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ORAL PRESENTATION

TIMOR GAP's Onshore Block: A Preliminary Assessment of Prospectivity in Onshore Timor-Leste

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1. ONSHORE BLOCK HISTORY

TIMOR GAP, E.P., the national oil company of Timor-Leste, was awarded the exclusive hydrocarbon exploration rights to the Onshore Block (Figure 1) by Government Resolution 44/2017 in December 2015. Subsequently the Onshore Block was divided into 3 sub-blocks (A, B & C, Figure 1), each with an area of approximately 1000km^2. In April 2017 Blocks A & C were gazetted as full PSC exploration areas (PSCs TL-OT17-08 and TL-OT-17-09 respectively) in 50:50 partnership with Australian company Timor Resources (a subsidiary of the Nepean Group), with Timor Resources assuming operatorship. In early 2018 talks are advanced on turning Block B into a third PSC licence area in partnership with a separate company, with TIMOR GAP taking operatorship.

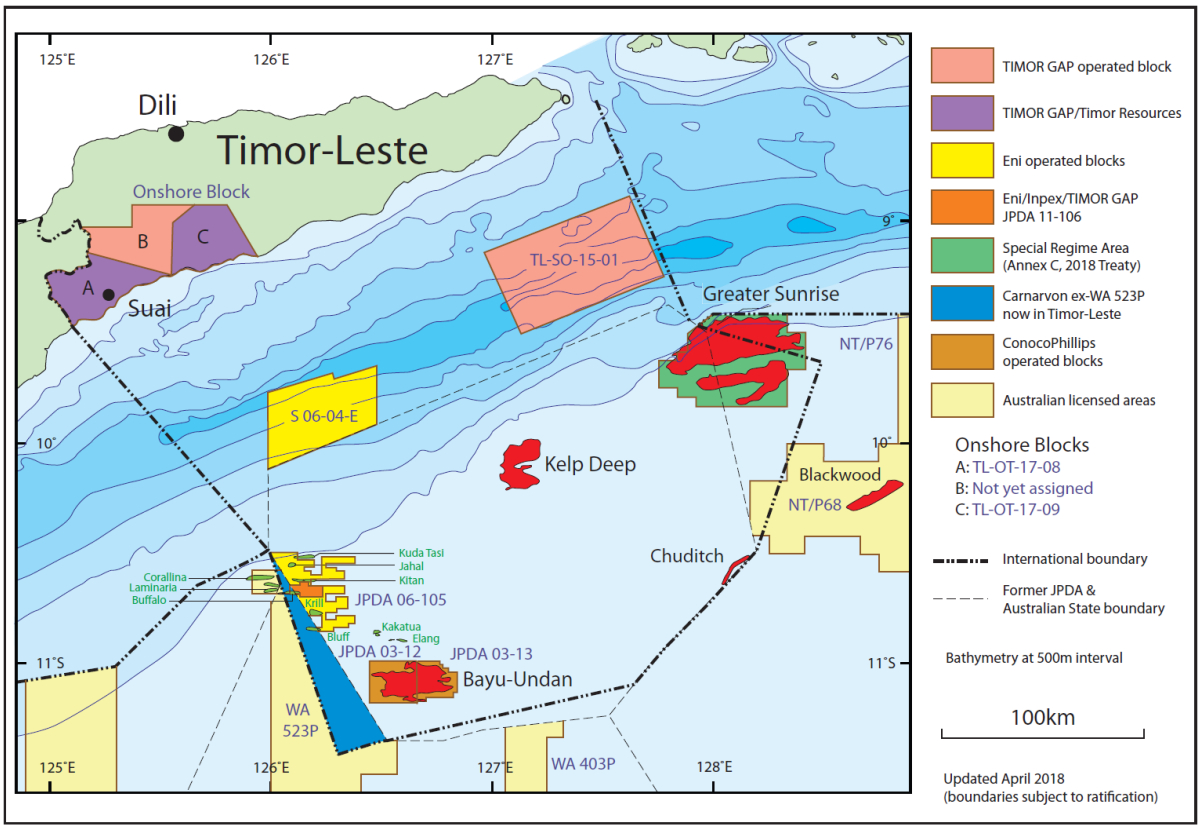

Figure 1. Timor-Leste current PSC licence areas, with offshore international boundaries following the 2018 treaty with Australia (subject to ratification). Oil fields are shown in green, gas fields in red. JPDA is the former Timor-Leste – Australia Joint Petroleum Development Area, annulled by the 2018 Timor-Leste – Australia maritime boundary treaty (subject to ratification).

