



Trefoil-2

FINAL WELL REPORT

Prepared by



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1.0 WELL DATA SUMMARY

Operator : Origin Energy Resources Ltd
 Well name : Trefoil – 2
 Basin : Bass
 Permit : T / 18P
 Operator : Origin Energy Resources Ltd
 Surface location : Latitude: 39° 53' 07.93" S
 : Longitude: 145° 22' 14.62" E

Bottom Hole Location : 20.75 m South of Surface Location
 : 31.33 m East of Surface Location
 Total depth : 3235.0 mMDRT

Rotary Table Elevation. : 26 m above MSL
 Sea-water depth : 69 m
 Rig Arrived : 12:00 hr 03 October, 2009
 Spud Well : 08:00 hr 6 October, 2009
 Bit Reached TD : 03:00 hr 18 November, 2009
 Total Time on Well : 58.17 days (58 days 4 hours)
 Budgeted Time On Well : 41.04 days
 Well Status : Plugged and Abandoned
 Permit Interests : Origin Energy Petroleum Pty Ltd 39.0%
 AWE Petroleum Pty Ltd 47.5%
 Cal Energy Gas (Australia) Ltd 8.5%
 Innamincka Petroleum Ltd 5.0%

Rig name : Kan Tan IV (semi-sub)
 Drilling Contractor : Maersk

Drilling Phases

Diameter (inch)	From (m)	To (mMDRT)	Mud Type
914(36")	95.0	155.0	Seawater / Bentonite sweeps
445(17½")	155.0	935.0	Seawater / Bentonite sweeps
31(12¼")	935.0	2520.0	KCl / Polymer
216(8½")	2520.0	3235.0	KCl / Polymer

Cased Hole

Casing Diameter (inch)	Casing Type	Shoe Depth (mMDRT)
762(30")	Conductor	153.0
340(13¾")	Surface	930.0
244(9⅝")	Intermediate	2520.0

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2.0 GENERAL INFORMATION

The proposed Trefoil-2 appraisal well is located in T/18P in the Bass Basin. The location is approximately 2.6km south of the suspended Trefoil-1 well, and the nearest population bases are Melbourne (231km NNW), and Port Latta (108km south). Offset wells include Aroo-1 (12.5km to the northeast), White Ibis and Bass-3 (13km and 14km to the southwest respectively). The Trefoil Field was discovered in November 2004, when Trefoil-1 intersected gas bearing zones, within the EVCN Palaeocene and Cretaceous. Wireline logs and mudlog data indicated the potential for up to 21 gas bearing zones. Trefoil-2 has been located in a down slip position to prove up the size of the Trefoil structure, and to address the following uncertainties.

- Structural/ depth mapping uncertainty.
- Reservoir quality, depositional environment and reservoir continuity.
- Gas-water contact depths and gas zones.
- Sw and water gradients.
- Permeability uncertainties.
- Potential compartmentalisation.
- Gas composition and liquid yield, and
- Transition zone heights.

The Trefoil-2 well was drilled vertically to a firm total depth (TD) of 3235.0 mMDRT to ensure the primary targets. Coring was performed through the reservoir section and evaluation data was obtained via MWD/LWD tools as well as wireline logs at TD. On completion of the wireline logging operations, Trefoil-2 was abandoned in accordance with regulatory requirements.

2.1 Geoservices Personnel

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ALS Engineers : Noel Elliot
: Gopesh Gopi
: Leigh Sack
: Brendan Barwick
: Lawrence Hannon

Mudloggers : Klaudyna Brzozowska
: Andrew Lowndes
: Paul Currie
: Pippa Duncan

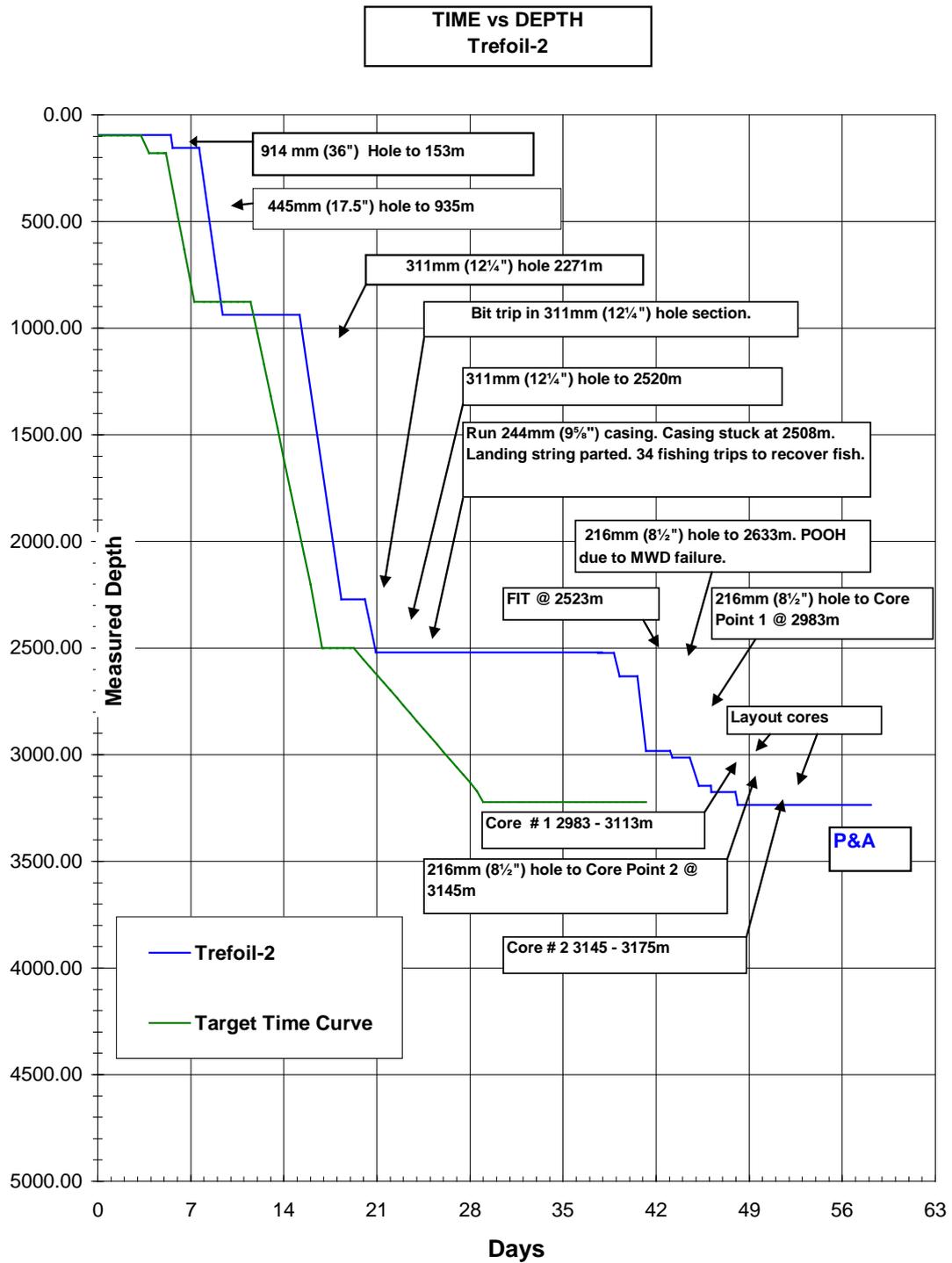
Sample Catchers : Eugene Miro
: Peter O Shaughnessy
: Leigh Dower
: Kepa O'Rilley

