DHM Footprints of The Oilfields of the Eromanga Basin, Queensland

07.03.18

DHM in the Eromanga Basin of Queensland

©

I OVERVIEW

Industry knowledge of the petroleum habitats of the Cooper and Eromanga Basins (CEB) (Figure 1) has been developing for over half a century. There are many proven fields both in the Palaeozoic (Cooper) and in the more extensive Mesozoic (Eromanga). Under Scotforth's petroleum endowment classification this is a moderate richness, moderate density, moderately mature province. It still has future potential with much of Eromanga still little drilled.

Scotforth has been DHM[1] surveying in the CEB for over five years and now ranks it highly as an effective DHM exploration play district. It observes both known fields and untested prospects with clarity and confidence as spectral "HLIs"[2] that can be considered versus existing conventional G&G field and prospect maps and patterns ("CLIs")[3].

The emerging DHM patterns suggest more fields await discovery than might be "conventionally" expected and some fields have further undeveloped potential. Accordingly, the CEB is less mature than commonly considered.

Scotforth's December 2017 Technical Brief[4] provided an opening DHM overview of the CEB with illustrative focus on the Western Flank Eromanga oil play sub-district of South Australia. This Brief now examines approximately 10% (100,000km^2) of the Queensland part of the Eromanaga Basin.

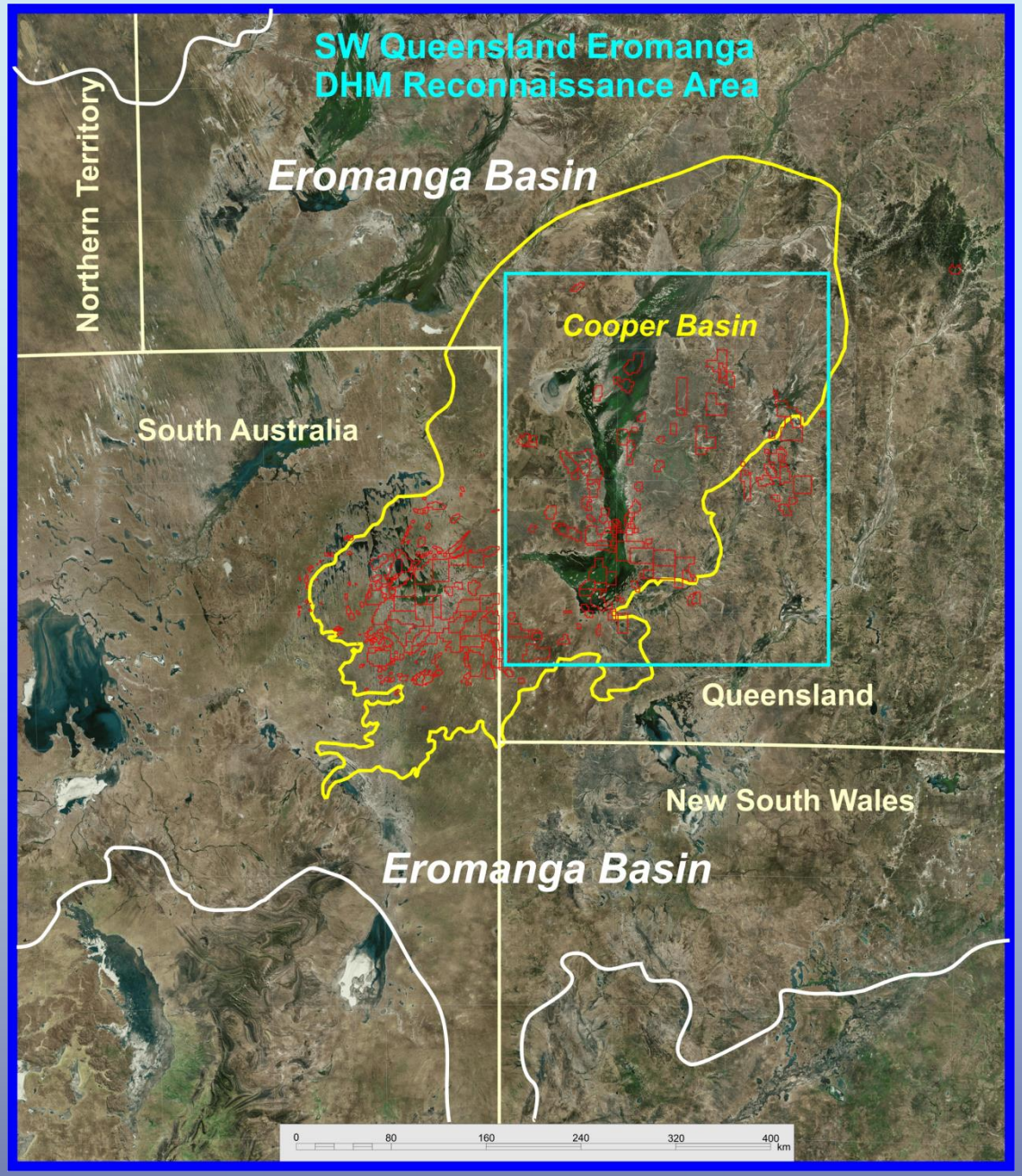
Eromanga Recon Area

(ca. 100,000km2)

The centrally located, Cooper Basin kitchen underlies the much more expansive Mesozoic Eromanga Basin where oil is mainly trapped in the Jurassic clastic reservoirs and most materially, in the Hutton sandstones.

There is continuity of this petroleum habitat south-westwards into South Australia.

Despite a near 60 year exploration history DHM suggests further fields and material petroleum resources await discovery.



The Queensland Eromanga Basin Reconnaissance

This Presentation Brief provides a taster of some DHM findings in the examined Queensland segment of the CEB (Figure 1). It does this with:

a) An illustrative DHM Fields Imagery Gallery and supporting synoptic DHM commentaries and

b) Examples of DHM identified untested exploration prospects in an emerging new DHM Prospect Inventory.

Six Field Areas are included in the Fields Gallery and one new Exploration Prospect example is provided.

The Queensland Eromanga Basin Product Offering

Three Products Available

Further to the Fields Gallery and example Exploration Prospect provided throughout the rest of this presentation, further Field Maps and Exploration Prospects are available on request, subject to commercial terms and conditions. The range of these DHM products are outlined below.

Product Levels:

Product Level I - **IPD[5] Maps of the Field Areas (Gross Area Patterns)**

Product Level II - **RBU[6] Maps and Example Spectral Cross Section Profiles of the Field Areas (Key Findings)**

Product Level III - **DHM Prospectivity Reports of the Field Area(s) including Individual Field and Prospect Area High Resolution Maps (IPDs and RBUs) and Prospect / Field Infill / Extension Inventories (Comprehensive Petroleum Resource Opportunities).**

II PRODUCING FIELDS GALLERY

The following Fields Gallery provides a mix of IPD and RBU examples for six Field Areas.

