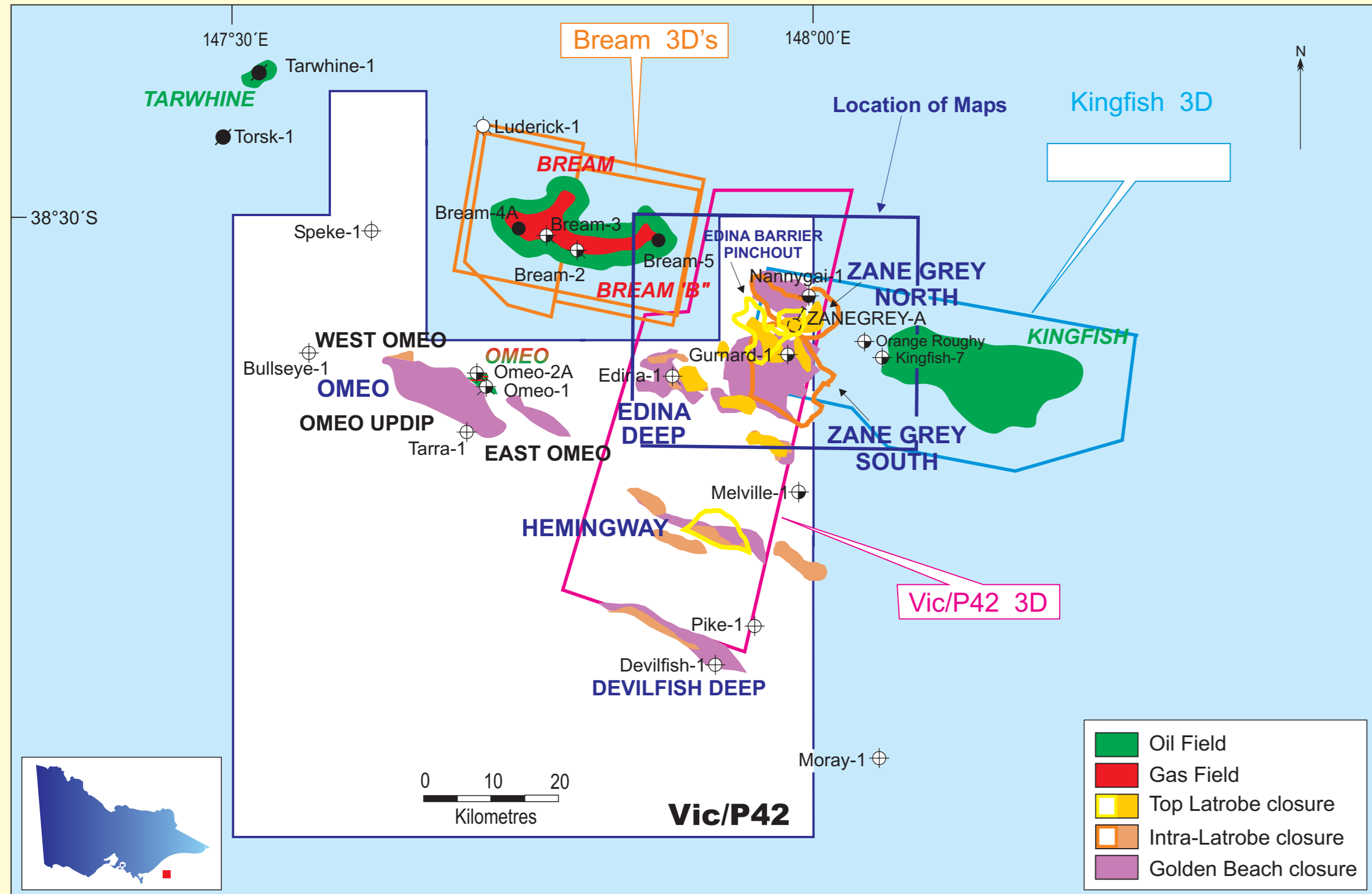
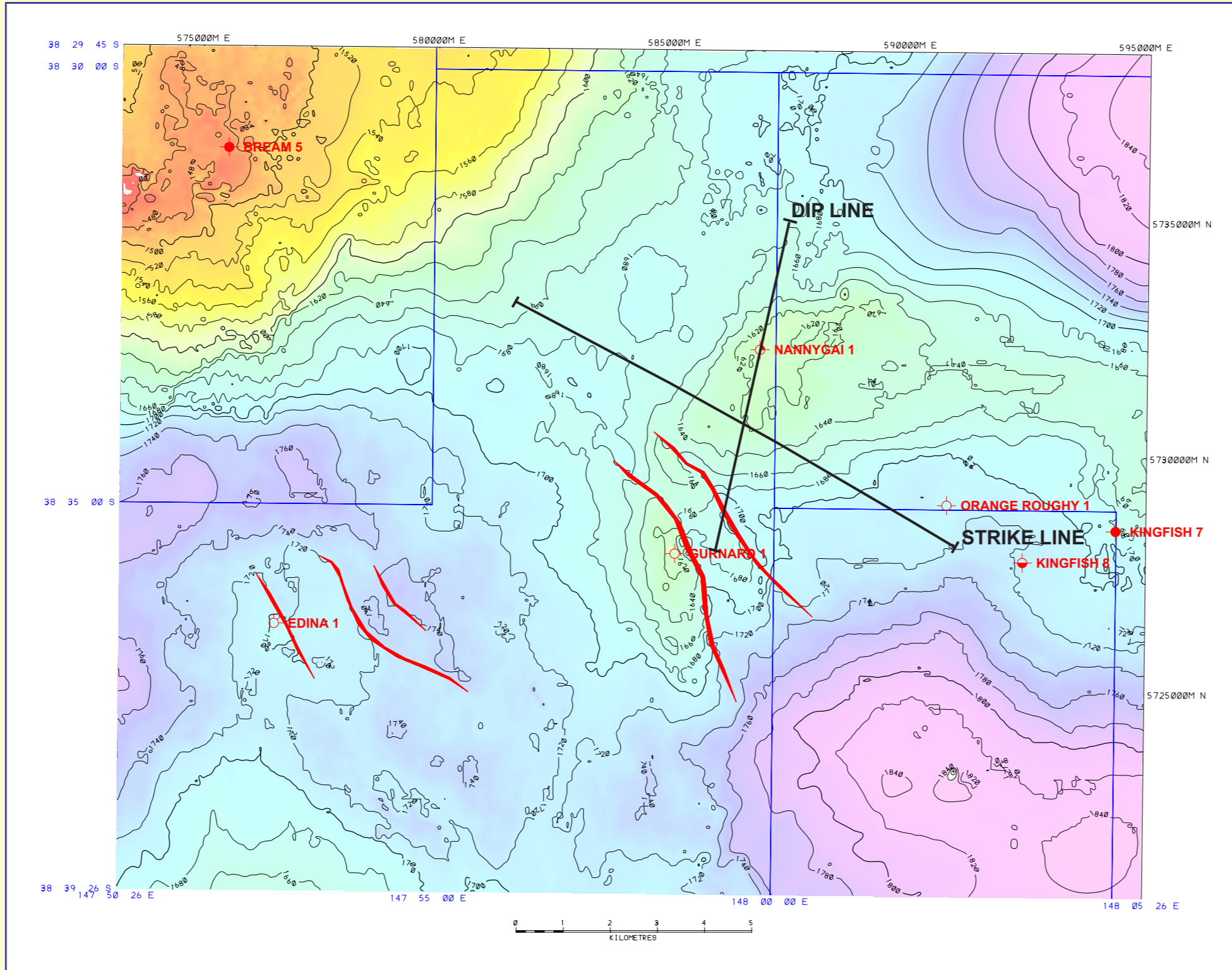