2.2 Contractor Information

Drilling : Maersk Drilling Property
Rig name : Kan Tan 4
Rig type : Semi-submersible
Mud logging : Geoservices Australasia
Mud engineering : Halliburton -Baroid
MWD : Halliburton- Sperry Sun
Wireline logging : Schlumberger Wireline
Cementing : Halliburton Cementing
Well head completion : Dril-Quip
ROV : Fugro
Casing : Premium Casing Services
Helicopters : Bristows

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2.3 Days vs. Depth Progress Chart



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2.4 Sample Collection Summary

Sample Type	Number of sets	Quantity per set	Sampling interval	From (m)	To (m)
Unwashed	1	500 grams	10 meters	940	1700
Washed and Dried	1	300 grams	5 meters	1700	2050
Samplex Trays	2		3-6 meters	2052	2499

Cuttings Distribution

Company	Unwashed and Dried Samples
Origin Australia	1

Company	Washed and Dried Samples
Origin Australia	1
Mineral Resources Tasmania	1
Geoscience Australia	1

Company	Set of Samplex Trays
Origin Australia	2

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3.0 GEOLOGICAL INFORMATION

3.1 Lithological Summary

All returns to the seabed prior to 935.0 mMDRT. Drilled 12¼" hole with a Riser from 935.0 mMDRT. Drilled 8½" hole from 2520.0 mMDRT

INTERVAL: 95.0 to 390.0 mMDRT
ROP (Range): 11 to 85 m/h
Av. ROP: 48 m/h

No samples recovered returns at to sea through ported conductor

INTERVAL: 390.0 to 795.0 mMDRT
ROP (Range): 7 to 285 m/h
Av. ROP: 84 m/h

No samples recovered returns at to sea through ported conductor. Below 630.0 mMDRT a notable increase in average ROP is observed after increasing the WOB.

INTERVAL: 795.0 to 938.0 mMDRT
ROP (Range): 8 to 127 m/h
Av. ROP: 27 m/h

No samples recovered returns to sea through ported conductor. Below 812.0 mMDRT a notable decrease in average ROP is observed after decreasing the RPM.

INTERVAL: 939.0 to 1190.0 mMDRT
ROP (Range): 20 to 40 m/h
Av. ROP: 80 m/h

CLAYSTONE: medium-occasionally light grey, soft-occasionally firm, amorphous-sub-blocky, calcareous grains: 10% clay, accessories: micromicaceous trace amount, calcareous 10-30%.

Show Details: No Hydrocarbon Shows

INTERVAL: 1162.0 to 1240.0 mMDRT
ROP (Range): 8 to 250 m/h
Av. ROP: 100 m/h

SILTSTONE: medium grey, medium to light grey, soft, sub-blocky, trace carbonaceous lamina, trace lithic fragments, trace calcareous clay.

SANDSTONE: light olive grey, medium grey, very soft to friable, very fine grains, sub-angular to sub-rounded, well sorted, spherical to sub-spherical, trace lithic fragments, 10% poor calcareous cement, good visual porosity, no fluorescence.

Show Details: No Hydrocarbon Shows

INTERVAL: 1240.0 to 1331.0 mMDRT
ROP (Range): 6 to 170 m/h

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Av. ROP: 66 m/h

CLAYSTONE: olive grey, dark greenish grey, soft to firm, sub-blocky, trace foraminifera, 2 % micro micaceous, trace fine green pyrite aggregates, 10% calcareous clay.

SILTSTONE: medium grey, medium - light grey, soft to firm, sub-blocky, 1% shell fragments, trace reddish brown, dolomitic limestone, trace lithic fragments, foraminifera, fine green pyrite aggregates, 5% calcareous clay, 10% clay.

Show Details: No Hydrocarbon Shows

INTERVAL: 1331.0 to 1440.0 mMDRT

ROP (Range): 8 to 112 m/h

Av. ROP: 58 m/h

SILTSTONE: olive grey, medium to dark grey, medium grey, soft firm, sub-blocky to blocky in part with 10 % very fine greenish quartz grains, trace altered lithic fragments, trace carbonaceous specks, trace very fine disseminated pyrite, trace glauconitic grains, 5% calcareous clay, 15% clay, grading to argillaceous siltstone.

CLAYSTONE: olive grey, dark greenish grey, soft to firm, sub-blocky, trace foraminifera, 2% micromicaceous, trace fine green pyrite aggregates, 10% calcareous clay.

Show Details: No Hydrocarbon Shows

INTERVAL: 1440.0 to 1480.0 mMDRT

ROP (Range): 15 to 115 m/h

Av. ROP: 69 m/h

SILTY SANDSTONE: olive grey, medium dark grey, very fine grains, sub-rounded, well sorted, sub-spherical to spherical quartz grains with 0 to 20% lithic component, soft to firm, sub-blocky to sub-fissile, trace carbonaceous specks, 5% calcareous cement, poor visual porosity, no fluorescence.

SILTSTONE: olive grey, medium grey, trace dark grey, soft to firm, sub-blocky, trace carbonaceous specks, lithic fragments, glauconitic, 5% calcareous clay, 10% very fine quartz sand.

Show Details: No Hydrocarbon Shows

INTERVAL: 1480.0 to 1569.0 mMDRT

ROP (Range): 7 to 170 m/h

Av. ROP: 66 m/h

SILTSTONE: olive grey, medium dark grey, soft to firm, trace friable, angular to sub-blocky, trace carbonaceous specks, calcite crystals, glauconitic, lithic fragments, 5% calcareous clay, 10% clay, 15% very fine quartz sand.

SANDSTONE: medium dark grey, dark grey, very fine green, sub-rounded, well sorted, sub-spherical to spherical quartz grains with 10-15% lithic fragments, 5% calcareous clay cement, 10% clay, poor visual porosity, no fluorescence.

Show Details: No Hydrocarbon Shows

INTERVAL: 1569.0 to 1700.0 mMDRT

ROP (Range): 8 to 121 m/h

Av. ROP: 55 m/h

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SILTSTONE: olive grey, soft to firm, sub-blocky, trace carbonaceous specks, glauconitic, trace lithic fragments, trace shell fragments, 5% calcareous clay, 10% clay, 5% very fine quartz sand.

SANDY SILTSTONE: olive grey, medium dark grey, soft to firm, angular to sub-blocky, trace carbonaceous specks, glauconitic, lithic fragments, micromicaceous, shell fragments, 5% calcareous clay, 10% clay, 20% very fine quartz sand.

Show Details: No Hydrocarbon Shows

INTERVAL: 1700.0 to 1800.0 mMDRT
ROP (Range): 15 to 115 m/h
Av. ROP: 69 m/h

ARGILLACEOUS SILTSTONE: olive grey, soft to firm, sub-blocky, trace micromicaceous, trace pyrite aggregates, trace lithic fragments, trace fossil fragments, trace glauconitic, trace dolomite, 5% calcareous clay, 25% very fine quartz sand.

CLAYSTONE: olive black, dusky brown, brownish grey, soft to firm, sub-blocky, trace micromicaceous, trace carbonaceous specks, 5% calcareous clay.

DOLOMITE: pale yellowish brown, dark yellowish brown, soft to very hard, sub-conchoidal fracture, crystalline to earthy in part, trace opaque calcareous crystal.

