YOLLA-3 & YOLLA-4
WELL PROPOSAL

T/L 1, BASS BASIN

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EXECUTIVE SUMMARY

WELL NAME	Yolla-3
LOCATION	Drilled from Platform: Latitude: 39 50 40.5S Longitude: 145 49 06.3E Northing: 558 8824N Easting: 398 910E Secondary Appraisal Objective – Top EVCM Latitude: 39 50 21.5S Longitude: 145 48 29.7E Northing: 558 9400N Easting: 398 032E Primary Objective – Intra EVCM (2809 Sand) Latitude: 39 50 17.8S Longitude: 145 48 22.7E Northing: 558 9510N Easting: 397 865E (Datum: GDA94 Zone 55)
PERMIT	T/L1 Offshore Bass Basin - Tasmania
INTEREST HOLDERS	Origin Energy Petroleum Pty Ltd (Operator) 32.5% Origin Energy Northwest Pty Ltd 5.0% AWE Petroleum Pty Ltd 30.0% CalEnergy Gas (Australia) Ltd 20.0% Wandoo Petroleum Pty Ltd 12.5%
TYPE OF WELL	Development
ANTICIPATED SPUD	Q2, 2004
ELEVATION	Water Depth: 80.8m RT: 25 m (nominal)
WELL STYLE	Deviated from Platform

WELL NAME	***Yolla-4***
LOCATION	Drilled from Platform: Latitude: 39 50 40.5S Longitude: 145 49 06.3E Northing: 558 8824N Easting: 398 910E Primary Objective – Intra EVCM (2809 Sand) Latitude: 39 50 59.14S Longitude: 145 48 13.8E Northing: 558 8233N Easting: 398 671E (Datum: GDA94 Zone 55)
PERMIT	T/L1 Offshore Bass Basin - Tasmania
INTEREST HOLDERS	Origin Energy Petroleum Pty Ltd (Operator) 32.5% Origin Energy Northwest Pty Ltd 5.0% AWE Petroleum Pty Ltd 30.0% CalEnergy Gas (Australia) Ltd 20.0% Wandoo Petroleum Pty Ltd 12.5%
TYPE OF WELL	Development
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ELEVATION	Water Depth: 80.8m RT: 25 m (nominal)
WELL STYLE	Deviated from Platform

Yolla-3 and Yolla-4 are development wells that will target sandstone reservoirs of the Eastern View Coal Measures (EVCM) previously intersected and evaluated in Yolla-1 and Yolla-2. Both wells will be deviated wells drilled from the Yolla-A platform location. Primary reservoir objectives in both wells are the Palaeocene Sandstone units termed the 2718, 2755, 2809 and 2973 units (based on the depth of intersection at Yolla-1). Yolla-4 is likely to be drilled before Yolla-3 for operational reasons. If the drilling order is reversed then changes may occur in the proposed coring and logging programs. The evaluation programs for both wells will be confirmed in the drilling programmes, which will be issued at a later date.

Yolla-3 is to be deviated from the platform location in a northwesterly direction. The primary objective of the well is to provide deliverability and production from the intra-EVCM from the northern part of structural closure within the vicinity of Yolla-1. Yolla-3 is also designed to evaluate further the Upper EVCM, close to the crest of the top EVCM structural closure. Yolla-3 is prognosed to intersect the 2809 Unit, 480m to the northwest and 2m structurally higher than Yolla-1. At the Top EVCM stratigraphic level, the well is prognosed to intersect 90m east and 2m higher than Yolla-1.

Yolla-4 will be deviated from the platform location in a southerly direction. The primary objective is to provide deliverability and production from the Intra-EVCM in the southern part of the Yolla Field, updip from Yolla-2. Yolla-4 will also evaluate the top EVCM stratigraphic level which is predicted to be intersected at or near to the OWC in Yolla-1.

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1.0 INTRODUCTION

1.1 Location

The proposed Yolla-3 and Yolla-4 wells are located in T/L1 in the northern part of the Yolla Gas Field within the Bass Basin (Fig. 1). The lease is located 120km from the northern Tasmanian coast and 220km south-southeast of Melbourne. The platform location is situated at 39 50 40.5S, 145 49 06.3E (558 8824N 398 910E; GDA94 Zone 55) in 81m of water.

Yolla-3

Yolla-3 is designed as a deviated well from the platform location. The well will intersect the top EVCM 480m south east of Yolla-1 (Seismic inline 522 CDP 1000) and the top of the 2809 reservoir 150m south-southwest of Yolla-1 (seismic inline 530 CDP 1000).

The well has a total horizontal reach of 1300m from the platform location at 398910E 5588824N. The well path coincides with seismic crossline 1000.

Yolla-4

Yolla-4 is designed as a deviated well from the platform location. The well will intersect the top EVCM 1290m north-northeast of Yolla-2 (seismic inline 477 CDP 974) and the top of the 2809 reservoir 940m north-northwest of Yolla-2 (seismic inline 475 CDP 950).

The well has a total horizontal reach of 718m from the platform location at 398910E 5588824N.

1.2 Permit Details

A retention lease was first awarded over the Yolla Field in 1991 and was subsequently renewed twice in 1996 and again in 2001. The companies of the Yolla Joint Venture gave financial approval for the BassGas Project for the development of Yolla to proceed, and executed an EPIC contract with Clough Engineering Ltd in June 2002 for delivery of the necessary production facilities. The Yolla Joint Venture subsequently applied for a production license from the Joint Authority in September 2003.

Of the 9 graticules within T/RL1, 4 blocks (3262, 3334, 3335 and 3407) were awarded in April 2003 as part of the new Production License, T/L1 (Fig. 2). After a series of farm-in agreements, withdrawals and company name changes, the current permit joint venture partners are: Origin Energy Petroleum Ltd (32.5%, Operator), Origin Energy Northwest Pty Ltd (5%), AWE Petroleum Pty Ltd (30.0%), CalEnergy Gas (Australia) Ltd (20.0%) and Wandoo Petroleum Pty Ltd (12.5%).

2.0 FIELD HISTORY

2.1 Drilling and Seismic Acquisition

The Yolla Gas Field is a large northwest-southeast trending fault bounded structure which has been compartmentalised by major faults.

Two wells have been drilled in the Yolla Field. Yolla-1 (Fig. 2) was drilled in June 1985 by AMOCO Ltd and encountered gas in both the Intra-Eastern View Coal Measures (EVCM) between 2700m and 3000mRT, and also in the Upper-EVCM at approximately 1830mRT. Gas Pay was encountered in 5 separate zones within the Intra-EVCM, and these provide the main reserves for the BassGas development. DST 1 in Yolla-1 tested gas and liquids from the 2809 Sand of the Intra-EVCM at rates of up to 425 000 m^3/day and 92 kl/day respectively (15.1 mmscfd and 580 bcpd).

Yolla-1 was suspended for possible future re-entry. The well was not fully abandoned and the wellhead remains on the seabed. It is not currently intended to use the Yolla-1 wellbore as part of the development. However, it is intended to retain Yolla-1 in its current state in case it can be used in some way during the production life of the field. The Yolla-1 wellbore is considered safe, but to complete its abandonment will require cutting casing below the mudline and recovering the wellhead. If no use for the well has been found before Yolla-5 and Yolla-6 are drilled circa 2012, it is likely that Yolla-1 will be abandoned at that time using the jack-up rig used to drill those wells.

A 3D seismic survey was acquired over the Yolla Field in mid 1994 with the aim of enabling more accurate depth mapping for the purpose of reserves estimation and appraisal/development planning. These data were subsequently reprocessed in early 2000. Updated depth maps were produced in December 2000 and January 2001 and form the basis for the latest field review and basis for the development plan issued in September 2002.

The Yolla-2 appraisal well was drilled in April and May 1998. The well was drilled 2.35km SSE of Yolla-1, and approximately 45m downdip at the intra-EVCM reservoir level. The well demonstrated good correlation to the sands intersected in Yolla-1, although many were intersected below the gas-water contact due to the low structural location of the well. Pressure data allowed confident interpretation of GWC levels in the different Intra-EVCM units. Yolla-2 was plugged and abandoned.

2.2 Regional Geology

2.2.1 Structure

The Bass Basin is located offshore in southeastern Australia between Victoria and Tasmania. It is one of a series of sedimentary basins that were formed in response to rifting during the Late Jurassic to Early Cretaceous between Australia and Antarctica (Williamson et al, 1987). The Bass Basin covers approximately 65,000 km^2 and water depths range from 30 to 90 m.

The Bass Basin is a failed intra-cratonic rift basin with structural features which highlight three separate phases of evolution: 1) initial northeast-southwest extension during the early Cretaceous, 2) Late Cretaceous to Pliocene thermal subsidence and 3) Miocene compression. The rifting created a series of northwest-southeast oriented grabens offset by associated east-west wrench movement. The Pelican, Yolla and Cormorant Troughs comprise the major depocentres in the Bass Basin (Fig. 3). The Yolla Field is located on the flank of the Yolla and Cormorant Troughs. These depocentres are fault-bounded half-grabens that progressively developed via growth faulting during the active rifting and thermal subsidence phases of basin evolution. The dominant structural trend in the basin is northwest-southeast, highlighted by the orientation of the major faults and troughs.

2.2.2 Stratigraphy

The stratigraphic succession in the Bass Basin comprises sediments ranging in age from Early Cretaceous to Recent (Fig. 4)

The Early Cretaceous Otway Group rests unconformably on pre-rift Palaeozoic black shales and quartzites and consists of clastic, volcaniclastic, fluvial and deltaic sediments ranging from coarse-grained sandstone to shale and coal. The

Otway Group was deposited as a very thick sequence of sediments (*C. australiensis* to *C. paradoxus*) that have been intersected in the Bass Basin at only one locale, Durroon-1, in the extreme southeast.

Localised uplift and erosion then occurred on the basin margins as the initial rifting phase subsided (Middle Cretaceous). The Otway Drift phase then began along the southern margin of Australia, which was largely contemporaneous with the start of the Tasman Rifting event on the eastern edge of the southern margin. This recommenced rifting in the Bass Basin, which resulted in deposition of the prospective Early Cretaceous to Late Eocene Eastern View Coal Measures (EVCM) which comprise a thick succession of sandstone, siltstone, shale and coal, deposited primarily within fluvial, deltaic and lacustrine depositional environments. Seismic data suggests that the EVCM is over 4000m thick in the Troughs. The EVCM thins markedly towards the basin margins and exhibits both onlap onto basement and erosional truncation. In a broad sense, the EVCM can be divided into three sequences separated by erosional unconformities. The middle sequence was penetrated in Bass-1 and Yolla-1 and –2 and contains the major gas accumulations in the Yolla Field. This sequence is bounded at the base by the *N. senectus* unconformity and at the top by the upper *M. diversus* unconformity.

The Lower Eastern View Coal Measures (EVCM) depositional sequence was deposited from Cenomanian to Santonian times (*A. distocrinatus* to *N. senectus*). These units have only been intersected in Durroon-1 in the southeast of the Bass Basin and are equivalent to the Golden Beach Group in the Gippsland Basin.

An angular unconformity is identified over localised highs on the basin margins at the top of the *N. senectus* zone. The boundary is marked in places by significant extrusive volcanism, similar to that observed in the Gippsland Basin. This event signals the termination of Tasman rifting, which was followed by sea floor spreading in conjunction with the already active drift in the Otway region. During this time, thermal subsidence dominated throughout the basin and thick, ubiquitous deposition of the Late Cretaceous to Palaeocene Lower EVCM occurred (*T. lillei* to Lower *M. diversus/P. asperopolus*).

The Late Cretaceous sediments are restricted mainly to the basin depocentres and axial reaches where accommodation space was sufficient for deposition and subsequent preservation. The section is missing on the basin margins due to sediment bypass. The Palaeocene section is extensive throughout with the greatest thickness of sediments in the basin depocentres and significant thinning towards the basin flanks, as a result of both condensing of the section and basement onlap.

The Late Cretaceous/Palaeocene Lower EVCM has been intersected in numerous wells in the basin, identifying it as a continuos sequence of late low stand sediments grading through a transgressive systems tract and finally capped by high stand sediments. Environments are gradational both laterally and temporally from alluvial through fluvio-deltaic and nearshore to deeper restricted lacustrine. Primary sediment input to the basin was from the southeast with minor localised input also deposited transversely from the flanks of the troughs. Extensive coal measures dominate the sedimentary sequence in the southeast of the basin (Pelican Trough) with increasingly thicker homogeneous shale units occurring through the Yolla and Cormorant Troughs.

The top of the Lower EVCM is identified by localised uplift and inversion of the pre-existing sedimentary sequence, caused by mild regional compression. The effects of this uplift are variable with the degree of erosion extending from the Mid *M. diversus* through to the *P. asperopolus* in places.

The Eocene upper EVCM (Mid *M. diversus*/*P. asperopolus* to Mid *N. asperus*) was then deposited under a regime of slower subsidence, resulting in more widespread, highly variable facies development. Fluctuating conditions of alluvial, fluvio-deltaic and shallow marine processes resulted with more extensive deposition of coal measure sediments. A regional marine transgression then occurred, resulting in the basin-wide deposition of the Demons Bluff, the base of which is marked by a locally very thick transgressive sand.

Conformably overlying the EVCM is the Late Eocene Demon's Bluff Formation. Lithologically this unit consists of a basal sequence of fine-grained carbonaceous shale and siltstone deposited in an open marine environment. The unit has an average thickness over the basin of approximately 120 m, but thins toward the basin margins. The Demon's Bluff Formation provides a regional top seal to hydrocarbons reservoired in the top-most sandstone units of the EVCM as demonstrated in Yolla-1.

The Demon's Bluff Formation is overlain by the Late Eocene to Pliocene age Torquay Group which broadly consists of a basal sequence of marls and calcareous shales which grade upwards into a succession of bioclastic limestones. The Torquay Group signifies continual deposition under pervasive marine conditions. The Torquay Group is punctuated in places by episodes of minor uplift and/or erosion accompanied by varying effects of volcanism. Large-scale extrusives (volcanoes) are observable on the seismic data with extensive sill and dyke networks also resulting from these events (Yolla-1, Cormorant-1 and Aroo-1).

3.0 YOLLA FIELD

The Yolla Field is a simple fault-bounded structure over a prominent Early Cretaceous ridge on the flank of the Cormorant Trough. The Field has been compartmentalised into 4 main areas termed Yolla Main, Yolla North, Yolla Northwest and Yolla South.

Reprocessing of the Yolla 3D seismic data in 2000 formed the basis for the subsequent field review and final development plan issued in September 2002. The data presented herein is based on this latest remapping and geological/engineering evaluation.

3.1 Geophysical Evaluation

3.1.1 Time Structure Mapping

The reprocessed Yolla 3D Seismic Survey was loaded into Schlumberger's Geoframe software and interpreted using the IESX and Geoviz modules. Eight horizons were interpreted as shown in Figure 5 and Table 1. The upper horizons were used for the interval velocity depth conversion.

Horizon Interpreted	Seismic Character	Purpose
Water Bottom (WB)	Strong Peak	Interval velocity depth conversion
Lower Mid Miocene (LMM)	Strong Peak	Interval velocity depth conversion
Top Volcano (V)	Strong Peak	Interval velocity depth conversion
Base Volcano (BV)	Strong Peak	Interval velocity depth conversion
Near top EVCM	Strong Trough	Secondary target
Middle M.Diversus (MDIV)	Strong Peak	Used to constrain picks on deeper horizons
Top 2718 Sand	Weak Peak	Uppermost sand of the main reservoir section
Top 2809 Sand	Weak Peak	Most prominent event within main reservoir section

Table 1: Horizons interpreted as a part of the remapping of the Yolla Field.

3.1.2 Well Ties

Synthetic seismograms were generated with the “Geoframe Synthetic” software and used to tie the well data into the 3D grid. A composite traverse between the wells shows the final tie of the Gamma ray logs to the seismic data (**Fig. 6**).

Time Interpretation

Time structure maps were produced for all horizons shown in Table 1. Picks were interpreted on every 5th inline and cross-lines were interpreted as required. Auto-tracking was used to fill in the remaining lines in the 3D grid. Time picks for the 2809 sand to the north of the field could not be made due to a deterioration in data quality; however this region is outside the area of the gas accumulation.

3.1.3 Dykes and Sills

The Yolla 3D region is intersected by a number of prominent dykes and several smaller ones that disrupt the stratigraphy. These features are prominent on the variance-cube time-slices, on which they can be seen to strike approximately N-S, (Fig. 7). The dykes are interpreted to be the primary source of the mid-Tertiary volcanism and also to be the source of a number of sills that have intruded the Eastern View Coal Measure sequence, (Fig. 5). Several smaller dykes are interpreted to intersect the fault block containing the gas reservoirs. These may be partial barriers to the transmissibility of gas and have therefore been included in the interpretation and subsequent reservoir modelling.

Sub-Seismic Sills

While no major sills are currently recognized from the seismic to significantly effect the main reservoir section, the wells do contain a number of thin sills within the reservoir section, that are either below or close to the limits of seismic resolution. These thin sills have the potential to locally adversely modify the reservoir through the effects of heating. One such feature may occur in the vicinity of the proposed Yolla 3.

3.1.4 Depth Conversion Methodology

As shown in **Figures 5** and **7**, a volcano lies immediately adjacent to the Yolla Gas field. This feature, together with a number of dykes and sills has a major influence on seismic velocities over the structure. The time depth curves from the check-shot surveys of Yolla 1 and 2 show a strong divergence, indicating that the interval velocities are highly laterally-variant, (**Fig. 8**). It is for this reason, together with the sparse well control, that a horizon-based velocity analysis approach was taken to the depth conversion.

CMP gathers from 33 2D lines were extracted from the 3D survey and used for horizon based stacking and interval velocity analysis. Twenty in-lines and 13 cross-lines were extracted. The gathers had all pre-processing steps applied, up to but excluding DMO. They were loaded into Paradigm Geophysical's "Power2D" module to perform the analyses. Full details of the depth conversion methodology may be found in the Yolla 3D 2000 reprocessing interpretation report (Taylor, 2002). A brief explanation of the method used is included below.

Horizon based velocity analysis

Both Horizon Stacking Velocity Analysis (HSVA) and Interval Velocity Analysis (IVA) were used to derive velocity information for depth conversion. The HSVA velocities were used for an average velocity depth conversion and the IVA velocities were used for an interval velocity depth conversion.

HSVA is simply regular stacking velocity applied along an interpreted time horizon. It can be scaled to approximate average velocity. HSVA analysis was done for the EVCM and 2718 horizons.

IVA is akin to HSVA but computes the semblance for a range of velocities in a target layer defined by 2 interpreted horizons. It is a layer stripping process that builds up a velocity model for successive layers from the top down. Ray-tracing is used to account for non-hyperbolic move-out. Its ability to derive the velocity field for a given layer relies on the accuracy of the velocity field derived in the overlying section. The method employed was the coherency inversion technique, as implemented in Paradigm Geophysical's "Power2D" module.

IVA was applied to the 5 layers bounded by the horizons shown in **Figure 5**. This was done for each of the 33 2D lines extracted from the 3D survey. For each successive layer, the interval velocity semblances on all lines were interpreted simultaneously, to produce a consistent grid of velocity picks, before proceeding to analyse the next layer. This was an important step as it minimised any systematic line to line errors.

3.1.5 Depth Conversion

The main method of depth conversion was an interval velocity approach using map-migration to convert successive layers to depth. The maps produced using this technique were the P50 case for volumetric estimates, (Figs. 9 to 11). A vertical-stretch type interval velocity depth conversion was also produced, (i.e. interval velocities without map-migration). A third depth conversion using average velocities based on the HSVA velocity picks was also produced but is regarded as the least accurate because of a tendency to overly smooth velocities across the faults.