## VIC/P42 - ZANEGREY NORTH, OFFSHORE GIPPSLAND BASIN, VICTORIA

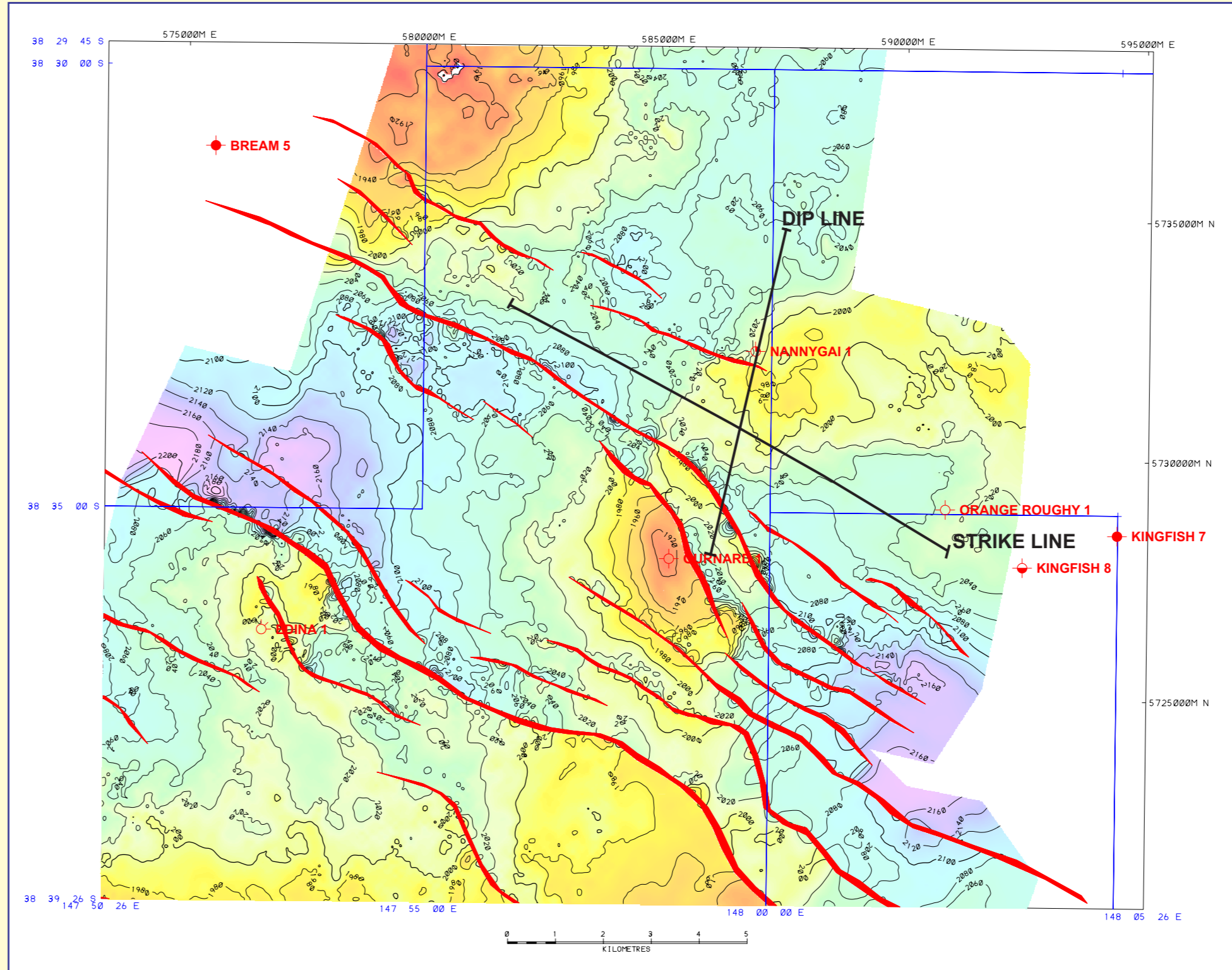
Identified Prospects & Leads in Vic/P42 and 3D seismic survey outlines



