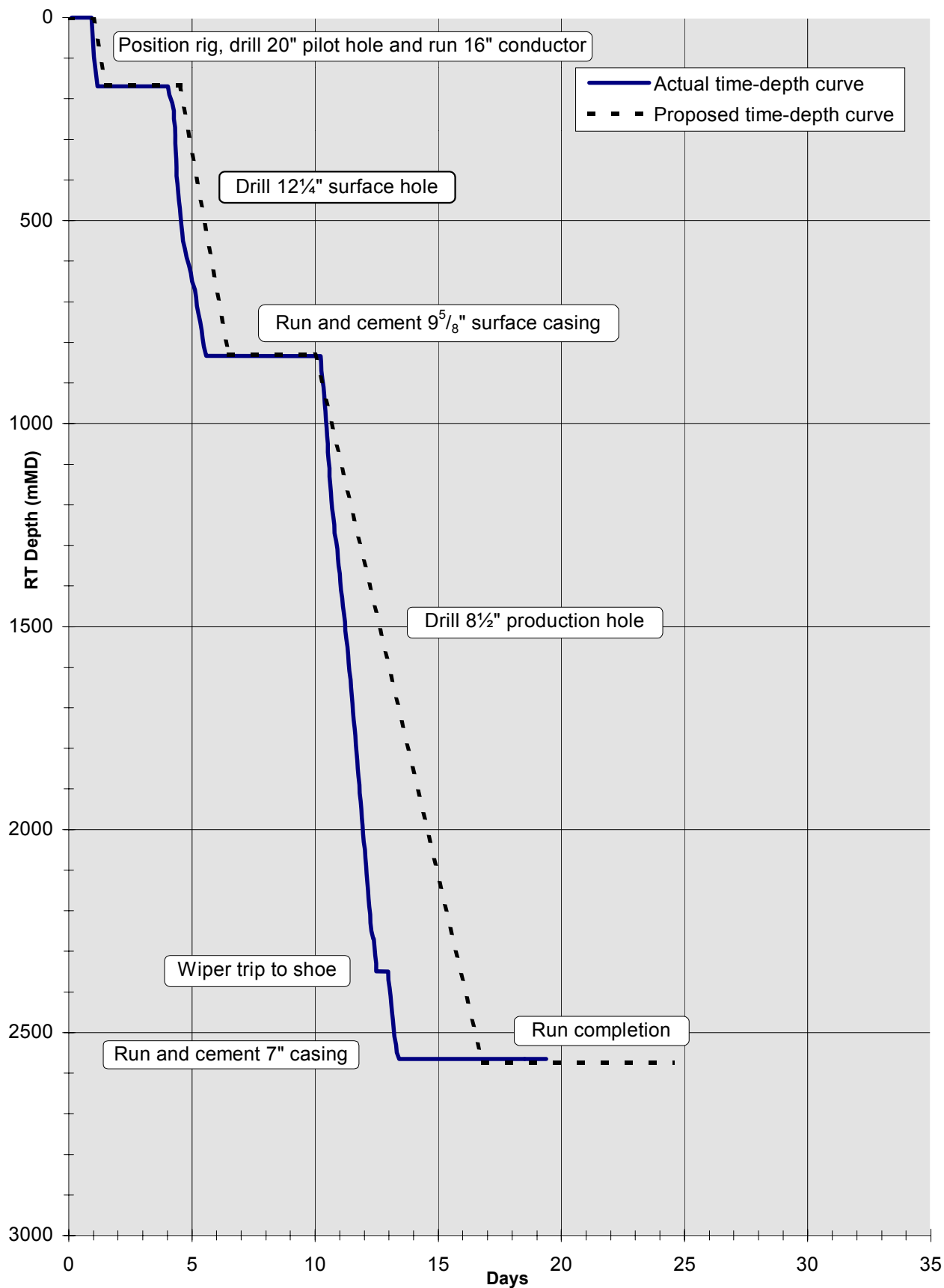
**West Tuna W-3 reached a total depth of 2565 m (1448.91 mTVD) at 10:00 hours on 07th October 2001.** The final survey at a depth of 2539.32 m had an inclination of 61.77° and an azimuth of 317.7°. 7" liner was set at a depth of 2559.8 m. West Tuna W-3 was completed as a single oil string with 3½" completion tubing run to 2433.7m. West Tuna W-3 was handed over to Production on 13-10-2001.