All velocity maps were calibrated to check-shot velocities in the wells. For the upper horizons the well Bass 1 was included together with Yolla 1 and 2. For each layer, the seismically derived velocities were scaled by a constant factor to approximately tie the check-shot velocities, then map-migrated to depth. A hand contoured mistie map was then used to flex the grids to exactly tie the wells.

The overall effect of the volcano on the velocity field can be seen by examining the final average velocity map produced by dividing the final depth conversion of the 2809 sand by the two-way-time map, (Fig. 12). It shows that the volcano has a large bearing on the velocities with the average velocity decreasing in a concentric manner away from the centre of the volcano. This is reasonably plausible given the expected effect of volcanic activity and is therefore taken as support for the veracity of the depth conversion.

3.2 Geological Evaluation

3.2.1 Intra-EVCM Reservoir

The primary targets for the Yolla-3 and -4 development wells are sandstone reservoirs in the Palaeocene section of the Eastern View Coal Measures (EVCM) corresponding with the Upper and Lower *L balmei* palynological zones (Enc. 1). Units have been intersected and correlated in both Yolla-1 and Yolla-2.

Four main reservoir units are targeted for production. These units are termed the 2718, 2755, 2809 and 2973 sand units based on the depth of intersection in the Yolla-1 discovery well. The 2755, 2809 and 2973 units are fluvial sandstone reservoirs based on core and formation imaging data. Intervening shaly and sandy sections are variously interpreted as lacustrine and fluvio-lacustine facies. A core taken from the 2973 unit in Yolla-2 showed that the reservoir comprised excellent reservoir quality within pebbly sandstone. Porosity and permeability ranged up to in excess of 20% with permeability in the multi-darcy range (Fig. 13). The seal for the gas accumulations is provided by intra-formational shales and by shale gouge along the Yolla bounding faults.

A DST (1) was conducted over the 2809 sand unit (2809.1-2824.6mRT) in Yolla-1 and flowed gas at 15.1 mmcfd and condensate at 580 bpd.

Determination of fluid contacts within the Yolla Field is possible using the available RFT data from Yolla-1 and the MDT data from Yolla-2 (Figs 14-16). MHA (2000) reviewed all the available pressure data from the Field and interpreted fluid contacts for the various reservoir levels within the intra-EVCM section. The most likely contacts for the reservoir units are documented in Table 2.

Reservoir	Most Likely Contact	Interpretation
2718	2727m SS	1 RFT point to define gas gradient. 2 MDT points from Yolla 2 probably indicate separate water gradient. Possibility of supercharging could lower contact to 2822m SS if common water gradient is assumed
2755, 2809	2834m SS	Defined using multiple MDT points. Well defined.
2952, 2973	2997m SS	Range of possible contact levels. Minimum at 2990.5mSS and a maximum at 3004.7m SS. Most likely level between these 2 points.

Table 2: Most Likely contacts for each reservoir unit.

3.2.2 Upper EVCM Reservoir

Yolla-1 intersected an interval with gas shows and fluorescence at approximately 1805m KB in the Upper EVCM. Significant gas shows were also intersected at 1830 – 1834m KB. Three DSTs were conducted over the unit. The results are as follows:

- DST 2: 1830 – 1835.2m KB. Flowed GTS at 2.2 MMcfd, RTSTM condensate/oil and 1675 bpd water. The water was interpreted to be channelling behind casing due to poor cementation.
- DST 2A: 1833.2 – 1833.8m KB. (After several cement squeezes). Flowed GTS at 1.0 MMcfd, 302 stbpd oil/condensate and no water. Oil:gas ratio fell throughout the test, possibly due to the onset of gas coning.
- DST 3: 1820.5 – 1840.5m KB. Flowed GTS at 11.8 MMcfd and OTS at 892 stbpd and no water. (Note: Perforations are now interpreted to be off depth relative to those reported at the time).

Yolla-2 intersected the top EVCM at 1844.0m KB. Log analysis (section 3.4) indicates that the unit is water-bearing. No DSTs or RFT data were collected over this interval.

Data is sparse concerning the facies of the Upper EVCM at Yolla 1. Core 1 from Yolla 1 (1838 to 1847.8m KB) had poor recovery (29%) and was significantly fractured. The whole core that was recovered shows the sandstone to be fine-grained and strongly bioturbated suggesting a significant marine influence in deposition. The log character in Yolla 1 suggests an interbedded sequence of dominantly argillaceous sandstone and minor siltstone (TEV4 – TEV6; 1829 – 1856.6m KB; Enc 1) overlain by a siltstone and claystone interval. In Yolla 2 a clear upward-coarsening trend is discernable over the correlative interval (TEV4 - TEV6; 1875.7 – 1891.7m KB; Enc 1). The lithology is again interpreted to be interbedded argillaceous sandstone and siltstone. The available evidence for the upper EVCM in the Yolla Field indicates a progradational shallow marine sequence in the TEV4-6. The depositional environment is probably lower to middle shoreface or delta mouthbar. The overlying shale-dominated section (TEV1 – TEV3) was probably deposited at the onset of the transgression that culminated in the deposition of the Demons Bluff Formation. The most likely environment of deposition for this interval is offshore marine.

Reservoir quality data is available for the cored interval in Yolla 1 and is presented in Table 3.

Depth	Ambient Porosity (%)	Ambient horizontal permeability (mD)
1845.40	29.6	75.00
1845.70	25.2	17.00
1846.00	25.8	11.00
1846.40	30.4	65.00
1846.70	30.0	51.00
1847.00	29.2	37.00
1847.30	30.0	42.00

Table 3: Upper EVCM core data – Yolla 1.

DST 2A provides the best evidence for the presence of a GOC in Yolla 1. This test initially produced oil and then subsequently gas. This is interpreted as gas coning (see section 4.2) and places the GOC close to the top of the perforated interval i.e. 1832.2m KB in Yolla 1.

McCarthy (1995) reviewed RFT data from the upper EVCM in Yolla 1. The RFT data are ambiguous due to supercharging and tight sampling points and any precise determination of fluid contacts is extremely difficult. McCarthy (1995) concluded that the OWC lies between 1841m KB and 1856m KB. In addition, a GOC has been defined at 1832.9m. This estimate is based on the high gas flow on DST 3 and the apparent presence of gas at the 1832.5m KB sampling point (although no records of this sample can be found). McCarthy (1995) interprets a sonic kick in the interval 1830-1833m KB as due to the presence of free gas.

Petrophysical analysis (Tye et al 2002) defines the OWC contact at 1831.1m SS (1842.2m KB Yolla 1). This appears to be the most accurate estimate for the OWC. No evidence for a gas cap is evident in this log analysis.

Based on the stratigraphic section intersected in Yolla-1 and –2 the Upper EVCM has been divided into 7 zones (TEV1-7; Enc 1). Depth maps were produced for the top TEV horizon (Fig. 9). The mapping shows a shallow-dipping, four-way dip southeast to northwest trending anticlinal structure. There is 24m of vertical closure at the top TEV4 stratigraphic level. The 1831.1m SS fluid contact (see above) coincides with the spill point for the TEV4 zone. Using this same fluid contact, it is clear that there is no structural closure for all zones above the TEV4.

3.3 Hydrocarbon in Place

3.3.1 Intra-EVCM

In early 2001, an OGIP review (Tye and Taylor 2001) was undertaken as a result of the remapping of the Yolla Field subsequent to the reprocessing of the Yolla 3D Seismic Survey. Estimates of OGIP were calculated probabilistically for each reservoir interval. These estimates were then consolidated probabilistically to provide a final estimate of OGIP for each unit within the Yolla Main and Yolla North Fault blocks. A 0.76 conversion factor was used to convert calculated OGIP to reserves. This factor accounts for both CO_2 and condensate removal for the final gas volume. Final OGIP and recoverable reserves are presented in Tables 4 and 5.

OGIP (bcf)				
Yolla Main Block				
SAND	**P90**	**P50**	**P10**	**Mean**
2718	14.2	30.8	57.5	33.8
2755	122.0	200.0	298.0	206.0
2809	45.8	87.3	145.0	91.7
2952	4.2	8.2	13.0	8.5
2973	67.4	107.0	160.0	111.0
Cons	342.0	448.0	569.0	452.0
Yolla North Block				
SAND	**P90**	**P50**	**P10**	**Mean**
2718	2.7	6.5	13.5	7.5
2755	12.4	28.4	52.6	30.8
2809	1.3	4.9	12.0	5.9
2952	0.4	0.9	1.4	0.9
2973	1.6	6.3	14.6	7.3
Cons	31.1	50.6	76.4	52.5
Total	**393**	**500**	**621**	**504**

Table 4: Probabilistic OGIP estimate for the Yolla Field. All sub totals and totals have been probabilistically consolidated

Recoverable (bcf)				
Yolla Main Block				
SAND	**P90**	**P50**	**P10**	**Mean**
2718	9.9	21.4	40.0	23.6
2755	84.5	139.0	208.0	144.0
2809	31.8	60.6	101.0	63.9
2952	2.9	5.7	9.1	5.9
2973	46.8	74.9	112.0	77.4
Consolidated	239.0	314.0	399.0	316.0
Yolla North Block				
SAND	**P90**	**P50**	**P10**	**Mean**
2718	1.9	4.5	9.4	5.2
2755	8.6	19.9	36.7	21.5
2809	0.9	3.4	8.4	4.1
2952	0.3	0.6	1.0	0.6
2973	1.1	4.4	10.2	5.1
Consolidated	21.6	35.3	53.2	36.6
Total bcf	**274**	**350**	**436**	**353**
Total PJ	**208.2**	**266.0**	**331.4**	**268.3**

Table 5: Probabilistic recoverable reserves estimate for the Yolla Field. All sub totals and totals have been probabilistically consolidated. The final row shows the probabilistic distribution in PJs.

3.3.2 Upper EVCM

Deterministic estimates of oil and gas in place were undertaken (Tye et al. 2002). An OWC of 1831.2 mSS and a GOC of 1821.9 mSS was assumed in the calculations. The results of subsequent volumetrics analysis for various variogram ranges are presented below in Table 6.

Case	Oil + Gas		Oil (MMbbls)	Gas (bcf)
	Oil (mil bbls)	Gas (bcf)		
3000m range	12.2	10.1	18.6	29.7
2000m range	13.0	10.5	19.6	31.3
1000m range	14.6	11.3	21.6	34.6
500m range	15.5	13.0	23.6	37.7
100m range	15.8	12.7	23.8	38.1

Table 6: Results from deterministic volumetric OOIP/OGIP calculation for all gas, all oil and oil + gas cases. OWC/GWC of 1831.2m SS and a GOC of 1821.9mm SS.

4.0 WELL EVALUATIONS

The indicative evaluation programs for these wells are based on the premise that Yolla-4 will be drilled first. If Yolla-3 becomes the first well drilled then the evaluation programs will be subject to change. The final logging, coring and testing programs will be included in the drilling programs which will be issued at a later date.

4.1 Yolla-3

The proposed Yolla-3 well is a deviated well from the platform location (398910E 5588824N) targeting gas in the northern part of the Yolla Field. The well has a total horizontal reach of 1300m and will drill to a measured depth of 3445m (3030mSS). Figure 17 shows the trace of the deviated well in reference to both the 2809 unit and Upper EVCM depth maps. The well trajectory coincides with seismic Xline 1000 (Fig. 18). A schematic of the proposed well trajectory and the prognosis with reference to seismic line, horizontal offset and TVD is shown in Figure 19 and Table 7 respectively.

The 2 key location objectives for the deviated well are the following:

1 Upper EVCM: 398032E 5589400N (Inline 522, Xline 1000) at 1818mSS.

2 Intra EVCM (2809 unit): 397865E 5589510N (Inline 530, Xline 1000) at 2795mSS.

This 2809 unit intersection location differs from that outlined in the Yolla Development Plan issued in September 2002. The revised location is 570m southeast of the previous location and 150m southeast of the Yolla-1 location. The primary reason for this revision is to avoid the possibility of intersecting a volcanic sill at the 2809 unit level. This potential sill is indicated by a high amplitude reflector (Fig. 20) which appears to be present on either side of the main Yolla bounding fault to the north of Yolla-1. The extent of this high amplitude reflector has been mapped (Fig. 21) and is interpreted to be indicative of the areal extent of the sill. Based on this data, the revised location carries significantly less risk of intersecting a sill at the 2809 unit level than the area to the north of Yolla-1 (including the previous Yolla-3 intra-EVCM intersection location). The revised location has the additional advantage that it is 3m updip from the previous Yolla-3 location and 2 m updip from Yolla-1.

Yolla 3 Proposed Well Path

KB: 25m nominal

Horizon	Depth SS	MD	Horiz Offset	Inline	Xline	Target Radius	Easting	Northing
Sea Level	0	25	0	480	1000		398910	5588824
Sea Bed	81.8	106.8	0	480	1000		398910	5588824
Kick Off	300	325	0	480	1000		398910	5588824
Arbitrary Point	600	654	135	485.4	1000			
Lwr Mid Mio	848	952	300	492	1000			
Angahook	1061	1244	500	500	1000			
Volcano	1201	1488	700	508	1000			
Base Volc	1367	1712	850	514	1000			
Demons Bluff	1657	2038	1000	520	1000			
EVCM (TEV4)	***1818***	***2207***	***1050***	***522***	***1000***	***20m***	***398032***	***5589400***
Sill (Top)	2580	2984	1200	528	1000			
Sill (base)	2647	3055	1225	529	1000			
2718 Sand	***2703***	***3112***	***1238***	***529.5***	***1000***			
2755 Sand	***2733.5***	***3144***	***1245***	***529.8***	***1000***			
2809 Sand	***2795***	***3206***	***1250***	***530***	***1000***	***80m***	***397865***	***5589510***
2952 Sand	***2938.3***	***3353***	***1275***	***531***	***1000***			
2973 Sand	***2959***	***3374***	***1281***	***531.25***	***1000***			
Base 2973 Sand	***2981.9***	***3397***	***1288***	***531.5***	***1000***			
Basalt	3025	3440	1300	532	1000			
TD	3030	3445	1301	532	1000		397844	5589524

Table 7: Yolla-3 well prognosis.

*Note MD numbers are preliminary

4.1.1 Primary Objectives

The primary objective for Yolla-3 are the Palaeocene reservoirs (2718, 2755, 2809 and 2973 sand units) previously intersected and tested in Yolla-1 and –2. The well will intersect the 2755 unit at 2733.7m SS and the 2809 unit at 2795.7 mSS which is 1.7m and 2m higher than the same levels in Yolla-1 respectively.

4.1.2 Secondary Objectives

The secondary objective for the well is the Upper EVCM which flowed gas and oil in Yolla-1. As a result of the Upper EVCM review (Tye et al. 2002) it was concluded that further evaluation was required for this interval. Yolla-3 is designed to achieve this via a detailed logging and coring programme. If a sufficiently encouraging hydrocarbon column is intersected then this interval will be included in the well completion in order to facilitate a programme of production testing. The well will intersect the Top EVCM at 1817.5 mSS, which is 1.4m higher than the same stratigraphic level in Yolla-1.

4.1.3 Predicted Total Depth

The proposed total depth (TD) for Yolla-3 is designed to ensure the primary and secondary targets have been fully evaluated. The TD is anticipated to be 3445 m MD which coincides with a subsea depth of 3030m. This depth is 5m below the top of the Basalt and allows for more than 40m of hole below the base of the lowermost Palaeocene reservoir. If the well is still within a live hydrocarbon column at this depth and sufficient encouragement of the existence of a commercial accumulation has been intersected, then the well should continue at least until 40m below the base of the hydrocarbon column.

4.1.4 Logging & Sampling

The preliminary logging program for Yolla-3 is summarised in Figure 22.

In order to evaluate fully the Upper EVCM in Yolla-3 an extensive logging suite is planned over the 12¼” section. Wireline PEx(HRLA)-CMR-SP is proposed to be run from the 12¼” TD to approximately 50m above the Upper EVCM reservoir. In addition, the FMI-HNGS and MDT-GR will also be acquired over the reservoir interval. The MDT will involve pre-tests and be configured to enable sampling if required. If core recovery is poor, then MSCT rotary sidewall cores will be considered through the reservoir zone so that porosity and permeability measurements can be undertaken in the hydrocarbon column.

Wireline PEx(HRLA)-CMR-BHC-HNGS-SP is proposed to be run in the 8 ½" hole from TD to 9 5/8" casing shoe. The MDT-GR is planned for the acquisition of pressure measurements only.

Schlumberger/Anadrill Logging tool mnemonics assumed

PEx: Platform Express Tool

HRLA: High-resolution Laterolog Array Tool
SP: Spontaneous Potential Tool
HNGS: High resolution natural gamma-ray spectrometry Tool
CMR: Combinable Magnetic Resonance Tool
FMI: Formation Micro-scanner Tool
MDT: Modular Dynamic Testing Tool
MSCT: Mechanical (rotary) Sidewall Coring Tool

4.1.5 Coring

It is planned to take one core in the Yolla-3 well. The core is to be taken from the Upper EVCM, specifically the TEV4 reservoir and will be 27m in length. However, if there is inadequate core recovery from the intra-EVCM reservoirs in Yolla-4 (assuming Yolla-4 is drilled first), then further coring may be considered for Yolla-3.

Identification of core point will be as follows:

Core 1 (27m): **Top EVCM.** The top of this core should be taken from 2197mMD, which is 10m above the predicted top of the EVCM at 2207mMD, (-1818mSS). At this depth the first major gas shows should be encountered, as seen in Yolla-1. If the interpreted top EVCM comes in high to prognosis, above the proposed core point, (based on ROP, gas shows and lithology correlation with Yolla-1) then coring should commence as soon as possible. The base of the core will be at 2224mMD, which is 3m below the predicted OWC at 2221mMD (-1831.1mSS).

4.1.6 Potential Hazards

The main hazards/risk associated with Yolla-3 well path concern the potential intersection of volcanic sills within the section. All of these volcanic units have the potential to be hard drilling. Based on seismic mapping an approximately 170m thick unit of tuffaceous Miocene volcanics is predicted within the intermediate section of the hole. A small dacitic sill is predicted at 2580mSS, approximately 50m above the intra-EVCM reservoir section based on seismic amplitude. This correlates with a 65m sill that was intersected at 2547mSS in Yolla-1. In addition, a high amplitude seismic response at the 2809 Sand reservoir level may also be indicative of a volcanic sill. The repositioning of the 2809 unit intersection point from that proposed in the Yolla Development Plan should reduce the risk of encountering this sill. Other hazards such as shallow gas are not expected, based on offset wells and seismic data.

4.2 Yolla-4

The proposed Yolla-4 well is a deviated well from the platform location (398910E 5588824N) targeting gas in the southern part of the Yolla Field. The well has a total horizontal reach of 718m and will drill a measured depth of 3159m to 3012mSS. Figure 17 shows the trace of the deviated well in reference to both the 2809 unit and Upper EVCM depth maps. A composite seismic line showing well trajectory is included as Figure 23. A schematic of the proposed well trajectory and the prognosis with reference to seismic line, horizontal offset and TVD is shown in Figure 24 and Table 8 respectively.

The 2 key location objectives for the deviated well are the following:

1 Upper EVCM: 398794E 5588512N (Inline 477, Xline 974) at 1832mSS.

2 Intra EVCM (2809 unit): 398671E 5588233N (Inline 475, Xline 950) at 2703mSS.

4.2.1 Primary Objectives

The primary objective for Yolla-4 are the Palaeocene reservoirs (2718, 2755, 2809 and 2973 sand units) previously intersected and tested in Yolla-1 and –2. The well will intersect the 2755 unit at 2707m SS and the 2809 unit at 2775 mSS.

4.2.2 Other Objectives

Yolla-4 is predicted to intersect the Upper EVCM at 1832 mSS which is within 1m of the interpreted OWC. As such the Upper EVCM is not considered a secondary target in Yolla-4. If a hydrocarbon column is intersected then further evaluation may be planned such as inclusion of this interval in the CST and MDT program.