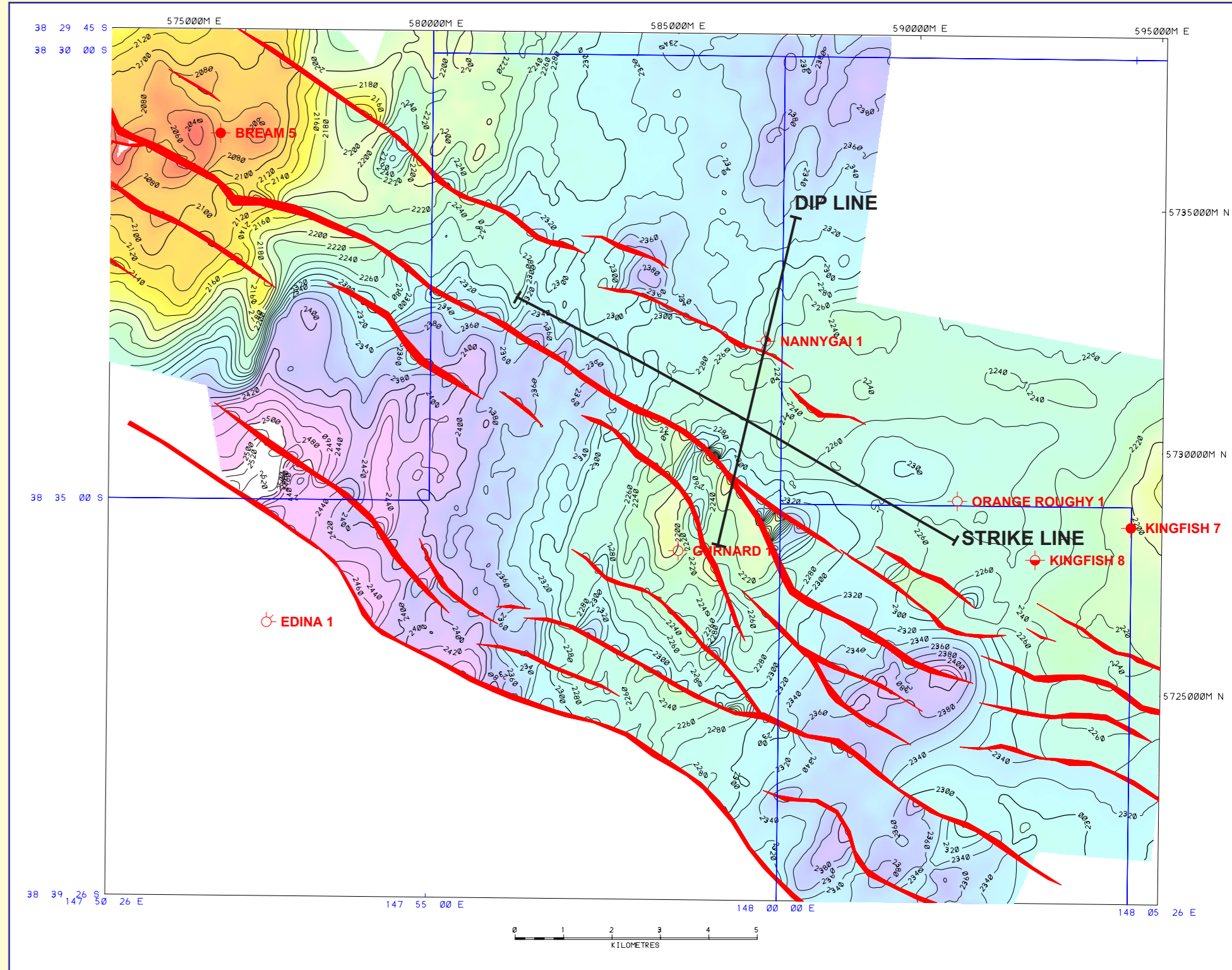
Top Latrobe Group TWT Map



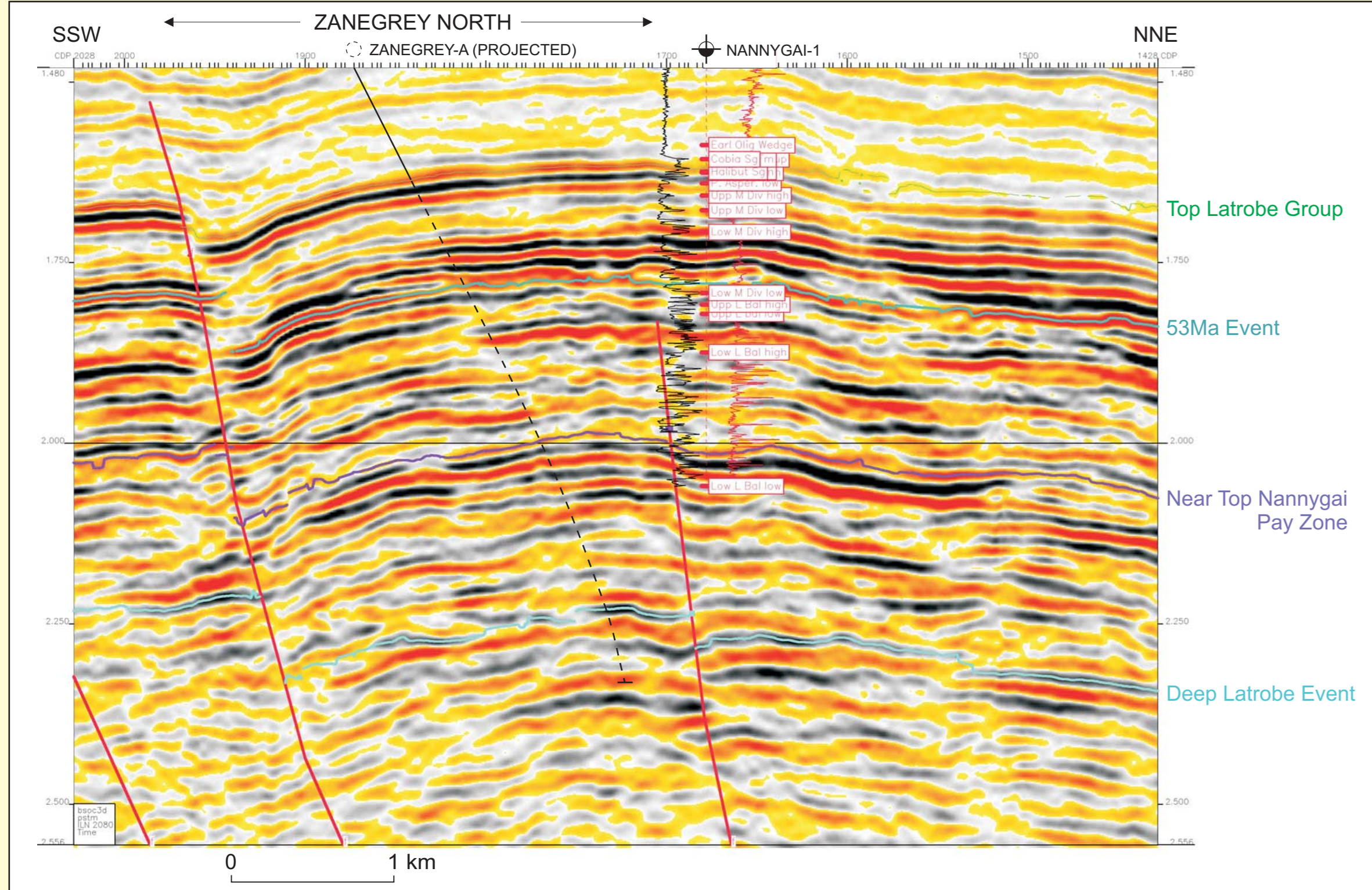
Top Nannigai Pay Zone Event (Intra Kingfish Formation, *L.balmei*) TWT Map