Show Details: No Hydrocarbon Shows

INTERVAL: 1800.0 to 1850.0 mMDRT
ROP (Range): 12 to 62 m/h
Av. ROP: 40 m/h

CLAYSTONE: olive black, olive grey, trace dark yellowish brown, soft to firm, sub-blocky, trace micromicaceous.

ARGILLACEOUS SILTSTONE: olive grey, yellowish brown in part, tr soft to firm, sub-blocky, trace micromicaceous, trace pyrite aggregates, trace lithic fragments, trace fossil fragments, trace glauconitic, trace dolomite, 5% calcareous clay, 25% very fine quartz sand.

DOLOMITE: pale yellowish brown, firm to hard, splintery to conchoidal fracture in part, earthy.

Show Details: No Hydrocarbon Shows

INTERVAL: 1850.0 to 1990.0 mMDRT
ROP (Range): 4 to 85 m/h
Av. ROP: 31 m/h

ARGILLACEOUS SILTSTONE: brownish black, soft to firm, sub-blocky, trace micromicaceous, trace pyrite aggregates, trace lithic fragments, trace fossil fragments, trace glauconitic, trace dolomite, 5-30% clay, 5% very fine quartz grains.

CLAYSTONE: medium grey, dark grey, brownish black, olive black, very soft to soft, amorphous to sub-blocky, trace micromicaceous. Trace glauconitic.

DOLOMITE: pale yellowish brown, dark yellowish brown, firm to hard, splintery to conchoidal fracture in part, crystalline to micro-crystalline.

Show Details: No Hydrocarbon Shows

INTERVAL: 1990.0 to 2105.0 mMDRT
ROP (Range): 12 to 73 m/h
Av. ROP: 31 m/h

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ARGILLACEOUS SILTSTONE: brownish black, olive black, soft to firm, amorphous to sub-blocky, trace micromicaceous, trace carbonaceous, trace lithic fragments, 35% clay, 5% calcareous clay.

CLAYSTONE: medium grey, medium to dark grey, moderately to hard, angular to sub-blocky, trace shell fragments, micromicaceous. 10% calcareous clay, 15% silt.

SANDY SILTSTONE: brownish black, olive black, soft to friable, sub-blocky, trace lithic fragments, 10% clay, 30% very fine quartz sand.

Show Details: No Hydrocarbon Shows

INTERVAL: 2105.0 to 2190.0 mMDRT
ROP (Range): 7 to 77 m/h
Av. ROP: 22 m/h

SILTSTONE: olive black, soft to firm, sub-blocky, trace lithic fragments, altered in part, trace micromicaceous, trace carbonaceous specks, 10% clay, 10% very fine clear quartz grains.

SANDSTONE: dark greenish grey, olive grey, dusky yellowish green, light grey, very fine to 30% fine grains, soft to firm, sub-rounded to sub-angular, moderately well sorted, 0-10% glauconitic grains, 15% clay, poor visual porosity, no fluorescence.

CLAYSTONE: medium blue grey, olive grey, medium grey, soft to firm, sub-blocky, trace micromicaceous. 10% calcareous clay.

Show Details: No Hydrocarbon Shows

INTERVAL: 2190.0 to 2233.0 mMDRT
ROP (Range): 6 to 77 m/h
Av. ROP: 28 m/h

SILTSTONE: olive grey, dark yellowish brown, soft to friable, sub-blocky, lithic fragments, trace carbonaceous laminas, 15% clay, 10% very fine clear quartz grains.

SANDY SILTSTONE: brownish black, brownish grey, olive grey, soft to friable, sub-blocky, trace fine carbonaceous laminas, lithic fragments, coarse clear quartz grains, 20% very fine clear quartz, 10% rock flour.

SILTY CLAYSTONE: olive grey, medium grey, brownish black, soft to firm, sub-blocky, trace lithic grains, carbonaceous fragments, shell fragments, 20% silt contents.

Show Details: No Hydrocarbon Shows

INTERVAL: 2233.0 to 2308.0 mMDRT
ROP (Range): 5 to 96 m/h
Av. ROP: 21 m/h

SANDSTONE: very light grey, olive grey, 40% coarse, 50% very coarse, 10% granules, clear quartz grains, sub-round to sub-angular, poorly sorted, sub-spherical, friable, angular, trace lithics fragments, kaolinite clay matrix, 80% rock flour, no fluorescence.

CLAYSTONE: olive grey, medium grey, soft to firm, sub-blocky, trace lithics fragments, dolomitic, glauconitic.

COAL: black, firm, sub-blocky to blocky, trace finely disseminated pyrite.

DOLOMITE: pale yellowish orange, moderately hard to hard, conchoidal to splintery.

Show Details: No Hydrocarbon Shows

INTERVAL: 2308.0 to 2372.0 mMDRT
ROP (Range): 5 to 82 m/h
Av. ROP: 26 m/h

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SILTSTONE: brown grey, brownish black, olive grey, soft to firm, sub-blocky, trace lithic fragments, thin carbonaceous laminas.

SANDSTONE: very light grey, 30% very fine, 50% fine 15% medium, 5% coarse grains clear quartz grains, sub-round to sub-angular, poorly sorted, sub-spherical, friable, angular, trace lithic fragments, kaolinite clay matrix, 90% rock flour, poor inferred visual porosity, no fluorescence.

CLAYSTONE: olive grey, medium grey, soft to firm, sub-blocky, trace lithic fragments, micromicaceous.

Show Details: No Hydrocarbon Shows

INTERVAL: 2372.0 to 2701.0 mMDRT

ROP (Range): 6 to 80 m/h

Av. ROP: 19 m/h

SILTSTONE: brown grey, brown black, olive grey, soft to firm, sub-blocky, trace lithic fragments. thin carbonaceous threads and specks

SANDSTONE: light olive grey, very light grey, fine green, friable, sub-angular to sub-round, moderately sorted, sub-spherical, friable visual porosity, no fluorescence.

ARGILLACEOUS SILTSTONE: olive grey, light grey, brown grey, soft, amorphous, trace coal and carbonaceous matter, 30% clay.

Show Details: No Hydrocarbon Shows

INTERVAL: 2701.0 to 2983.0mMDRT

ROP (Range): 1 to 101 m/h

Av. ROP: 17 m/h

SANDSTONE: very light grey, clear and opaque, predominantly loose to friable, quartzose, fine grained, 10% very fine grained, 40% medium, sub-angular to sub-rounded, sub-spherical to sub-elongate, poor siliceous cement when aggregates, traces pyrite cement, 5% clay matrix, traces brown mica flakes, fair visual porosity inferred, no hydrocarbon indications.

SILTSTONE: olive grey, brownish black, soft to firm, sub-blocky to blocky, trace carbonaceous material as thin laminae and specks, trace lithic fragments, trace micromicas, trace black, bright coal pieces.

CLAYSTONE: olive grey, olive black, soft to firm, sub-blocky to blocky, increase in carbonaceous material.

COAL: brownish black to black, soft to firm, argillaceous and dull to bright, conchoidal fracture in part, traces amber.

Show Details: No Hydrocarbon Shows

INTERVAL: 2983.0 to 3013.0 mMDRT

ROP (Range): 1 to 32 m/h

Av. ROP: 7 m/h

Core (1) : 2983m – 3013m

Cut 30m recovered 31.2m

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2983.0 mMDRT SANDSTONE: white to very light grey, yellowish grey, clear, very fine to very coarse grained, loose to moderately hard, poorly sorted, rounded to subangular, subspherical to spherical, common argillaceous cement, trace lithic fragments, common carbonaceous material, common mica flakes, good inferred visual porosity, no hydrocarbon fluorescence.