Yolla 4 Proposed Well Path

KB: 25m nominal

Horizon	Depth SS	Depth MD	Horiz Offset	Inline	Xline	Target Radius	Easting	Northing
Sea Level	0	25	0	480	1000			
Sea Bed	81.8	106.8	0	480	1000			
Lmio	849	874	0	480	1000			
Kick Off	900	925	0	480	1000			
Angahook	1062	1099	63	480	995			
Volcano	1201	1243	103	479	992			
Base Volc	1378	1435	177	479	986			
Demons Bluff	1705	1778	280	478	978			
EVCM	1832	1916	334	477	974		398794	5588512
Fault (fardles)	2453	2569	534	476	958			
2718 Sand	***2664***	***2790***	***601***	***475***	***953***			
2755 Sand	***2707***	***2831***	***613***	***475***	***952***			
2809 Sand	***2775***	***2903***	***637***	***475***	***950***	***100m***	***398671***	***5588233***
2952 Sand	***2928***	***3070***	***683***	***474.5***	***946.5***			
2973 Sand	***2950***	***3094***	***695***	***474.5***	***945.5***			
2973 Base	***2974***	***3119***	***702***	***474.25***	***945***			
Basalt	3005	3152	716	474	944			
TD	3012	3159	718	474	944			

Table 8: Yolla-4 well prognosis.

*Note MD numbers are preliminary

4.2.3 Predicted Total Depth

The proposed total depth (TD) for Yolla-4 is designed to ensure the primary target has been fully evaluated. The TD is anticipated to be 3159 m MD which coincides with a subsea depth of 3012m. This depth is 40m below the base of the lowermost Palaeocene reservoir. If the well is still within a live hydrocarbon column at this depth and sufficient encouragement of the existence of a commercial accumulation has been intersected, then the well should continue at least until 40m below the base of the hydrocarbon column. The TD is 7m below the predicted top of basalt in the well.

4.2.4 Logging & Sampling

The preliminary logging program for Yolla-4 is summarised in Fig. 25.

As the 9 5/8" casing shoe is to be set in the Demons Bluff Formation, and there is no evaluation needed above this point it is proposed to log the 12 1/4 " hole through casing in the final logging run at 8 ½" TD. Wireline PEx (HRLA)-CMR -SP is expected to be run 1 in the 8 ½" hole from TD to 9 5/8" casing. Run 2 is proposed as FMI-DSI-HNGS with GR – DSI to be logged up through casing until the DSI signal is lost, and GR to be logged to surface. The MDT-GR will be carried out to help define fluid contacts, and for evaluation of the top EVCM if significant hydrocarbons are intersected. The CSAT – Offset checkshot is proposed to be run from TD until there is a loss of signal. If there is poor core recovery through the main reservoir sands then MSCT rotary sidewall coring may be undertaken to enable direct measurement of reservoir parameters. A CST-GR is a contingent item in the case where extra information as to formation composition/quality and/or palynology is required.

Schlumberger/Anadrill Logging tool mnemonics assumed

PEx: Platform Express Tool
HRLA: High-resolution Laterolog Array Tool
SP: Spontaneous Potential Tool
HNGS: High resolution natural gamma-ray spectrometry Tool
CMR: Combinable Magnetic Resonance Tool
DSI: Dipole Sonic Imaging Tool
MDT: Modular Dynamic Testing Tool
CSAT: Offset Checkshot Survey
MSCT: Mechanical (rotary) Sidewall Coring Tool
CST: Sidewall Coring Tool

4.2.5 Coring

There are 3 cores planned for Yolla-4 within the intra-EVCM reservoirs. However, if there is inadequate core recovery from Yolla-4, then coring of these intervals may be considered for Yolla-3 which is expected to be drilled after Yolla-4.

The cores will be 54m long and target the main Palaeocene reservoirs; the 2755, 2809 and 2973 units (Figure 26). This core data will provide valuable reservoir quality data for future well planning, field modelling and calibrating logs for future log interpretation.

Identification of core points will be as follows:

Core 1 (54m): Intra EVCM 2755 sand. Coring should commence at 10m above the predicted top of the 2755 reservoir. Currently the reservoir top is predicted at 2831mMD (-2707mSS) therefore if the overlying markers and other indications are that the depth prognosis is correct, then coring should commence at a depth of 2821mMD. The base of core 1 will then be at 2875mMD.

Core 2 (54m): Intra EVCM 2809 sand. Core 2 should be taken immediately following core 1. Following on from the above discussion, the top of core 2 will be at around 2875mMD and the base at 2929mMD (-2800mSS). The predicted top and base depths for the 2809 sand are 2903mMD (2775mSS) and 2929mMD (-2800mSS) respectively. The GWC for this zone at at a depth of -2834mSS (2964mMD).

Core 3 (54m): Intra EVCM 2973 sand. The top of core 3 should be picked from the first sign of significant gas shows and sand lithology encountered after the thick shale package between the 2873 sand and the 2952 sand (see enclosure 1). The gas increase and sand will herald the intersection of the 2952 sand. This sand is predicted to be at 3070mMD (-2928mSS) so if the core point is picked approximately 2m below the top of the 2952 sand, coring will commence at 3072mMD and continue until 3126mMD. This will ensure total coverage of the 2973 sand which is predicted between 3094mMD (2950mSS) and 3119mMD (-2974mSS). The GWC for this lower zone is uncertain and has an interpreted most likely depth of -2997mSS (3144mMD) but may be as high as -2990.5mSS and as low as -3004.7mSS.

4.2.6 Potential Hazards

Yolla-4 is predicted to intersect an approximately 180m thick tuffaceous Miocene volcanic unit at 1062 mSS (1095 RT; Fig. 25) and a Palaeocene basalt at 3005 mSS (3152m RT) based on seismic interpretation. No volcanic sills are predicted within or close to the reservoir section. A major fault will be intersected at approximately 2540m RT (Fig. 25)

5.0 PRODUCTION TESTING

A test program has been planned for both Yolla-3 and Yolla-4, to be conducted immediately after the wells are completed, using the drilling rig facilities and testing equipment.

The major objectives of Yolla-3 and Yolla-4 well testing are summarised as follows:

- To clean up each zone in each well prior to production.
- To determine flow capacity of individual reservoir unit.
- To collect fluid samples from each sand unit.

5.1 Intra-EVCM Reservoir Units (Yolla-3 and Yolla-4)

In order to achieve the above objectives a test program comprised of a short clean-up flow/shut-in, followed by a short multiple rate production test and pressure build up is planned for each major sand unit (2973, 2809, 2755 and 2718) in Yolla 3 and Yolla 4.

Surface and bottom hole pressure data will be collected during the flow and shut-in periods. Condensate and gas samples will be taken during the flow period from each zone for recombination and analysis.

Water samples will be collected during the flow periods if water production occurs during the test.

5.2 Upper EVCM Reservoir (Yolla-3)

Yolla-3 has been designed to intersect and evaluate the Upper EVCM reservoir (also known as 1830 sand) seen at Yolla-1. The Yolla-3 well will be perforated in the Upper EVCM, which may then be selectively produced via a sliding sleeve.

In order to assist evaluation of the reservoir, a short clean-up flow / shut in followed by a short multi-rate flow and a build-up test is also proposed for the 1830 sand.

Surface and bottom hole pressure data will be collected during the flow and shut-in periods.

Liquid and gas samples will be collected during the flow period for recombination and analysis. Water samples will be also collected if water production occurs during the production test.

6.0 PREDICTED STRATIGRAPHY

A summary of the depth prognosis and predicted stratigraphy for Yolla-3 and Yolla-4 is included in Tables 7 and 9 and Figures 22 and 26 respectively. The lithological descriptions are based mainly on data from Yolla-1 and Yolla-2. Given the proximity of these wells to the proposed development wells, the predicted stratigraphy is likely to be very similar. Note that all depths are in metres subsea (mSS).

6.1 Torquay Group

(Yolla-3: 82 – 1061 mSS, Yolla-4: 82 – 1062 mSS)

The Torquay Group is composed of an upper bioclastic limestone section and a lower marl section with the change in lithology being transitional at around 848 mSS (Yolla-3) and 849 mSS (Yolla-4).

The upper limestone section comprises white to mid-grey, coarse- to fine-grained unconsolidated bioclastic calcarenite to calcirudite composed of friable and loosely cemented skeletal debris consisting of pelecypods, bryozoans, foraminifera and gastropods. The fragment size decreases with depth with biocalcirudites grading to biocalcarenites and calcarenites and finally calcilutites. Quartz grains appear in the lower portion of the limestone interval. There is a general increase in the proportion of clay in silt towards the base of this interval.

The clay content significantly increases at approximately 850m. Below this depth the section is dominated by calcareous claystone. These are soft, dispersive and light green-grey. The calcareous content decreases with depth to approximately 15% near the base of the unit.

6.2 Angahook Formation

(Yolla-3: 1061-1201 mSS, Yolla-4: 1062-1201 mSS)

This unit is described as unit 1 in the Yolla-1 and Yolla-2 Well Completion Reports. It comprises light coloured, slightly calcareous claystone, which become firmer with depth. Some units become silty and trace amounts of medium-grained quartz sand are present in the basal portion of this interval.

6.3 Miocene Volcanics

(Yolla-3: 1201 - 1367 mSS, Yolla-4: 1201 – 1378 mSS)

This unit is dominated by tuffaceous material, sandstone, siltstone and claystone. Volcanics are white to light pale blue, firm-soft and slightly calcareous. Sandstone is predominantly fine-grained, well sorted and quartzose. Claystone is medium to dark grey, firm and calcareous. Siltstone is yellow-white-brown, contain trace glauconite and some calcareous cement.

6.4 Angahook Formation - Undifferentiated Oligocene

(Yolla-3: 1367 - 1657 mSS, Yolla-4: 1378 – 1705 mSS)

The upper part of this section comprises dominantly sandstone with minor interbedded claystone. Sandstone is fine- to very fine-grained with abundant clay and calcite cement. Claystone is of dark grey to olive brown, non-calcareous, firm with trace quartz grains and common disseminated pyrite.

The middle part of this unit (approximately 1470mSS to 1705mSS) comprises interbedded reddish-brown sandy dolomites and dolomitic limestone interbedded with fine-grained dolomitic quartz sandstone and medium brown, silty and sandy claystone.

6.5 Demons Bluff Formation

(Yolla-3: 1657 – 1818 mSS, Yolla-4: 1705 – 1832 mSS)

The boundary with the overlying Angahook Formation is gradational and indistinct but an increase in mica content could signal the top of the Demons Bluff Formation.

The Demons Bluff Formation is dominated by claystone with thin interbeds of sandstone and dolomitic limestone. The claystone characteristically becomes darker and more reddish brown with depth to almost black at the base. Sandstones are reddish brown, very fine- to fine-grained, argillaceous with abundant calcite and dolomitic cement. Trace glauconite was noted in Yolla-1.

6.6 Eastern View Coal Measures

(Yolla-3: 1818 – 3025 mSS, Yolla-4: 1832 – 3005 mSS)

The Eastern View Coal Measures (EVCM) within Yolla-1 and Yolla-2 consists of interbedded sandstone, siltstone, claystone and minor coal.

The contact between the top of the EVCM and the overlying Demons Bluff Formation is lithologically gradational with siltstone gradually becoming more sandy downhole and eventually grading into very fine grained, moderately sorted to well sorted, quartz sandstone. The top may be picked from a change in the resistivity baseline and a slight decrease in gamma ray, as a response to the increase in sand into the system.

The top of the upper EVCM is expected to consist of 20 to 30m of siltstone grading to sandstone. The sand package underlying this siltstone is hydrocarbon-bearing in Yolla-1 and is included as an appraisal target in Yolla-3. The sandstone is fine-grained, with abundant clay matrix. Core 1 in Yolla-1 was obtained from this interval and showed the section to be strongly bioturbated. The siltstone is dark grey to yellow brown, firm to soft and in part thinly interbedded with brown claystone that is soft and silty.

The remainder of the Eocene EVCM (1818 – 2703mSS Yolla-3; 1832 – 2664mSS Yolla-4) is a thick succession of interbedded sandstone, siltstone, claystone and coal. Sandstone units are either a) friable, fine-grained, angular, moderately to well sorted, friable with abundant clay matrix and some mica or b) fine- coarse grained (medium- to coarse-grained dominant), unconsolidated, angular to rounded and quartzose.

Coal is common in the Eocene section with seams typically 1-3m thick. Coal is bituminous, black, glossy, hard and brittle. Shale interbedded with the coal and sandstone is typically black, moderately hard to fissile, non-calcareous and brittle. They contain varying proportions of coaly material and pyrite.

The main reservoir section of the EVCM is of Palaeocene age (2703mSS – TD Yolla-3; 2664 – 3005mSS Yolla-4) and comprises interbedded sandstone, siltstone and shale with rare thin coal seams. Five reservoir units are predicted in the Palaeocene section and are termed the 2718, 2755, 2809, 2952 and 2973 sands (based on the measured depth of intersection at Yolla-1). See Table 7 and 9 for the depth prognosis for each of these units. Sandstone ranged from fine- to very coarse-grained (dominantly medium-grained, well cemented, sub angular to subrounded, micaceous and abundant carbonaceous matter. Two types of claystone are described in the Yolla-1 interval a) lighter coloured and very silty with moderate amounts of organic material and b) dark coloured, less silty and organic-rich, occasionally grading to coal.

In addition to siliciclastic lithologies Yolla-1 and Yolla-2 intersected intervals of extrusive and intrusive igneous rock. Extrusives were intersected within the EVCM at Yolla-1 between 2413 – 2422 mRT and 2567 – 2580 mRT. These consist of dark grey pumice and cream-white tuff. A dolerite intrusive was also intersected between 2584 – 2651 mRT and is predicted in the Yolla-3 section between 2580 – 2647 mSS.

6.7 Basalt

(Yolla-3: 3025 – 3030 mSS (TD). Yolla-4: 3005 – 3012 mSS (TD))

A thick sequence of amygdaloidal basalt is present at the base of the stratigraphic section. The basalt ranges from fresh to highly altered. The basalt has primarily altered to a mixture of carbonates, chlorite, silica and zeolite. The basalt is commonly fractured and veined.

7.0 REFERENCES

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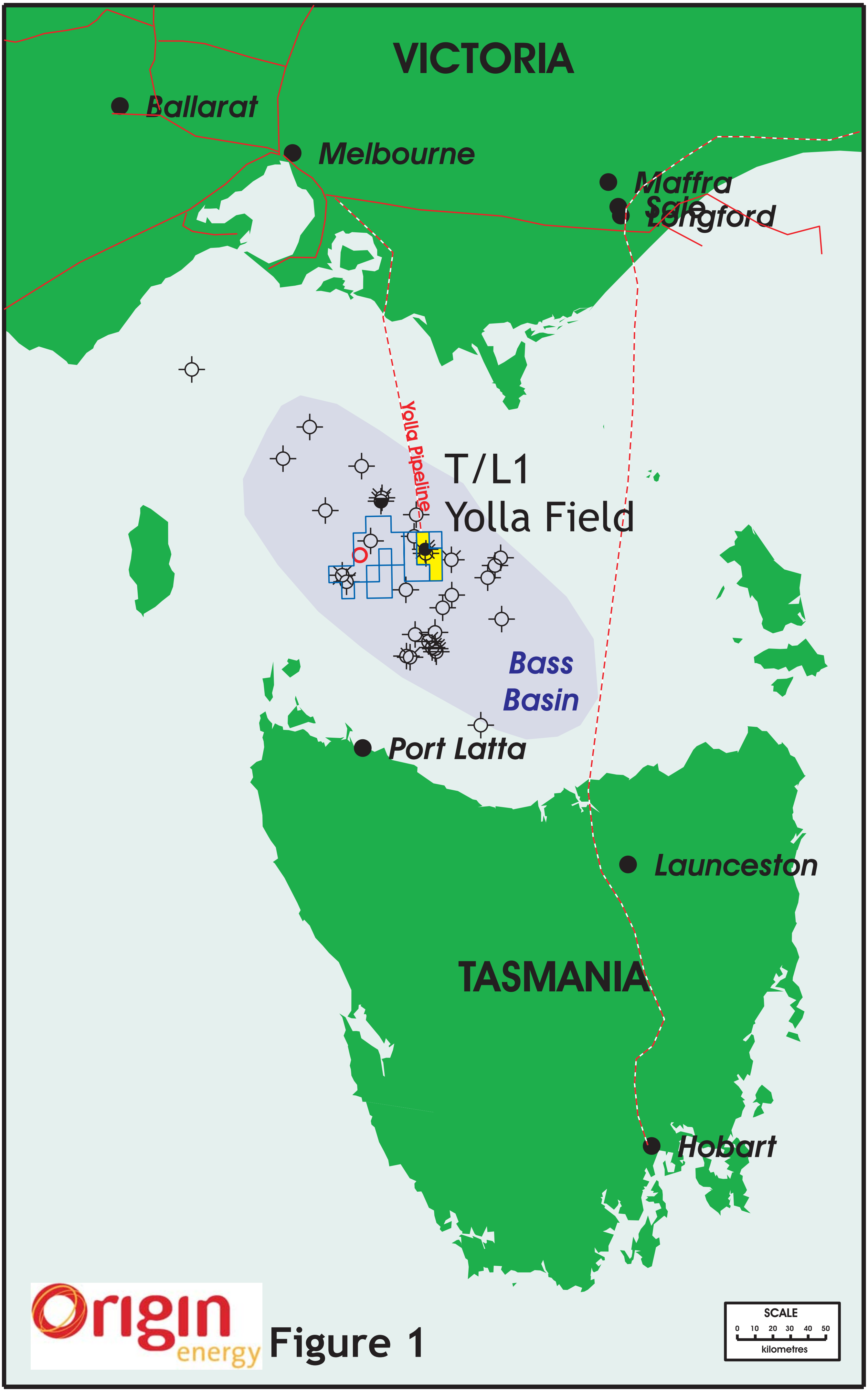
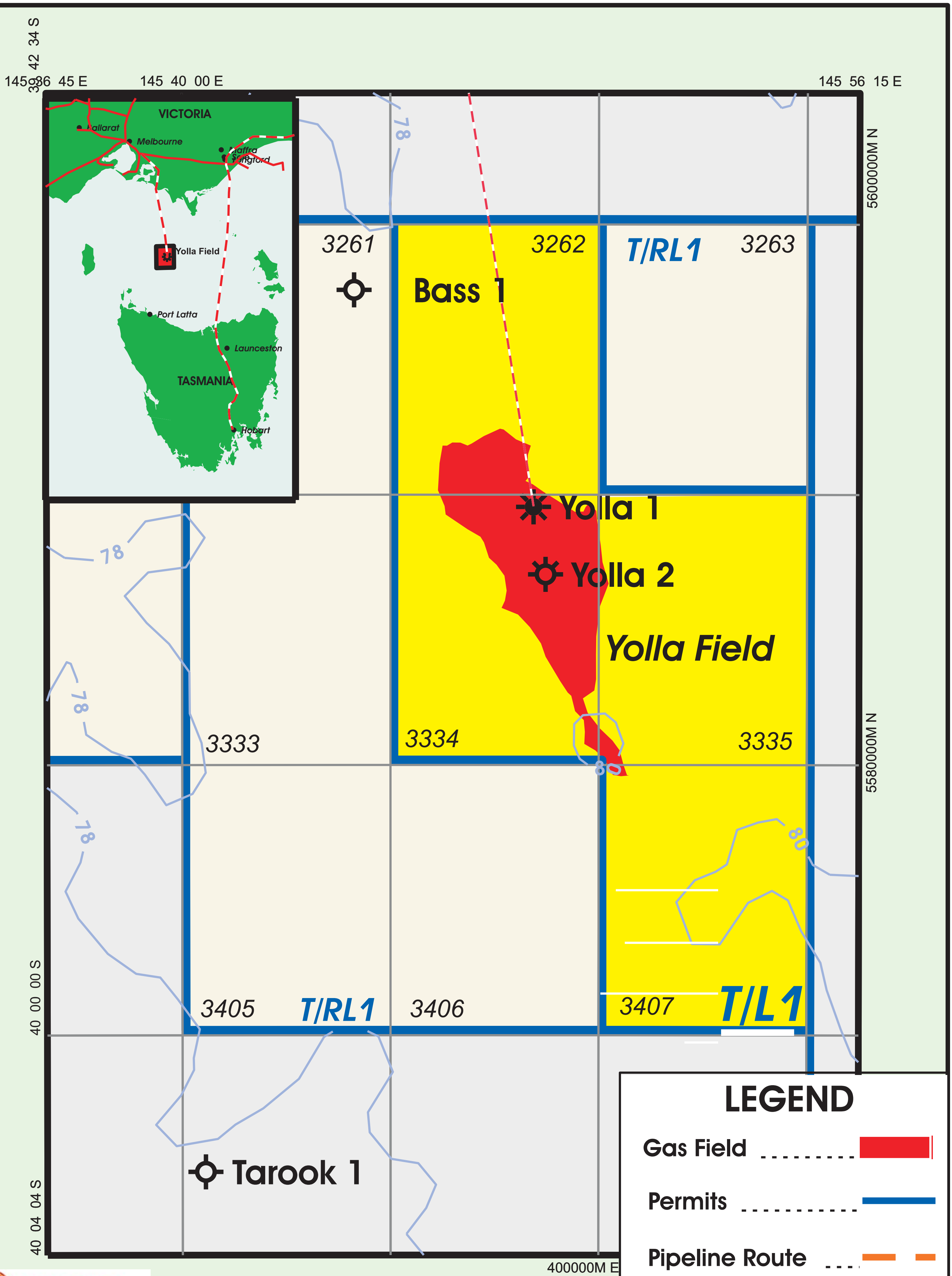

