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Petroleum Exploration (& Appraisal) Year in Review 2022

APPEA Conference 2023

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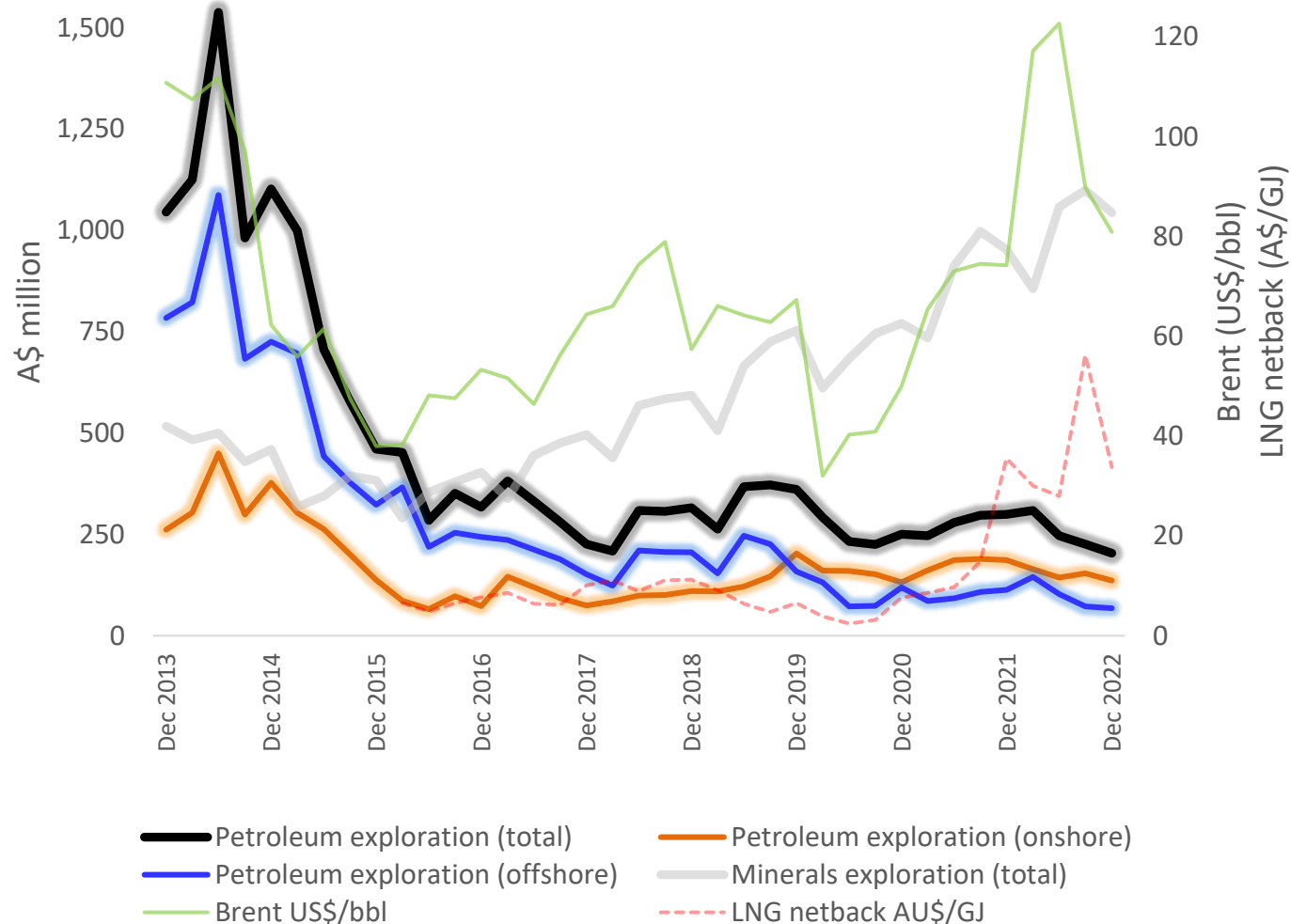
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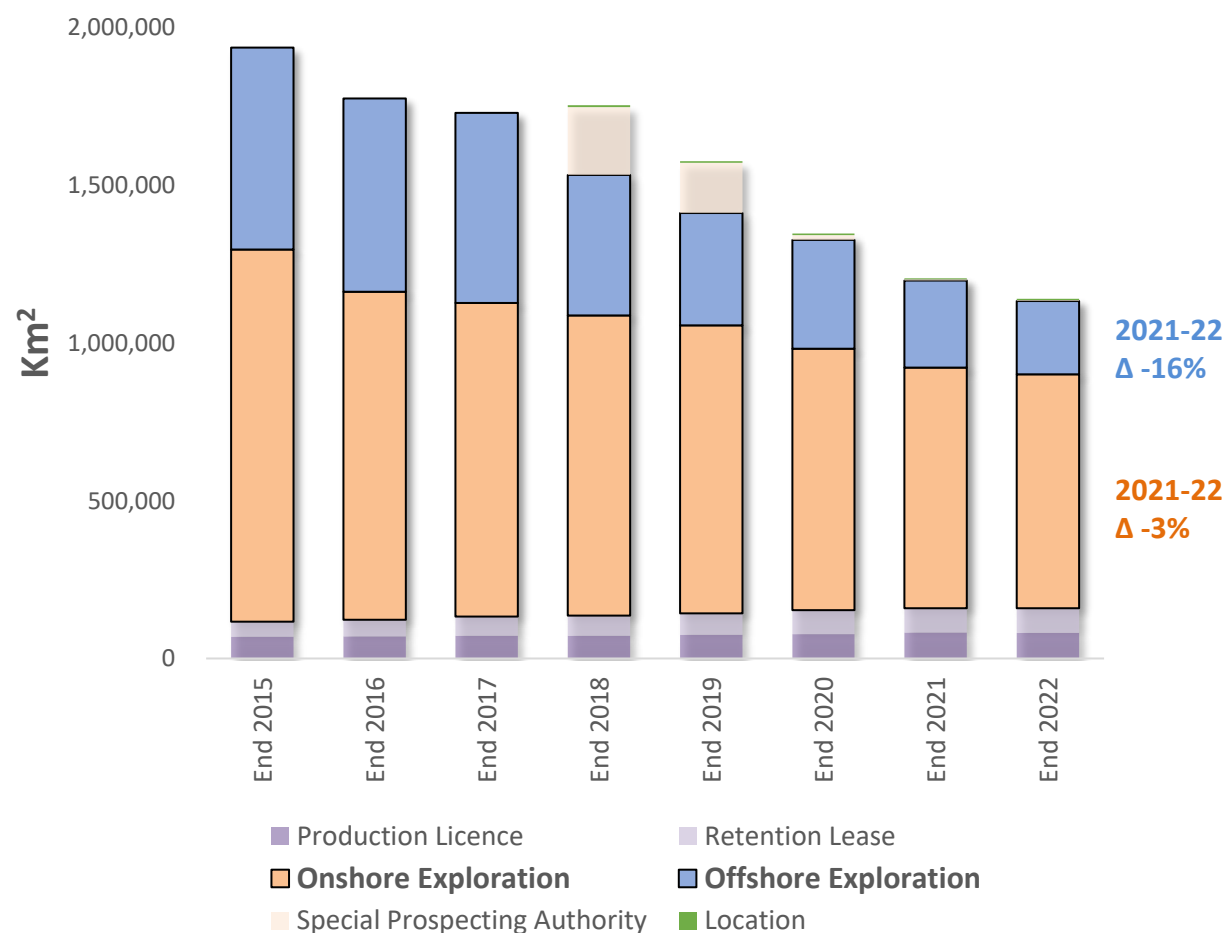
- Petroleum exploration spend *trends and observations*
- Petroleum titles..... *trends and observations*
- Summary of exploration acreage releases and permits awarded
- Summary of exploration transactions & farmins
- Summary of exploration & appraisal activity – wells and surveys
- Key exploration and appraisal well summaries
- Exploration wells planned 2023+
- Summary, key take-aways & acknowledgements