2988.0 mMDRT SANDSTONE: white to very light grey, yellowish grey, clear, trace pinkish grey, very fine to fine grained, soft to moderately hard, moderately to well sorted, subrounded to rounded, subspherical to spherical, common silica cement, some argillaceous cement, 1% mica flakes, 2% green amber, trace lithic fragments, fair inferred visual porosity, no hydrocarbon fluorescence.

2993.0 mMDRT SILTSTONE: medium grey to medium dark grey, dark grey, moderately hard to hard, blocky to subfissile, 15-25% mica flakes.

2988.0 mMDRT SANDSTONE: white to very light grey, yellowish grey, clear, fine to medium grained, trace very coarse grains, firm to moderately hard, poorly sorted, subrounded to angular, subspherical to spherical, 15% calcareous cement, trace mica flakes, trace coal, trace green amber, fair inferred visual porosity, no hydrocarbon fluorescence.

3003.0 mMDRT SANDSTONE: white to very light grey, yellowish grey, clear, fine to very coarse grains, firm to moderately hard, poorly sorted, subrounded to angular, subspherical to spherical, 5% silica cement, trace mica flakes, trace green amber, fair inferred visual porosity, no hydrocarbon fluorescence.

3008.0 mMDRT SANDSTONE: white to very light grey, medium light grey to yellowish grey, clear, fine to granular grained, firm to moderately hard, poorly sorted, subrounded to angular, subspherical to spherical, 5% silica cement, trace mica flakes, fair inferred porosity, no hydrocarbon fluorescence.

3013.0 mMDRT SANDSTONE: white to very light grey, yellowish grey to light greenish grey, clear, fine to very coarse grained, firm to moderately hard, poorly sorted, subrounded to angular, subspherical to spherical, 10% silica cement, trace mica, fair inferred porosity, no hydrocarbon fluorescence.

Show Details: No Hydrocarbon Shows

INTERVAL: 3013.0 to 3068.0 mMDRT
ROP (Range): 4 to 45 m/h
Av. ROP: 10 m/h

SANDSTONE: very light grey, clear and opaque, predominantly loose to friable, quartzose, fine grained, 10% very fine grained, 40% medium, sub-angular to sub-rounded, sub-spherical to sub-elongate, poor siliceous cement when aggregates, traces pyrite cement, 5% clay matrix, traces brown mica flakes, fair visual porosity inferred, no hydrocarbon indications.

SILTSTONE: olive grey, brownish black, soft to firm, sub-blocky to blocky, trace carbonaceous material as thin laminae and specks, trace lithic fragments, trace micromicas, trace black, bright coal pieces.

CLAYSTONE: olive grey, olive black, soft to firm, sub-blocky to blocky, increase in carbonaceous material.

Show Details: No Hydrocarbon Shows

INTERVAL: 3068.0 to 3145.0 mMDRT
ROP (Range): 2 to 31 m/h
Av. ROP: 13 m/h

SANDSTONE: loose quartz grains, clear, opaque, very light grey, coarse grained, 10% very coarse, 10% medium grained, angular (shattered) to subangular to subrounded, moderately sorted, subelongate to subspherical, traces white clay matrix adhering to grain surfaces and in

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part reconstituting as soft, sticky, amorphous clay, fair to good visual porosity inferred, no hydrocarbon fluorescence.

SILTSTONE: olive black, olive grey, soft to firm, subblocky to subfissile in part, 2% mica flakes, including larger muscovitic type, trace lithic fragments, trace carbonaceous material.

CLAYSTONE: olive black, soft to firm, blocky to subblocky, trace dark mica flakes.

Show Details: No Hydrocarbon Shows

INTERVAL: 3145.0 to 3175.0 mMDRT

ROP (Range): 3 to 29 m/h

Av. ROP: 9 m/h

Core (2) : 3145m – 3175m

Cut 30m recovered 29.3m

3145.0 mMDRT SANDSTONE: light grey, mottled, quartzose, fine grained, firm to moderately hard, subangular to subrounded, moderately wellsorted, subspherical, traces carbonaceous material, mica flakes, 5% white clay matrix, moderate siliceous cement, fair visualporosity, no hydrocarbon fluorescence.

3150.0 mMDRT SANDSTONE: white, trace yellowish grey grains, quartzose, friable to firm, fine to medium grained, subangular to subrounded, poorly sorted, subspherical, traces biotitic mica flakes, traces carbonaceous material, fair visual porosity, no hydrocarbon fluorescence.

3155.0 mMDRT SANDSTONE: very light grey, trace yellowish grey grains, trace medium grey grains, quartzose, hard to moderately hard, fine to very coarse grained, rounded very coarse grains to sub angular to subrounded, poorly sorted, spherical to subspherical to subelongate, trace amber, trace carbonaceous material, trace biotitic mica flakes, fair visual porosity, overall yellow green fluorescence, slow blooming to streaming blue white cut, blue yellow bright film residue.

3160.0 mMDRT SANDSTONE: white, quartzose, fine to very coarse grained, firm, subangular to subrounded, poorly sorted, subspherical, 15% white clay matrix, poor siliceous cement, trace amber, poor visual porosity, dull yellow overall fluorescence, very slow diffuse dull yellow cut, no residue.

3165.0 mMDRT SANDSTONE: white to very light grey, quartzose, moderately hard, fine to very coarse grained, subangular to subrounded, poorly sorted, subspherical to subelongate, 10% white clay matrix, moderately well siliceous cemented, poor visual porosity, pale yellow overall fluorescence, slow diffuse yellow green fluorescence, dull yellow film residue.

3170.0 mMDRT SANDSTONE: white to very light grey, quartzose, friable, medium to very coarse grained, subangular to subrounded, moderately sorted, subspherical to spherical, 5% white clay matrix, poor siliceous cement, fair visual porosity, dull yellow overall fluorescence, no cut, no residue.

3175.0 mMDRT SANDSTONE: white, grey mottled, quartzose, friable, fine grained to granular, subangular to subrounded, very poorly sorted, subspherical, 10% white and medium grey clay matrix, poor siliceous cement, traces carbonaceous material, poor visual porosity, dull yellow fluorescence, no cut, blue white film residue.

Show Details: Fluorescence was present. See descriptions above.

INTERVAL: 3175.0 to 3235.0 mMDRT

ROP (Range): 2 to 30 m/h

Av. ROP: 10 m/h

SANDSTONE: loose quartz grains, clear, opaque, very light grey, coarse grained, 10% very coarse, 10% medium grained, angular (shattered) to subangular to subrounded, moderately sorted, subelongate to subspherical, traces white clay matrix adhering to grain surfaces and in

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part reconstituting as soft, sticky, amorphous clay, fair to good visual porosity inferred, no hydrocarbon fluorescence.

SILTSTONE: olive black, olive grey, soft to firm, subblocky to subfissile in part, 2% mica flakes, including larger muscovitic type, trace lithic fragments, trace carbonaceous material.

CLAYSTONE: olive black, soft to firm, blocky to subblocky, trace dark mica flakes.