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1	15-10-2001	Geoservices Unit 95	Base Mudlogging Coordinator	

**WELL PROFILE**

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### WTN W-3 TIME-DEPTH CURVE (measured depth)



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**BIT RUN SUMMARY**

BIT	Size (")	Type	Jets	In (m)	Out (m)	Hours	Condition
1	20"	Smith SDGHC	3 x 20	94.7	170	2.99	1-1-WT-A-EEE-I-NO-TC
2	12¼"	Reed-Hycalog DS195	5 x 18	170	833	23.23	0-1-CT-S-X-I-NO-TD
3	8½"	Geod S75BHPX	7 x 14	833	833	0	DTF
4	8½"	Hughes MX-20	3 x 22	833	838	0.89	1-1-WT-A-EEE-I-BT-BHA
3RR	8½"	Geod S75BHPX	7 x 14	838	2565	39.76	4-7-WT-A-X-I-LT-TD

**CASING DATA**

Type	Size (Inches)	Weight (lb/ft)	Grade	Thread	Depth (mMDRT)
Conductor	16"	84	K-55	BTC	166.5
Surface	9 <sup>5</sup> / <sub>8</sub> "	47	L-80	LT&C	830
Production	7"	26	L-80	LT&C	2559.8

**CEMENTING DATA**

Casing details	Cement Type	Dry Cement Volume (sx)	Cement Additives	Mix Water (bbls)	Slurry Volume (bbls)	Slurry Density (ppg)	Cement to/from (mMDRT)	Casing Pressure Test (psi)
16"	ABC Class G	278	3.5 kg/bbl CaCl <sub>2</sub>	34	57	15.9	Surf-170	200
9 <sup>5</sup> / <sub>8</sub> "	ABC Class G	540	14.6 gal/10bbl Econolite	161	213	12.5	Surf-833	2000
		300		37	62	15.8		
7"	ABC Class G	730	32 gal/10bbl Halad 413 1 gal/10bbl SCR-100 0.25 gal/bbl NF-5	90	151	15.8	1919-2559.8	2000

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1	15-10-2001	Geoservices Unit 95	Base Mudlogging Coordinator	

**WELL DIRECTIONAL PROFILE**  
(From Geoservices Software)

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1	15-10-2001	Geoservices Unit 95	Base Mudlogging Coordinator	

**WELL DIARY**

- 24th September 2001** Rig released rig at 01:00 hours. Prepare to skid rig from W-9 to W-3. Skid to W-3 and reinstate rig over W-3. Make up 20" bit and BHA as per program and run in hole to Seabed at 94.7 m.
- 25th September 2001** Drill 20" conductor hole from 97 m to 170 m, pumping gel sweeps every single. Displace hole to 30 bbl gel pill and pull out of hole to 94 m, allow hole to stabilise and run in hole to bottom. Rotate and work string whilst circulating 2 times hole volume, displace well to gel pill and pull out of hole laying out BHA and bit. Rig up to run 16" casing and run in hole with 16" shoe joint and conductor to 166.5 m. Rig up inner cementing string and run in hole with same. Fill conductor with seawater and monitor for 30 min - OK, circulate 1.5 times hole volume and establish 5 bbl/min pump rate. HOWCO mix, pump and cement 16" conductor as per program and displace with seawater, bleed off, floats hold - OK. Pull out of hole with cement string to 136 m and circulate bottoms up, pull out of hole to surface and rack back cement BHA. Pick up conductor 90 klbs and wait on cement.
- 26th September 2001** Continue to wait on cement. Function test crown saver - OK. Change fitting on bell nipple. Prepare diverter system for installing and testing. Prepare conductor for cutting, slack off weight on conductor, and monitor for 15 min. JSA-pick up conductor - 4K, Furmanite make final cut. JSA - pull out of the hole, break down and lay out 10 casing joints, secure, clean well head area. JSA - rig down and clean 16" casing handling equipment. Conduct rig service. Rig to pick up 26" well head adaptor work. Position well head adaptor for weld, erect habitat and prepare to weld. JSA - conduct rig maintenance while wait on construction to weld MC2 (26") adaptor to 16" conductor and rig down same. JSA - nipple up diverter, install deluge skids and erect scaffold to hook up flow lines.
- 27th September 2001** JSA - continue to rig up scaffold around diverter to install flow line. Install 2x side outlets to well head adaptor. JSA - pick up stand drill pipe - collars and run in the hole. Function test diverter system, make up TDS and lines to HOWCO. Fill riser with sea water. Close diverter bag and ball. HOWCO pressure test to 200 psi - OK. JSA - pick up, break out and lay out 8" drill collar and cement stinger assembly. Run in hole - unable to lay out stabiliser due to helicopter. Continue to lay out stabiliser, run in hole with 5" drill pipe to 120 m. Lay out 5" drill pipe from 120 m to surface. JSA - pick up, break out and lay out side entry sub and pumping assembly. Test crown automatic and turnstops - OK. Clean and clear rig floor of excess equipment. Prepare to pick up BHA, pick up and make up 12 1/4" bit and BHA. Set bend to 1.5 degrees. Orient MWD and UBHO, shallow test at 35 m. Run in hole with HWDP and tag at 164.5 m. Drill cement, shoe and rat hole from 164 m to 170 m, while displacing to mud. Pull back inside shoe. JSA - rig up Schlumberger wireline sheaves. Drill and survey with MWD  
12 1/4" hole from 170m to 190 m.
- 28th September 2001** Drill shoe track and new hole to 190m. Run gyroscopic survey. Drill ahead to 226m and take gyro survey. Kick-off well and drill to 254m and rig down Schlumberger sheaves. Drill, steer and survey 12 1/4" hole to 554m. Circulate whilst reset pump #2. Drill ahead to 661m, circulate & condition hi-vis mud. Drill, steer & survey 12 1/4" hole to 725 m.
- 29th September 2001** Drill, steer and survey 12 1/4" hole 725 m to 833m. Conduct H2S drill during connection and don BA sets. Circulate hole clean, flow check and pull out of the hole to 154 m. Circulate bottoms up, rig service. Run in hole with 5" drill pipe to 833 m, precautionary wash & ream last 2 stands to bottom. Circulate 2 times bottoms up - until hole clean. Spot 150 bbl hi-vis on bottom. Flow check and pull out of the hole. Rack HWDP, clean and clear rig floor. Rig up to run 9 5/8" casing. Make up shoe and float collar, test float, run casing.