Earlier exploration for hydrocarbons in onshore Timor-Leste was carried out particularly by Australian company Timor Oil between 1957 and 1975. The company drilled 18 exploration wells in the Onshore Block area (16 in Block A, 2 in Block C), with hydrocarbons encountered in 9 wells in Block A, and 1 well in Block C. Of these, two wells in Block A tested significant oil flows: Matai-1A at an unsustained rate of 110 bbl/day, and Cota Taçi-1 at 216 bbl/day.

In 1968 Timor Oil acquired 248 km of 2D seismic along the south coast of East Timor, and in 1969 and 1970 shot further seismic (248km and ~30km respectively) in what is now Block A. In 1994 Pertamina, the national oil company of Indonesia, acquired 314 km of 2D seismic across the southern parts of Blocks A, B & C. The 1994 seismic data has recently been reprocessed by Timor Resources. Timor Oil also acquired an extensive onshore gravity database particularly across the southern parts of Blocks A & C. We are currently awaiting the results of an airborne gravity-magnetic survey carried out across the entirety of Timor-Leste, acquired through Government funding in 2017.

During 2017 TIMOR GAP focused on reconnaissance geological mapping in Blocks A (Figure 3) and C (Figure 6). An updated lithostratigraphy has been developed as a framework for this mapping, as summarised in Figure 2.

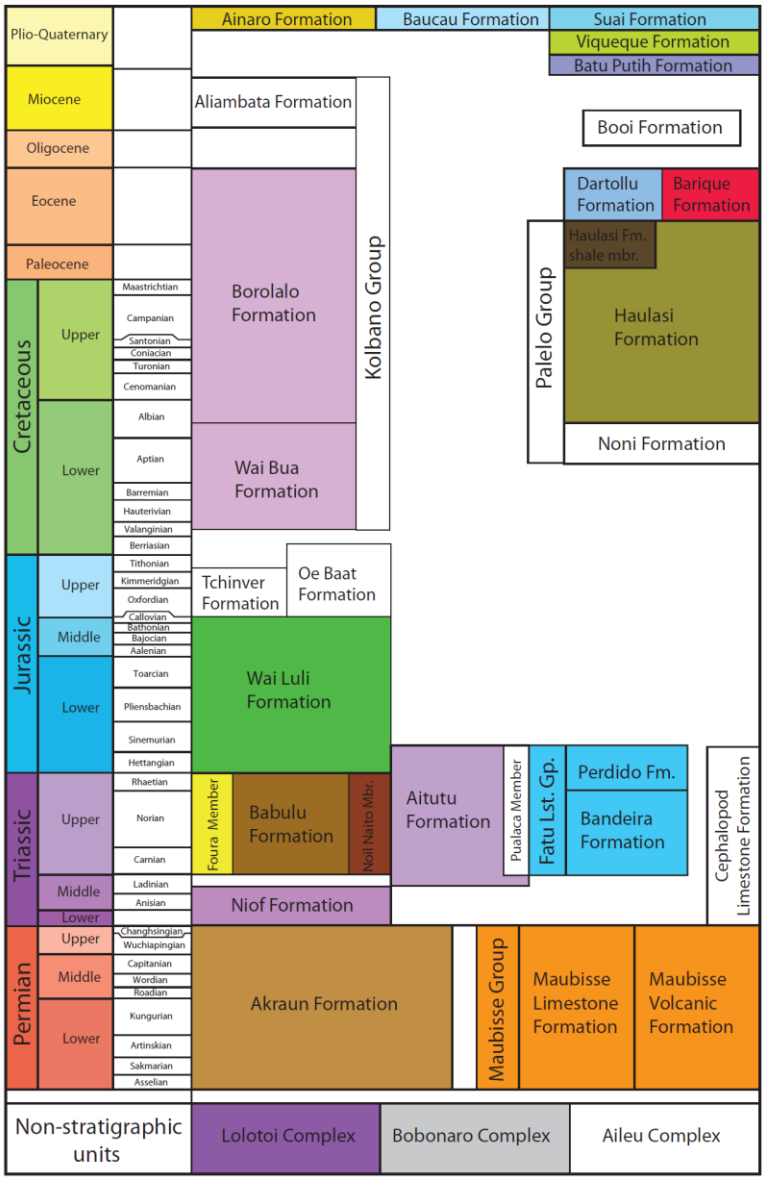

Figure 2: TIMOR GAP preliminary revised lithostratigraphy for Timor-Leste. The colour scheme is that for the reconnaissance geological mapping (Figures 3 & 6). Units left blank have not yet been encountered in the Onshore Block mapping areas. Note that the Permian Akraun Formation is a new name suggested equivalent to the Atahoc and Cribas formations of Audley-Charles [1].