Together these types of DHM products create high focus petroleum resource potential opportunities for further E&P endeavours:

- **the "present" fields products for incremental infill / development drilling (optimisation) locations and for undrilled satellite field extension discoveries and**
- **the "future fields" products for excellent, low risk new exploration opportunities, targeting significant petroleum resource potential.**

Black Stump (IPD)

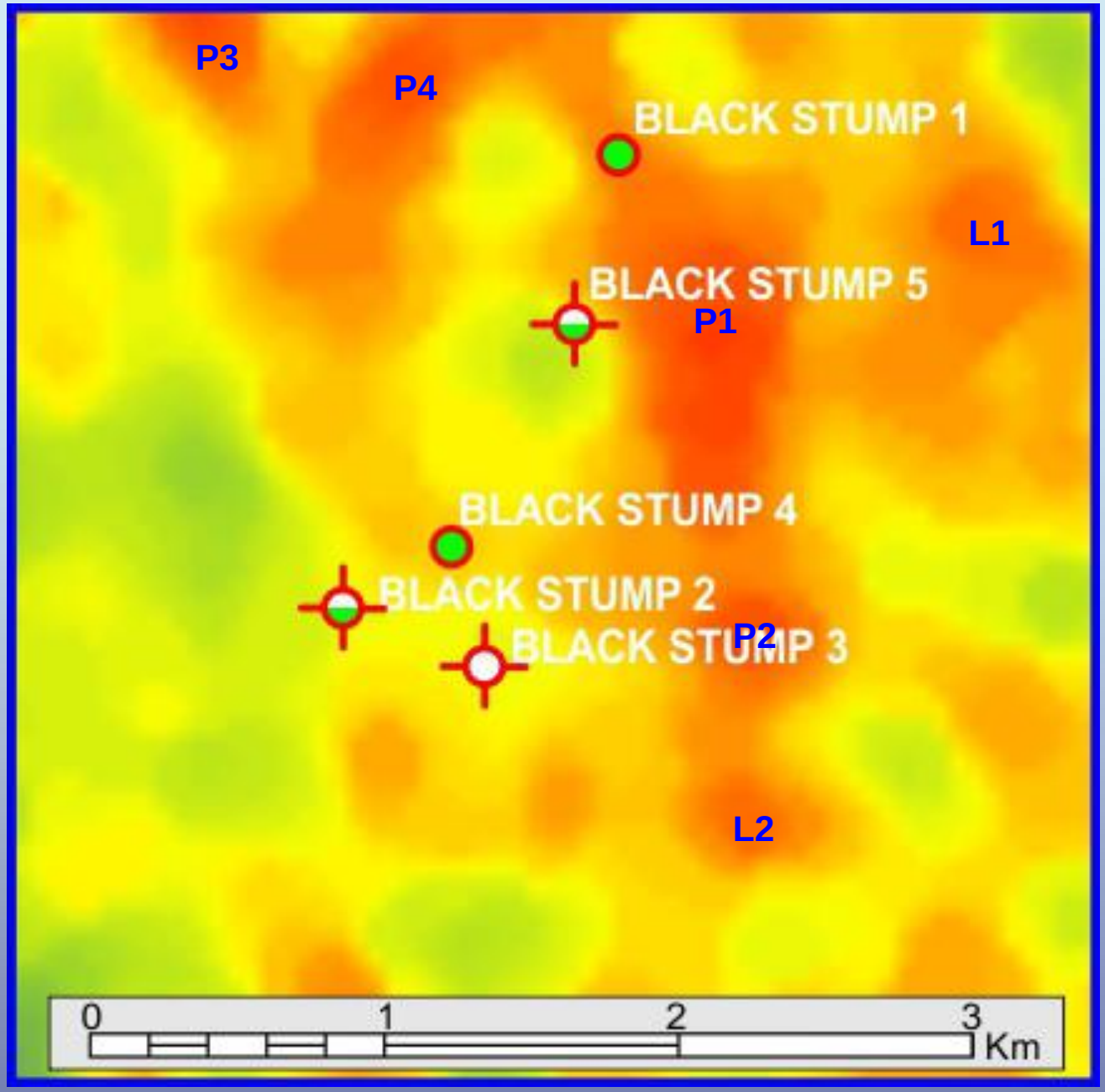
Small field - max 2P Reserves 77MBbls (2009).

Strong main HLI to east of D&A BS #5 with BS#1 producer at its northern end.

BS#5 oilwell on separate weak HLI to the west.

Further untested HLIs in Field Area.

Central P1 plus Ps 2-4 look best on under this single image examination. Leads 1 and 2 have some merit too.



Bodalla South (IPD)

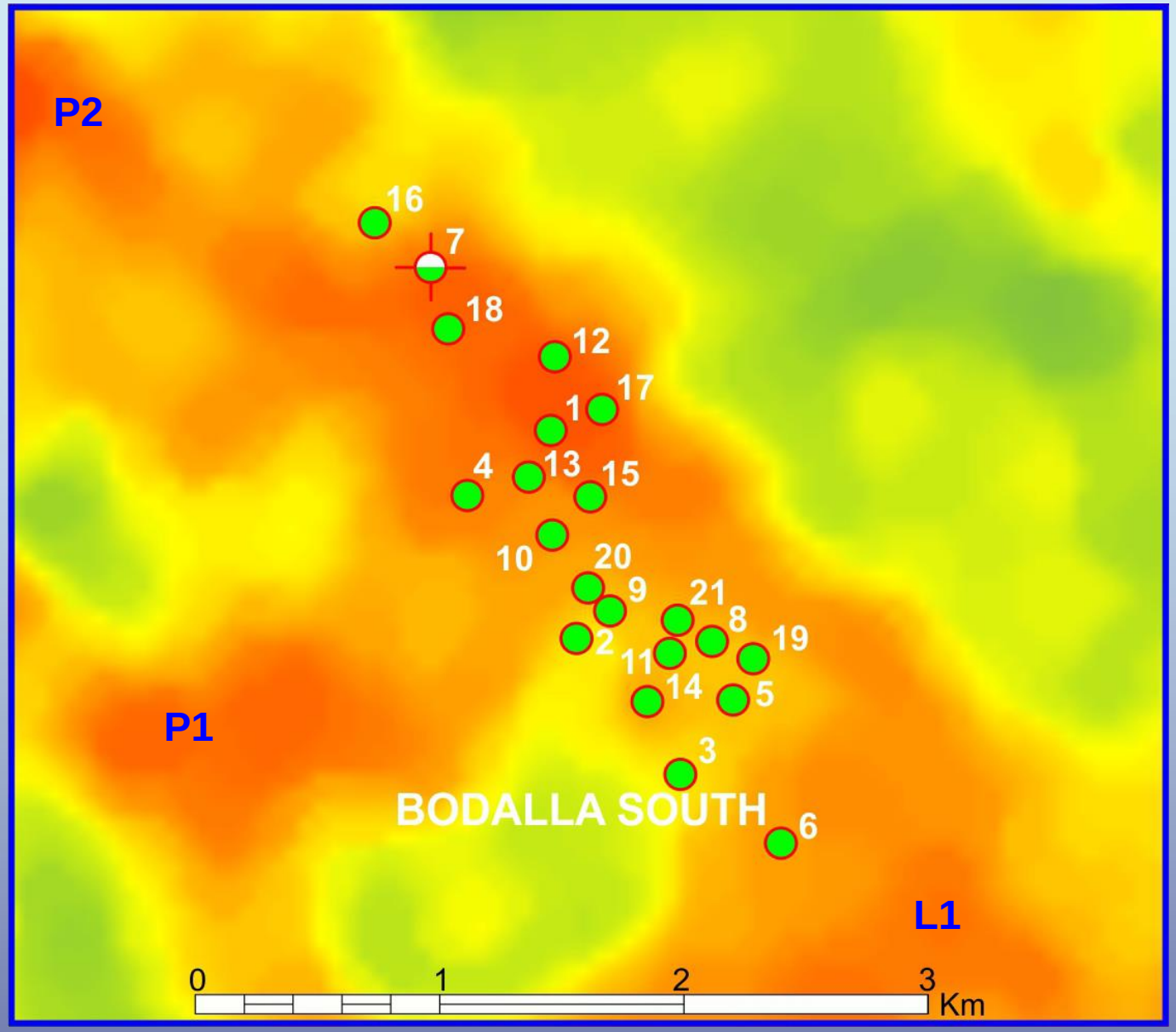
Discovered in 1984 on the anticlinal upthrown side of the NW-SE trending Tallyabra Fault.

Accumulations in both the Hutton and Windorah Jurassic sandstones reservoirs.

EUR >6MMBbls.