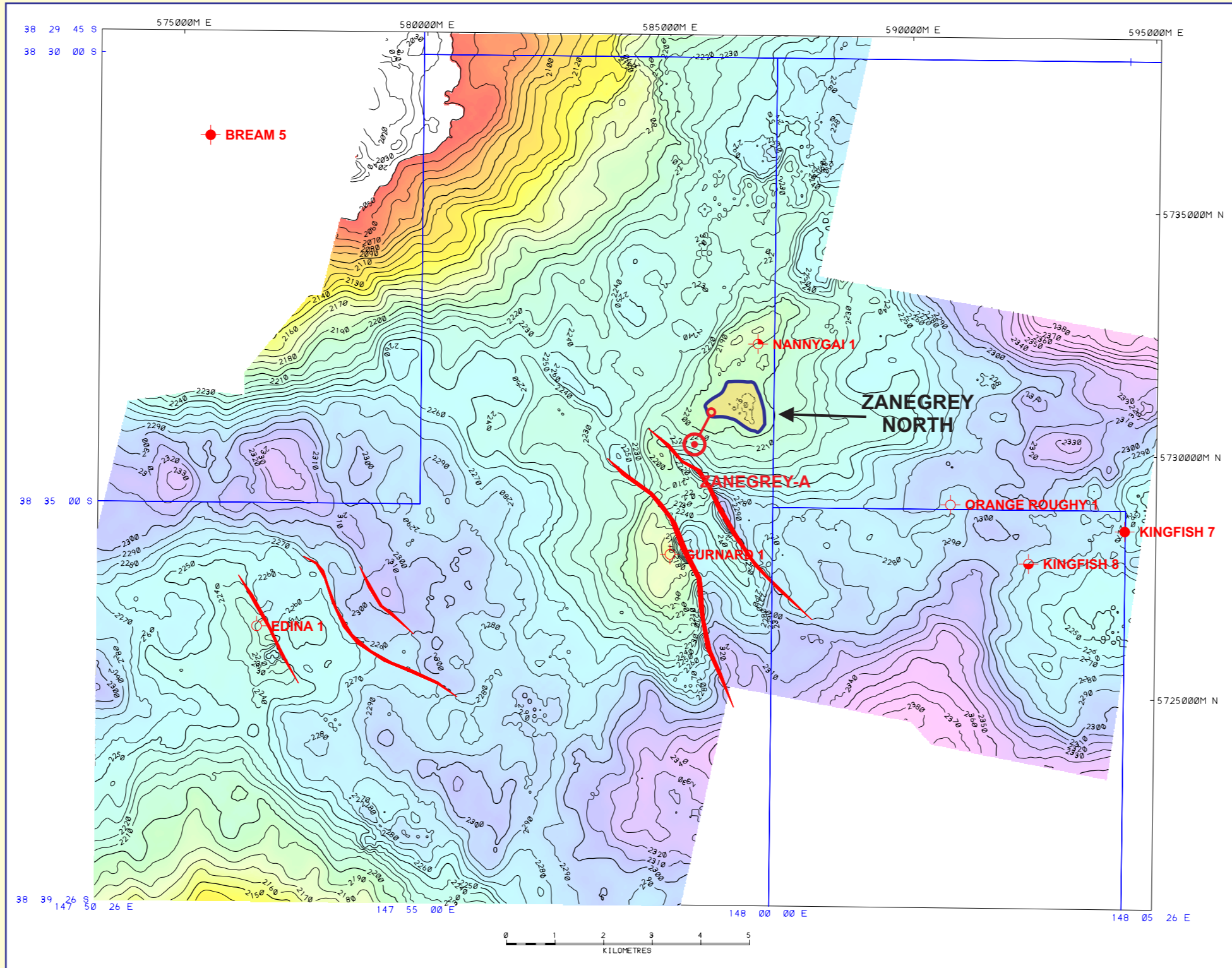
Deep Latrobe Event (Intra Volador Formation, *F.longus*) TWT Map