2. HYDROCARBON INDICATIONS

More than 70 natural or drilling-induced hydrocarbon seeps or shows are now documented from across Timor-Leste, with more than 30 in Block A, about 20 in Block B and at least 6 in Block C. Across the territory oils are described as greenish and brown to black in colour, sweet, with gravities ranging from 14.5-44.6°API (heavier oils biodegraded), and with sulphur contents of 0.06-1.36% (a report of 4% sulphur [2] is apparently a typographical error for 0.4%). Higher sulphur values are associated with heavier, more biodegraded oils. Based on published and unpublished geochemical studies [5, 6, 8] and Timor Oil unpublished reports, the oils appear to derive from a common Triassic-Jurassic suboxic, somewhat restricted marine shale source containing mixed Type II/III kerogen, including a high proportion of land plant detritus.

3. BLOCK A (SUAI AREA)

The Suai area was the primary focus for Timor Oil's exploration between 1959-1972. Figure 3 shows the core region of the Suai Basin, a synorogenic basin of late Miocene to Recent age developed unconformably on top of the Timor fold and thrust belt. Timor Oil's wells primarily targeted reservoir in the Suai Basin succession (Viqueque Formation sandstone reservoir target), but as Figure 4 shows, most of the hydrocarbon shows were encountered in the sub-basinal thrustbelt, or even in the underlying Lolotoi metamorphic complex. Figure 5 is a cross-sectional interpretation of the Suai area, highlighting the primary exploration plays that TIMOR GAP recognise in the block. Based on our fieldwork, we interpret the Lolotoi Complex as basement to the fold and thrust belt cover sequences, both originating on the Australian continental margin. However, Timor Resources are also investigating the alternative interpretation of the Lolotoi Complex as allochthonous (obducted forearc), opening up the possibility of subthrust plays beneath outcropping Lolotoi Complex.