Further potential in SE, SW and NW Prospects and Leads (see RBU).

No wells in non-anomalous areas.

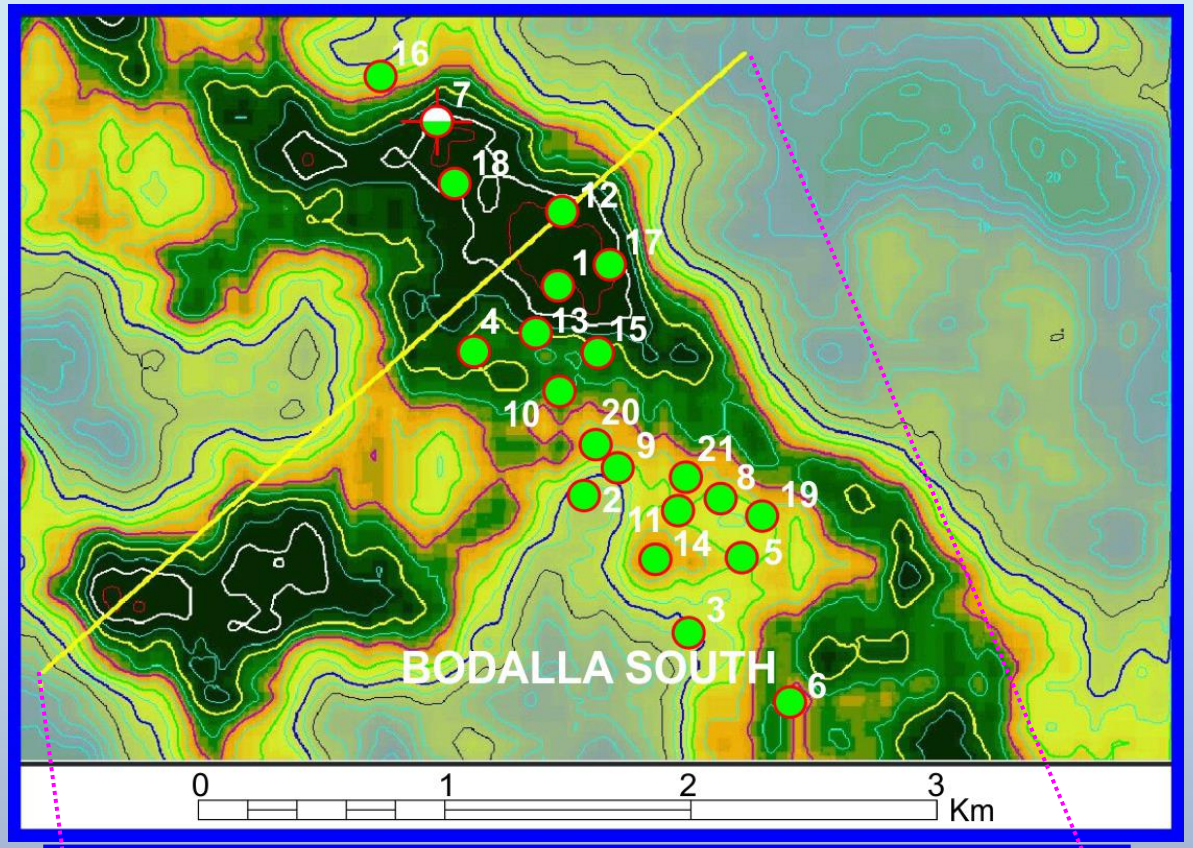


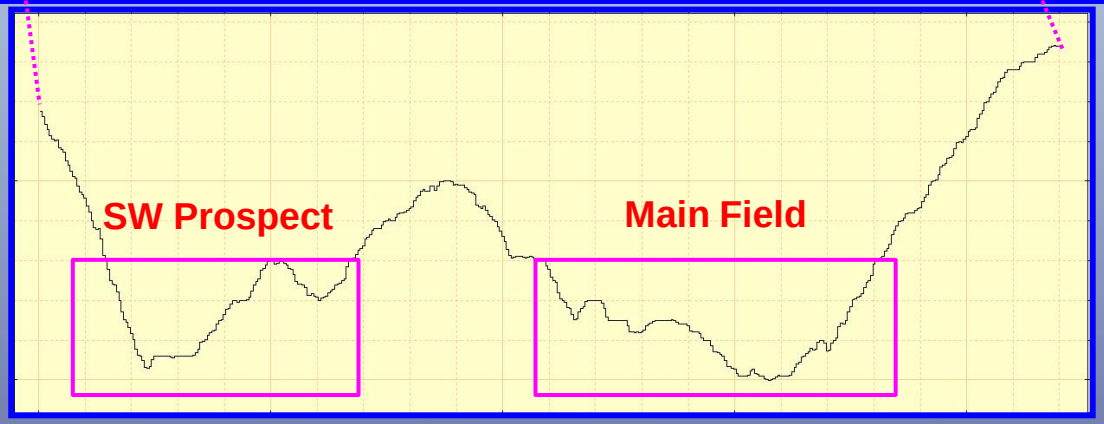
Bodalla South & SW Prospect (RBU & SW-NE Profile)

Very clear HLI features with well developed inner core areas.

SW Prospect coincides with shallower intra-Jurassic high observed on W-E seismic lines (published papers).

Best of untested Prospects in Field Area - as strong an HLI as developed over many parts of the main field area.