Petroleum Exploration Spend



- **Petroleum exploration spend is decreasing**
- Petroleum exploration spend for 2022 A\$984 million in total (-12% from 2021)
 - Onshore exploration spend A\$597 million, down 17% from 2021
 - Offshore exploration spend A\$387 million, down 3% from 2021
- For comparison, minerals exploration spend for 2022 was over A\$4 billion
- **Onshore exploration spend has been greater than offshore spend since late-2019**
- **Petroleum exploration spend is de-linked from commodity prices (oil price and LNG netback)**

Area under Petroleum Title (Federal and State jurisdictions)



- The only things going up are production licenses and retention licenses.
- 14 Australian Federal offshore exploration permit titles surrendered in 2022

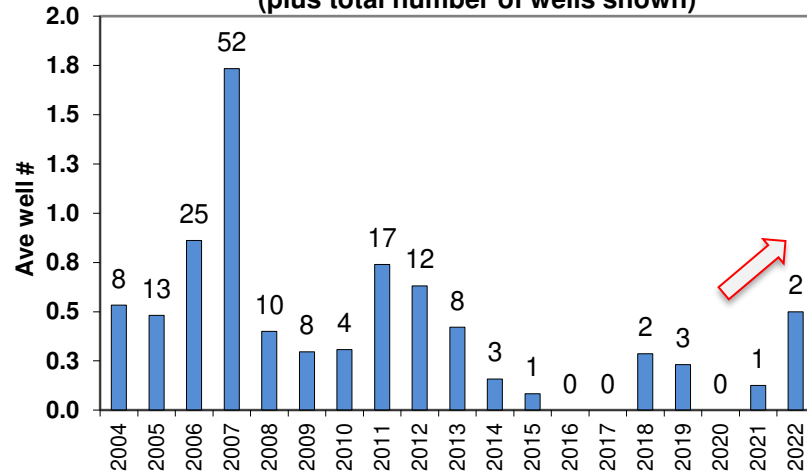
Over the past 7-years:

- Area under production license has grown 18%, on average 3% per annum
- Area under retention lease has grown 63%, on average 9% per annum
- Area under exploration license has decreased 46%
 - -37% onshore, on average -5% per annum
 - -64% offshore, on average -9% per annum
- Offshore exploration licenses represented 38% of the total in 2017 declining ever since to 24% in 2022