VICTORIA
Ballarat
Melbourne
Maffra
Sale
Longford
Yolla Pipeline
T/L1
Yolla Field
Bass
Basin
Port Latta
Launceston
TASMANIA
Hobart
SCALE
0 10 20 30 40 50
kilometres

Figure 1



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40 04 04 S
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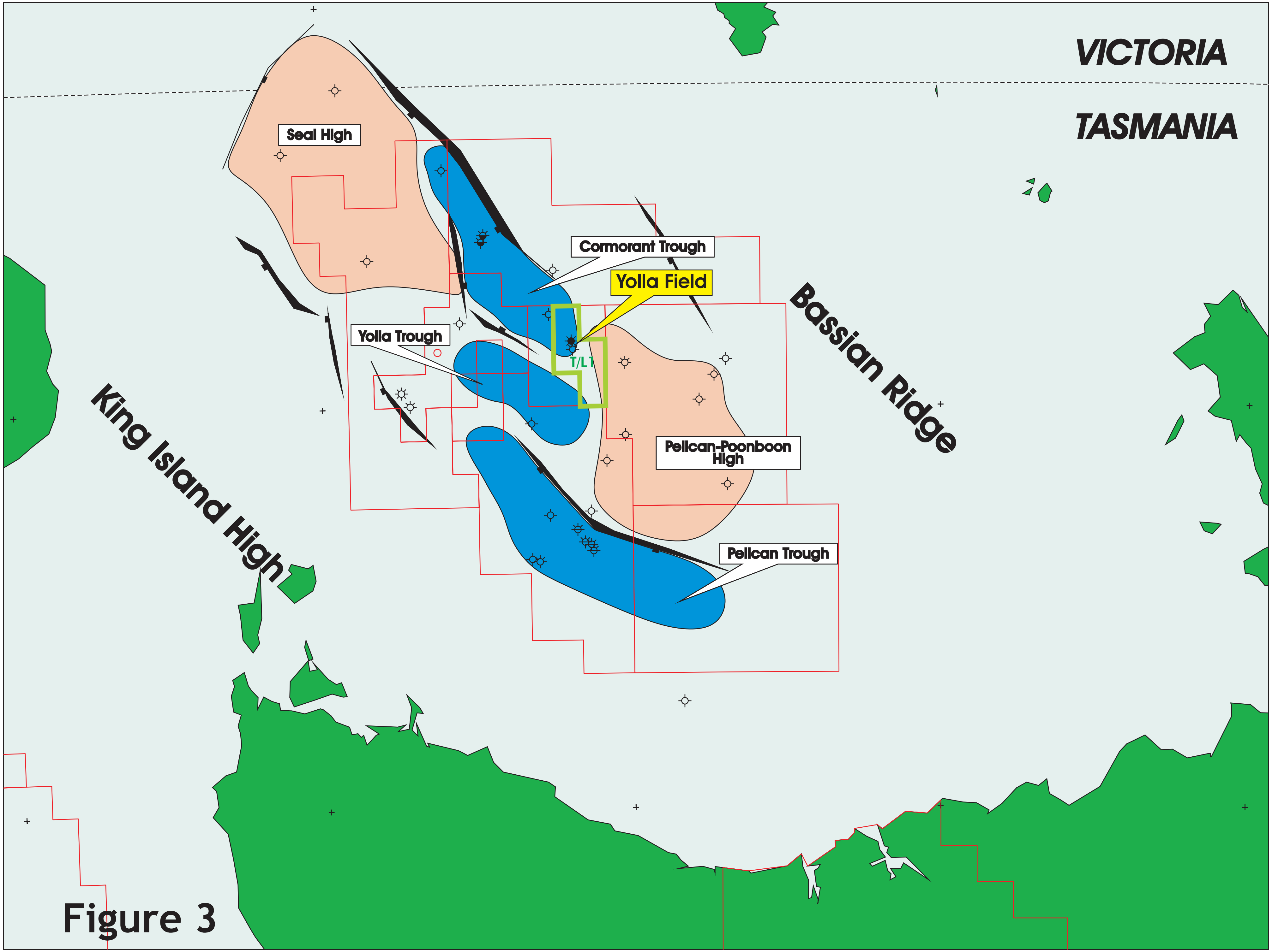
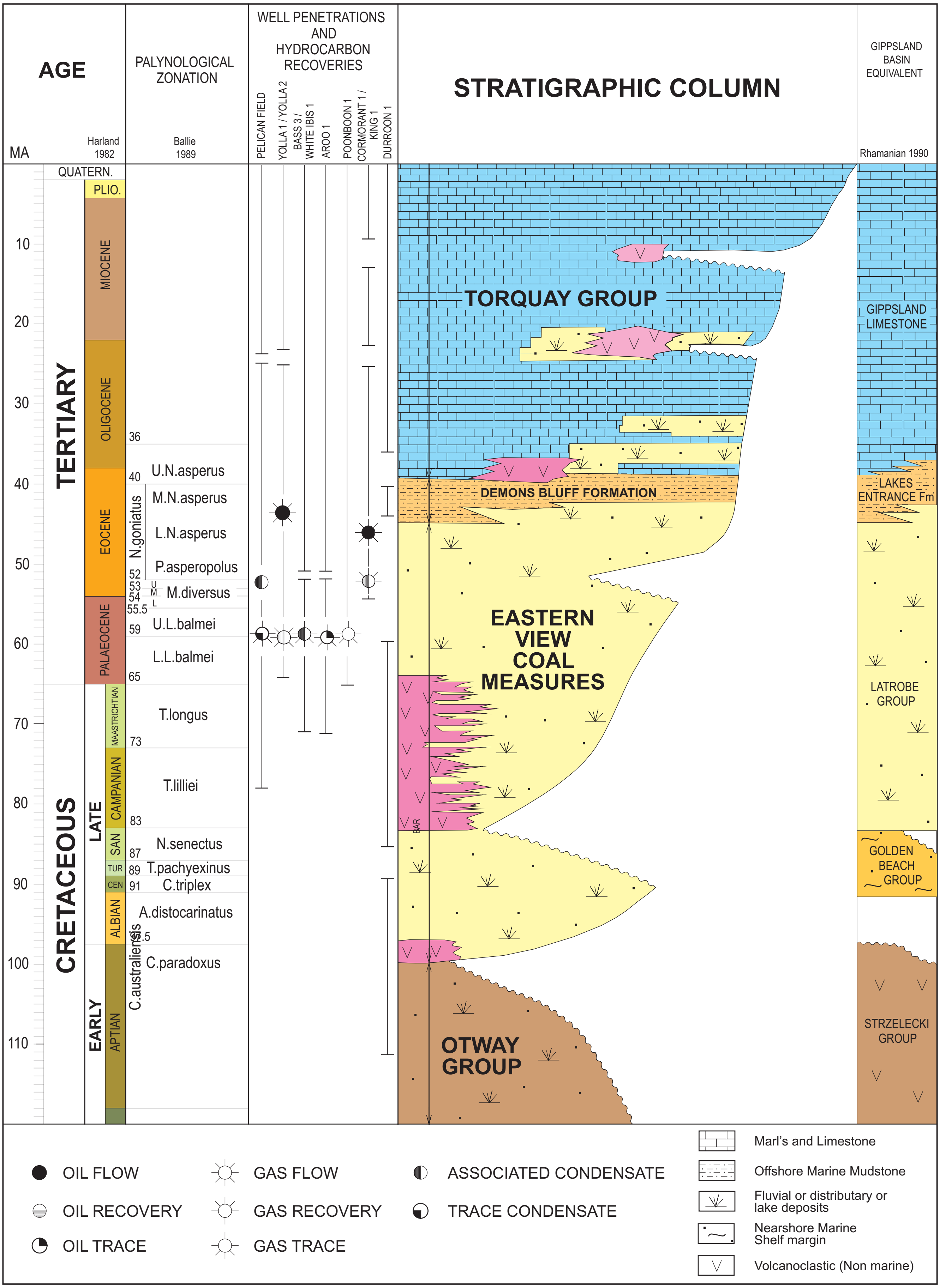
VICTORIA
Ballarat
Melbourne
Sale
Longford
Yolla Field
Port Latta
Launceston
TASMANIA
Hobart
78
80
3261
3262
3263
3333
3334
3335
3405
3406
3407
T/RL1
T/L1
Bass 1
Yolla 1
Yolla 2
Yolla Field
Tarook 1
LEGEND
Gas Field
Permits
Pipeline Route
Bathymetry (m)

Figure 2



VICTORIA
TASMANIA
Seal High
Cormorant Trough
Yolla Field
T/L1
Yolla Trough
Bassian Ridge
King Island High
Pelican-Poonboon High
Pelican Trough

Figure 3



AGE
MA
Harland 1982
PALYNOLOGICAL ZONATION
Ballie 1989
WELL PENETRATIONS AND HYDROCARBON RECOVERIES
PELICAN FIELD
YOLLA 1 / YOLLA 2
BASS 3 / WHITE IBIS 1
AROO 1
POONBOON 1
CORMORANT 1 / KING 1
DURROON 1
STRATIGRAPHIC COLUMN
GIPPSLAND BASIN EQUIVALENT
Rhamanian 1990
QUATERN.
PLIO.
MIOCENE
OLIGOCENE
EOCENE
PALAEOCENE
TERTIARY
CRETACEOUS
LATE
EARLY
MAASTRICHTIAN
CAMPANIAN
SAN
TUR
CEN
ALBIAN
APTIAN
U.N.asperus
M.N.asperus
L.N.asperus
P.asperopolus
N.goniatus
M.diversus
U.L.balmei
L.L.balmei
T.longus
T.lilliei
N.senectus
T.pachyexinus
C.triplex
A.distocarinatus
C.paradoxus
C.australiensis
TORQUAY GROUP
DEMONS BLUFF FORMATION
EASTERN VIEW COAL MEASURES
OTWAY GROUP
BAR
GIPPSLAND LIMESTONE
LAKES ENTRANCE Fm
LATROBE GROUP
GOLDEN BEACH GROUP
STRZELECKI GROUP
OIL FLOW
OIL RECOVERY
OIL TRACE
GAS FLOW
GAS RECOVERY
GAS TRACE
ASSOCIATED CONDENSATE
TRACE CONDENSATE
Marl's and Limestone
Offshore Marine Mudstone
Fluvial or distributary or lake deposits
Nearshore Marine Shelf margin
Volcanoclastic (Non marine)

Figure 4

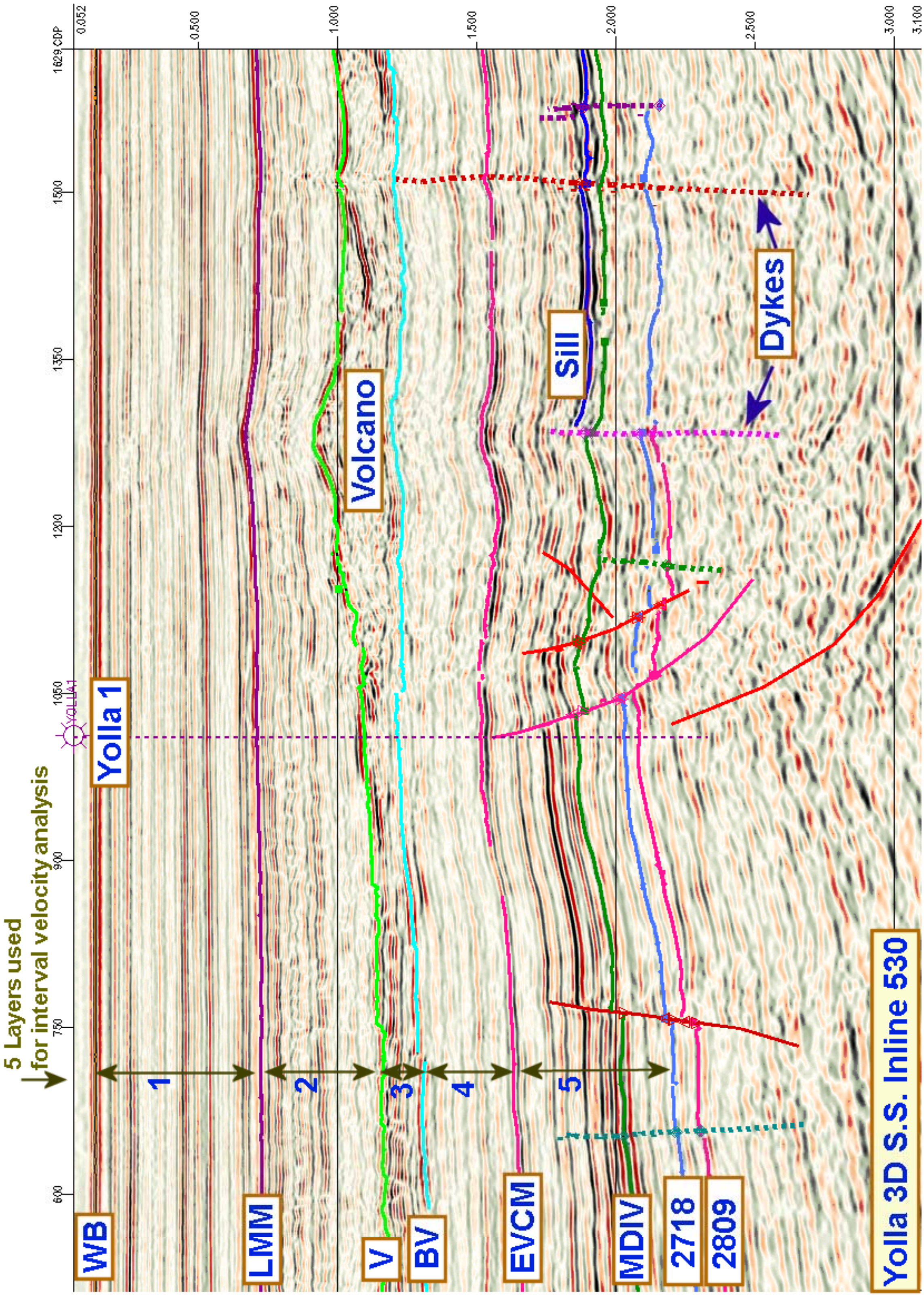
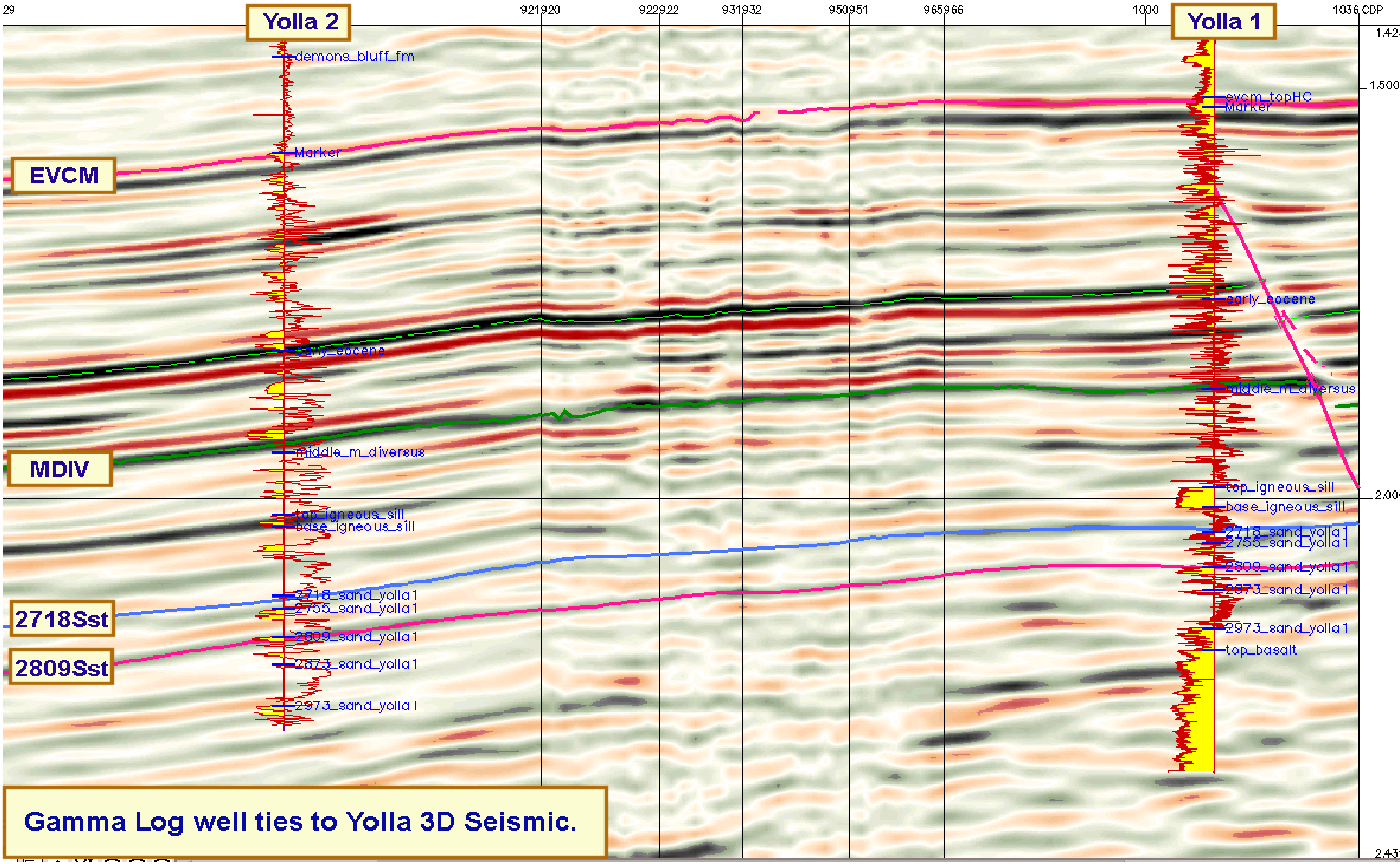

5 Layers used for interval velocity analysis
Yolla 1
Volcano
Sill
Dykes
WB
LMM
V
BV
EVCM
MDIV
2718
2809
1
2
3
4
5
Yolla 3D S.S. Inline 530

Figure 5



29
921920
922922
931932
950951
965966
1000
1036 CDP
1.42
1.500
2.00
2.43
Yolla 2
Yolla 1
demons_bluff_fm
Marker
early_eocene
middle_m_diversus
top_igneous_sill
base_igneous_sill
2718_sand_yolla1
2755_sand_yolla1
2809_sand_yolla1
2873_sand_yolla1
2973_sand_yolla1
evcm_topHC
top_basalt
EVCM
MDIV
2718Sst
2809Sst
Gamma Log well ties to Yolla 3D Seismic.