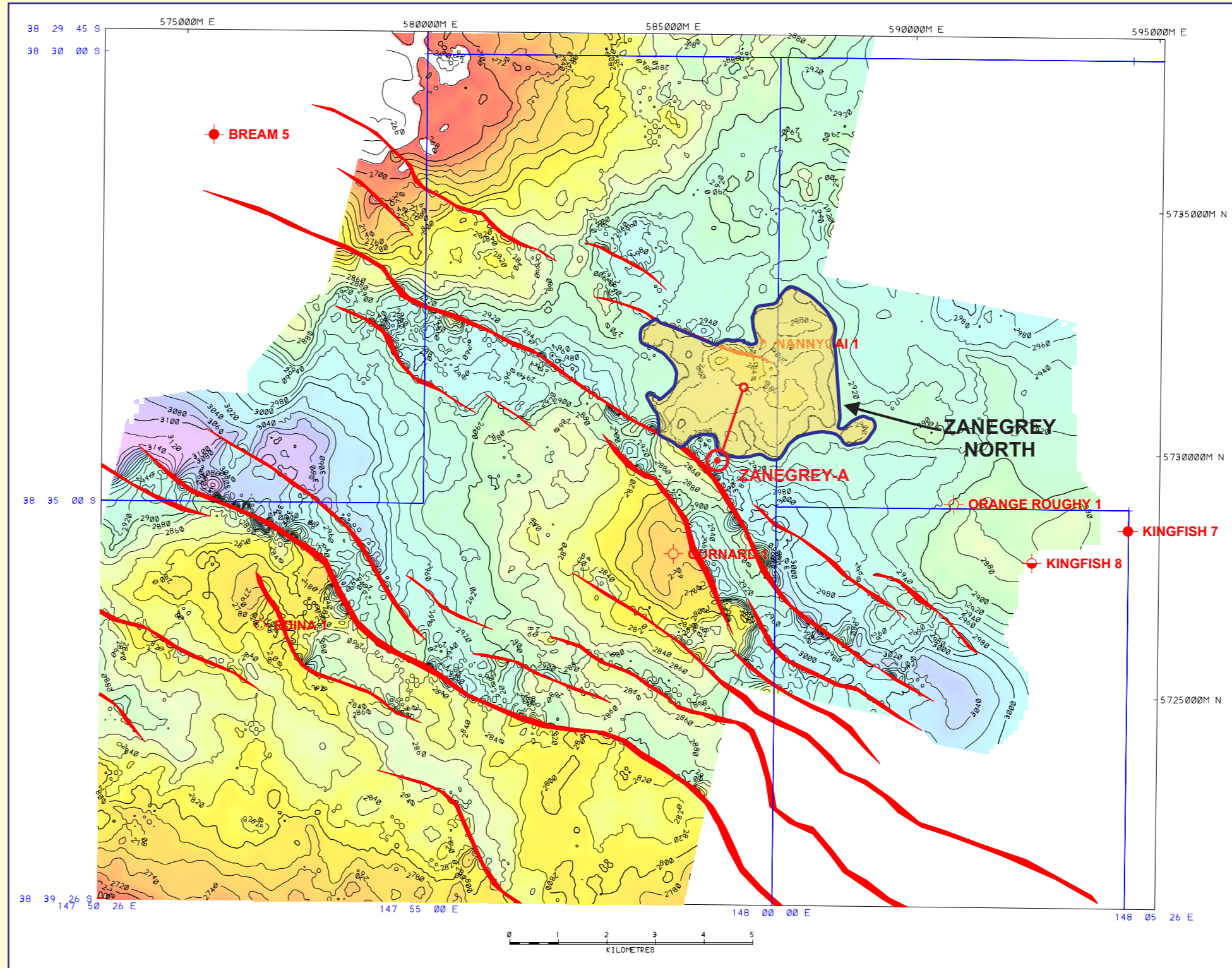
3D Dip Line (For location of line see TWT maps above)