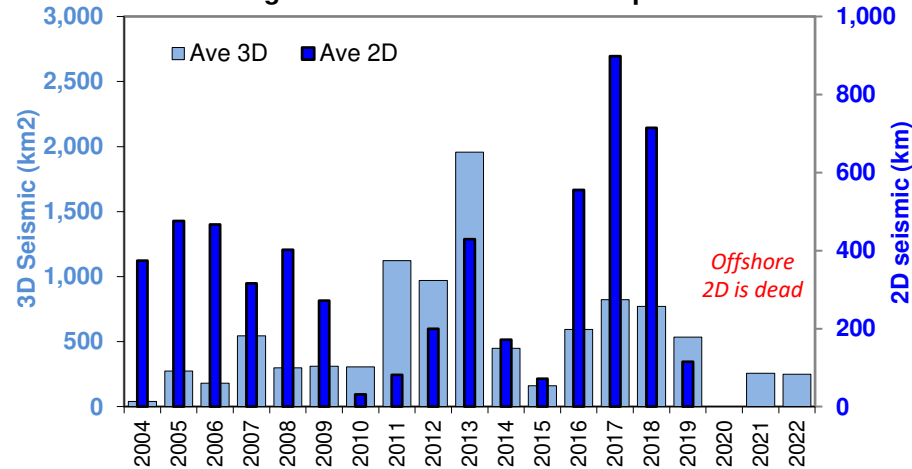
Federal Offshore Petroleum Release Round Bids & Awards



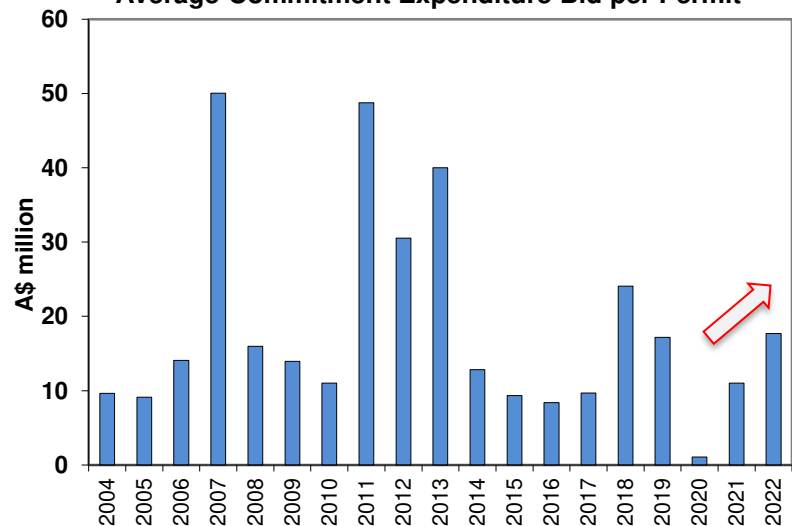
Average Commitment Wells Bid per Permit
(plus total number of wells shown)



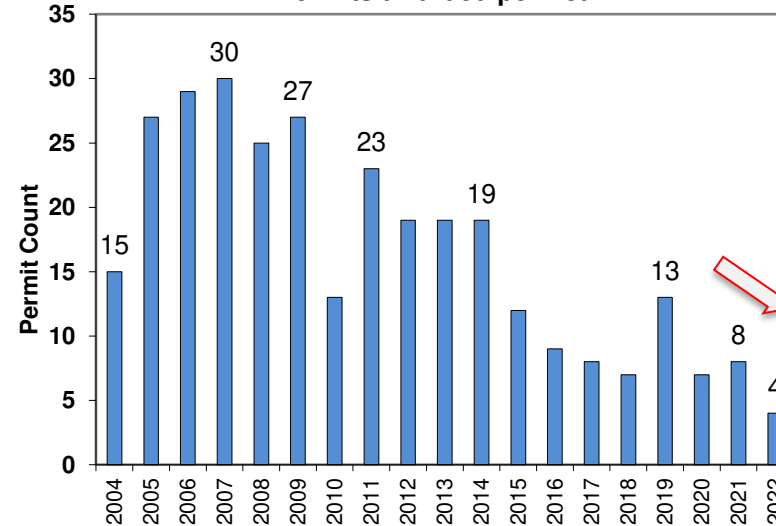
Average Seismic Commitment Bid per Permit