Figure 6

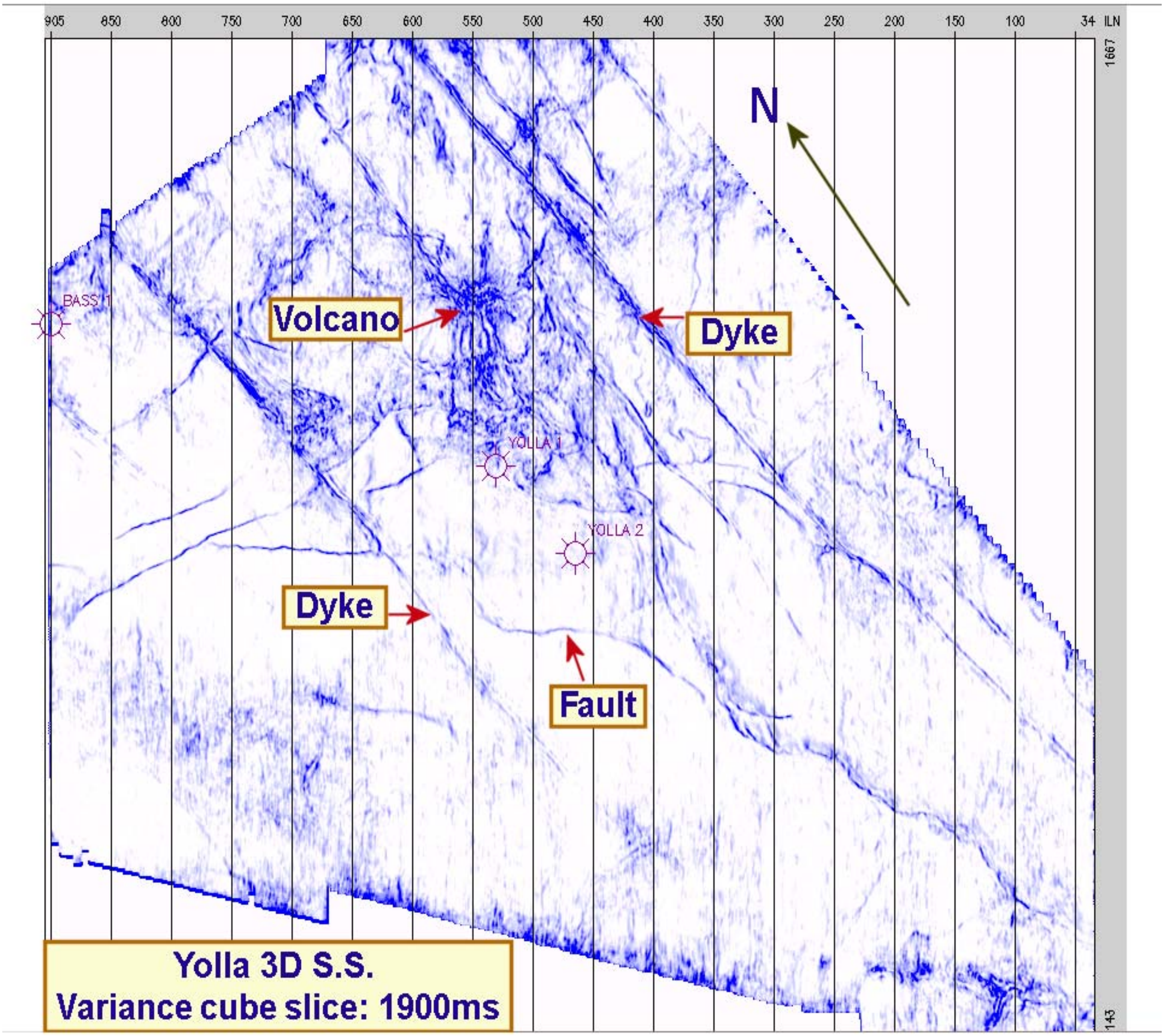
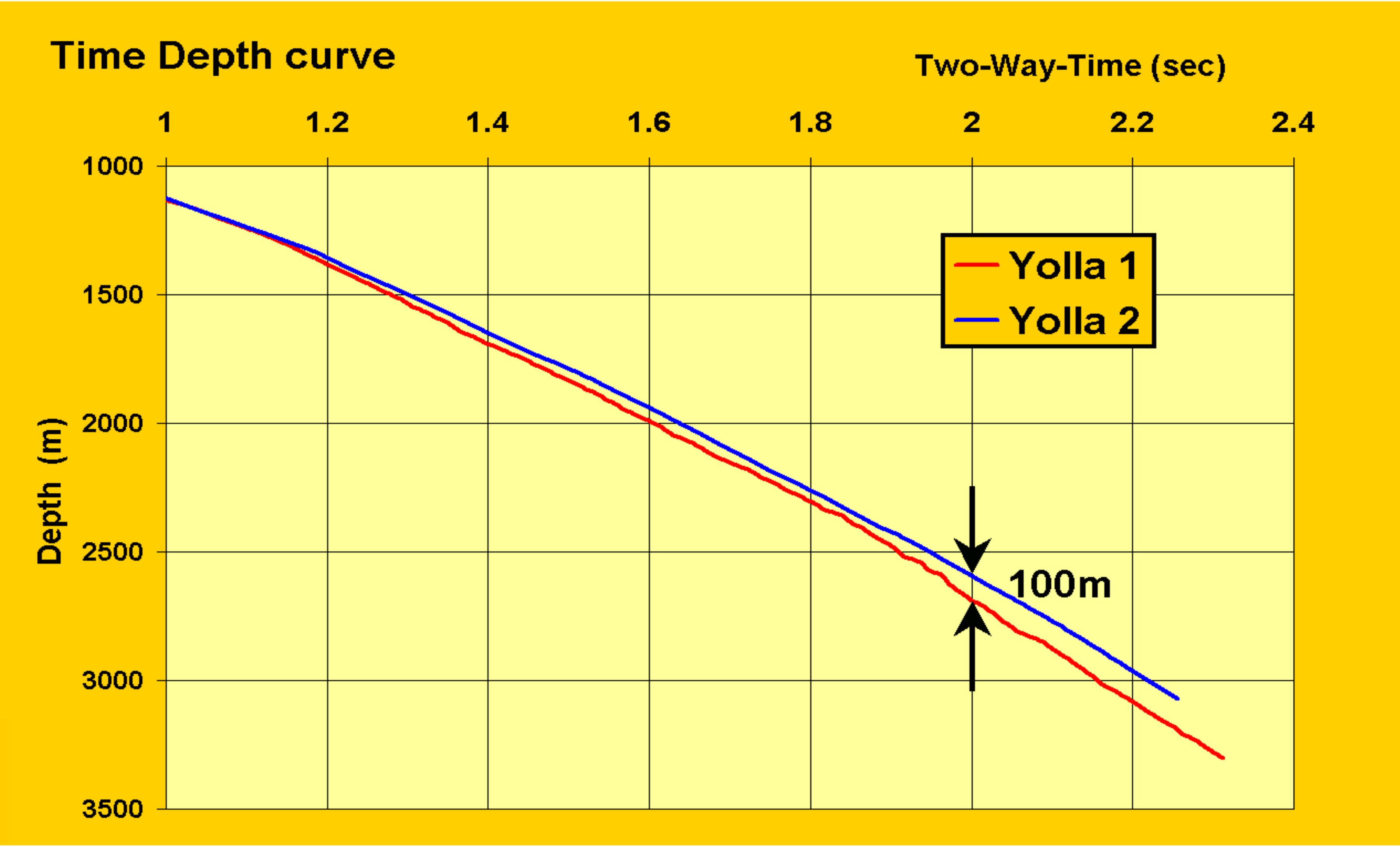

905
850
800
750
700
650
600
550
500
450
400
350
300
250
200
150
100
34
ILN
1667
143
N
BASS 1
Volcano
Dyke
YOLLA 1
YOLLA 2
Dyke
Fault
Yolla 3D S.S.
Variance cube slice: 1900ms

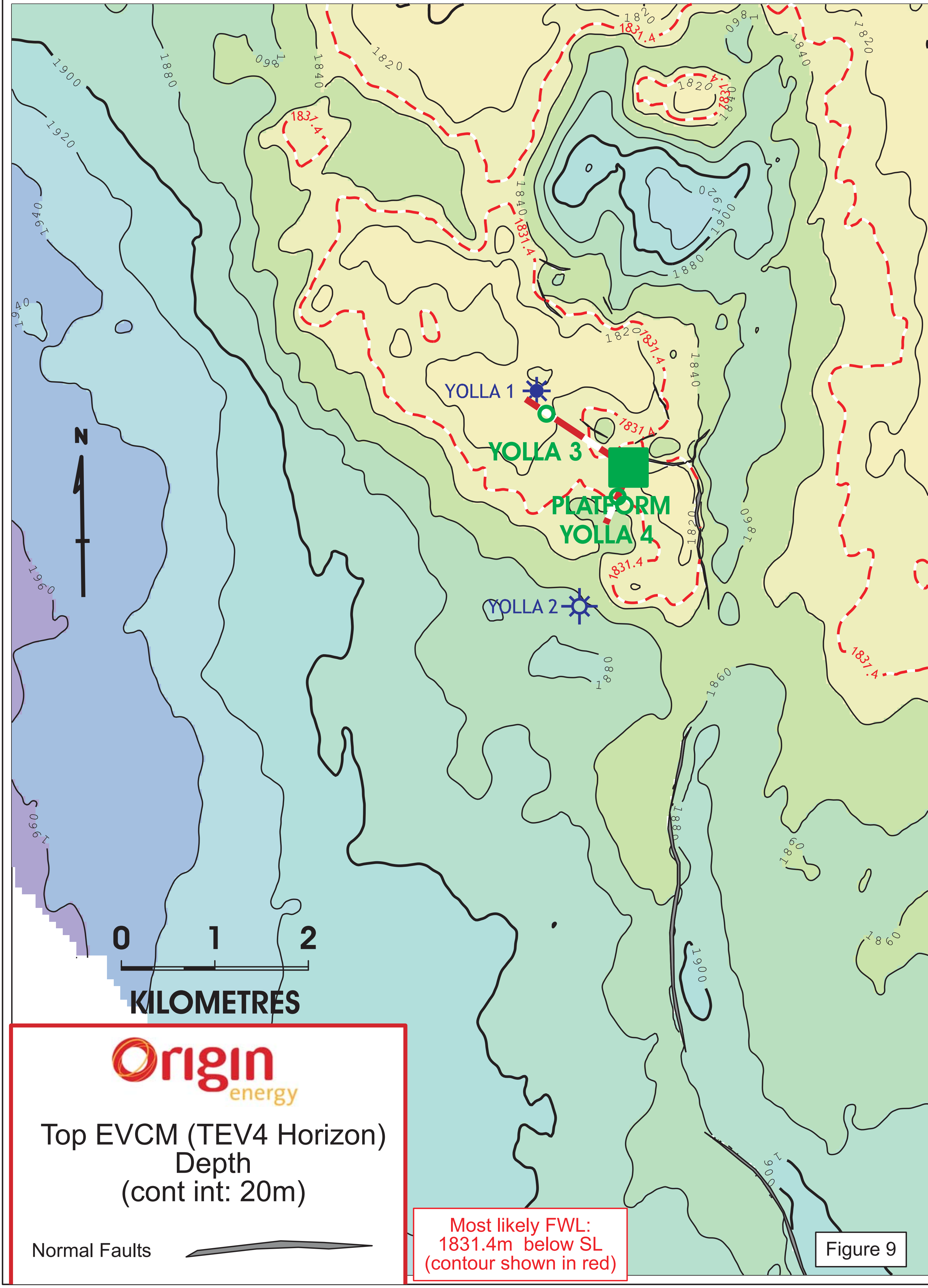
Figure 7



Time Depth curve
Two-Way-Time (sec)
1
1.2
1.4
1.6
1.8
2
2.2
2.4
1000
1500
2000
2500
3000
3500
Depth (m)
Yolla 1
Yolla 2
100m

Figure 8

Yolla Gas Field T/L1 - T/RL1



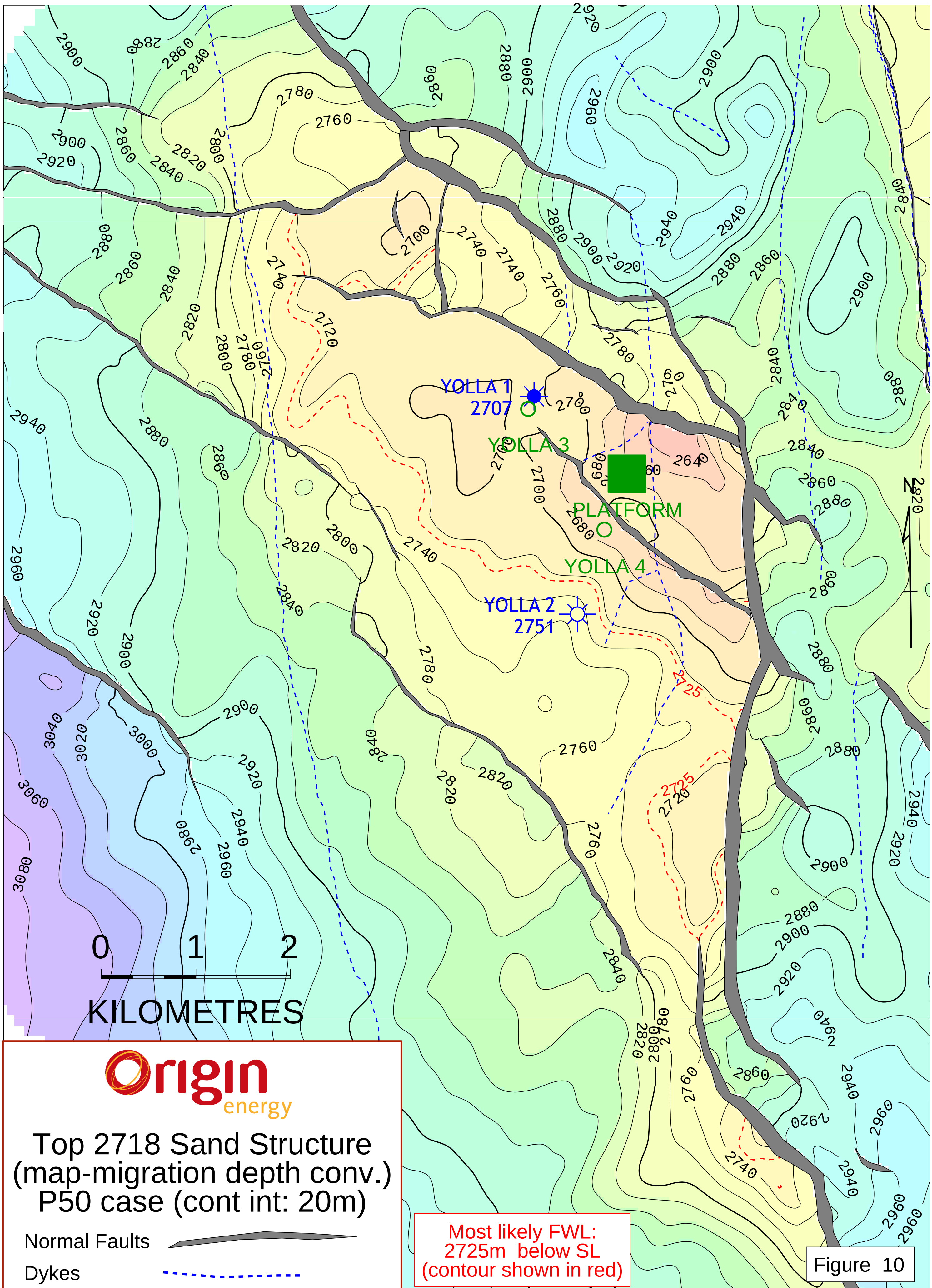
Top EVCM (TEV4 Horizon)
Depth
(cont int: 20m)

Normal Faults

Most likely FWL:
1831.4m below SL
(contour shown in red)

Figure 9

Yolla Gas Field T/L1 - T/RL1



Origin energy

Top 2718 Sand Structure
(map-migration depth conv.)
P50 case (cont int: 20m)