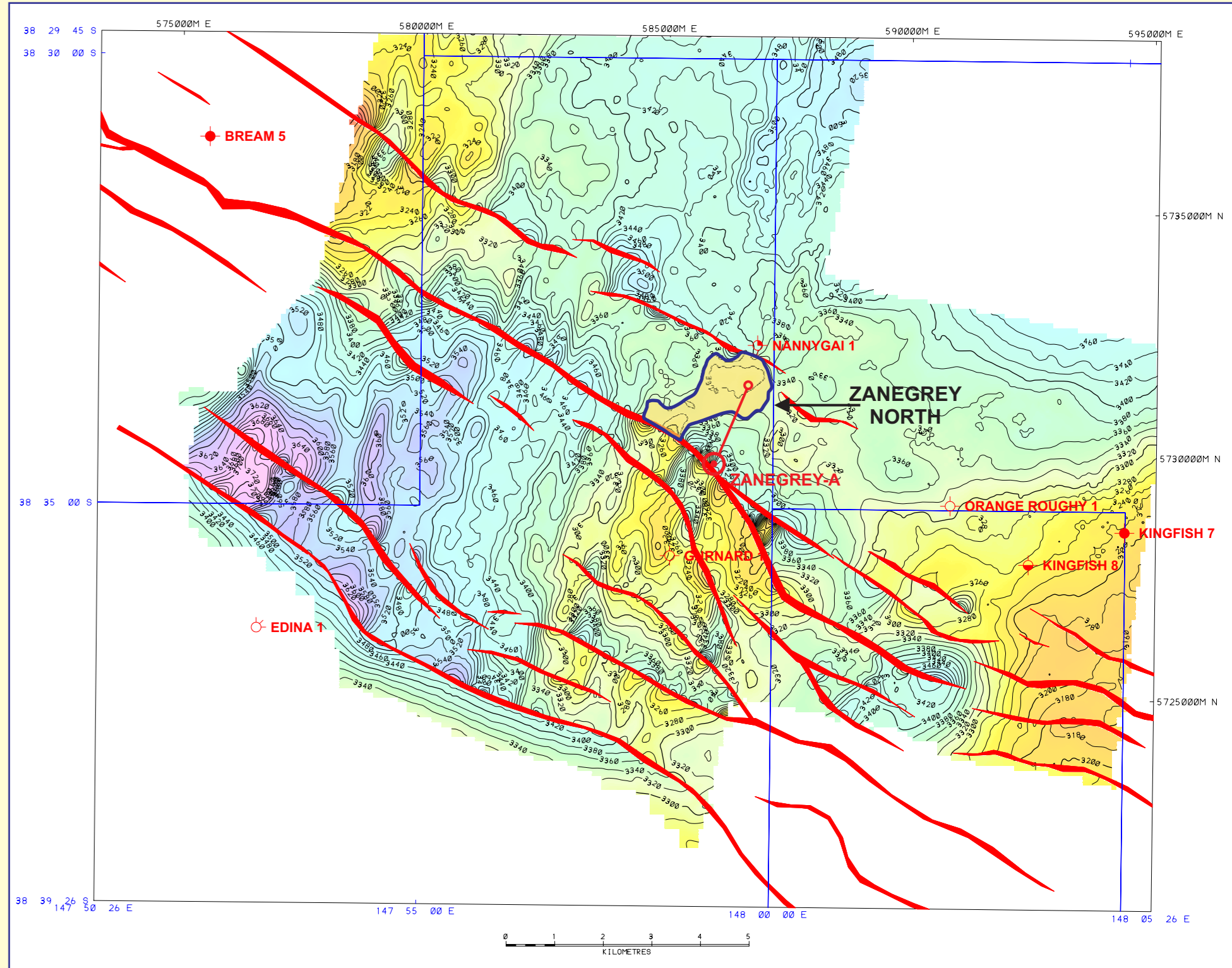
Top Latrobe Group Depth Map



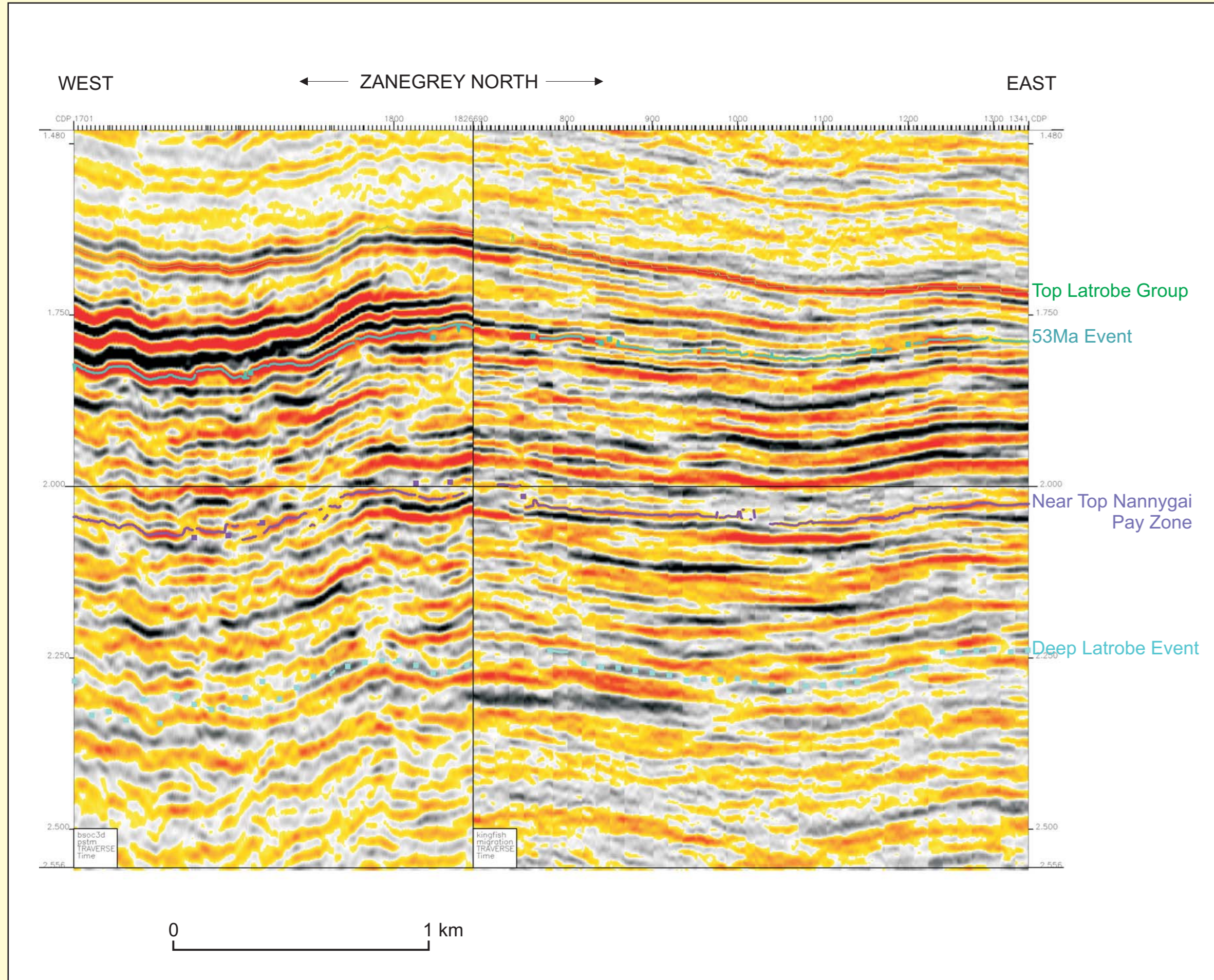
Top Nannigai Pay Zone Event (Intra Kingfish Formation, *L.balmei*) Depth Map