Average Commitment Expenditure Bid per Permit



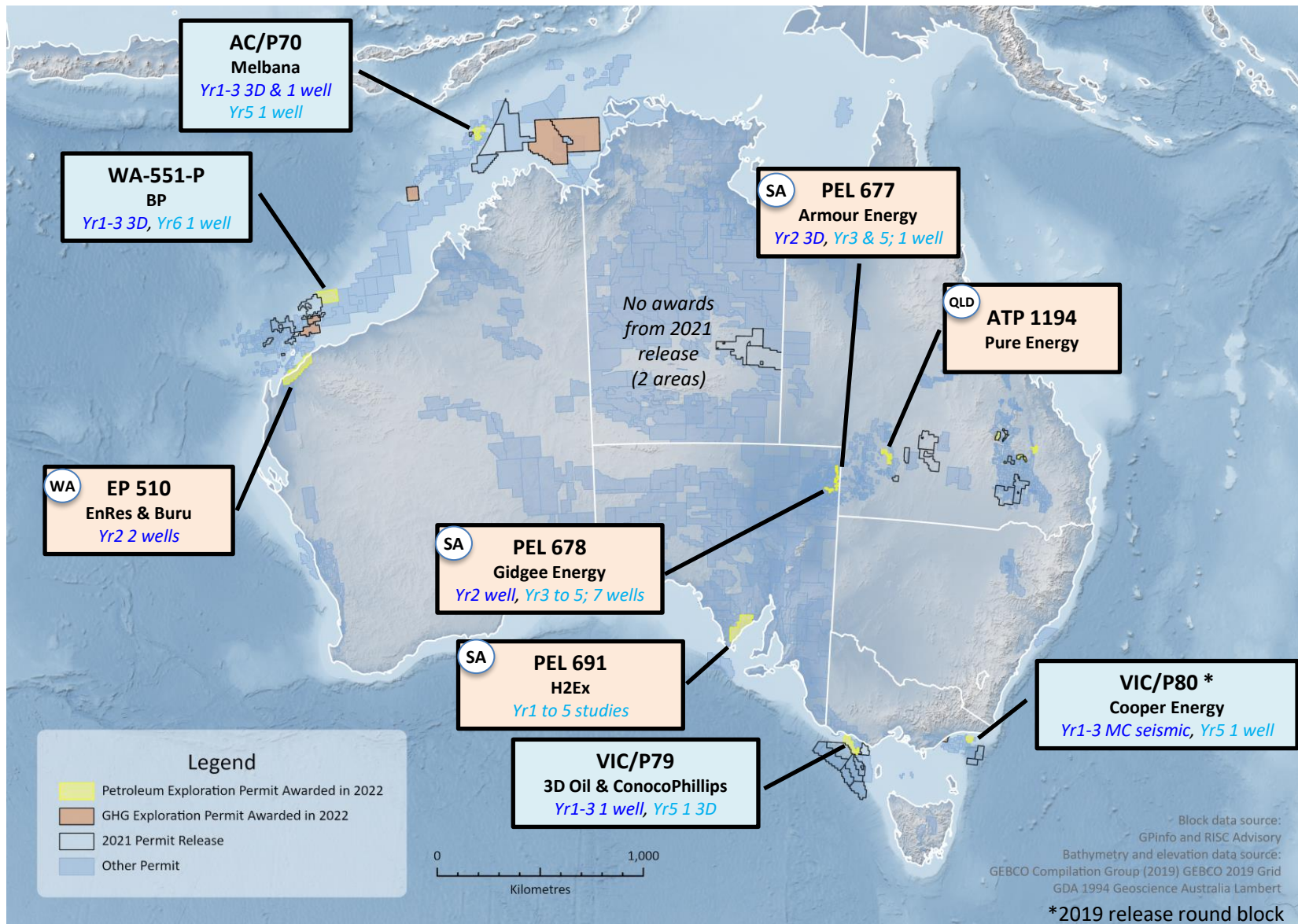
Permits awarded per Year



In 2022.....

- **4 Federal offshore exploration permits awarded**
- **2 firm wells** in guaranteed work program (Yrs 1-3)
- 1,000 km² of firm 3D
- A\$71 million in total firm expenditure ('guaranteed work program', Yrs 1-3)
- Discretionary (and negotiable) secondary term spend A\$116 million
- 2 awards in Otway, 1 award in Beagle and 1 in the Vulcan
- **1 award from 2019 release round (bids closed March 2020)**
- 3 awards from 2020 release round (bids closed June 2021)
- 3 awards to small cap ASX listed entities, 1 to a super-major (BP)
- **No awards yet in 2023**