Show Details: No Hydrocarbon Shows

3.2 Gas Ratio Interpretation – Introduction Lithological Summary

Gas composition and total gas in mud at the possum belly were measured using the Geoservices Reserval™ that utilises a GZG degasser to extract gas from mud. The Reserval™ also measures the Gas-In values from active pits utilising a GZG degasser installed in the active pit. The Gas-Out/Gas-In was monitored at an 80:20 ratio in the chromatograph cycle. The GFF (coupled with a GZ11degasser) was used as a backup gas detection system. Both use the FID technique of measuring ions released when hydrocarbons are burnt in a pure hydrogen flame.

Gas is extracted from the mud at the shale shakers by a degasser that is essentially an agitator inside a chamber through which the mud continually passes. The gas is then drawn back to the unit through tubing to the gas analysis equipment. Independent sensors in the unit also measure H₂S and CO₂.

The composition of the gas in mud from the formation is significant in determining the geochemical origin and value of a show. There are several methods that can be used to determine whether the hydrocarbon gas in mud comes from a potential gas or oil zone. Amongst these methods are the Triangle Diagram (also known as the gas composition diagram), Pixler Diagram (also known as the gas ratios method), and the gas Wetness/Balance/Character plots.

3.3 Explanation of Gas Composition Diagrams

The Triangle or Gas Composition Diagram is used to graphically represent the hydrocarbon distribution in the gas and to determine whether it corresponds to a gas or oil reservoir. The triangular diagram is obtained by tracing lines on three scales at 120° to each other, corresponding respectively to the ratios of ethane, propane and normal butane to the total gas. The scales are arranged in such a way that if the apex of the triangle is upward, the diagram represents the analysis of gas from a gas zone, while if the apex points downwards, the diagram represents the analysis of gas from an oil zone. A large triangle diagram represents dry gas or low GOR oil, while small triangles represent wet gases or high GOR oils. The centre of the triangle should fall inside the area delineated by the dotted line, which encircles compositions that are regarded as 'normal'. If the triangle area is outside this area the gas indicates that the reservoir is not exploitable and that the heavier hydrocarbon composition is 'abnormal' i.e. hydrocarbons that are chemically altered or gases with special compositions which are not associated with oil.

The Gas Ratio Analysis Diagram is a plot of the ratio of C1 to the other gas elements. The magnitude of the methane to ethane ratio determines if the reservoir contains gas or oil or if it is non-productive. The following conclusions are possible:

Ratio C1/C2: < 2 non-productive zone

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2 – 15	oil present
15 – 65	gas present
> 65	non-productive zone

The slope of the line of the ratio plot of C1/C2, C1/C3, C1/C4 and C1/C5 indicates whether the reservoir will produce hydrocarbons or hydrocarbons and water. Positive line slopes indicate production; negative line slopes indicate water-bearing formations. When using the Gas Ratio Diagram, the following points should be borne in mind:

1. Productive dry gas zones may show only C1, but abnormally high shows of C1 are usually indicative of saltwater zones.
2. If the ratio C1/C2 is low in the oil section and the ratio C1/C4 is high in the gas section, the zone is probably non-productive.
3. If any ratio (C1/C5 except in an oil based mud) is lower than the preceding ratio then the zone is probably non-productive.
4. The ratios may not be definitive for zones of low permeability.
5. Steep gas ratio plots may be indicative of tight zones.

3.4 Explanation of Wetness/Balance/Character Curves

Another method for evaluating gas zones plots against depth three ratios: hydrocarbon Wetness (W_h), hydrocarbon Balance (B_h) and hydrocarbon Character (C_h), where:

$$W_h = \frac{(C2 + C3 + C4 + C5)}{(C1+C2+C3+C4+C5)} \times 100 (\%)$$

$$B_h = \frac{(C1 + C2)}{(C3 + C4 + C5)}$$

$$C_h = \frac{(C4 + C5)}{C3}$$

Wetness (W_h) is the primary zone indicator and provides a measure of the relative proportion of heavier gases in the overall gas show as follows:

$W_h < 0.5$	Light non-associated gas with low productivity potential or only geo-pressured methane.
$0.5 < W_h < 17.5$	Potentially productive gas with gas density increasing with W_h .
$17.5 < W_h < 40.0$	Potentially productive oil with gravity decreasing as W_h increases.
$W_h > 40.0$	Heavy or residual oil with low productivity potential.

As reservoir hydrocarbons become denser in the transition from gas to oil, Balance (B_h) and Wetness (W_h) values move closer together and eventually intersect. The zone guidelines for B_h combine with those for W_h to improve reliability of show evaluation as follows:

$W_h < 0.5$ And $B_h > 100$	Very light, dry gas that is almost certainly non-productive.
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|---|--|
| $0.5 < W_h < 17.5$
and $W_h < B_h < 100$ | Productive gas with gas increasing in wetness and density as the two curves converge. |
| $0.5 < W_h < 17.5$
And $B_h < W_h$ | Productive gas condensate or a high gravity gas/oil ratio. |
| $17.5 < W_h < 40$
and $B_h < W_h$ | Productive oil with oil gravity decreasing – density increasing as the curves diverge. |
| $17.5 < W_h < 40$
And $B_h > W_h$ | Non-productive residual oil. |

Character (C_h) values serve to resolve ambiguities between oil or gas indications by defining the following:

- | | |
|--|--|
| $0.5 < W_h < 17.5$
And $B_h < W_h$
and $C_h < 0.5$ | Productive wet gas or condensate. |
| $0.5 < W_h < 17.5$
And $B_h < W_h$
and $C_h > 0.5$ | Productive high gravity and/or high GOR oil. |

It is important to note that in the conclusion to each of the interpretive tools, the terms ‘productive’ and ‘non-productive’ are used in a geochemical sense. Ultimate production of a zone is dependent upon reservoir thickness and extent as well as other physical and economic factors that are not taken into account when analysing gas compositions. The methods discussed here are intended to assist the interpretive skills of the geologist or log analyst.

3.5 Gas Composition Discussion

Gas monitoring while drilling Trefoil-2 commenced using the Geoservices Reserval™ and GFF gas systems from 932.0 mMDRT. Background gas was first observed from a depth of 932.0 mMDRT, where it was present in low concentrations of around 0.01. Present solely as methane (C1), it remained at this low concentration until around 960.0 mMDRT where the gas concentrations began to increase. Background gas increased to around 0.4% to end of the 12¼" hole with peaks reaching as high as 0.89%. A trip gas peak of 2.2% was observed at 2271.0 mMDRT after a bit trip. During the 8½" section background gas between 0.1% to 0.4% was observed. A peak of 2.27% occurred at 2830.0 mMDRT. Gas from Core # 1 was only logged after the trip and as a result there were poor returns. During Core #2 a peak of 2.8% was observed at 3150.0 mMDRT, but gas from 3161 mMDRT was not logged until after the trip.

Gas Peaks listed below are from the Reserval gas equipment. A GFF backup gas system was run as well and plotted the same trends. The Reserval gas is more analytical of gas readings and picks up more background gases and has a constant mud flow. The Backup GZ11 degasser has a higher mud flow through it and liberates more gas from the mud to the chamber and during gas zones. The calibrations of both gas equipment were checked during the well and were very accurate.