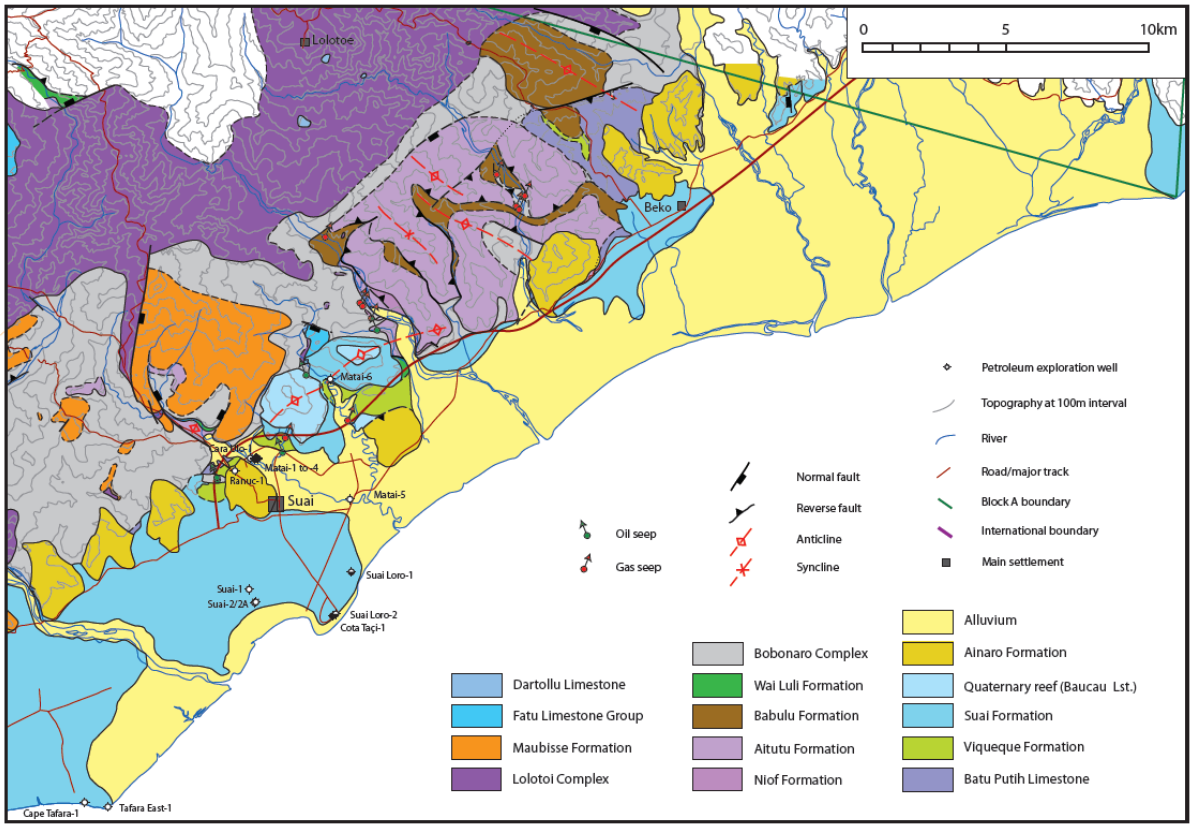

Figure 3: Suai Basin geology, Block A.

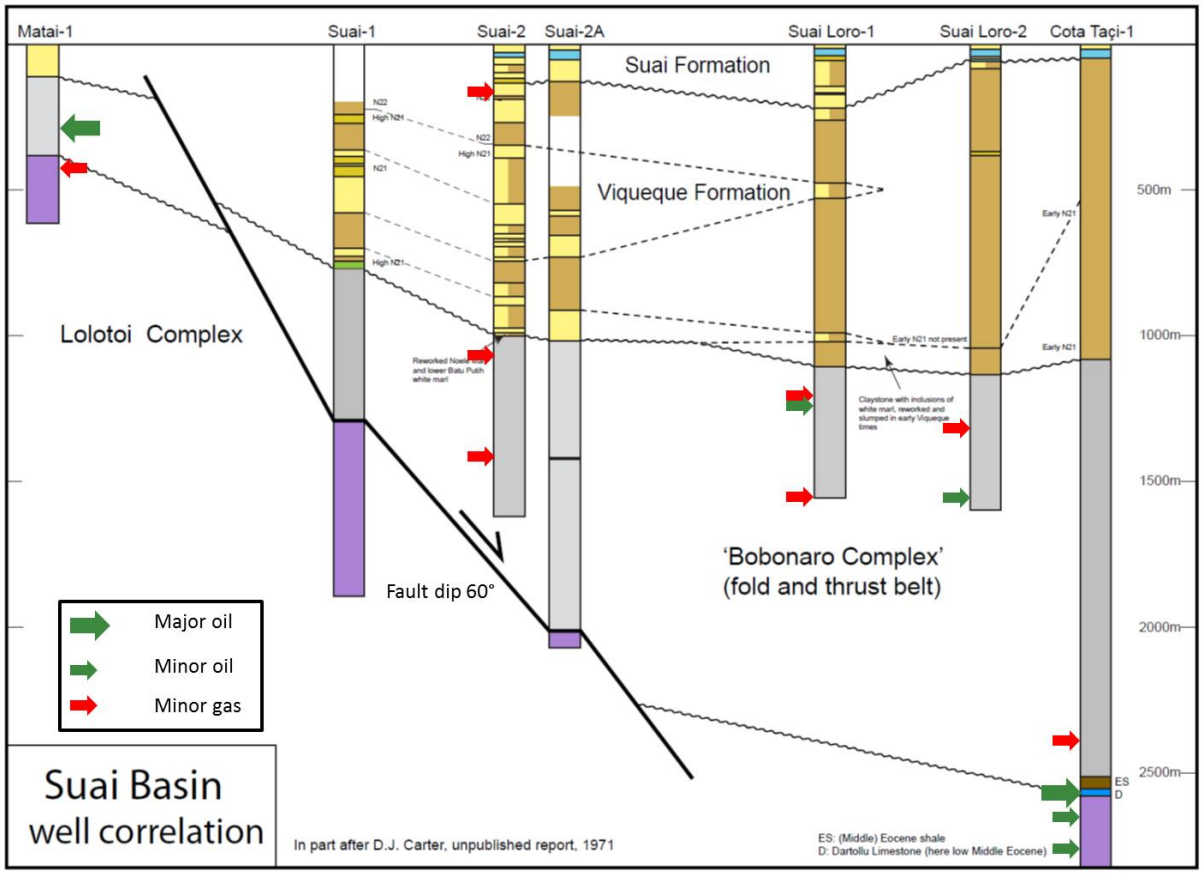

Figure 4: Suai Basin well correlation and hydrocarbon shows. See Figure 3 for well locations.