2022 Petroleum Exploration Permit Awards



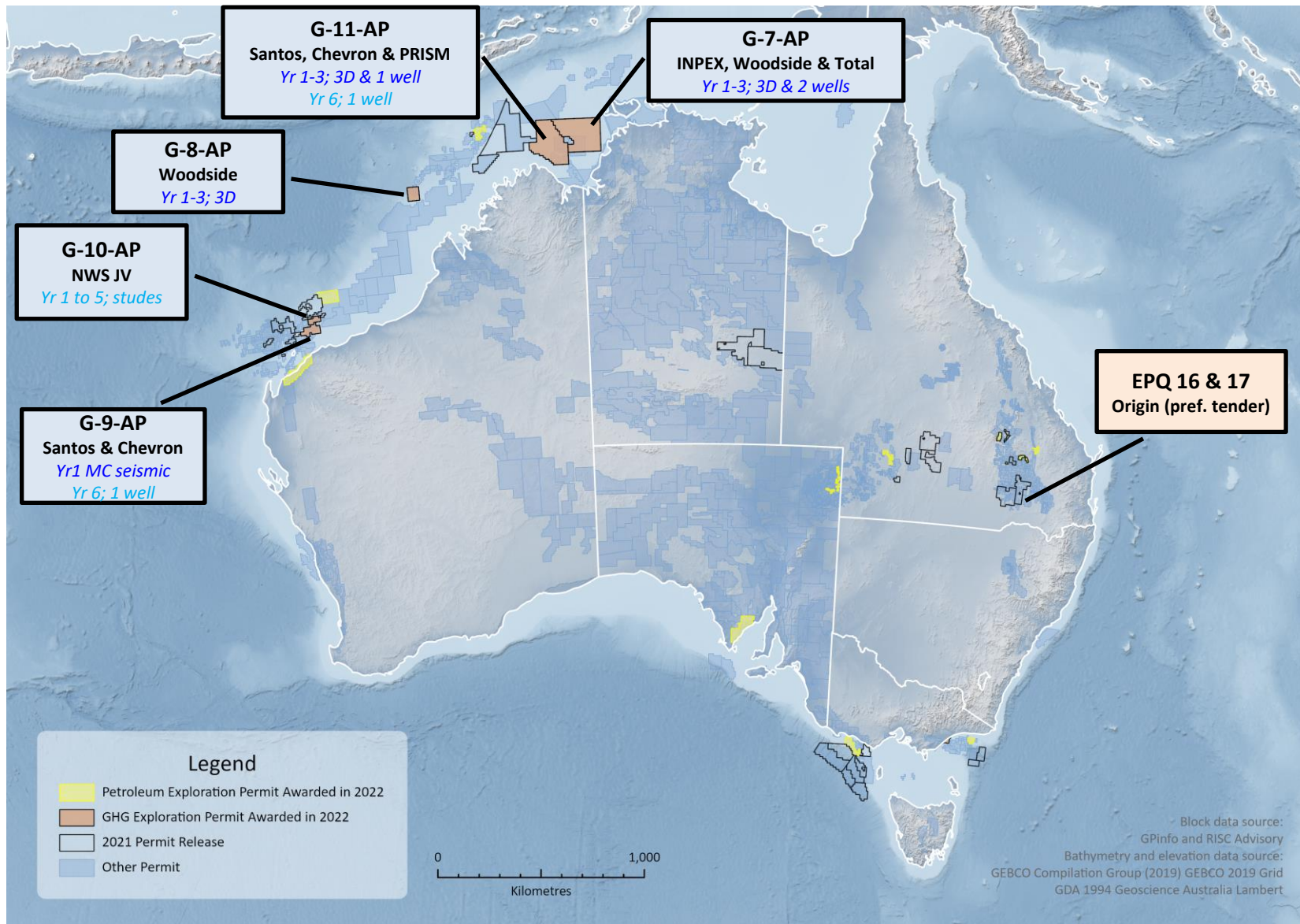
Australian Federal Offshore Petroleum Exploration Permits

- 4 awards
- 3 from 2020 round & 1 from 2019 round
- No awards for 2021 round (closed 3 March 2022)**

State Jurisdiction Petroleum Exploration Permits (onshore)

- WA 1 permit
- SA 3 permits
- QLD 5 permits
4 being CSG exploration permits, 1 with domestic supply obligations (AMSC)

2022 GHG Assessment Permit Awards



Australian Federal Offshore Greenhouse Gas Storage (GHG) Acreage Awards

- 5 permit awards
(from 5 2021 release areas)

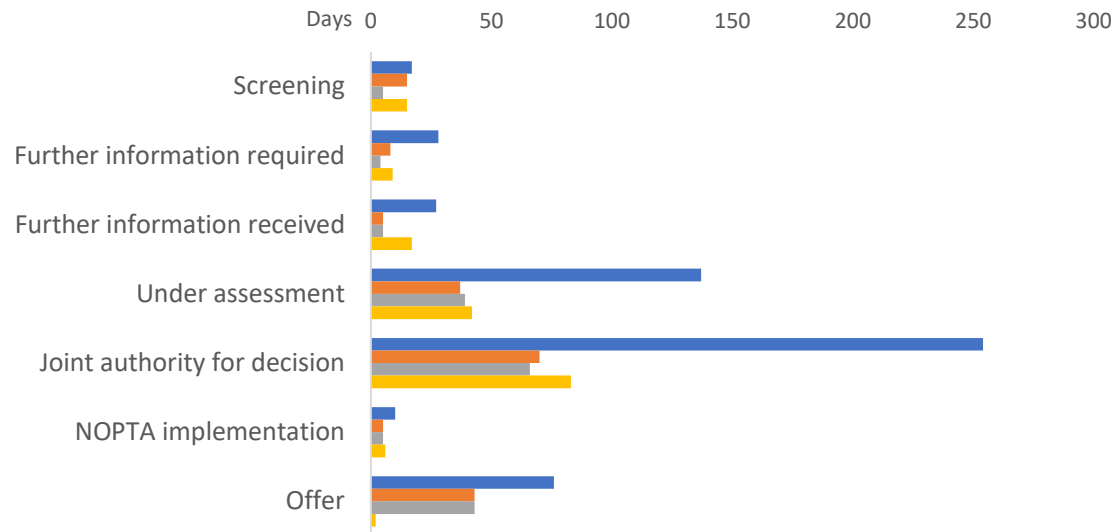
State Jurisdiction GHG Exploration Permits