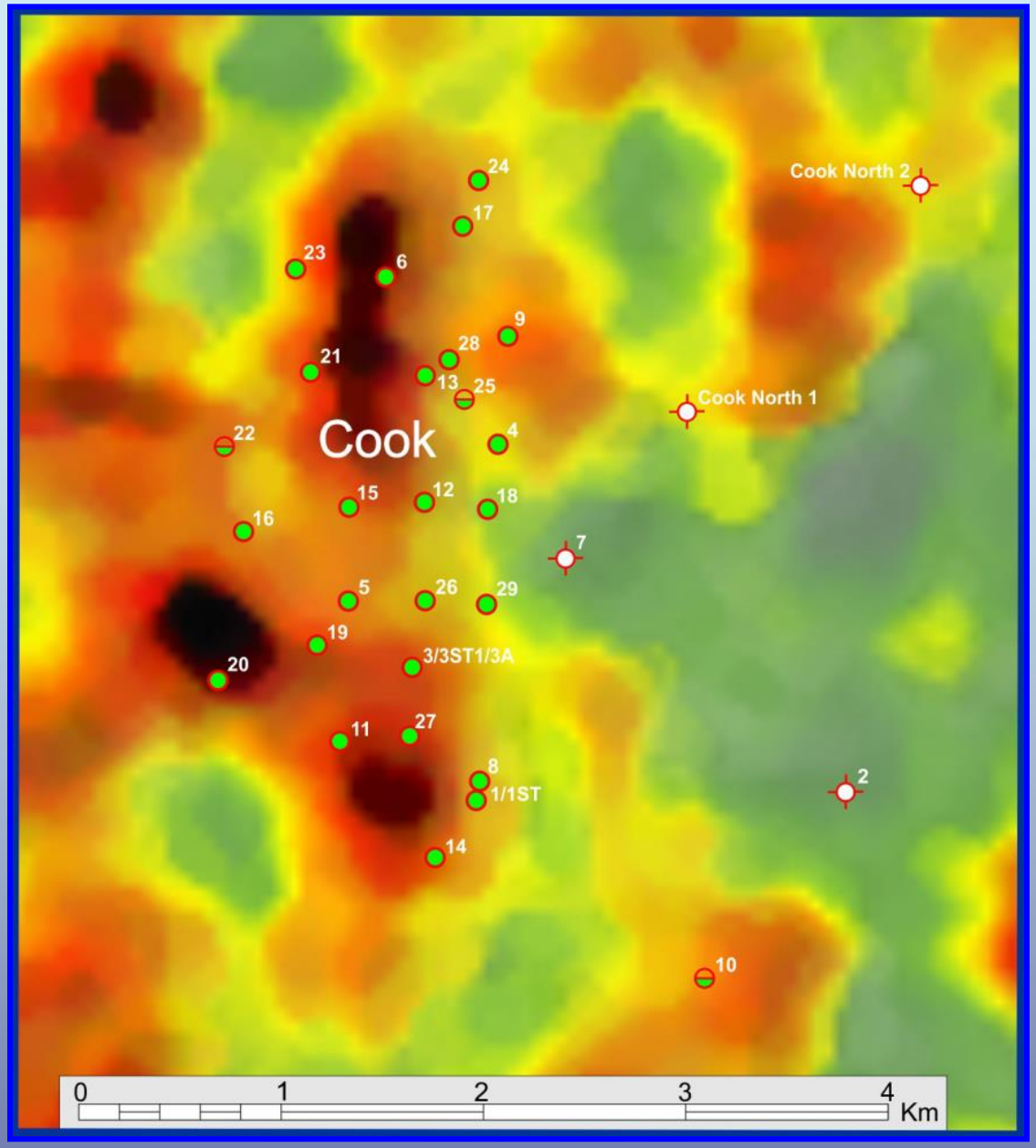




Cook (IPD)

A strong HLI response area characterises this significant field.

Significant incremental prospectivity is suggested to the west of the main field but much less to the east where LPZ non-anomalous terrains prevail apart from one lead area between the D&A Cook North #1 and #2 wells.



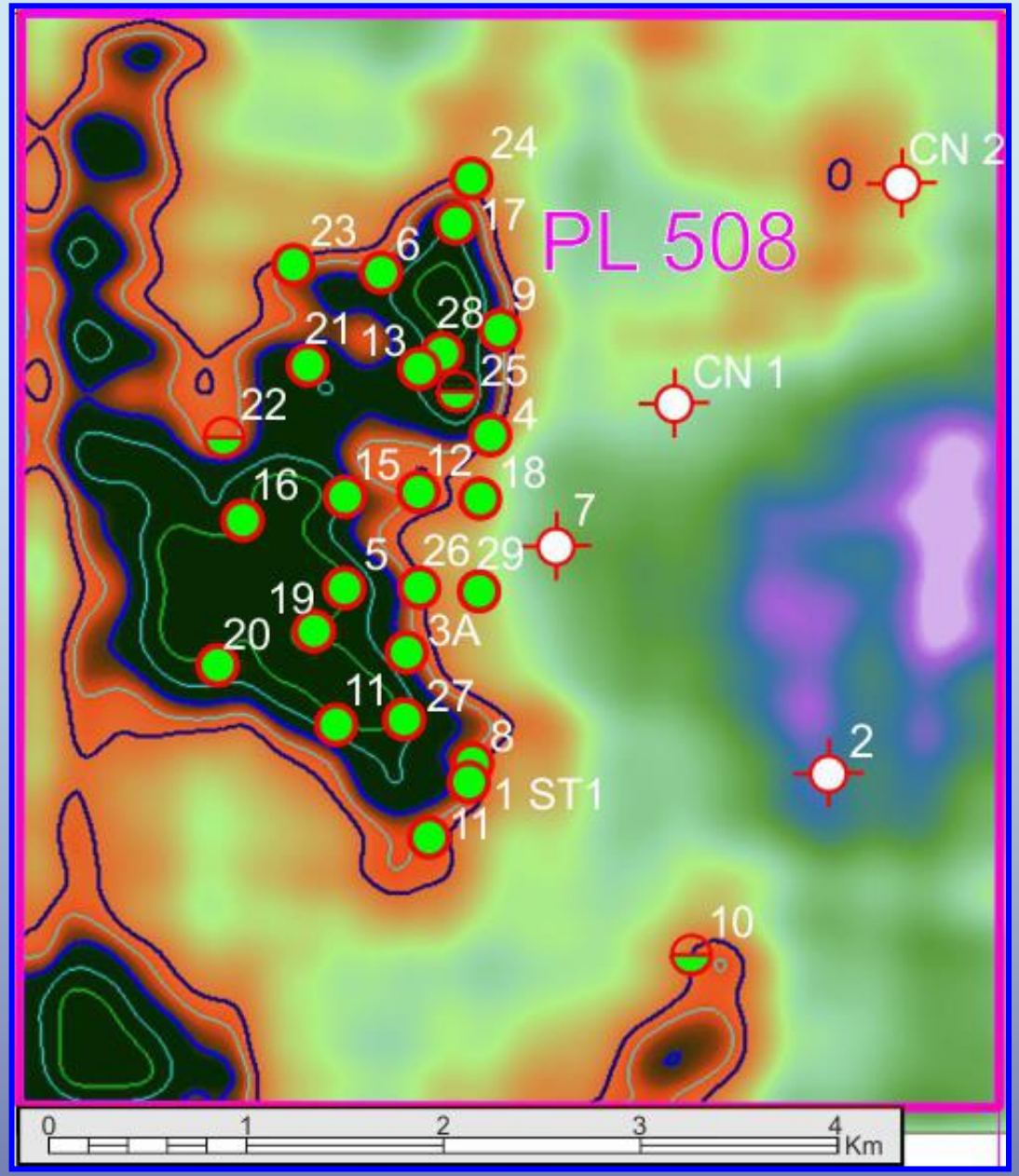
Cook (RBU)

One of the larger fields: (EUR 5+ MMBls).

RBU spectral intensity map expression of Cook Field showing the field extension outliers and some infill possibilities such as between wells #16, #19 and #20.

The elongate N-S satellite HLI at the western edge of the image appears to merit at least a one well test on one of its "culminations".

Little of interest to the east of Cook Field – essentially LPZ terrains.