Normal Faults

Dykes

Figure 10

Yolla Gas Field T/L1 - T/RL1

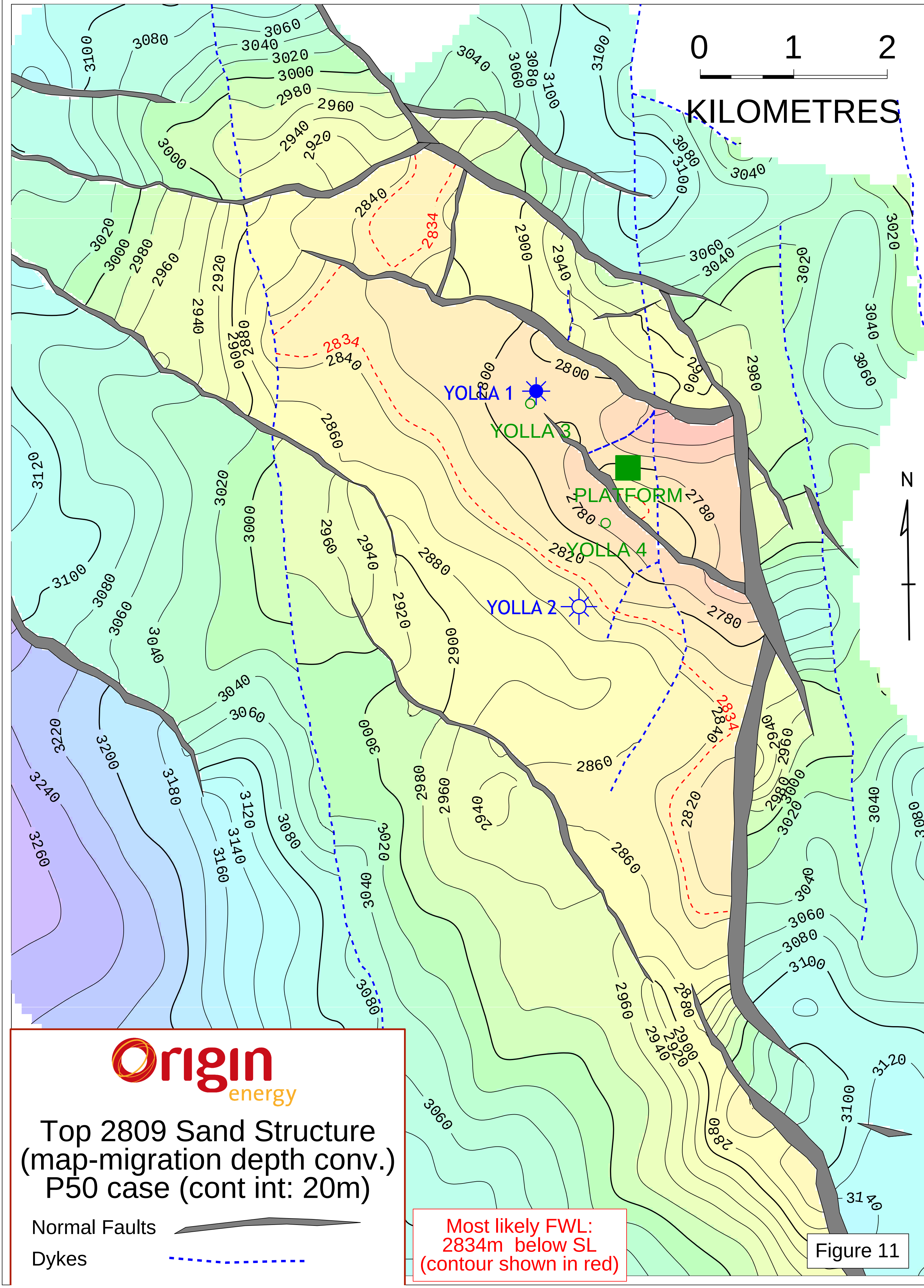


Figure 11

Yolla Gas Field   T/L1 - T/RL1

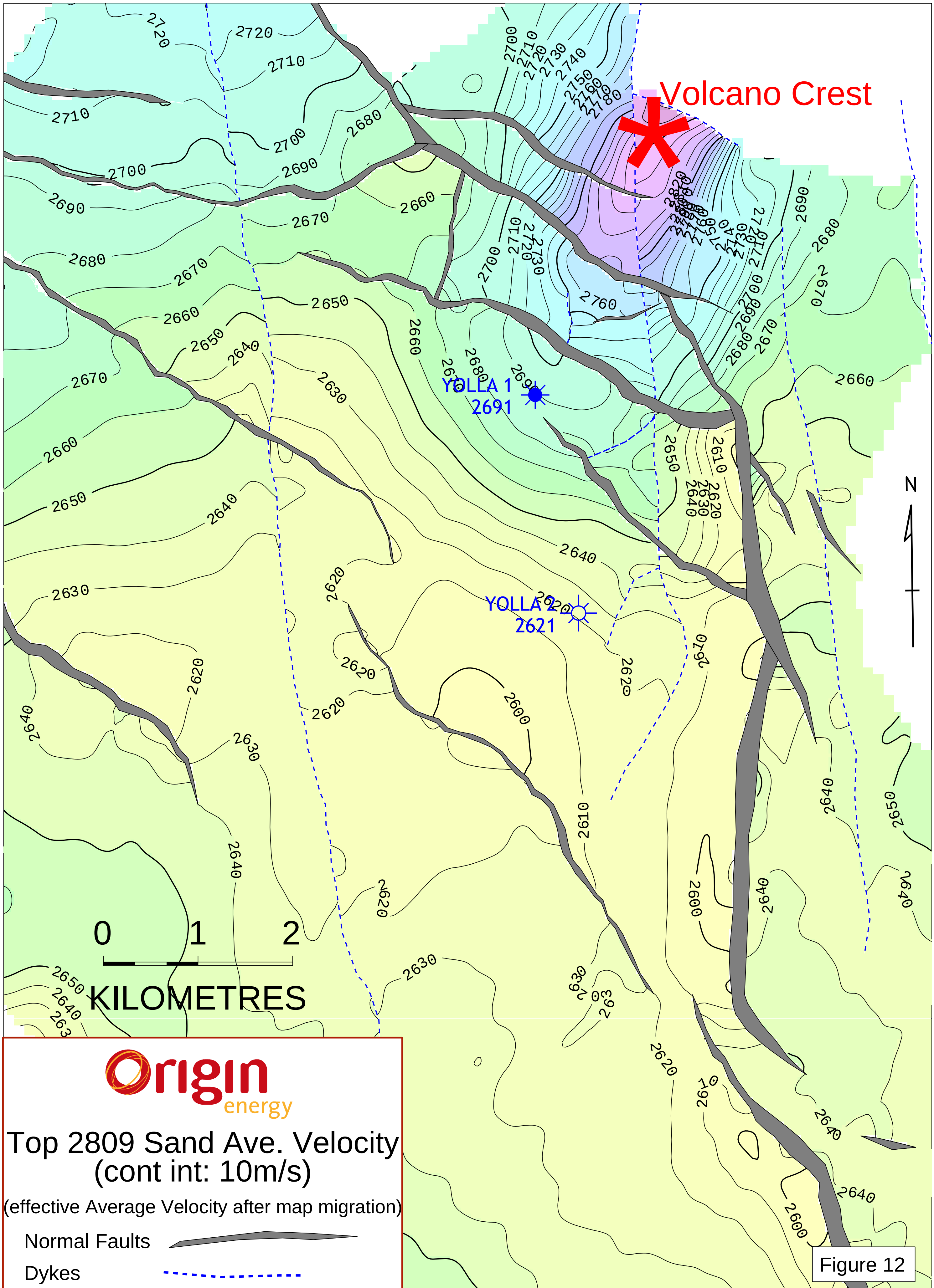


Figure 12

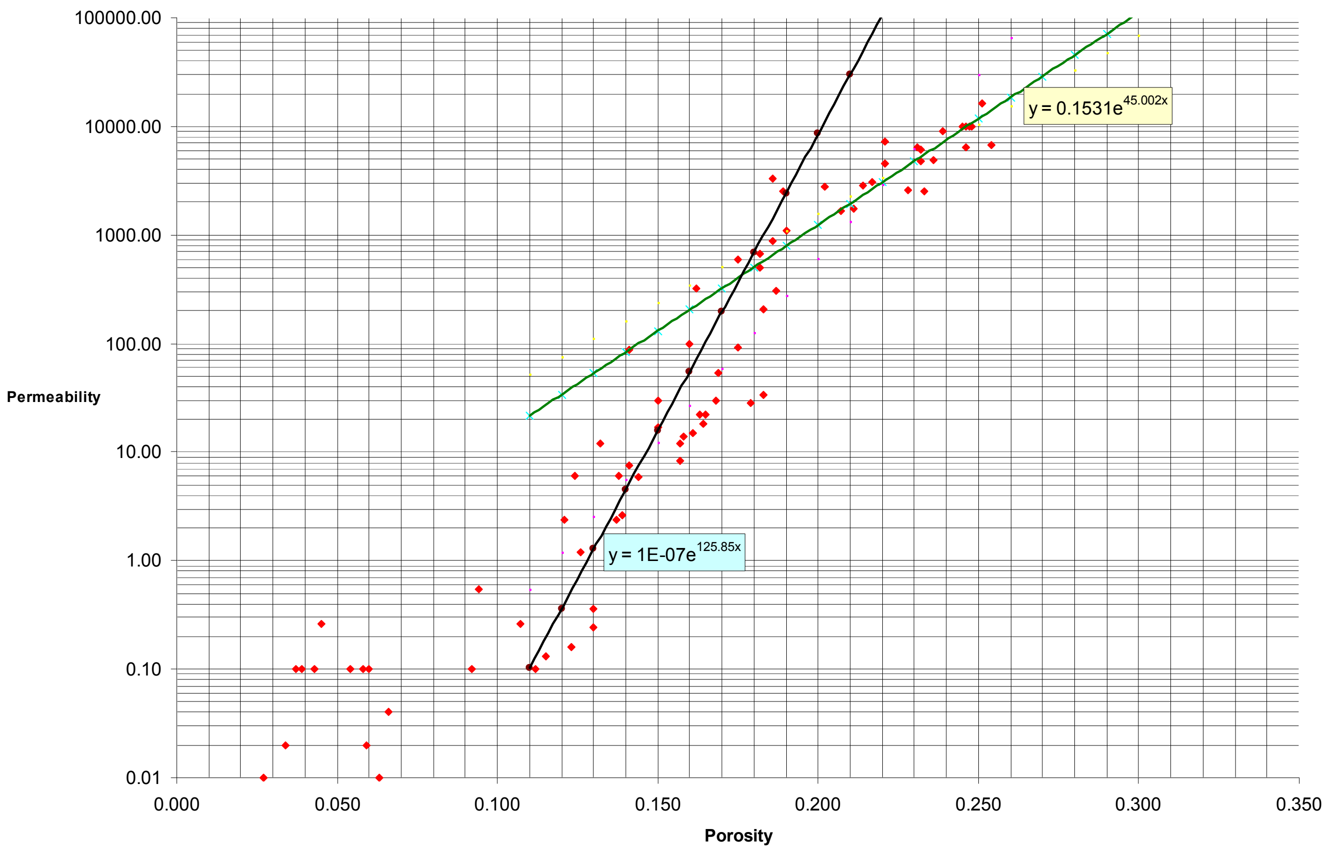


Figure 13: Yolla-2 EVCM Porosity – Permeability cross-plot and trendlines.