Revision	Date	Issued by	Approved by	Remarks
1	15-10-2001	Geoservices Unit 95	Base Mudlogging Coordinator	

<b>30th September 2001</b>	Run 9 <sup>5</sup> / <sub>8</sub> " casing to 830 m. Rig down Weatherford. Rig up cement head and lines. Circulate casing volume. Pump cement as per programme. Pump 10 bbl freshwater to flush lines, test lines and pump cement. Bump plug at 2000 psi and hold 10 minutes. Observe plug drop from cement head. Wait on cement. Remove lines, scaffold, change mud pumps to 6" liners. Rig down cement lines and head, remove long bails. Lift and support bell nipple. Furmanite cut 9 <sup>5</sup> / <sub>8</sub> " casing at diverter. Dismantle scaffold. Lay out casing, bell nipple and diverter. Clean mud tanks. Lift and support lower surface riser.
<b>1st October 2001</b>	Obtain permit, JSA to lift lower riser and support same. Furmanite second cut and lay out casing joint. Lower riser, rig up lifting equipment and support MC2 adaptor. Rig with Furmanite cut MC2 adaptor from conductor and lay out same. Cut 9 <sup>5</sup> / <sub>8</sub> " casing and dress stump. Erect habitat and weld braiden head to 9 <sup>5</sup> / <sub>8</sub> " casing. Slip and cut drill line. Weld A section to 9 <sup>5</sup> / <sub>8</sub> " casing. Lay out and strap 7" casing. Dress mud pumps to 6" liners. Mix drill mud. X ray A section.
<b>2nd October 2001</b>	Change pump liners, pressure test TDS and mix mud. Weld and x-ray braden head. Nipple up BOP. Pressure test BOP. Make up BHA and test MWD. Run in the hole.
<b>3rd October 2001</b>	Make up 8½" BHA and run in hole. Begin to drill cement at 804m, pressure increase and unable to circulate. POOH, check MWD tool and remove obstruction. Lay out motor and run in hole with rotary BHA. Drill cement, shoe track and displace hole to mud. Drill 5m of new formation and conduct PIT (EMW: 12.5ppg). Slug pipe and POOH.
<b>4th October 2001</b>	Make up BHA, pick up MWD tools and motor, load radioactive source and Run in Hole with steerable BHA. Drill, steer and survey 8½" hole from 838m to 1374m.
<b>5th October 2001</b>	Drill, steer and survey 8½" hole from 1374m to 2032m.
<b>6th October 2001</b>	Drill, steer and survey 8½" hole from 2032m to 2348m, circulate bottoms up and pull out of hole to shoe. Cut and slip drilling line and run in hole, wash last stand to bottom and continue drilling to 2378m.
<b>7th October 2001</b>	Drill, steer and survey 8½" hole from 2348m to 2565m. Circulate 1.5 times Latrobe volume at TD and backream to top of Latrobe. Circulate hole clean and pull out of hole to shoe. Circulate bottoms up and continue to pull out of hole to surface. Lay out BHA and MWD tools. Jet BOPs with water and change out rams.
<b>8th October 2001</b>	Change out rams and rig up to run 7" casing. Run casing in hole, work casing through tight sections and circulate bottoms up at 2560m.
<b>9th October 2001</b>	Cement as program. Displace with rig pumps. Unable to bump plug. Check floats - holding. WOC. Rig down and layout cement head, change out bails, and disconnect flow lines. Lift BOP's and riser and cut casing and layout. Nipple down BOP's and riser. Dress casing stump and nipple up BOP's and Riser.
<b>10th October 2001</b>	Continue to nipple up BOP's, Riser, Bell nipple and flow lines, make up test assembly and seat same in B section, pressure test lines, upper pipe rams, lower pipe rams and casing - OK. Run Wearbushing, pick up and make up 7" scraper assembly and run in hole with same.
<b>11th October 2001</b>	Continue to run in hole with 7" scraper assembly and tag cement at 2532m. Work scraper from 2483m to 2502m and drill cement from 2532m to 2535m. Circulate well clean and displace well to inhibited brine. HOWCO pressure test 7" casing, pull out of hole from 2535m to 2135m. Pull out of hole and lay out drill pipe from 2135m to 252m, pull out of hole and lay out 3½" HWDP and 7" scraper assembly. run in hole with Wearbushing running tool, pull Wearbushing make up and jet tubing hanger area. Rig up Schlumberger wireline, run in hole with gauge ring and junk basket, obtain radio silence and make up & run in hole with MXAR.