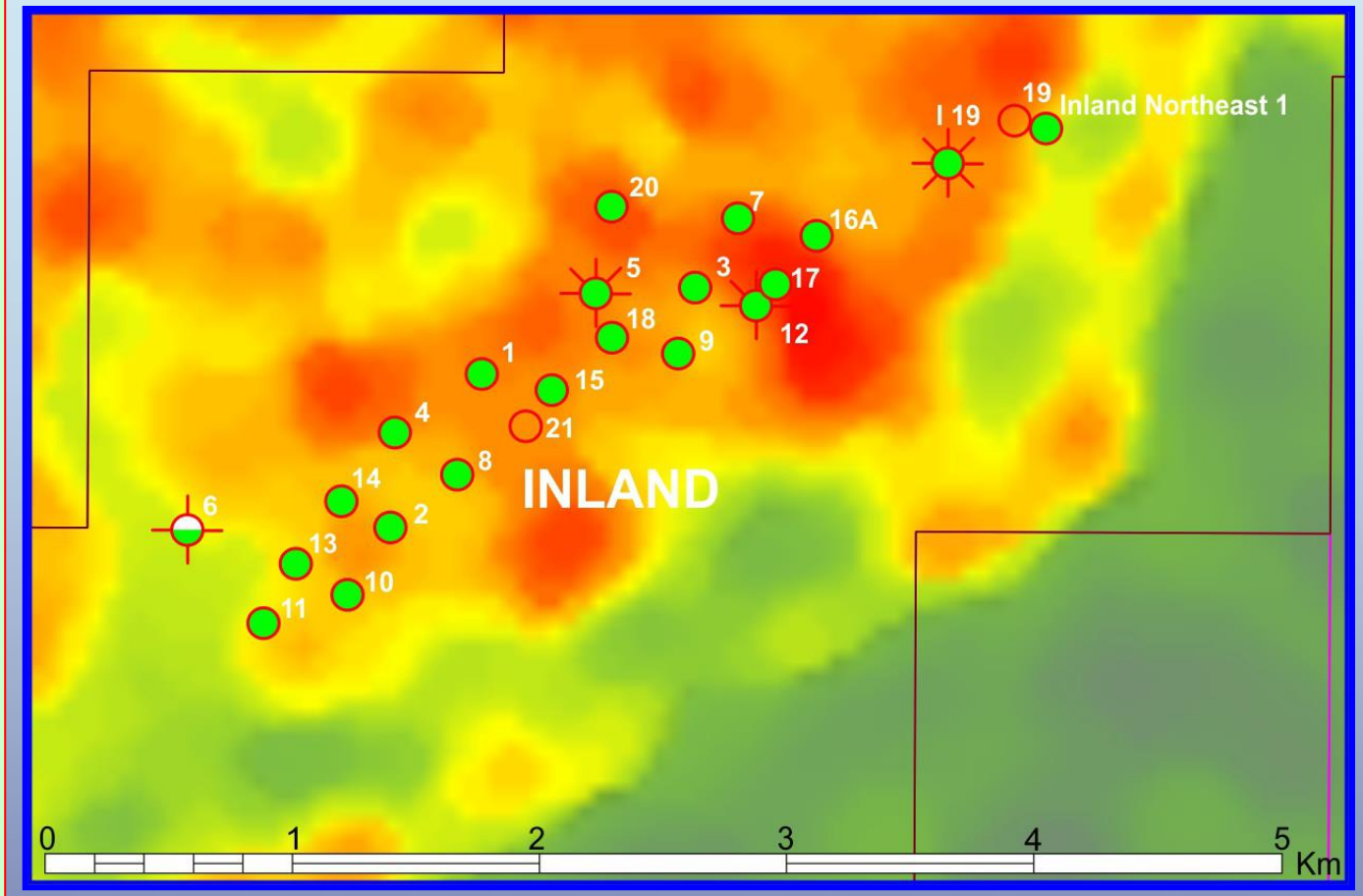
DHM in Queensland

Inland (IPD)

Broad anomalous overall HLI pattern that represents rather variably from image to image but main field area remains very similar in all.

All producers are on anomaly. No wells drilled off anomaly except #6 (D&A) on western margin.

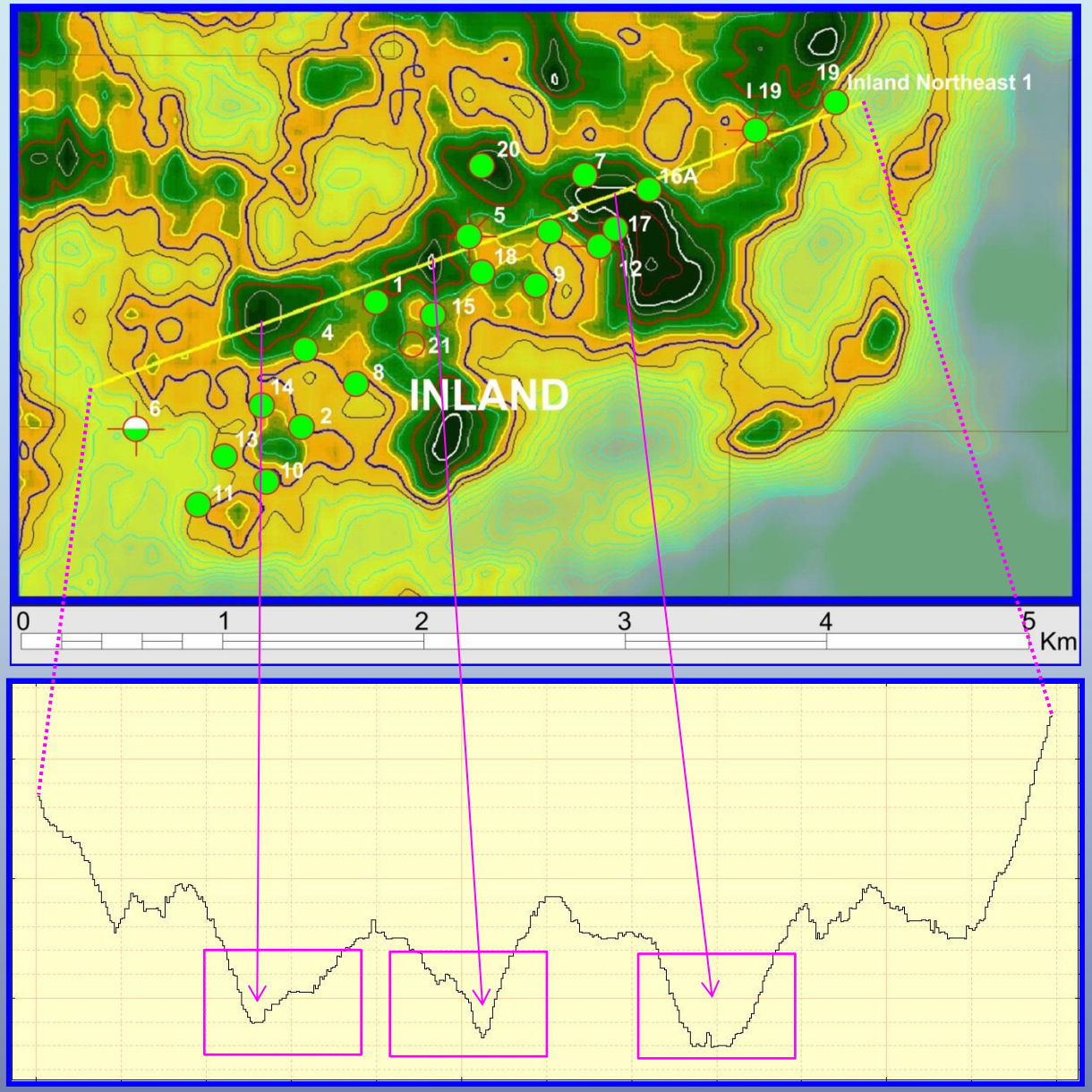
Suggestion of several not yet drilled infill / satellite pool possibilities in high intensity sub-areas –as displayed in following RBU representation.



Inland (RBU)

Several higher and lower intensity sub-areas are apparent within the main field. Not all have been drilled (magenta insets in RBU profile).

To the north of the main field area there appear to be some new leads which merit consideration versus known structure – possibly across the field bounding fault?