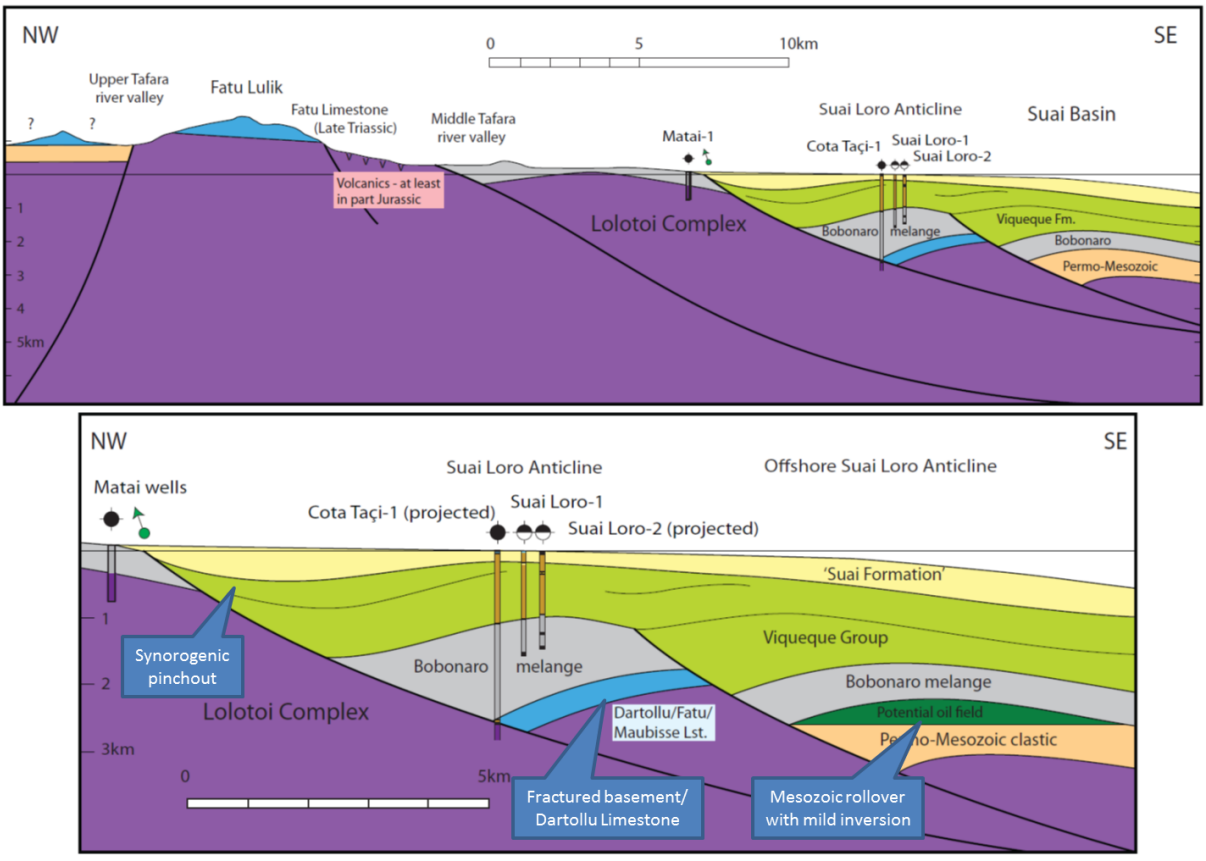

Figure 5: Suai Basin cross-section and exploration plays. See Figure 3 for well locations.

4. BLOCK C (BETANO-SAMÉ AREA)

The Block C area has received relatively little geological investigation since the reconnaissance mapping of Audley-Charles (1968) [1]. Figure 6 shows our new reconnaissance geological map for this area based on our 2017 fieldwork. In our pre-fieldwork interpretation [4] we had identified three main foldbelt exploration leads in Block C, with two additional (Lolotoi) basement highs as secondary leads. Our fieldwork has strengthened the case for a potential subthrust domal culmination beneath the Central Betano structure (Figures 6 & 7) and identified a small but potentially prospective new anticline 5km south of Samé. However, the case for a western prospect was weakened by the discovery of extensive Permian outcrop in an area previously interpreted (based on mapping [1] and remote sensing data) as an antiformal culmination in Mesozoic cover sequences. Timor Resources are, however, considering the possibility of a subthrust play in this area based on the reprocessed 1994 seismic data. The third, eastern, prospect has little surface expression, and will require seismic and/or shallow drilling to more fully delineate. One of the two basement-high leads was probably also invalidated by our fieldwork, as Lolotoi Complex was found outcropping on the crest of the high, so that any previously sealed basement structure in this area is probably breached.