Revision	Date	Issued by	Approved by	Remarks
1	15-10-2001	Geoservices Unit 95	Base Mudlogging Coordinator	

<b>12th October 2001</b>	Continue to run in hole with MXAR and set at 2490.6, pull out of hole with setting tool. Make up tail pipe and packer assembly, correlate and set packer at 2433.7m. Pull out of hole and rig down wireline. Pick up and run in hole with 3½" completion string.
<b>13th October 2001</b>	Break out circulating head and lay out 3 joints for space out, make up tubing pup joints and tubing hanger assembly, land out and engage hanger, HOWCO test tubing 1500psi - OK. Rig down landing joint, install back pressure valve, nipple down BOP's, Cameron terminate control line at tubing hanger. Nipple up Xmas tree and wing valves, Cameron pressure test upper void, Pull BPV and run check valve and test SLR seal. HOWCO test tubing, production annulus - OK. Rig down HP lines and raise permit and reinstate platform grating.
<b>14th October 2001</b>	Prepare to skid rig, skid to W-20.

Revision	Date	Issued by	Approved by	Remarks
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## **Section 2**

### **Geological Summary**

<b>Revision</b>	<b>Date</b>	<b>Issued by</b>	<b>Approved by</b>	<b>Remarks</b>
1	15-10-2001	Geoservices Unit 95	Base Mudlogging Coordinator	

**FORMATION TOPS**

DESCRIPTION	MD (m) - RT	TVD (m) - RT
Top of Lakes Entrance	1889.9	1142.5
Top of Latrobe Group	2404	1374.2
Top of Coarse Clastics	2426	1384.2
<b>TOTAL DEPTH</b>	<b>2565</b>	<b>1448.91</b>

**GEOLOGICAL SUMMARY****LAKES ENTRANCE FORMATION**1889.9 m - 2404 m      **CLAYSTONE**

**CLAYSTONE:** Light olive grey to light grey, occasional medium grey, calcareous, locally grading to traces of siltstone in part, trace to locally disseminated and nodular pyrite, trace ooids and microfossil fragments, trace carbonaceous specks, traces of sparry calcite fragments, dominantly soft to firm, sub-blocky.

**LATROBE FORMATION**2404 m - 2426 m      **Interbedded CLAYSTONE and SILTSTONE**

**CLAYSTONE:** Pale yellow orange to dark yellow orange, light brown, mottled greenish grey, arenaceous in part, nodular glauconite, occasional medium quartz grains, very soft, sub-blocky to amorphous in part.