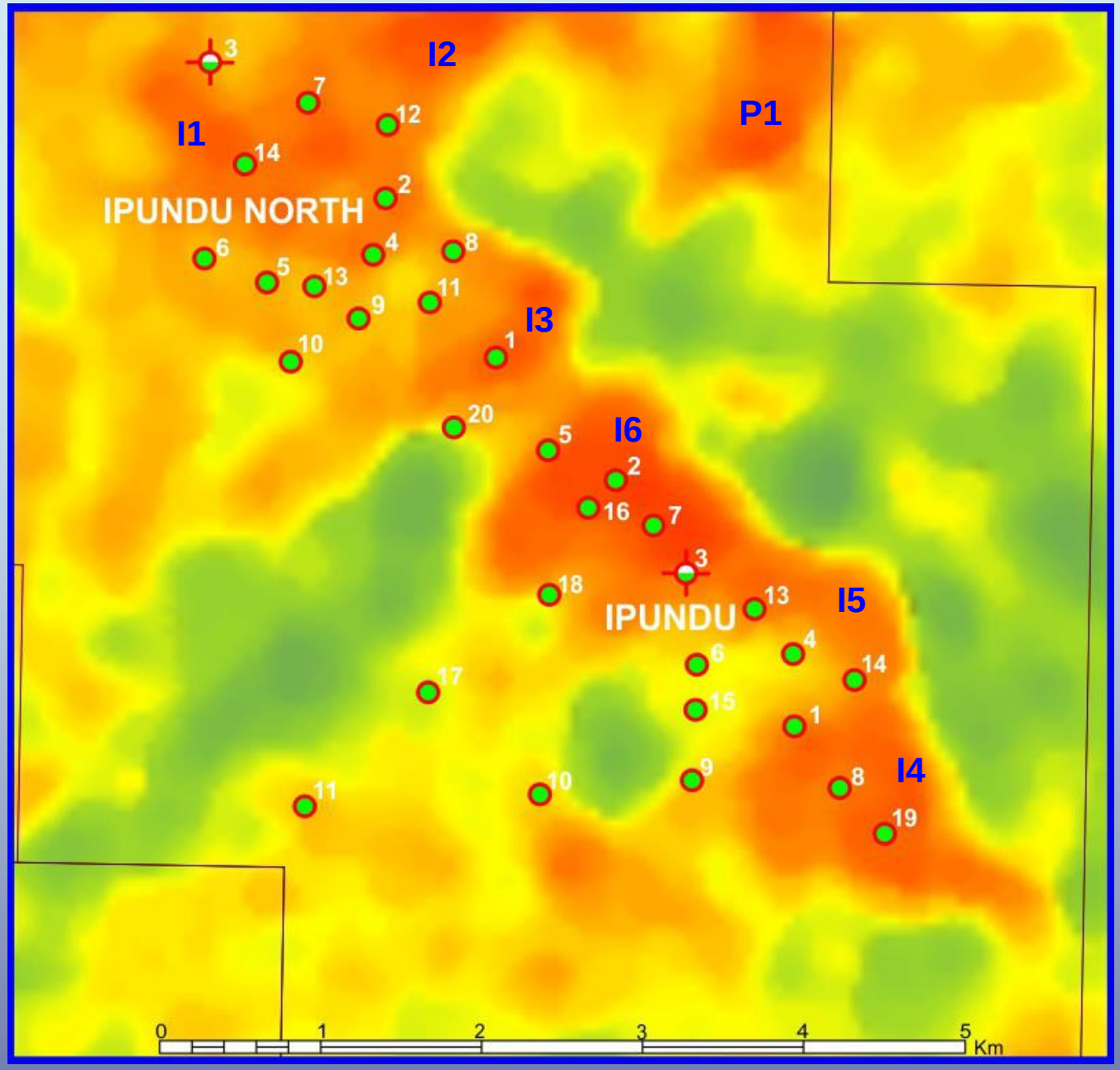
Ipundu & Ipundu North (IPD)

Good HLI response in Field Area.

No wells drilled in off-anomaly areas.

Infill locations and Satellite prospects present.

More localised details will display under RBU assessment.

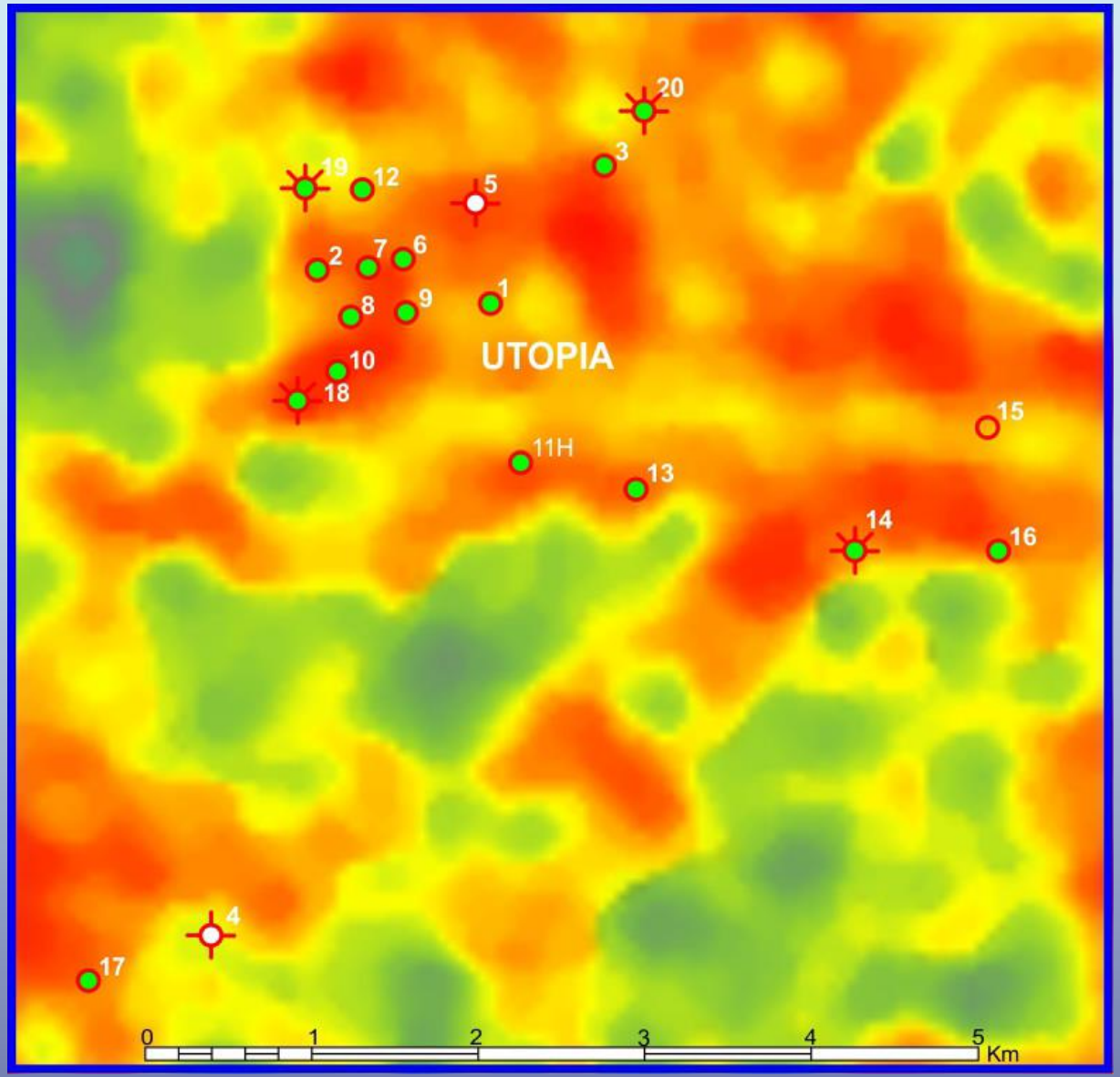


Utopia (IPD)

A rather "busy" HLI Field Area with the pattern suggesting a number of ancillary untested small pools – possibly of stratigraphic nature.

Only one D&A present "On-Anomaly" - Ut #5 which logged minor oil but produced water on test. Ut#4 drilled "Off-Anomaly" was D&A.