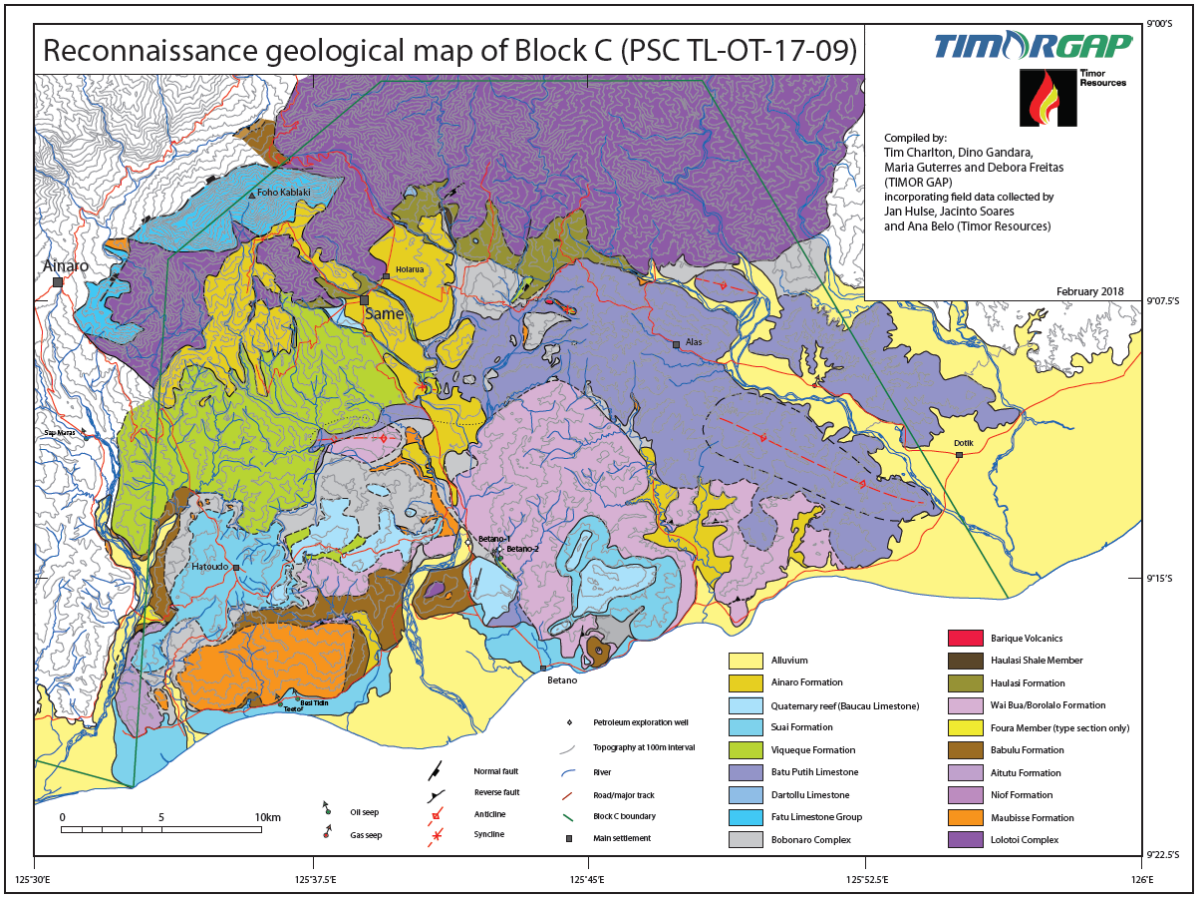

Figure 6: Reconnaissance geological map of Block C.

In addition to the petroleum exploration aspects of the new mapping in Block C, there are also several aspects of more academic significance:

i. The widespread outcrop of the Permian Maubisse Formation in the southern half of the area. No Maubisse Formation was indicated in this area on Audley-Charles's map [1].

ii. The separation of the deep marine carbonate Batu Putih Formation (primarily in the east) from the siliciclastic Viqueque Formation in the synorogenic Colitie Syncline [1] running E-W through the centre of Block C.