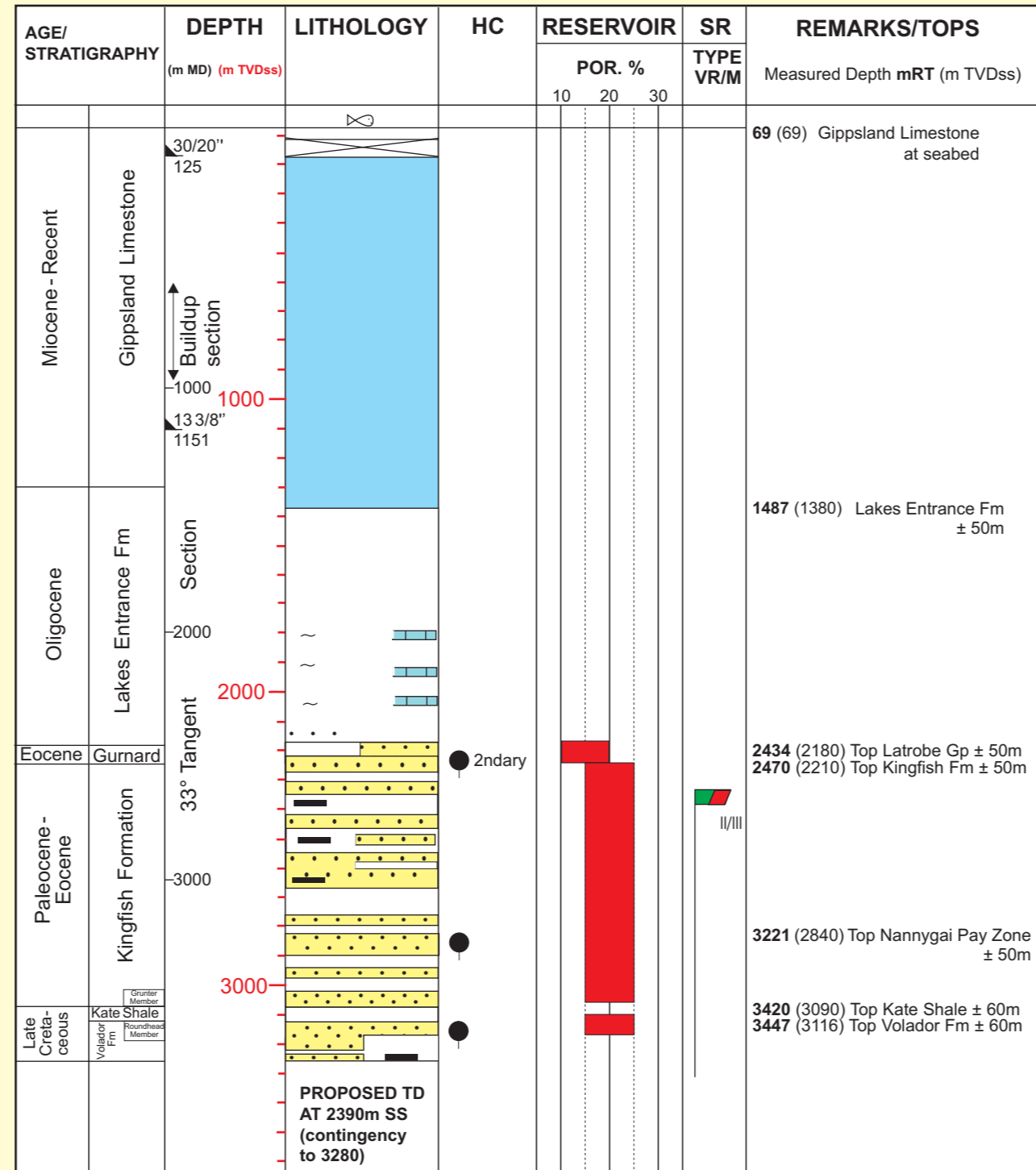
Deep Latrobe Event (Intra Volador Formation, *F.longus*) Depth Map



3D Strike Line (For location of line see TWT maps above)



ZaneGrey-A Preliminary Prognosis (Deviated)



#### Well Description

ZaneGrey-A will be drilled to test the ZaneGrey North Prospect. The well will be deviated to follow the migrating target culminations and to stay outside the 500m exclusion zone around the Bream-Kingfish oil pipeline. Assuming a semi-submersible rig is used the surface location will be 1500m SSW from the pipeline (500m exclusion zone plus 1000m anchor pattern length). The well will kick off in the 17° section at around 500m to establish a hole angle of 33 degrees on a bearing of 015. This tangent section will be maintained until TD. The geological objectives of the well are to:

- Determine the depth of the Top Latrobe Group at the well location. This information will enable a decision to abandon the well to be made if it is demonstrated that the depth conversion is invalid and structural closure is unlikely. Hence the TD is proposed at 2390m subsea with a contingency to deepen.
- If the top Latrobe Group is encountered within prognosis the well will be deepened to a TD of 3280m subsea to enable evaluation of the Roundhead Member and significant reservoir - seal pairs of the Kingfish Formation (including the reservoir with interpreted live oil encountered in Nannigai-1).
- Test Upper Latrobe Group reservoirs within a faulted anticline updip of the Nannigai-1 well.

#### ZaneGrey North

ZaneGrey North is a faulted anticline updip of Nannigai-1 drilled in 1972. The anticline appears to be formed by a major basin forming normal fault striking NW-SE through the northeast northeast of Nannigai-1 and east of ZaneGrey North, although both these areas are beyond the limit of good data quality in the BSOC 3D, and over the Kingfish 3D dataset. Good hydrocarbon shows were encountered in sandstone over the interval 2898 - 2914m in Kingfish Formation *L. balmei* zone sediments. Log analysis interpreted some 6m of live oil in the interval 2898 - 2904m. This is argued to demonstrate structural closure.

Current depth conversion work, albeit equivocal, suggests Nannigai-1 may have drilled on the northern closure limit at intra-Latrobe Group levels. Interpreted spill points are mapped northeast of Nannigai-1 and east of ZaneGrey North, although both these areas are beyond the limit of good data quality in the BSOC 3D, and over the Kingfish 3D dataset. Good hydrocarbon shows were encountered in sandstone over the interval 2898 - 2914m in Kingfish Formation *L. balmei* zone sediments. Log analysis interpreted some 6m of live oil in the interval 2898 - 2904m. This is argued to demonstrate structural closure.