Other producers all "On-Anomaly"

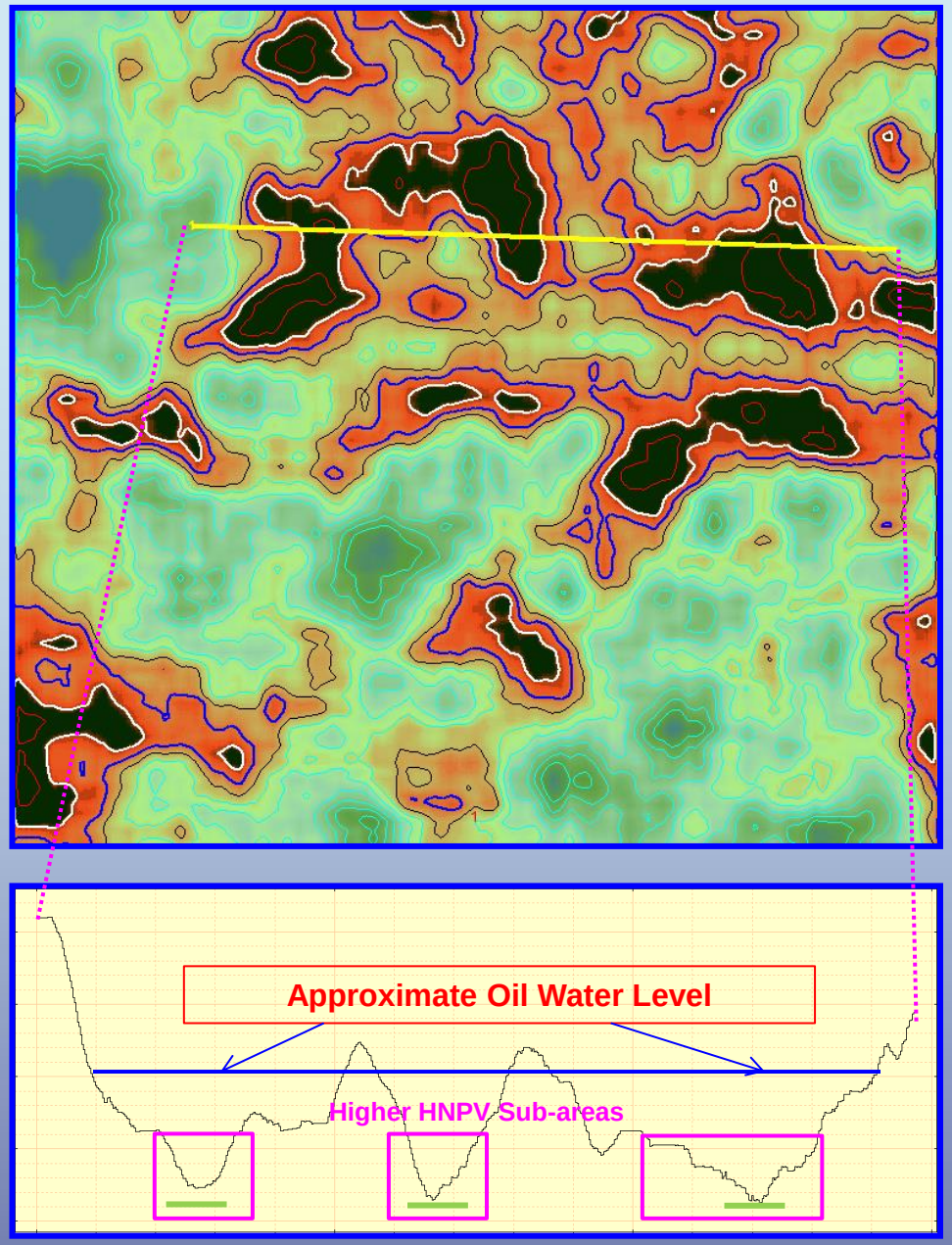


Utopia (RBU Map & X-Section Spectral Profile)

RBU mapping suggests as many as ten local sweetspots with better developed HNPV characteristics based on spectral intensity responses. Some of these remain undrilled.

W-E cross-section illustrates the mainly drilled western "core" plus two undrilled similar cores to the east of it.

This DHM suggests more resources are yet to be added and produced in Utopia.



III EXPLORATION PROSPECT GALLERY

Using the same imagery processing as in the Field Gallery, Scotforth has been building an inventory of untested Eromanga exploration prospects with equivalent quality and HLI characteristics to those of the proven fields (the "Prospect Book").

It currently stands at over 20 prospects ranging in size from as small as 2km^2 to over 30km^2. By analogy with the look-alike proven fields these features could readily offer Prospective Resources of anywhere from 1 to 25+ mm barrels.

Given a Base Case DHM Survey Effectiveness rating here of approximately 75%[5] the top ranking features have pre-drill Probabilities of Discovery of similar order if wells are located optimally.

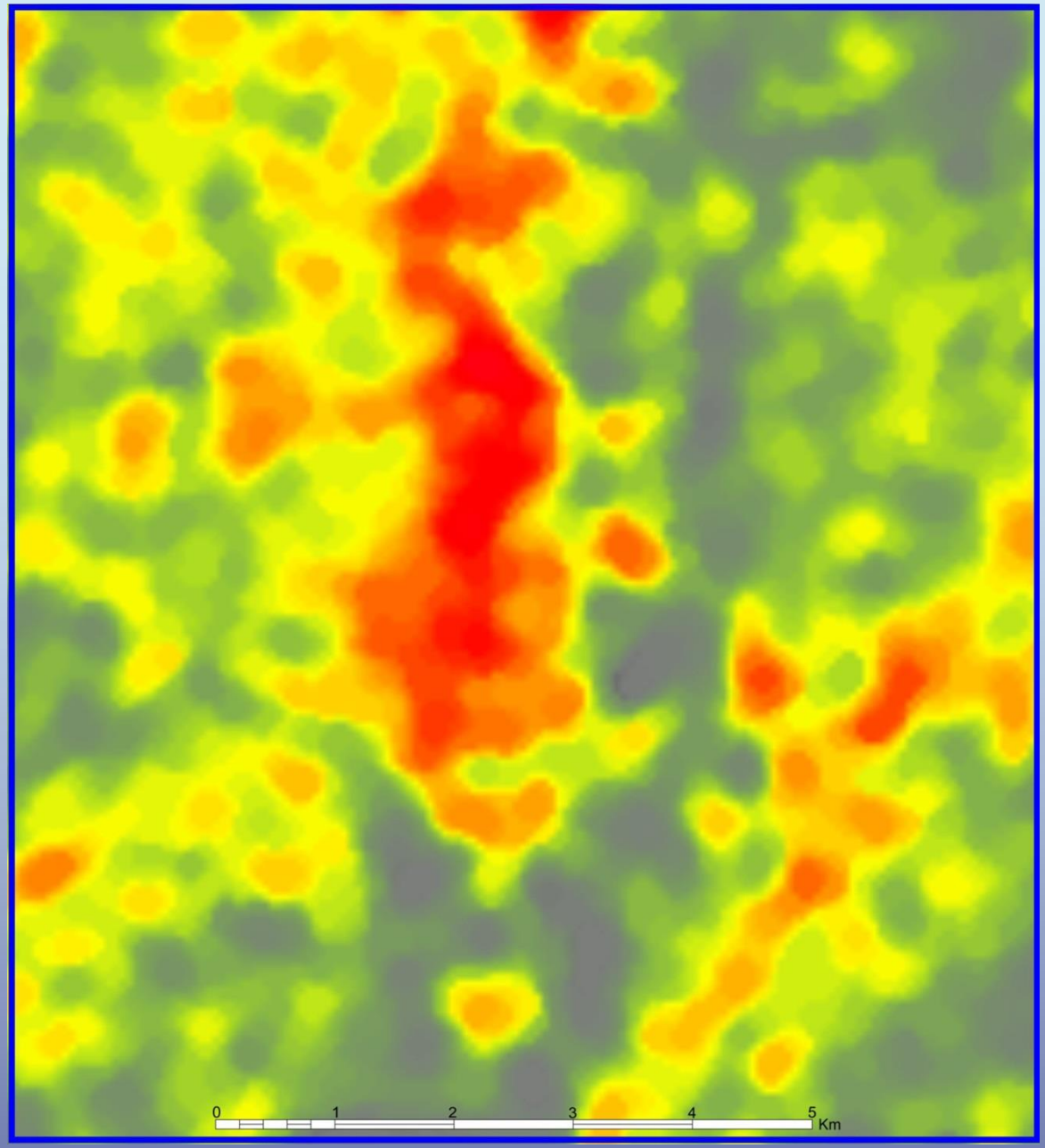
The following exploration prospect example illustrates just one of the many Prospect Book members – in addition to near field satellite prospects, such as already displayed at Bodalla SW (P1).