iii. The extensive development of the Haulasi Formation on the southern margin of the Lolotoi Complex north of the Colitie Syncline (as previously identified by [3] and [7]). Preliminary age determinations for the Haulasi Formation (MGPalaeo report to Timor Resources, December 2017) indicates Late and ?Late Cretaceous ages, and marine shelf environments of deposition. The list of six genera and one species of dinoflagellates recorded in the report (*Exochosphaeridium*, *Florentinia*, *Heterosphaeridium*, *Odontochitina*, *Palaeohystrichophora infusorioides*, *Spiniferites*, *Subtilisphaera*) have also been identified in full in 7 wells drilled on the Australian continental margin to the south of Timor (Bayu-1, Fohn-1, Lynedoch-2,

Mistral-1, Mount Ashmore-1, Sikatan-1 and Wallaroo-1 wells; other wells from this area list some or most of these genera [10]). All 7 genera/species occur in the late Albian-early Cenomanian interval in the Mount Ashmore-1 well. This may suggest an Australian rather than Asian palaeogeographic affinity for the Haulasi Formation, which previously has been considered an allocthonous forearc succession obducted during collision, e.g. [7]. The Haulasi Formation outcropping in the north of Block C is significantly less deformed than the partly contemporaneous Wai Bua and Borolalo formations in the south of the block. The Wai Bua/Borolalo formations represent Australian continental margin deepwater facies but are located to the south of (inboard of) the apparently more proximal marine Haulasi Formation. These data are consistent with the Wai Bua/Borolalo formations being overthrust from the northern pre-collisional continental margin of Australia, while the more proximal Haulasi Formation unconformably overlying the Lolotoi Complex may have attained its present position through late-stage basement uplift (Figure 7). If any geological unit in Timor could be described as structurally allochthononous, it might be the Wai Bua-Borolalo succession rather than the Haulasi-Lolotoi grouping.

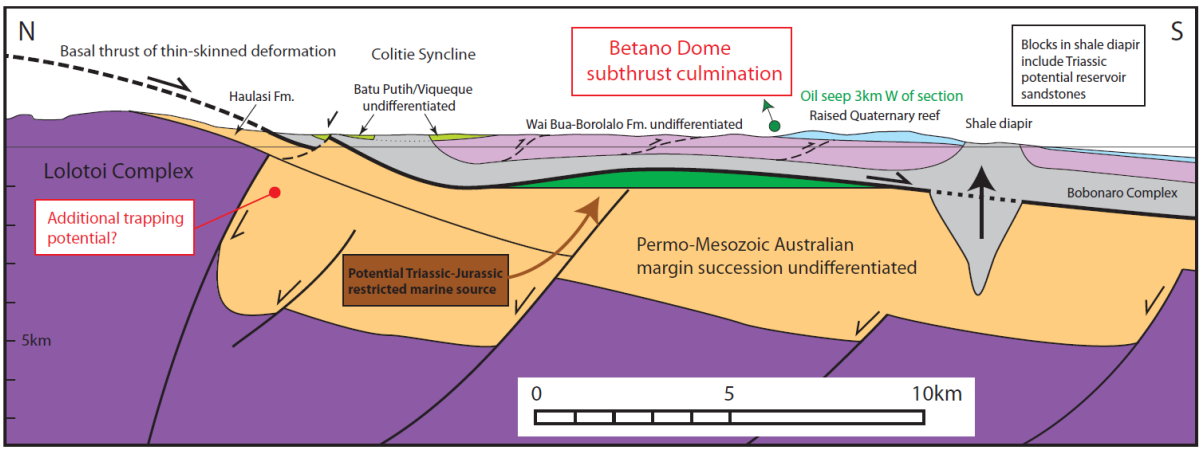

Figure 7: Cross-section N-S through central Block C. Deeper structure additionally constrained by electromagnetic Profile B of [9]. A possible subthrust graben in the north of the section (based on the electromagnetic profile) could form a potential kitchen for restricted marine Triassic-Jurassic source rocks.

5. BLOCK B

Block B occupies the more interior parts of the Onshore Block area, including mountains up to nearly 3000m elevation. There are, however, also abundant surface hydrocarbon indications in this area, particularly associated with the Bazol Anticline, and to a lesser extent the Aitutu Anticline (Timor Oil unpublished reports; Audley-Charles [1]; Figure 8).