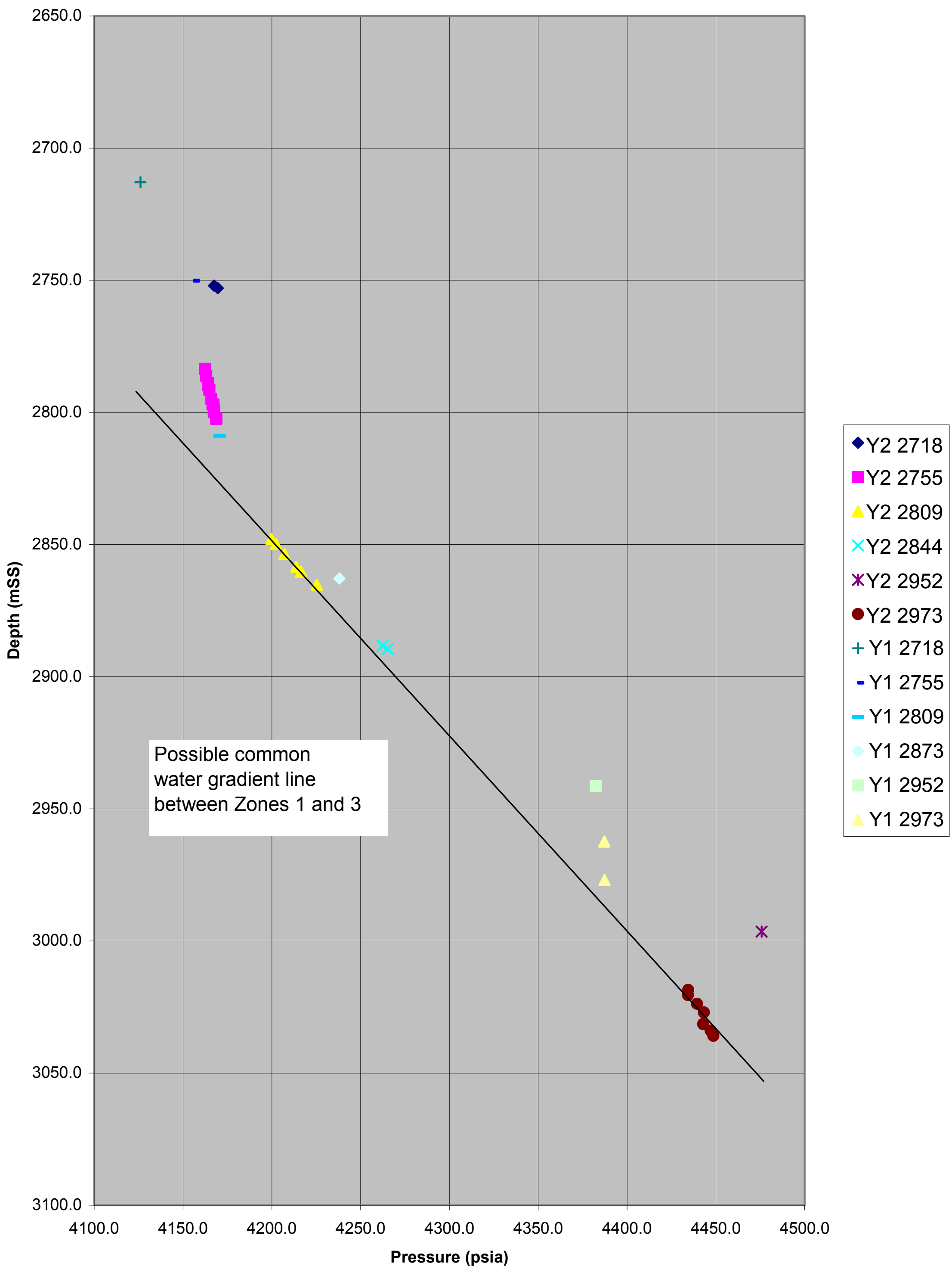


Figure 14: Yolla Field Intra-EVCM RFT Pressure Data

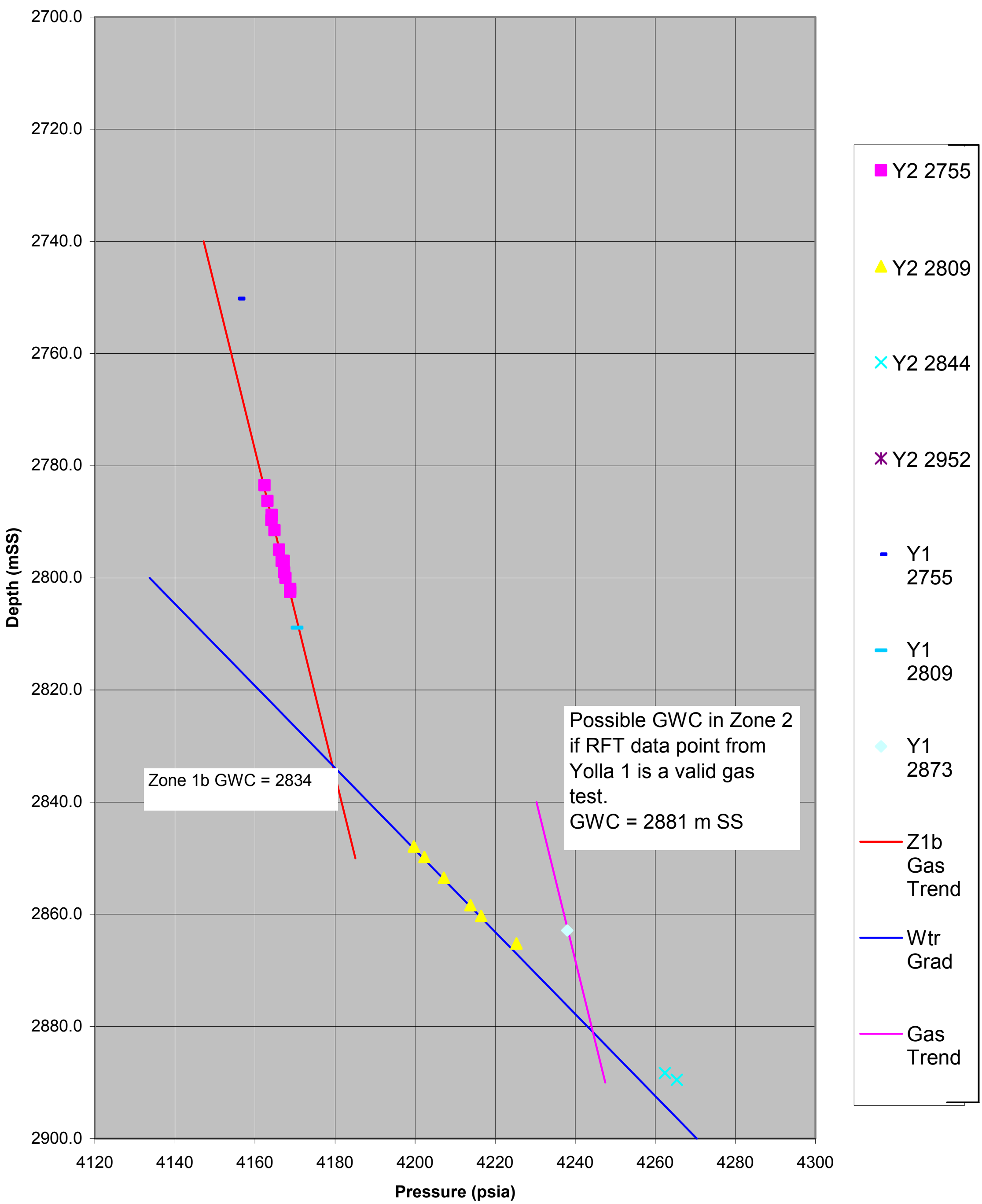


Figure 15: Yolla Field RFT Data **-** 2755 and 2809 Sand

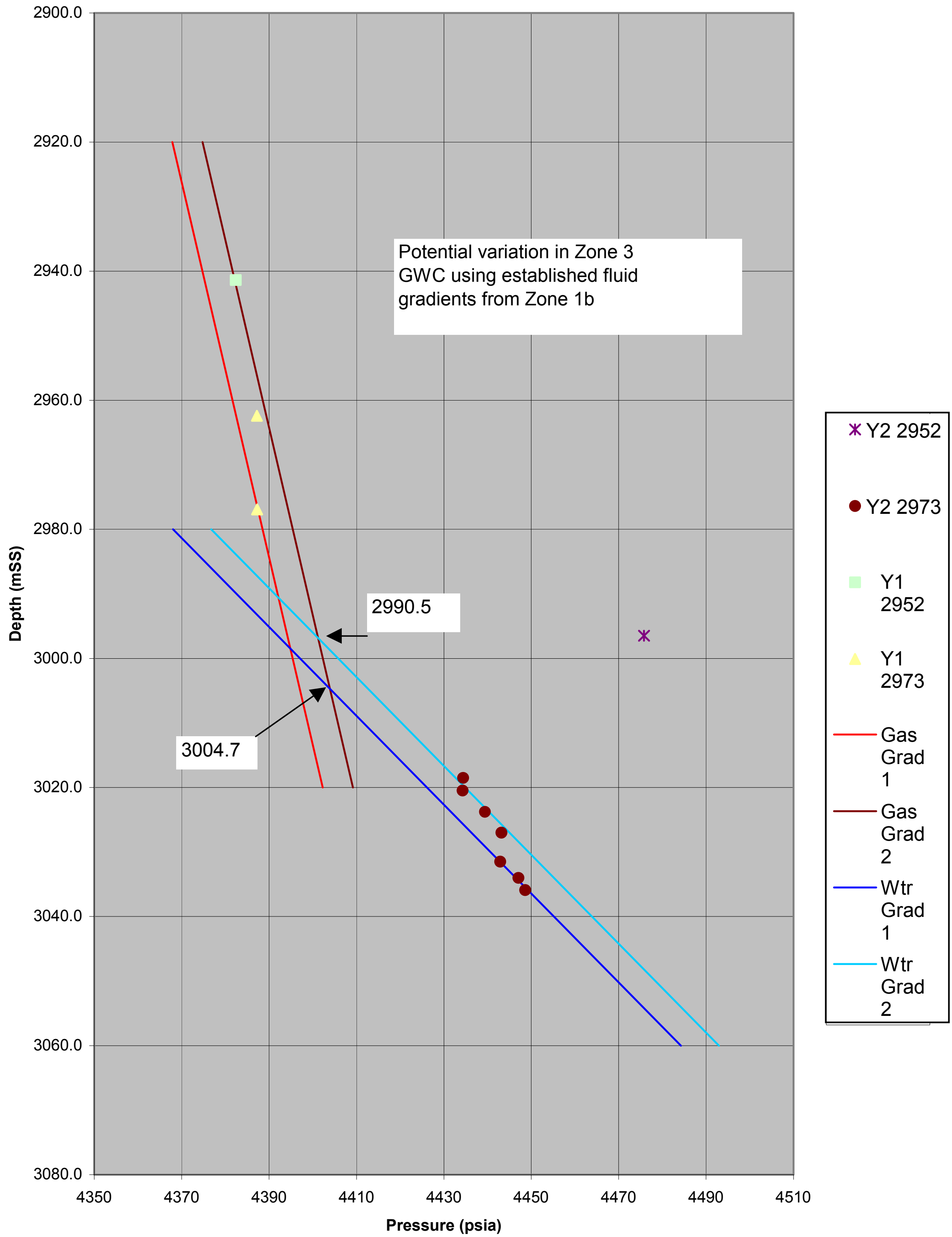
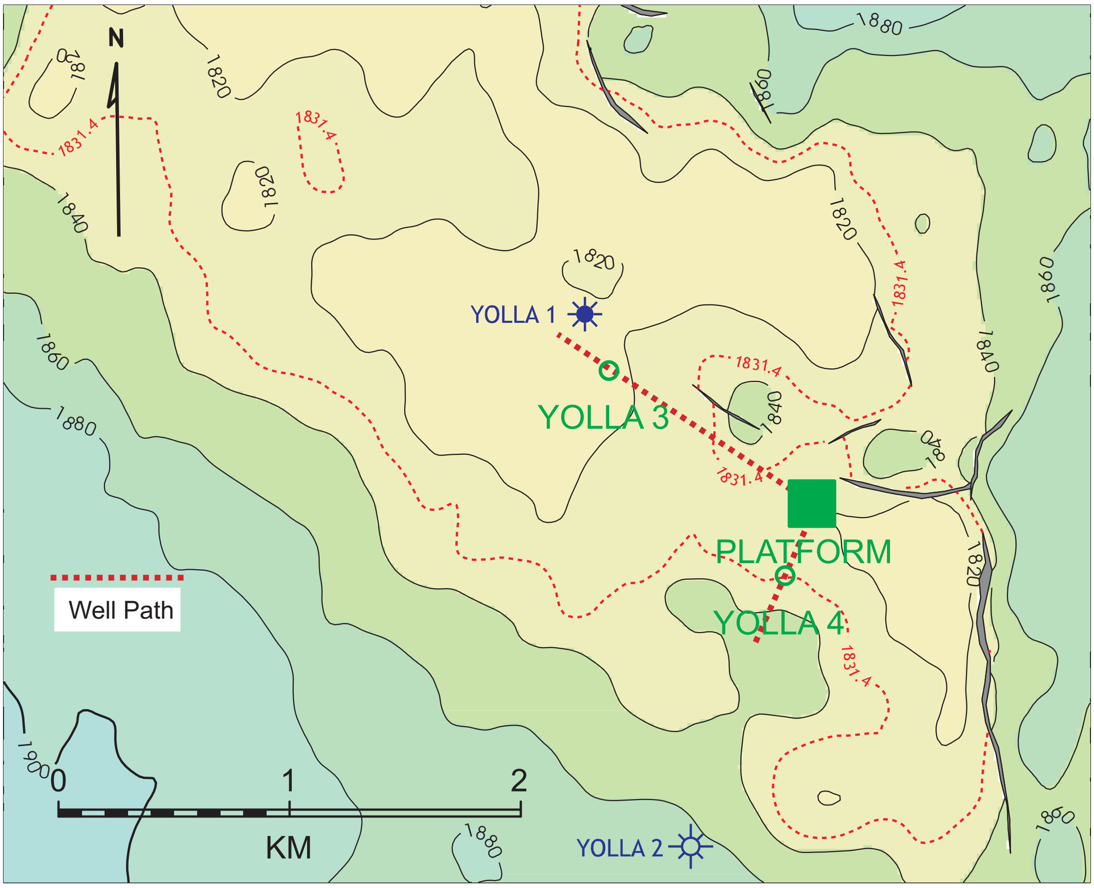
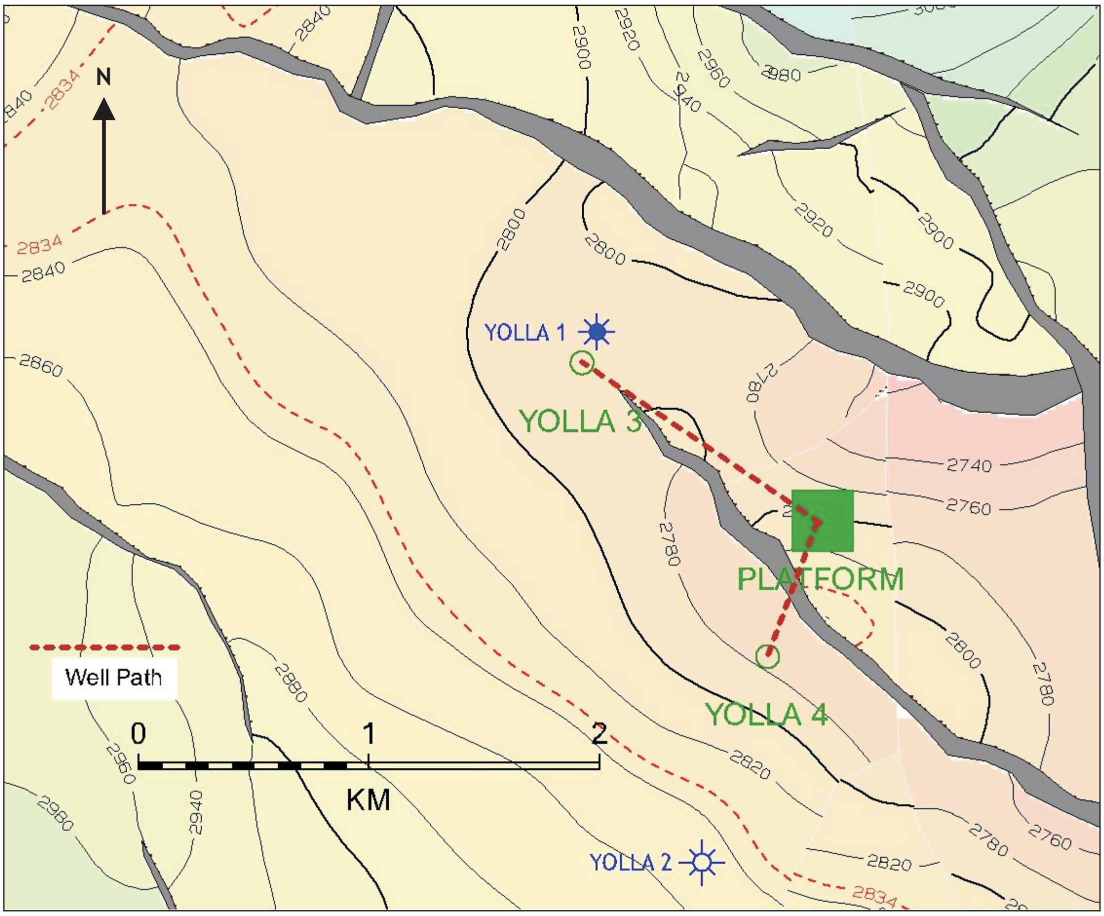


Figure 16: Yolla Field RFT Data - 2973 Sand



Upper EVCM (TEV4) Depth map



Intra-EVCM (2809 unit) Depth map

Figure 17: Plan view of well trajectories at Top EVCM (TEV4) and 2809 Sand stratigraphic level

Indicative Well Path Yolla 3

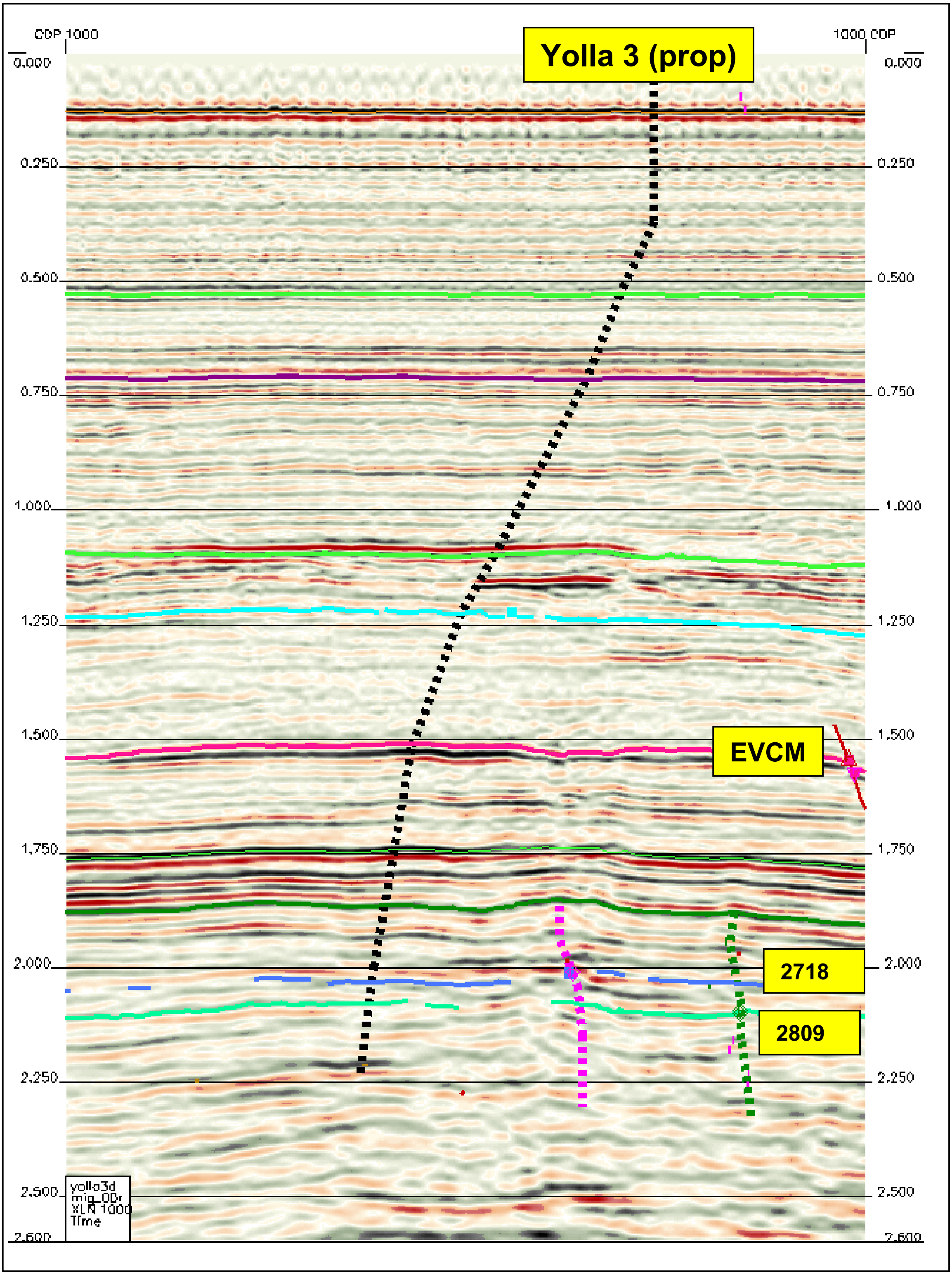


Figure 18: Seismic section showing Yolla 3 well path.

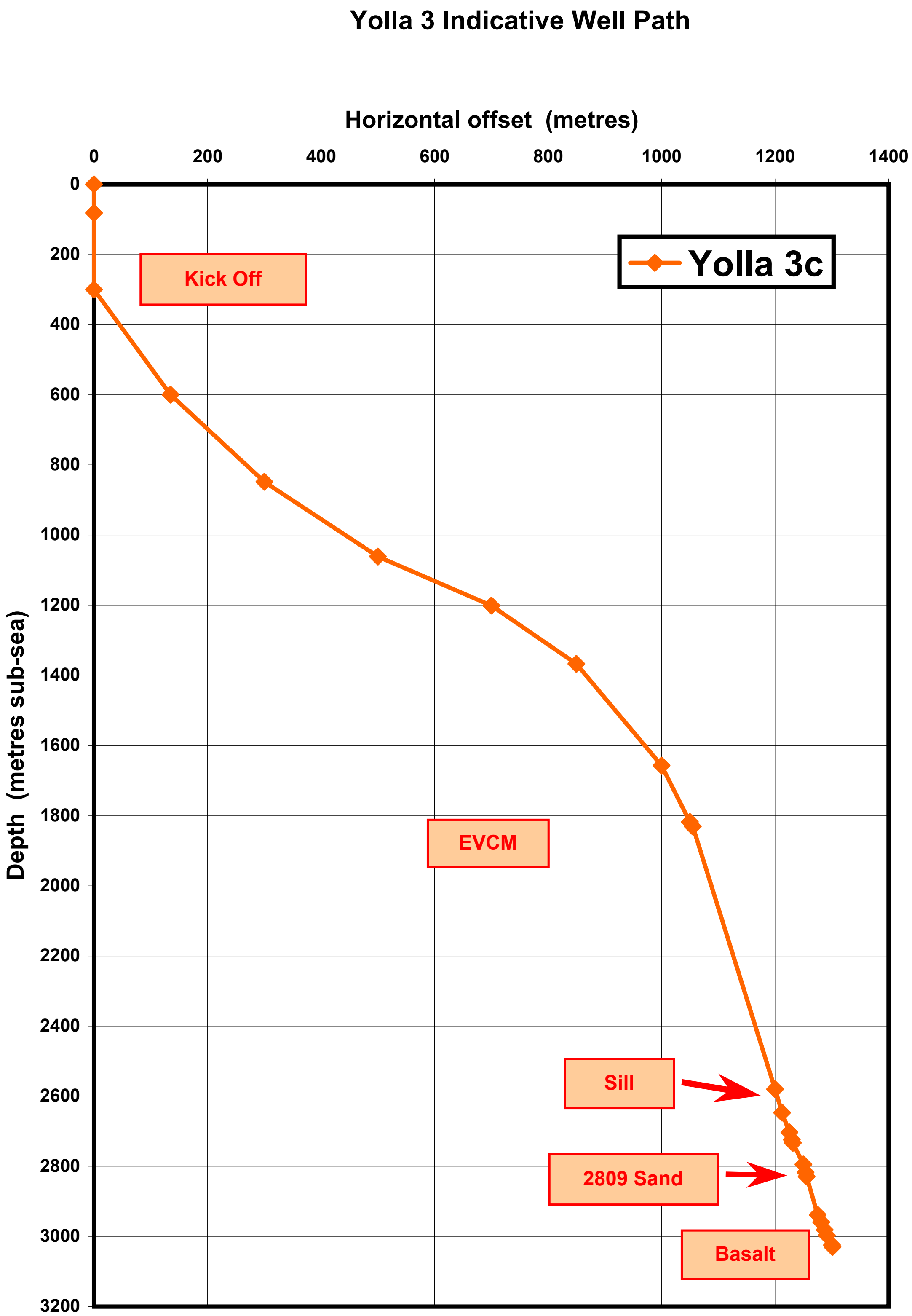


Figure 19: Yolla-3 indicative well path

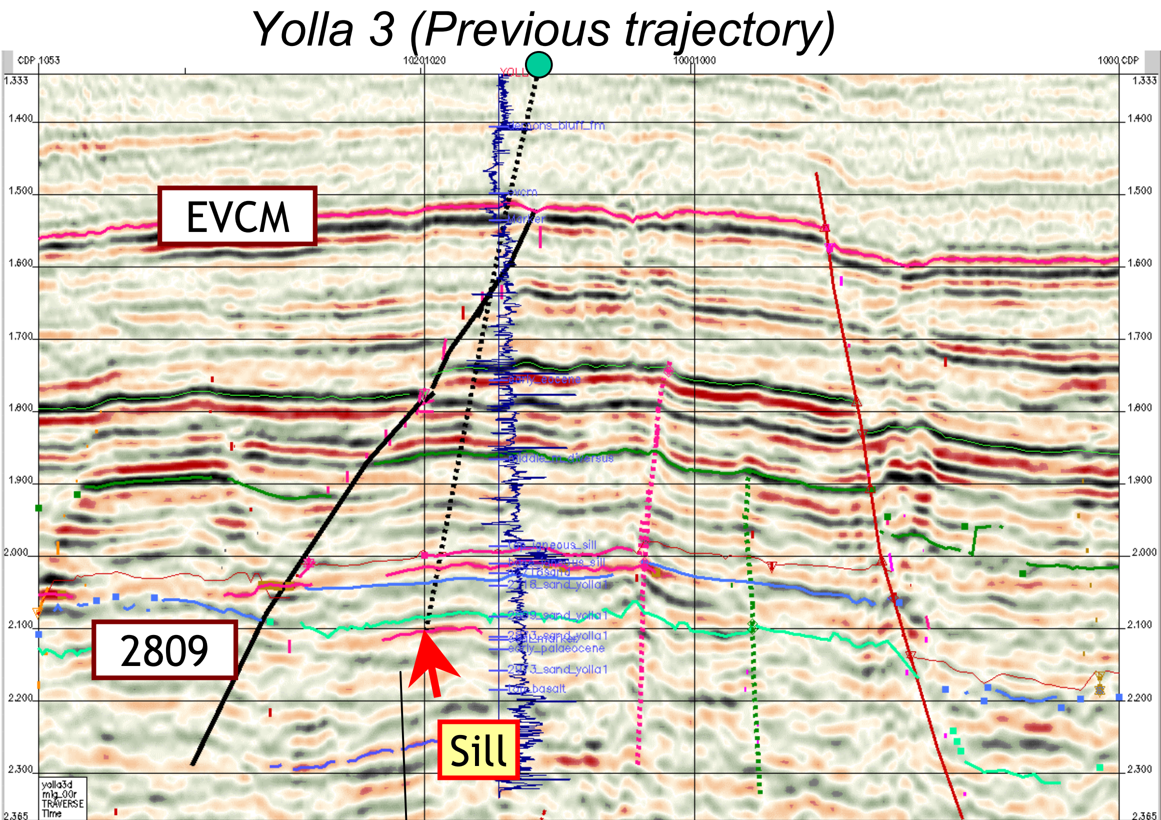


Figure 20: Previous Yolla-3 well trajectory showing potential sill at 2809 sand level.

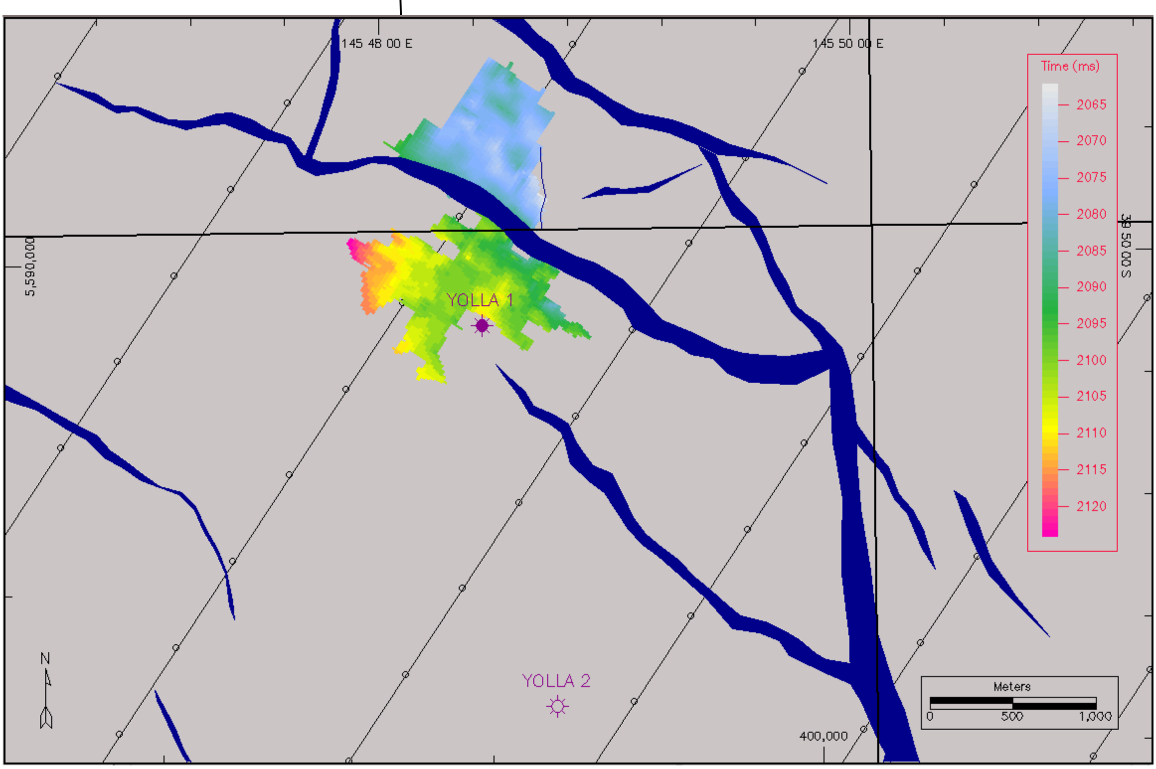


Figure 21: Potential areal extent of sill at 2809 level within vicinity of Yolla 1.