- SA; 1 permit awarded, GSEL 759 (3D Oil, over Caroline-1 well)
- SA; 13 areas with 'preferred tender' status under consideration, and subject to native title negotiation
- QLD; 2 permits 'preferred tender' status from 2021 release round, and subject to native title negotiation

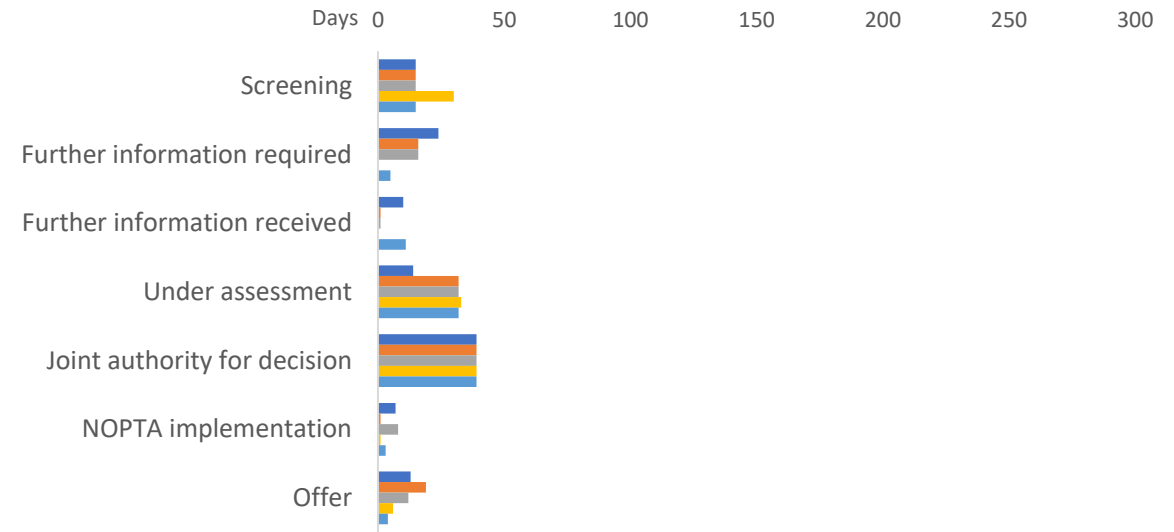
Federal Offshore Petroleum vs GHG Permit Awards