Little new geological work has yet been carried out in Block B, although it is a primary target for investigation in the 2018 field season. What work has been undertaken so far, however, suggests a rather different relationship between the Bazol Anticline and associated gas seeps compared to earlier interpretations. Whereas Audley-Charles [1] showed a Permian-cored Bazol Anticline with a WSW-ENE trend and the gas seeps occurring primarily along the northern flank of the anticline, our reconnaissance studies suggest that the anticline trends NW-SE with the gas seeps primarily along the southern flank of the anticline, and rocks only as old as Triassic exposed in the anticlinal core. This suggests the possibility that the gas seeps might originate from a Permian gas-charged anticlinal core. Similar potential prospectivity at the Permian level may be associated with the larger Aituto Anticline to the NE of the Bazol Anticline, as also recognised (and nearly drilled) by Timor Oil in the 1960s. The Aituto Anticline is comparable in size and in its collision-zone structural setting (but not in stratigraphy) to the giant Hides gas field of Papua New Guinea (Figure 8).

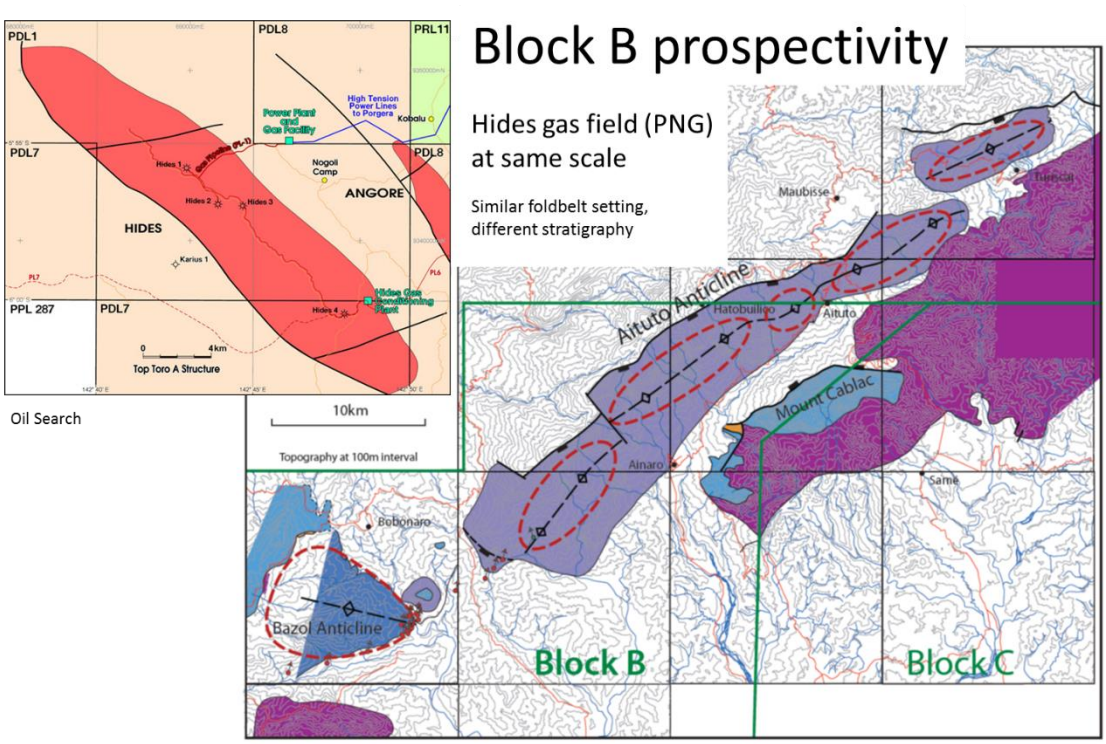

Figure 8: The Bazol and Aituto anticlines in the north of Block B, with the giant Hides gas field (Papua New Guinea) shown at the same scale for comparison. Only reconnaissance fieldwork has so far been carried out in Block B, but it is a primary target for work during 2018.

6. WIDER TIMOR-LESTE ONSHORE PROSPECTIVITY

The Onshore Blocks in the SW of Timor-Leste are currently the only onshore areas licensed by the Timor-Leste Government as PSCs. Considerable exploration potential also exists, however, in the eastern half of the country. Particularly strong natural oil and gas seeps occur at Pualaca in the central mountains, while both natural and drilling-induced strong surface seeps are found at Aliambata on the south coast. These areas attracted significant exploration interest from the end of the nineteenth century until the early stages of Timor Oil's investigation in the late 1950s, but have been largely neglected since that time. Elsewhere, potentially large subsurface anticlines may be indicated by domal folding of Quaternary reef terraces along the north coast of the island, and despite a widespread perception that these internal parts of the Timor fold and thrust belt 'should' be too structurally complex to be prospective, this is not borne out by the relatively simple fold/thrust belt structural style seen at outcrop in these areas.

ACKNOWLEDGMENTS

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