New Prospect (IPD)

Intense, elongated, untested HLI surrounded by non-anomalous terrains.

Measures approximately 5 x 2kms.

Being undrilled its gross area limits / calibration is uncontrolled but RBU definition gives some guidance and form indication as to "closing contour" limits (next slide) which should approximate to high HNPV (Hydrocarbon Net Pore Volume) trap area.



DHM in Queensland

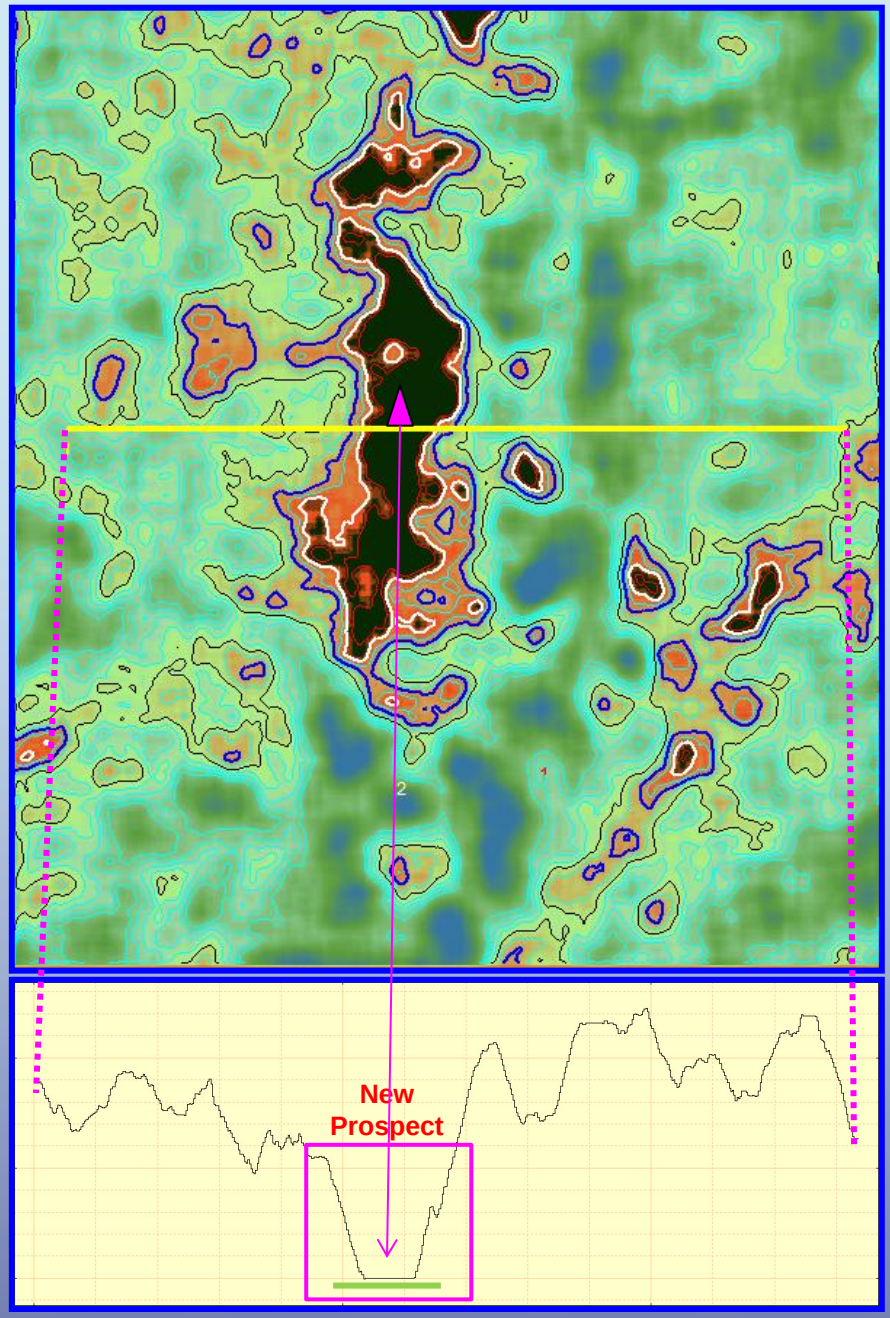
New Prospect (RBU & Spectral X-Section Profile)

High intensity HLI with very clean, highly differentiated inner core area, the preferred location (▲) for a first exploration well test.

Gross trap area is likely to be within the green/ black HLI and highest HNPV sub-areas within the black innner core.

Total prospect size is large enough to be 25-50 million barrels recoverable.

Just one of many emerging new prospects and leads in the Reconnaissance Area awaiting exploration progression.



DHM in Queensland

IV FUTURE PETROLEUM EXPECTATIONS

This DHM Reconnaissance suggests that the ultimate conventional hydrocarbon potential of the CEB in Queensland is considerably greater than currently / conventionally perceived, at least in some sub-areas, given the size of the Prospect Book observed in just 10% of the whole basin examined so far. A further Yet to Find of 100-250+ million barrels of recoverable oil in new "fields of the future" seems plausible.

As with DHM investigated basins in other countries, a concerted exploration campaign deploying the best of HLI and CLI (conventional exploration) surveys can optimally achieve this success on an accelerated, lower cost basis. Scotforth suggests that:

- **Extensive area-wide 3D surveying is not necessary and does not necessarily discern high versus low discovery probability prospects**
- **The DHM Prospect Book can be used to develop low risk total prospect inventory portfolios and rank individual prospects by expected size and success probability**
- **The Best of DHM prospects supported by local area 3-D seismic can lead to optimal exploration and appraisal drilling programs – both for maximum success and for early high net pay / high deliverability results.**
- **This new integrated exploration approach can increase industry's success performance in Queensland by delivering:**
    - **New Prospect Discovery rates of 70 to 80% (HLI + CLI combined)**
    - **More effective appraisal and early field mapping.**

V COMMERCIAL ENGAGEMENT

Scotforth is now ready to engage with new clients, partners and allies in Queensland to create this enhanced success. It offers three product levels:

Product Level I - **IPD[5] Maps of the Field Areas (Gross Area Patterns)**

Product Level II - **RBU[6] Maps and Example Spectral Cross Section Profiles of the Field Areas (Key Findings)**

Product Level III - **DHM Prospectivity Reports of the Field Area(s) including Individual Field and Prospect Area High Resolution Maps (IPDs and RBUs) and Prospect / Field Infill / Extension Inventories (Comprehensive Petroleum Resource Opportunities).**

Additionally we are able to offer (as we do globally) bespoke acreage specific DHM Surveys of clients' leases and exploration licences.

We will be pleased to discuss these Queensland DHM exploration and petroleum resource development possibilities on a client by client basis, providing commercial terms that are attractive to both parties for either existing programme activities and/or new pursuit of ventures.

Please contact us to discuss how we can make this happen: opportunities@scotforth.com

Footnotes /Glossary

1. **DHM** Direct Hydrocarbon Mapping based on Scotforth's proprietary "Remote Sensing Direct Detection of Hydrocarbons" ("RSDD-H") processing od satellite images, considered to provide detectable surface spectral patterns (footprints) of trapped subsurface hydrocarbons.

2. **HLIs** Spectral Hydrocarbon Lead Indicator anomalies observed on RSDD-H based imagery

3. **CLIs** Conventional exploration G&G prospectivity lead indicators

4. **December 2017 Technical Brief**

   News article on the Western Flank, Eromanga Basin, South Australia oil play.

5. **IPD** Iso-photo Density Display form of HLIs

6. **RBU** Relative Brightness Unit Display of HLIs – measured and contoured.