No CO₂ or H₂S gas was recorded in Trefoil-2

3.6 Gas Peaks (From Reserval™ Gas Detection System)

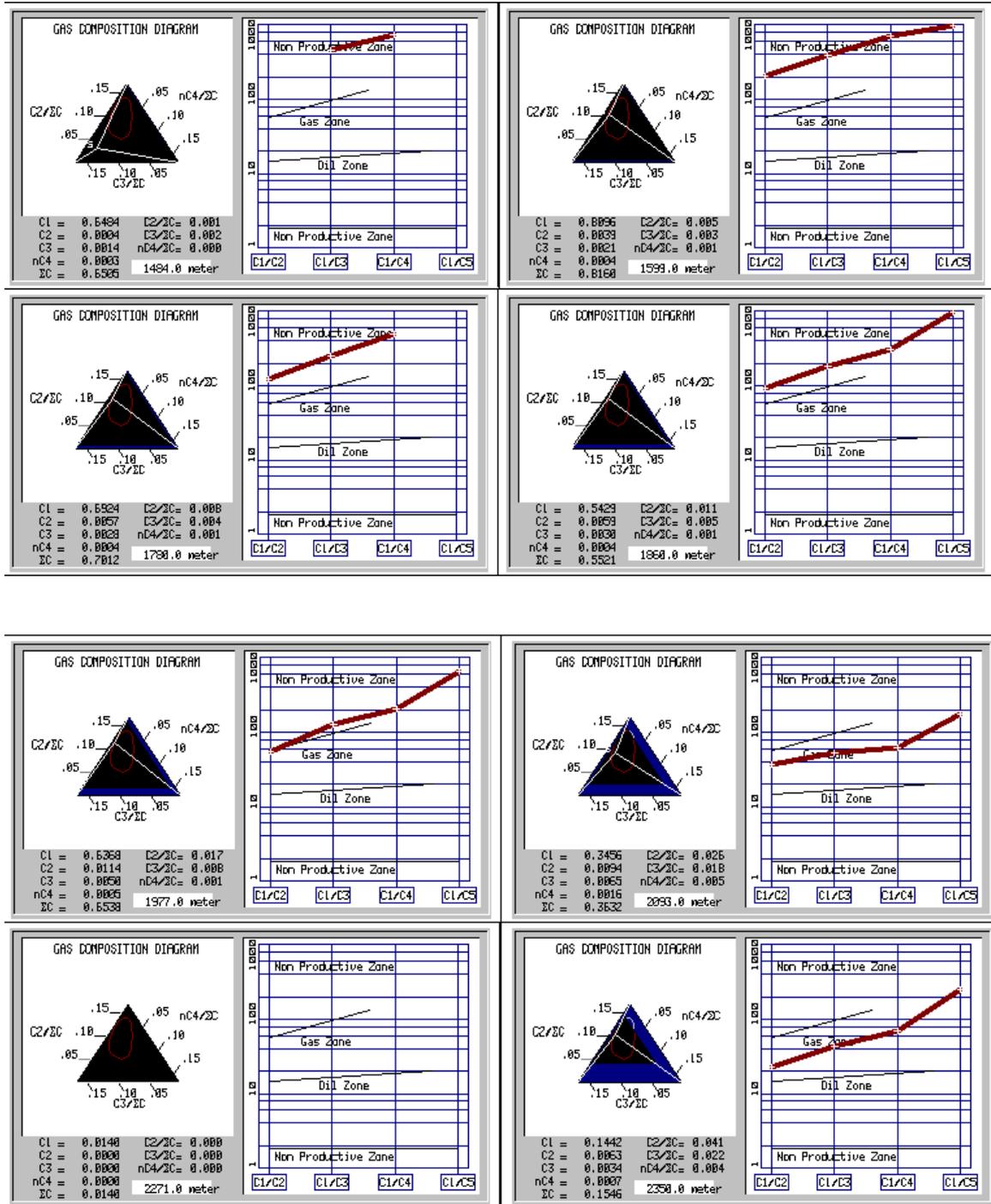
The following gas peaks were recorded while drilling Trefoil-2

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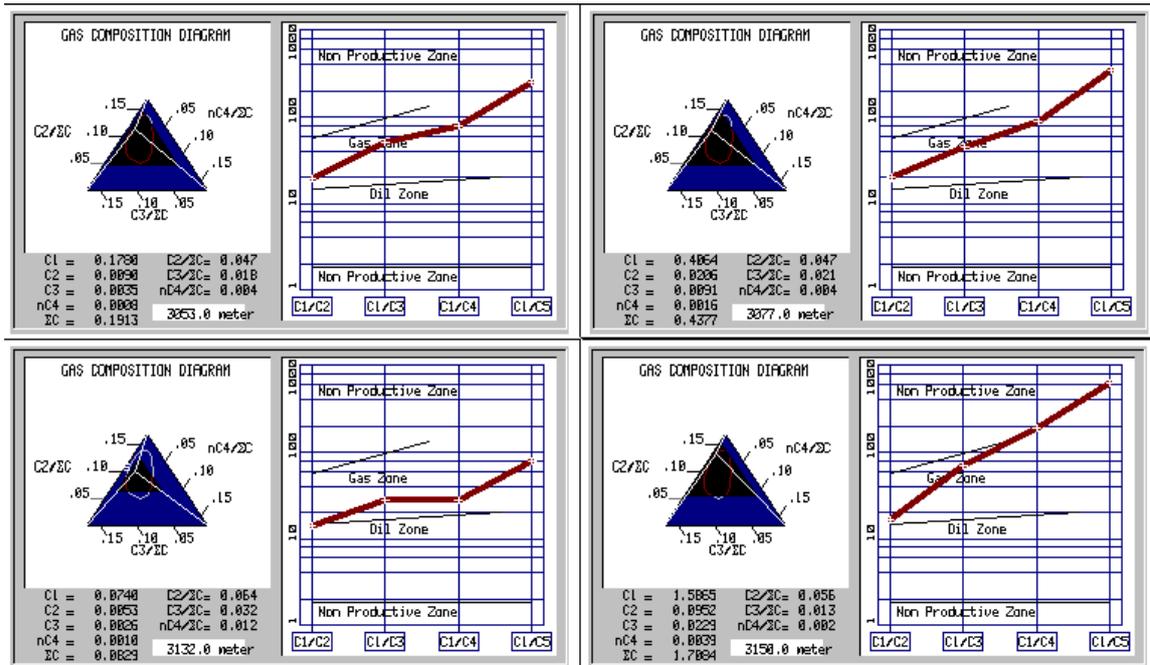
DEPTH METRES	TOTAL GAS PEAK / TRIP %	C1 %	C2 %	C3 %	IC4 %	NC4 %	IC5 %	NC5 %
1022.0	0.1984	0.2419	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1120.0	0.2098	0.2329	0.0000	0.0002	0.0001	0.0000	0.0001	0.0000
1195.5	0.6012	0.6107	0.000	0.0007	0.0002	0.0001	0.0002	0.0001
1266.0	0.6328	0.6271	0.0021	0.0011	0.0004	0.0002	0.0002	0.0000
1366.5	0.6785	0.6127	0.0023	0.0014	0.0005	0.0003	0.0003	0.0000
1439.0	0.5149	0.4820	0.0217	0.0013	0.0005	0.0002	0.0003	0.0001
1484.0	0.6738	0.6484	0.0004	0.0014	0.0006	0.0003	0.0004	0.0001
1601.5	0.8657	0.8351	0.0048	0.0022	0.0008	0.0005	0.0008	0.0001
1711.0	0.5780	0.5424	0.0036	0.0019	0.0007	0.0003	0.0005	0.0002
1780.0	0.7602	0.6924	0.0057	0.0028	0.0010	0.0004	0.0005	0.0001
1865.0	0.8825	0.7478	0.0088	0.0041	0.0018	0.0004	0.0005	0.0002
1915.5	0.6696	0.6035	0.0081	0.0036	0.0018	0.0005	0.0006	0.0002
1977.0	0.7021	0.6368	0.0114	0.0050	0.0026	0.0005	0.0008	0.0001
2060.5	0.8938	0.7663	0.0184	0.0102	0.0058	0.0013	0.0019	0.0004
2094.5	0.5249	0.4445	0.0115	0.0075	0.0044	0.0018	0.0018	0.0004
2162.0	0.2109	0.1620	0.0042	0.0032	0.0019	0.0009	0.0007	0.0001
2286.0	0.1865	0.1541	0.0054	0.0030	0.0014	0.0000	0.0000	0.0000
2331.0	0.1348	0.1026	0.0044	0.0020	0.0000	0.0000	0.0000	0.0000
2350.0	0.3338	0.2467	0.0114	0.0063	0.0023	0.0011	0.0006	0.0001
2431.5	0.2156	0.1367	0.0081	0.0047	0.0024	0.0010	0.0010	0.0001
2556.0	0.1618	0.1113	0.0082	0.0039	0.0024	0.0006	0.0009	0.0001
2615.0	0.4021	0.3107	0.0161	0.0080	0.0037	0.0018	0.0014	0.0003
2830.0	2.2761	1.2091	0.1739	0.1596	0.0442	0.0427	0.0161	0.0119
2857.0	2.1890	1.6649	0.1626	0.1626	0.6841	0.0167	0.0154	0.0046
2889.0	1.4059	0.9603	0.0846	0.0467	0.0127	0.0147	0.0110	0.0041
2906.0	0.8779	0.5391	0.0400	0.0174	0.0045	0.0034	0.0106	0.0014
2958.0	0.2633	0.1544	0.0095	0.0047	0.0031	0.0019	0.0015	0.0007
3053.0	0.3777	0.1780	0.0090	0.0035	0.0014	0.0008	0.0004	0.0003
3077.0	0.7722	0.4064	0.0206	0.0091	0.0029	0.0016	0.0007	0.0004
3132.0	1.0910	0.5684	0.0385	0.0166	0.0081	0.0048	0.0029	0.0014
3150.0	2.8086	1.6258	0.0965	0.0224	0.0045	0.0039	0.0015	0.0009
3200.0	0.5774	0.3879	0.0256	0.0100	0.0028	0.0020	0.0009	0.0005