**SILTSTONE** Light grey brown to medium brown, medium grey in part, argillaceous to very fine arenaceous, trace disseminated pyrite to occasional nodular pyrite, glauconite, trace carbonaceous material, firm, sub-blocky to blocky.

**COARSE CLASTICS**2426 m - 2565 m      **SANDSTONE with minor SILTSTONE**

**SANDSTONE:** Clear to translucent, opaque to occasionally milky, medium to coarse, occasionally very coarse, poorly sorted, sub-angular to sub-rounded, local minor pyritic cement grading to trace with depth, siliceous cement, traces of nodular pyrite, generally loose and clean, fair to good inferred porosity, very good in part.

**SILTSTONE** Light to medium brown, locally dark brown to brown black, light grey, very argillaceous, common carbonaceous, micromicaceous, firm to very soft, sub-fissile to fissile.

Revision	Date	Issued by	Approved by	Remarks
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## GAS REPORT

No gas was recorded while drilling out from the conductor at 166.5 m. Gas was first recorded at 325 m and consisted of C<sub>1</sub> (Methane). The composition of the gas remained unchanged throughout the 12¼" hole section and in the 8½" hole section until 1500 m, where traces of C<sub>2</sub> (Ethane) were detected. In this section of the hole total hydrocarbon gases detected averaged 20 to 30 units, beginning at around 5 units and increasing steadily until they plateaued between 25 and 35 units with occasional peaks of 40 units to 1500 m.

Before entering the Lakes Entrance formation at 1889.9 m only C<sub>1</sub> and C<sub>2</sub> gases were detected. C<sub>2</sub> increased gradually from trace amounts to eventually constitute 2% of the total hydrocarbons at 1889 m. No other gases were detected in this section of the well.

Once the Lakes Entrance formation was entered the composition of the gases remained unchanged. Gas levels increased to between 40 and 50 units and as the depth increased the composition of the gases gradually changed to include more C<sub>2</sub> and trace amounts of C<sub>3</sub>. By 2210m C<sub>2</sub> had increased to 3% and C<sub>3</sub> was reaching 1%. This trend continued until a wiper trip at 2348 m with more C<sub>3</sub>, and some C<sub>4</sub> gases being detected. After the trip Baracarb was added to the mud system, mud added to the system would also have accounted for the drop in detected gas levels after the trip until and entering the Latrobe at 2404m. Gas levels averaged between 45 and 55 units for this section of the hole.

On penetrating the Latrobe formation at 2404 m there was an immediate increase in gas levels. The composition of the gas also changed dramatically with an increase in heavier gases (C<sub>2</sub> to C<sub>5</sub>) indicating a hydrocarbon bearing lithology. Gas levels throughout the Latrobe were consistently over 500 units, and over 1000 units in some sections. Background gas levels throughout the Latrobe were between 500 and 700 units. The lowest levels of gas recorded were at the top of the Latrobe and at the bottom of the hole beneath the Oil Water contact, after 2490 m the gas levels dropped steadily, finally reaching 35 units at TD.

Localised increases in background gas are attributable to the penetration rate which was dependant upon the drilling method, being either rotary or slide, carried out at the time. Changes in gas levels were also noticed after short wiper trips. No CO<sub>2</sub> or H<sub>2</sub>S was detected while drilling West Tuna W-3.

### Gas peaks through the Latrobe Group

Depth metres	Total Gas units	C <sub>1</sub> %	C <sub>2</sub> %	C <sub>3</sub> %	iC <sub>4</sub> %	nC <sub>4</sub> %	iC <sub>5</sub> %	nC <sub>5</sub> %
2413.5	726	10.28	0.51	0.24	0.05	0.07	0.03	0.03
2418	875	10.85	0.56	0.29	0.06	0.09	0.05	0.04
2435.5	1360	16.59	0.75	0.39	0.07	0.11	0.05	0.05
2440.5	1545	24.85	1.11	0.59	0.11	0.16	0.07	0.06
2452	1159	15.46	0.84	0.41	0.08	0.13	0.06	0.05
2457.5	1132	14.97	0.85	0.48	0.09	0.13	0.06	0.05
2465	1611	25.62	1.21	0.54	0.10	0.17	0.07	0.07
2469	1676	25.14	1.30	0.67	0.12	0.19	0.08	0.07
2476.5	1604	24.76	1.23	0.63	0.12	0.20	0.08	0.08
2487	948	6.95	0.71	0.53	0.13	0.26	0.12	0.13
2501.5	424	3.69	0.38	0.29	0.07	0.13	0.07	0.08

Revision	Date	Issued by	Approved by	Remarks
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