Petroleum exploration permit awards 2022



GHG assessment permit awards 2022

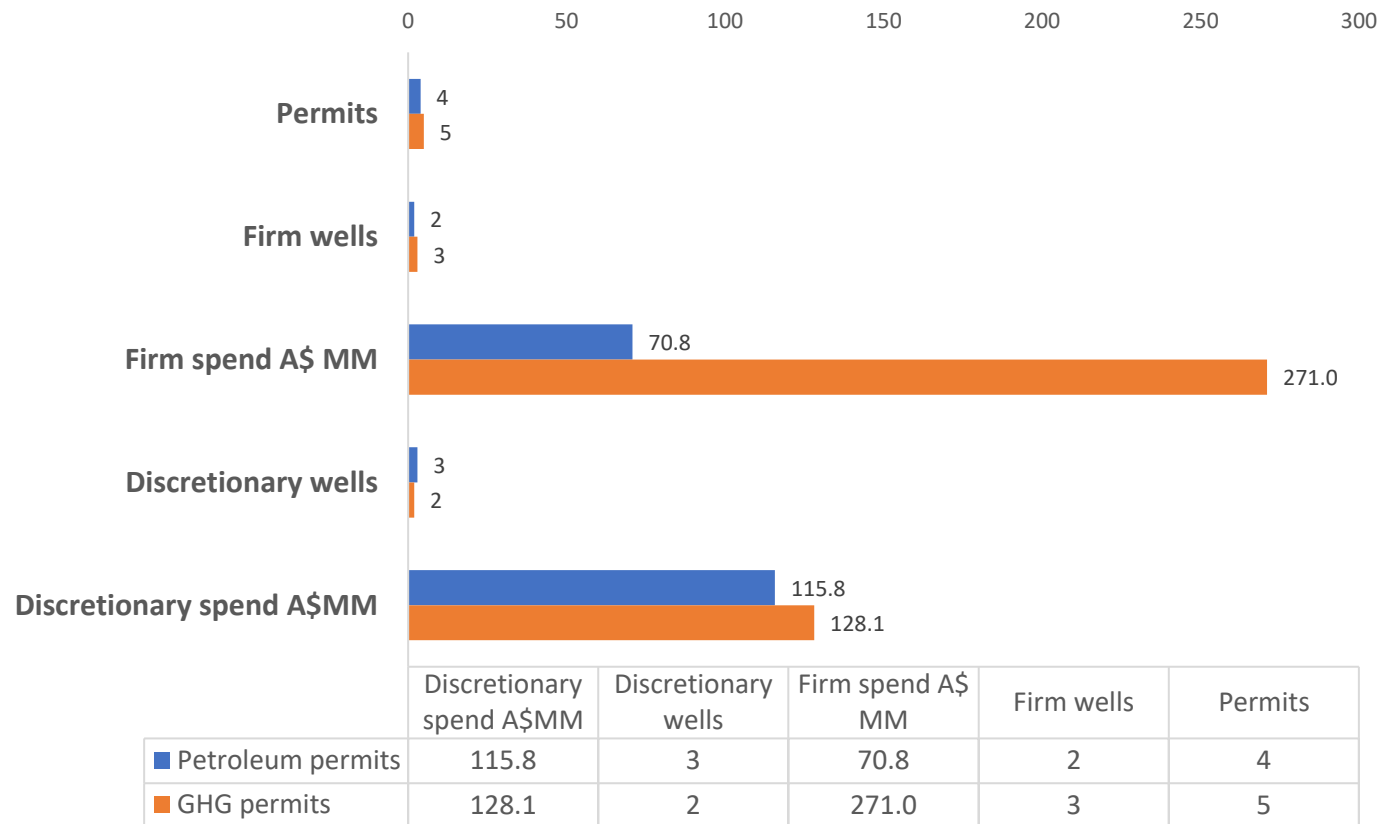


- Time taken for evaluation/decision/award differs between petroleum exploration and GHG assessment permits.
- Note time taken for Joint Authority to approve award of VIC/P80 (2019 release round block)
- No awards from for 2021 petroleum release round (closed 3 March 2022)**

Federal Offshore Petroleum vs GHG Permit Awards

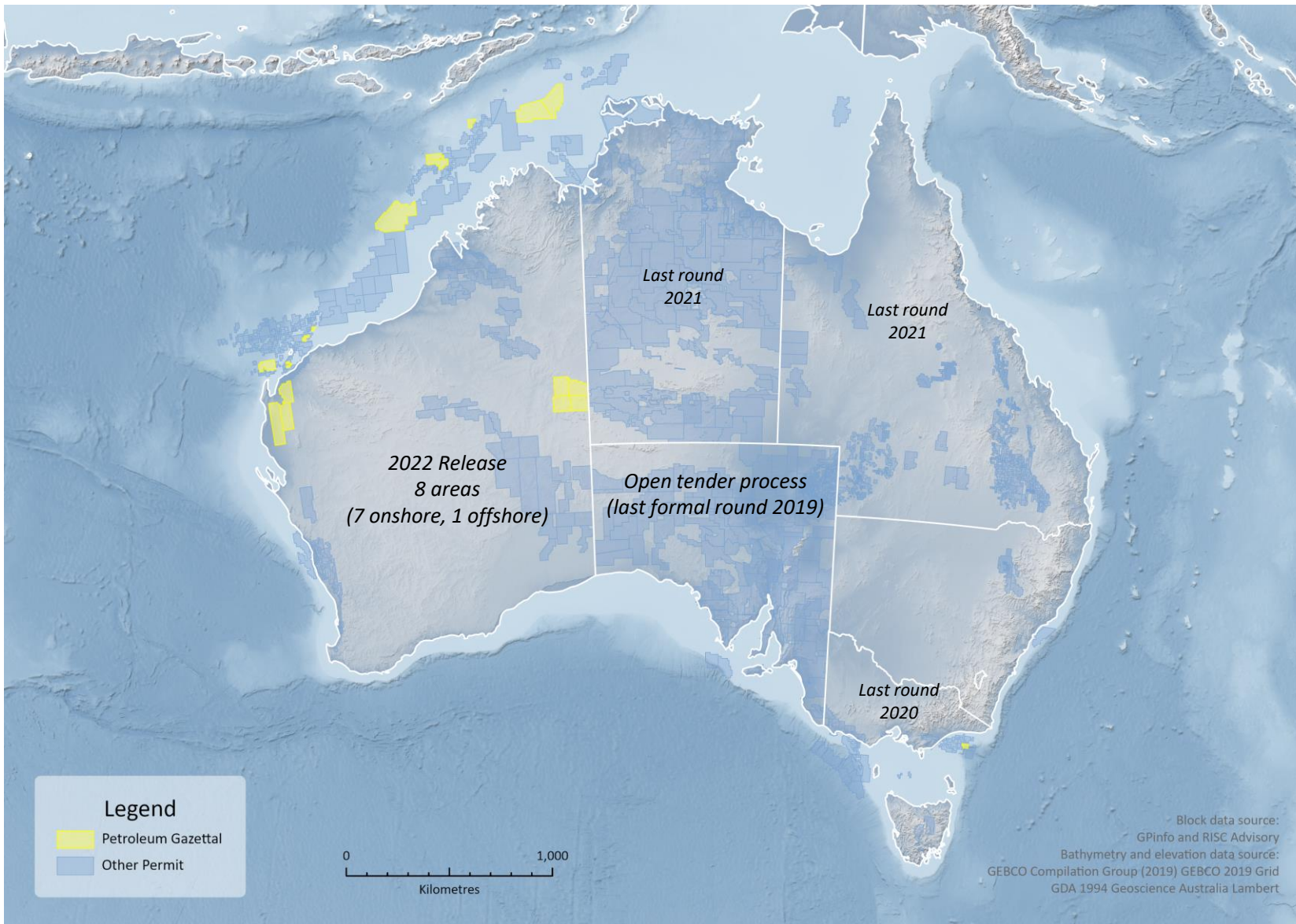


Petroleum exploration vs GHG assessment permits
(awarded 2022)