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3.7 Gas Ratio Diagram



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4.0 PRESSURE ANALYSIS

4.1 Pressure Summary

Formation pressures were monitored throughout this well by recording a range of indicators. These indicators vary from direct observations of background gas and cuttings to drilling characteristics such as torque and tight hole, as well as quantitative methods like the D'exponent.

D'exponent: This is a normalized rate of penetration that takes into account mud weight, bit wear and hydraulics. It can be reliably used in shales and clean claystones; and as an indicator in siltstones, silty shales and calcareous claystones. A normal trend line is established through normally pressured shale points, representing a normal compaction trend, and any leftward deviation of subsequent shale points from this trend, representing relative under-compaction, indicates overpressure (plotted relative to depth) or increased porosity due to changes in the lithology.

The D'exponent calculation was not ideally suited for the detection of overpressure in this particular instance due to the fact that PDC bits were used. However Geoservices used both qualitative and quantitative techniques to monitor for abnormal pressure. The D-exponent plus close monitoring of gas levels, pit volumes, hole conditions and mud weights ensured that the well was drilled safely. Continuous consultation with well site Geologist and MWD/LWD operators ensured that Geoservices data was cross-referenced for accuracy and reliability.

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Overpressure: The trend line was set for the Trefoil-2 well from 95.0 mMDRT to 2520.0 mMDRT in the 311mm (12¼”) hole section, which drilled through formation dominantly consisted of a suitable Silt stone ,Claystone & Sandy Siltstone. The slope of the trend line is
a coeff = 0.0001426
b coeff = -0.2046304

The trend through this well follows a gradual increasing trend from 1700.0 mMDRT to TD o the well at 3235.0 mMDRT. The D'exponent trend seen was one of general compaction with occasional leftward shifts, due to formation changes. A slight leftward shift was noted in places with increasing amounts of Sand and Silt in the formations drilled. No overpressure was encountered in the Trfoil-2 well.

Formation pressure evaluation using D'exponent was done using the Eaton method. The Eaton method states the relationship between the formation pressure and the Dcs/Dcn ratio depending on changes in the overburden gradient.

$$P = S - (S-P_n) * (D_{cs}/D_{cn})^{1.2}$$

- Where: P : formation pressure gradient
S : overburden gradient
Pn: normal pressure gradient
Dcs: observed d'exponent
Dcn: normalised d'exponent

D'exponent:

Coefficients used for this well, results plotted in Geoservices Pressure Log.

- Poisson : a = 0.26600 b = -2.66700
source : Santa Barbara (Soft)
- Overburden : a = 0.01304 b = -0.17314 c = 1.43350
source : Santa Barbara (Soft)

The Trefoil-2 well was drilled with water based mud.

Gas: No abnormality in gas ratios was observed.

Flow-line Temperature: There were no indications of abnormal pressures from temperature measurements of Trefoil-2.

Cuttings: There were no cuttings observed at the shakers that may have indicated an abnormally pressured zone in this well.

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5.0 DRILLING INFORMATION

5.1 Bit Records

BIT	Size	Type	Jets	In (m)	Out	Hour	Condition
1	26/36	Hughes CR-1	N/A	95	155	4.0	0-0-NO- -I-NO-TD.
2	17½	Smith XR+VCPS	1 x 13/32, 3x22/3 2	155	935	33.3	2-2-NO-A-2-I-NO-TD
3	12¼	Reed RSR616M-A21	8 x 13/32	935	2271	39.2	1-1-BT-N-X-I-CT-PP
3 RR	12¼	Reed RSR616M-A21	8 x 13/32	2271	2520	13.4	1-1-CT-A-X-I-PN-TD
4	8½	BHC GT 1	8 x 13/32	2520	2523	0.5	1-1-WT-A-1-I- -BHA
5	8½	STC M1616VPBX	6 x14	2520	2633	5.5	0-1-WT-G-X-I-NO-DTF
5RR 1	8½	STC M1616VPBX	6 x14	2633	2983	22.1	1-2-CT-S-X-I-WT-CP
6	8½	Corepro MCP572 Coring bit	M 2-3- 3	2983	3113	4.2	1-1-NO-FC-X-I-NO-BHA
5RR 2	8½	STC M1616VPBX	6 x 14	3113	3145	11.6	1-2-CT-S-X-I-WT-CP
6RR 1	8½	Corepro MCP572 Coring bit	M 2-3- 3	3145	3175	3.8	1-1-NO-FC-X-I-NO-BHA
5RR 3	8½	STC M1616VPBX	6 x 14	3175	3235	6.1	1-2-CT-S-X-I-NO-TD

5.2 Mud Records

The 914 (36") section was drilled to 155.0 mMDRT with seawater and bentonite sweeps with returns to the seabed. The 445 (17½") section from 155.0 to 935.0 mMDRT was also drilled with seawater and bentonite sweeps with returns on seabed.