YOLLA-3

Inline 840 CDP 2665

Platform Location: (GDA 94 Zone 55)
Easting: 398 910
Northing: 558 8824
Horizontal Offset at TD: 1300m

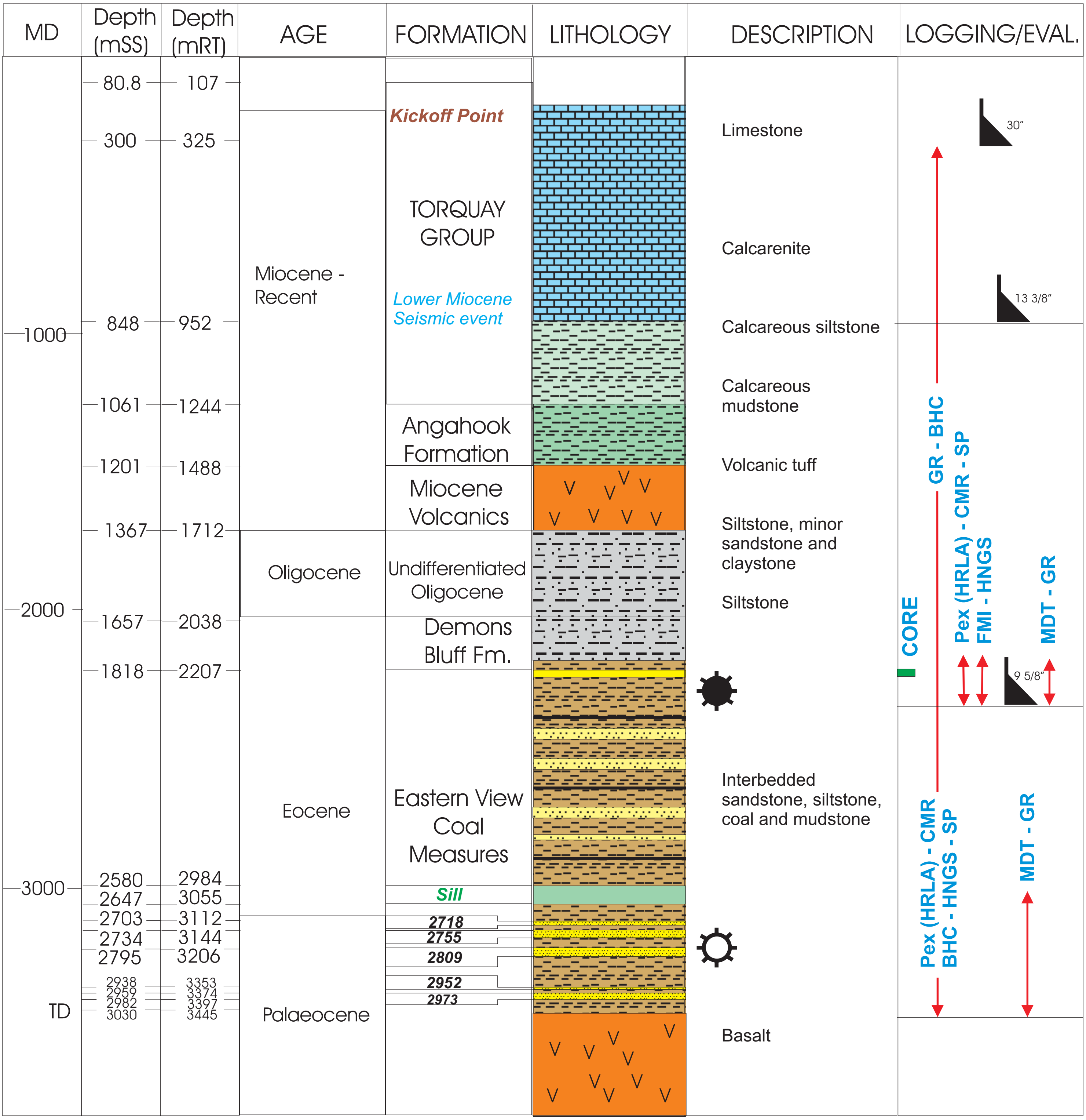


Figure 22: Predicted stratigraphy for Yolla 3.

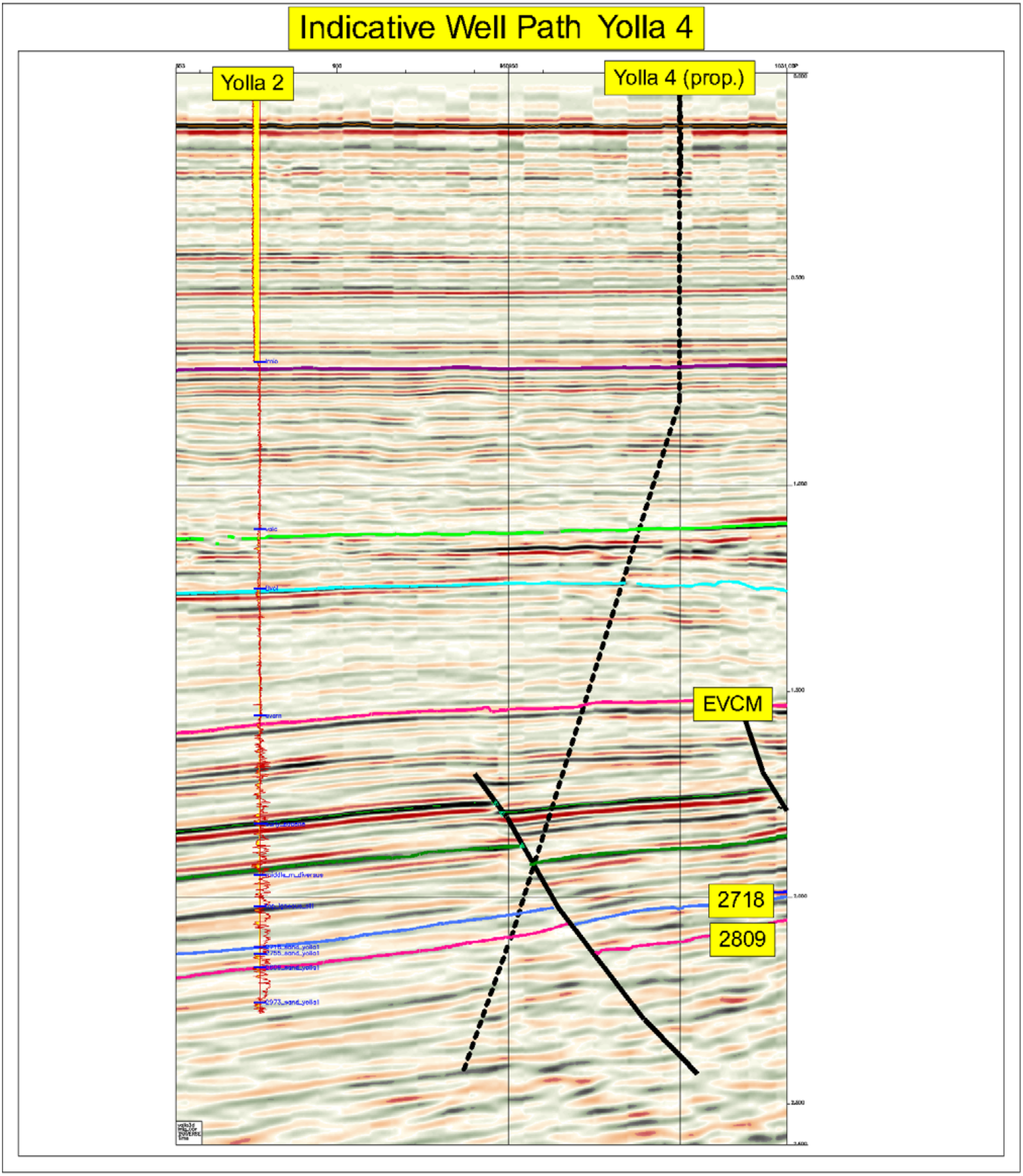


Figure 23: Seismic section showing Yolla 4 well path.

Yolla 4 Indicative Well Path

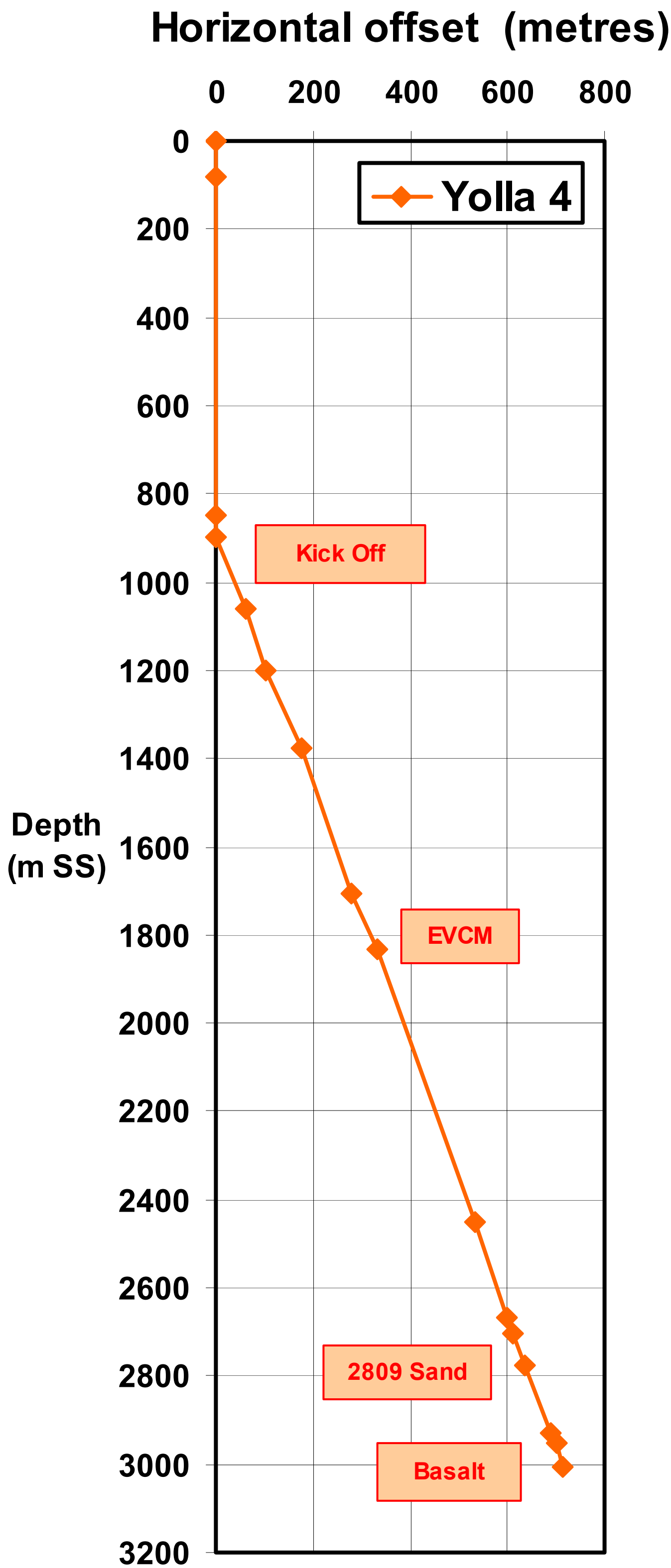


Figure 24: Yolla 4 indicative well path.

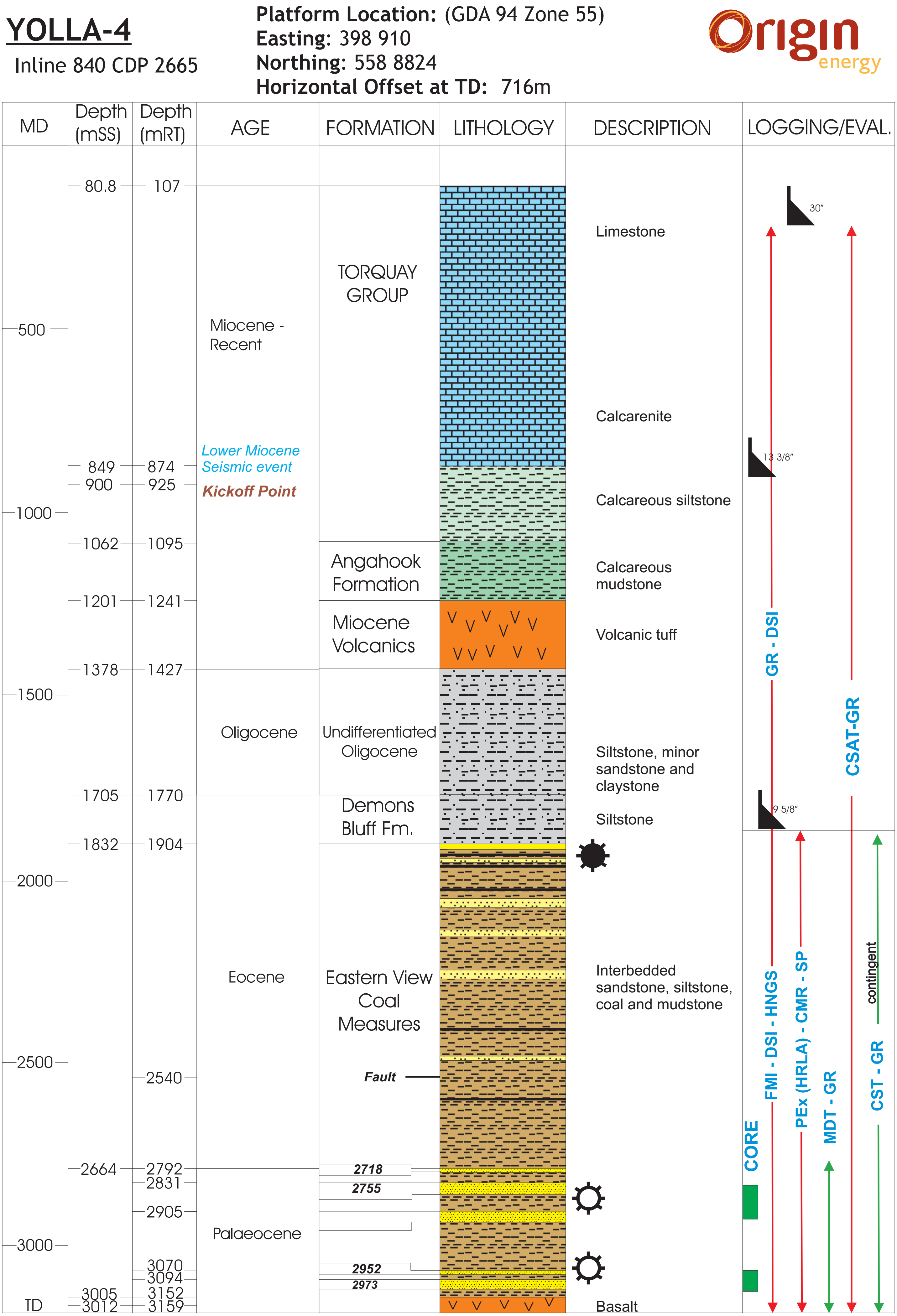


Figure 25: Predicted stratigraphy for Yolla 4.

Yolla 4 Intra-EVCM proposed Core Intervals

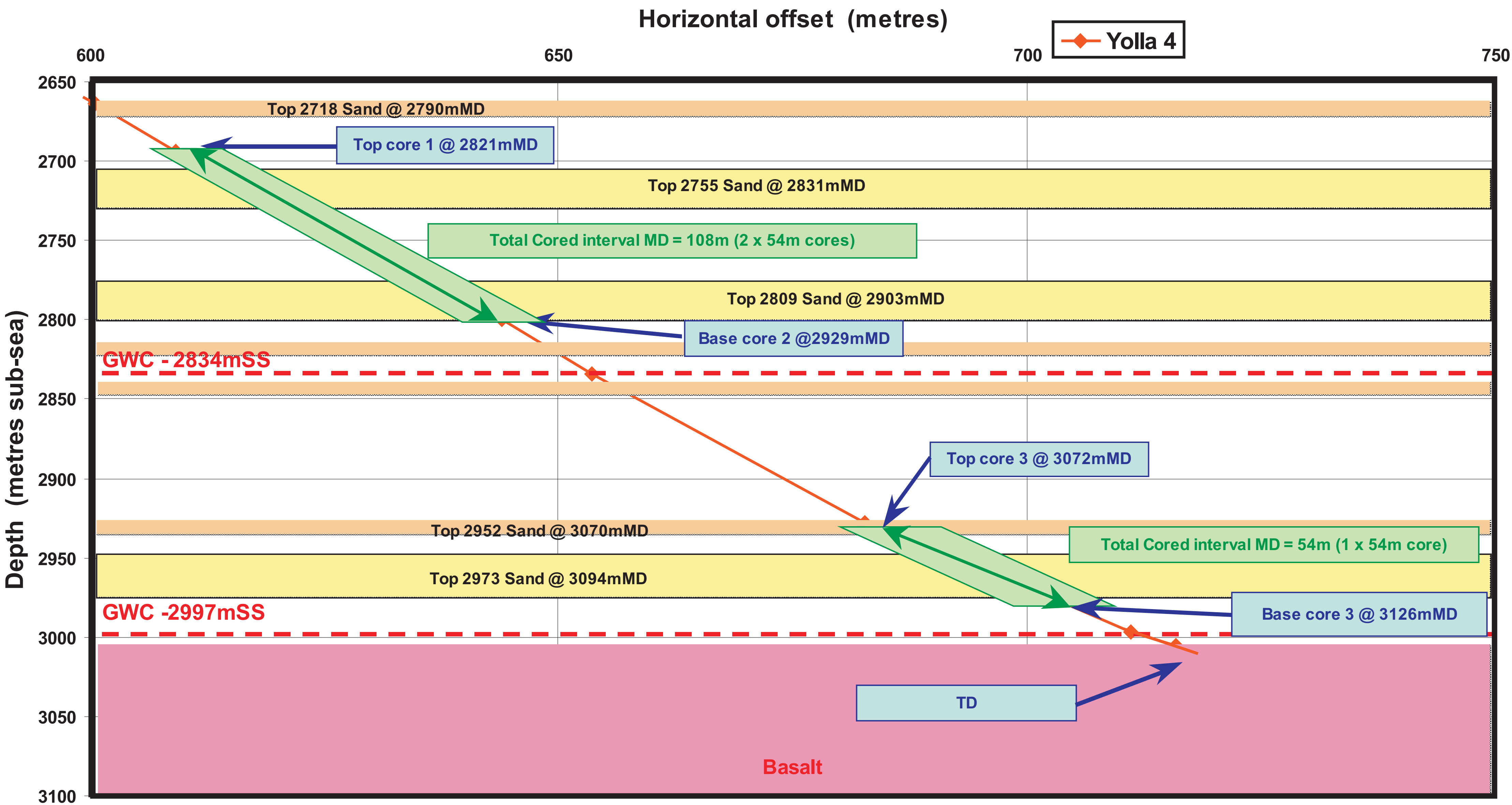


Figure 26

ENCLOSURE 1
YOLLA 1
YOLLA 2
TD 3367.1 m
KB 11.1 m
TD 3077.7 m
DF 12.5 m
UPPER EVCM
TEV1
TEV1A
OWC
TEV2
TEV3
TEV4
TEV5
TEV6
TEV7
1831.1mSS
INTRA-EVCM
Volcanics
GWC
2727mSS
2718
2755
2809
GWC
2834mSS
2844
2873
2952
2973
GWC
2997mSS
Volcanics
Bass 1
Yolla 1
Yolla 2
KILOMETERS