The acquisition of 3D seismic in 2002 by BSOC over the area has recognised a significant updip component to Nannigai-1 at the level of the interpreted pay zone and at deeper and shallower horizons in both time and depth. Detailed velocity information through the high velocity submarine canyon sequence has been derived from advanced geophysical processing techniques, although a significant depth conversion risk remains. A minor laterally discontinuous normal fault is identified at intra-Latrobe Group levels downthrowing the Nannigai-1 area close to the well location, from a significant area updip (in TWT and depth) to the southwest. This, and the interpreted closure at the level of the pay zone, augurs well for this being updip and within depth closure at intra Kingfish and Volador formation levels. The deeper Roundhead Member forms a primary objective. A smaller areal anticlinal closure at Top Latrobe Group forms a secondary objective.

Regional correlation across the southern Gippsland Basin has identified that a prospective sequence of reservoir seal pairs remains untested (by Nannigai-1) updip in ZaneGrey North for the Kingfish Formation and within deeper undrilled sequences of the Kingfish and Volador formations, and within deep Golden Beach Subgroup deposits (the latter correlated over long distance with Archer-1 and Anemone-1 wells to the southeast).

#### Reservoirs

The Kingfish and Volador formations form the primary reservoir objectives in the prospect, in particular thick sandstones of the Roundhead and Grunter members. In the nearby Kingfish Oil Field, Kingfish Formation reservoirs are a sequence of sandstones deposited in lower and upper shelf settings with minor marine shale interbeds. Reservoir quality is expected to be excellent with average porosities around 20% and permeabilities of several Darcies. Deeper porosity declines due to compaction although porosities of over 25% can remain even at depths of 3000m. A similar unit to the Grunter Member is encountered in Gurnard-1 and forms a high net to gross sandstone, approximately 28m thick, overlying the Kate Shale. In the Volador Formation, the Roundhead Member was encountered in Gurnard-1 and Roundhead-1 and is expected to form a massive sandstone unit approximately 42m thick.

Numerous other sandstone reservoirs, subordinate to these identified targets are expected to occur throughout the sequence.

#### Seals

Top seals are likely to be provided (in a stacked pay) by back barrier lagoonal and interdistributary shales becoming more prevalent deeper in the sequence (possibly from Nannigai pay zone level and deeper). Regionally, the Kingfish Formation becomes more distal to the palaeoshoreline with depth at this location and the potential for developing laterally extensive lower coastal plain shales exists, which is interpreted to augur well for intraformational sealing.

A top seal is also likely to be provided by shales of the Lakes Entrance Formation. Seat seal may separate the Gurnard and Kingfish formations and any hydrocarbon fill (as was the case in Kingfish). This may generate lateral sealing within stratigraphically trapped Gurnard Formation reservoirs (as was the case in Kingfish between P1.1 and M1.2 reservoirs). An eastwards truncation of the upper part of the Kingfish Formation strata leads to the potential for 'rim' plays, with top seal from Gurnard Formation shales and lateral seals from intraformational marine shales of the Kingfish Formation.

Whilst ZaneGrey North is predominantly a faulted anticlinal closure, lateral fault seal on the major basin forming fault to its southwest may also enhance structural closure, albeit with a higher risk. Lateral juxtaposition of high net to gross sequences in this downthrown block with lower net to gross sequences of the deeper Volador Formation in the ZaneGrey South fault block augur well for any cross fault seal. Clay smear potential was determined for Nannigai-1 and indicates that below 2550m CSP values are in excess of a likely sealing threshold of 45 (for fault throws of over 30m).

#### Source Rocks

Non-marine coastal plain organic rich mudstones and coals represent the source rocks for both oil and gas in the basin. These are dominantly of terrestrial plant origin and widely distributed throughout the Latrobe Group. Gas and oil mature source rocks for the ZaneGrey North Prospect are interpreted to occur in the Central Deep to the northeast. Potential oil mature source rocks are interpreted within the Latrobe Group Halibut Subgroup immediately to the northeast, which is interpreted to have provided an oil charge to the undersaturated giant Kingfish Oil Field. Charge is expected to originate directly from the northeast, or via spill from the Kingfish Field through the saddle to the east.

A gas mature kitchen is mapped at the top Golden Beach level immediately to the northeast of ZaneGrey, however the lack of gas within Kingfish suggests that vertical migration may not be occurring. Gas is present at the top Latrobe in Bream to the west, although this structure is much shallower than ZaneGrey and unlikely to be a conduit for gas migration. Simplicity would suggest that, as ZaneGrey is between a gas and oil field, and an oil field, then it might be expected that any hydrocarbons encountered would be 'oil with some gas'.

Any oil encountered in ZaneGrey is likely to have properties comparable with Bream and Kingfish. The Bream oil is described as a paraffinic crude with 45° API and a pour point of 60°F. Kingfish oil is 47° API and a pour point of 60°F. The Bream oil is saturated at reservoir conditions and is in contact with a large, low CO<sub>2</sub> gas cap. No indication of H<sub>2</sub>S is identified in nearby wells.

#### Risks

The main risks for the ZaneGrey North Prospect relate to the mapped depth closure and hence the depth conversion. A strong lateral velocity variation in the overburden makes the depth conversion problematic and the single greatest geological risk. Detailed seismic velocity data and analysis have been used to minimise the risk, and structural closure is considered to be greater than depth uncertainty. Whilst depth closure is a high risk, there is also significant upside in the mapped spill to the east and northeast. Intraformational sealing and breaching by minor faulting is a secondary risk.

#### Reserves Potential

Risked and unrisked reserves potential has been estimated for the potential plays in the prospect and are summarised below. These reserve estimates are unrisked and for Vic/P42 only.

	UNRISKED RESERVES (RECOVERABLE)		RISKED RESERVES (RECOVERABLE)					
			POS	MSV		P90 OIL Mmb	P50 OIL Mmb	P10 OIL Mmb
	OIL Mmb	GAS Bcf		OIL Mmb	GAS Bcf			
ZaneGrey North	134.0	0.0	34%	87.7	9.0	52.3	86.7	124.5

VIC/P42  
ZANEGREY NORTH  
OFFSHORE GIPPSLAND BASIN

January, 2004