The BOP and riser were installed. Displaced the well to mud, and closed in the system. The 311(12¼") section was drilled with KCL/Polymer mud from 935.0 to 2520.0 mMDRT with mud weight 9.1 ppg.

After the 3m of new formation of 216 (8½") hole were drilled to 2523.0 mMDRT, pumped 25bbls of Hi Vis pill and circulated the hole clean. Performed the FIT to 740psi, with a mud weight of 9.4ppg, giving an equivalent mud weight of 11.0ppg. The section was drilled with KCL/Polymer mud from 2520.0 to TD of 3235.0 mMDRT with mud weight of 9.2ppg.

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5.3 Drilling Phase Summary

5.3.2 914 mm (36") Hole Section

Date	: 6 th October 2009
Measured depth	: 95.0 mMDRT to 155.0 mMDRT
Vertical depth	: 95.0 mMDRT to 155.0 mMDRT
Number of bits used	: 1
Mud type	: Seawater with bentonite sweeps

Trefoil-2 was spudded at 08:00hrs, on the 6th of October, 2009. A Hughes CR1 Tri-cone 26" Bit was used in conjunction with a 36" hole opener to drill the 914 (36") Phase. The seabed was tagged at 95.0 mMDRT and the 36" Phase was drilled to a depth of 155.0 mMDRT, in 4.0 on bottom hours, with no problems. The hole was displaced to 9.0ppg mud, and the conductor pipe was run, and cemented.

5.3.3 445 mm (17½") Hole Section

Dates	: 8 th October to 10 th October 2009
Measured depth	: 155.0 mMDRT to 935.0 mMDRT
Vertical depth	: 155.0 mMDRT to 934.9 mMDRT
Number of bits used	: 1
Mud type	: Seawater with bentonite sweeps

A Smith 17½", XR+VCPS, was made up to the BHA, run in the hole, and the conductor cement drilled out. The 17½" phase was drilled to a depth of 935.0 mMDRT, with no hole problems encountered. The phase was drilled in 33.3 on bottom hours, giving an average ROP of 23.4m/hr. A wiper trip was done, encountering tight hole from 903.0 mMDRT to 832.0 mMDRT, where the string was back reamed, and then pulled to the conductor on the elevators. When running back to bottom, the string was washed and reamed from 582.0 mMDRT to 639.0 mMDRT. The drillstring was then pulled out of the hole. The 340 (13¾") casing was run, and cemented, to a shoe depth of 930.0 mMDRT.

5.3.4 311 mm (12¼") Hole Section

Dates	: 15 th October to 21 st October 2009
Measured depth	: 935.0 mMDRT to 2520.0 mMDRT
Vertical depth	: 934.9 mMDRT to 2519.7 mMDRT
Number of bits used	: 1 RR
Mud type	: KCL/Polymer

A Reed RSR616M-A21, 31(12¼") bit, in conjunction with the 9^{5/8}" Sperry Drill lobe 6/7-5.0, with ported float installed, was run in the hole to drill out the shoe track, casing shoe and 12¼" rat hole to 938.0 mMDRT. A successful Formation Integrity test of 1025psi (1515 ppg equivalent mud weight) with 9.1 ppg mud was performed at 930.0 mMDRT, prior to drilling ahead. Drilling

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continued from 938.0 mMDRT to 2271.0 mMDRT. The drill string was pulled out of the hole for a bit change due to slow rate of penetration & high torque. Bit #3 drilled 1336.0 m, in 39.2 hours, giving an average rate of penetration of 34.1 m/hr. The same Reed RSR616M-A21 bit was run again and it took an additional 13.40 hours to reach total depth for the 31(12¼") section at 2520.0 mMDRT. A wiper trip was run. The 9⁵/₈" casing was run to 2508m where it became stuck. Remedial work was carried out before drilling the 8½" phase. The 244 (9⁵/₈") casing was run, and cemented, to a shoe depth of 2050.0 mMDRT.

5.3.5 216 mm (8½") Hole Section

Dates	: 7 th November to 18 th November 2009
Measured depth	: 2520.0 mMDRT to 3235.0 mMDRT
Vertical depth	: 2519.7 mMDRT to 3233.9 mMDRT
Number of bits used	: 2, 5 RR
Mud type	: KCL/Polymer

Bit #4, a Smith MI616VBPX, 216(8½") PDC bit was made up to BHA #38, and run in the hole to 2402.0 mMDRT. The drillstring was washed and reamed from 2402.0 mMDRT to 2494.0 mMDRT. The float collar was tagged, SCR's and CLF, taken. The shoe track, and were drilled to a shoe depth of 2520.0 mMDRT, and 3m of new formation was drilled to 2523mRT. A 25bbl Hi Vis pill was pumped, and the hole was circulated clean. A successful leak off test was performed at 2520mMDRT, with 9.4ppg mud, achieving 740psi, giving a mud weight equivalent of 11.0ppg. After pumping a slug, the drillstring was pulled out of the hole to surface, and the drilling BHA #39, was made up. Bit #5 was made up to BHA #39, and included Halliburton MWD tools, consisting of gamma ray, resistivity, and survey tools. The drillstring was run in the hole to the 9 5/8" casing shoe, where the shoe track and shoe were reamed before drilling ahead. The 8½" hole was drilled from 2323.0 mMDRT to 2633.0 mMDRT, at which depth; the drillstring was pulled out of the hole to surface, due to failure of the MWD tools. Bit #5 drilled 106.0m, in 5.5hrs, giving an average ROP of 19.2 m/hr. The MWD tools were replaced, and Bit #5RR1, and BHA #39, was run in the hole to 89 mMDRT. A successful shallow test was performed on the MWD tools. the drillstring was run in the hole to 2633.0 mMDRT. Drilling of the 216(8½") hole re-commenced, a Trip Gas of 0.2041% was recorded. At a depth of 2644.0 mMDRT, a 40bbl loss was monitored, and drilling continued to a depth of 2983.0 mMDRT, where the first core point was picked. At core point, the hole was circulated clean, and the drillstring was pulled out of the hole to change to the coring BHA. Bit #5RR1, drilled 349.5m, in 22.1 on bottom hours, giving an average ROP of 7.5m/hr. The core bit, Bit #6 drilled a total of 30 m in 4.2 on bottom hours. The drillstring was pulled out of hole and changed to Bit #5RR2. 8½" Hole was drilled from 3113.0 mMDRT to the second coring point at 3145.0 mMDRT. This took a total of 11.6 on bottom hours. The hole was circulated clean and the drill string was pulled to surface to the coring BHA. Bit #6RR1 drilled a total of 30m in 3.8 on bottom hours. The core BHA was pulled to surface and Bit #5RR3 drilled from 3175.0 mMDRT to the total depth of 3235.0 mMDRT in 6.1 on bottom hours. The hole was circulated clean and the BHA was pulled out of hole to run wireline tools.

Run # 1, SP-CMR+-HRLA-PEX-HNGS

Run # 2, MDT-GR

Run # 3, FMI-DSI-GR

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Trefoil - 2 was plugged and abandoned, as per the drilling program.

6.0 ENCLOSURES

- | | | |
|----|---|--------|
| A. | ASCII Data Disc | |
| B. | Formation Evaluation Log (Masterlog Measured Depth) | 1:500 |
| C. | Drilling Data Log | 1:1000 |
| D. | Pressure Evaluation Log | 1:1000 |
| E. | Gas Evaluation Log | 1:500 |
| F. | Cuttings Sample Manifest | |

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