- **Work program associated with GHG Assessment permits dwarfs petroleum exploration work program**
- **Average firm spend (Years 1-3)**
 - A\$17.7 million for petroleum permits
 - A\$54.2 million for GHG permits
- **GHG permits dominated by majors**
 - Woodside, Chevron, INPEX, Total *as opposed to*
 - Petroleum exploration permits (Cooper Energy, Melbana, 3D Oil & BP)

2022 Acreage Releases



Federal Offshore Petroleum Release Round

- 10 areas (21 in 2021 & 42 in 2020)
- Release delayed due to Federal election (August instead of June)
- Bids due 2 March 2023

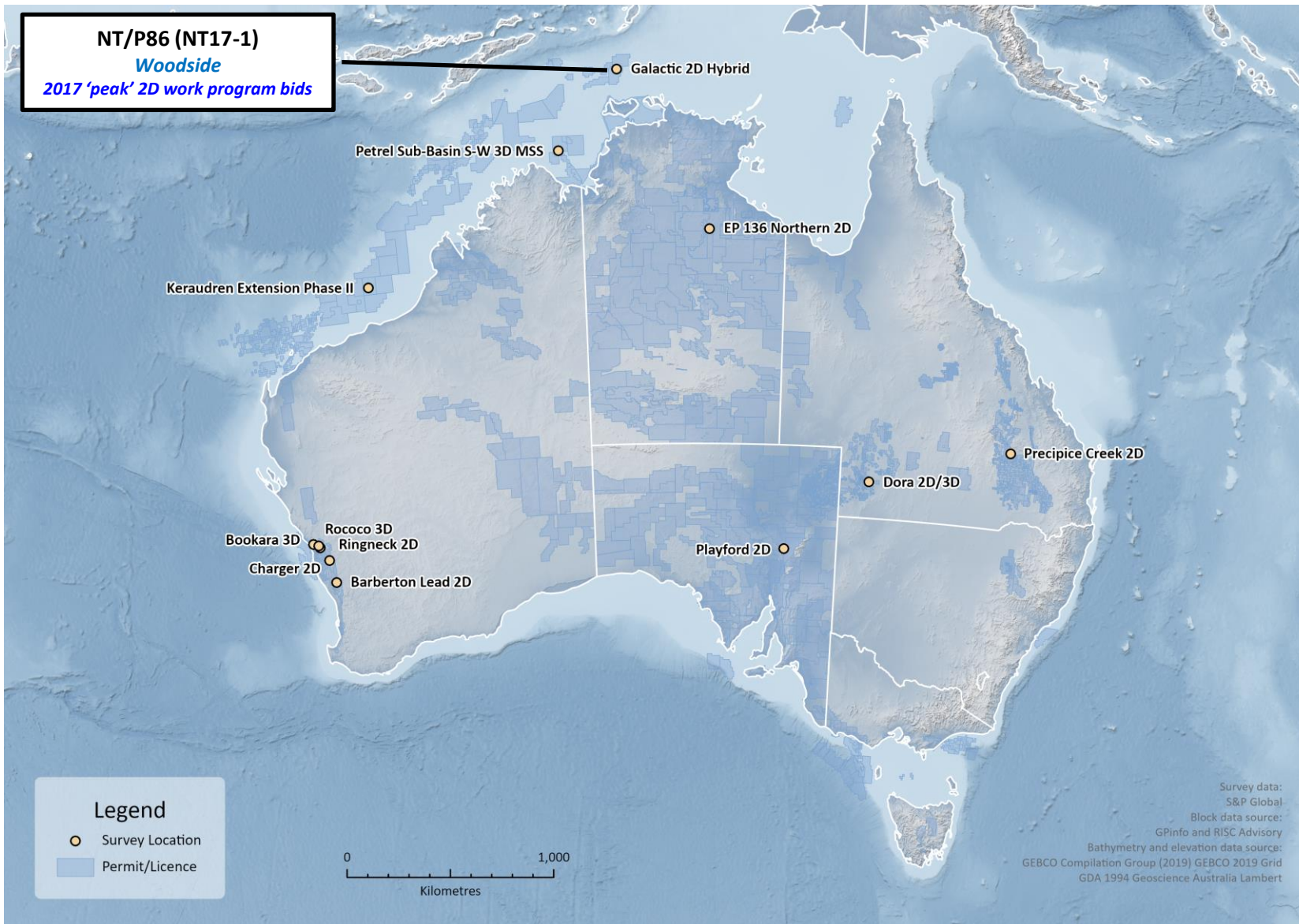
Western Australia Petroleum Release Round

- 7 onshore areas, 1 offshore area (territorial waters)
- Released March and closed June 2022
- 7 bids received
- 'Preferred bidder' announced on 4 areas (subject to native title negotiation)

Federal Offshore Greenhouse Gas Storage Acreage Release

- Nominations for areas closed July 2022 but.....
- Release round was not announced in December as expected

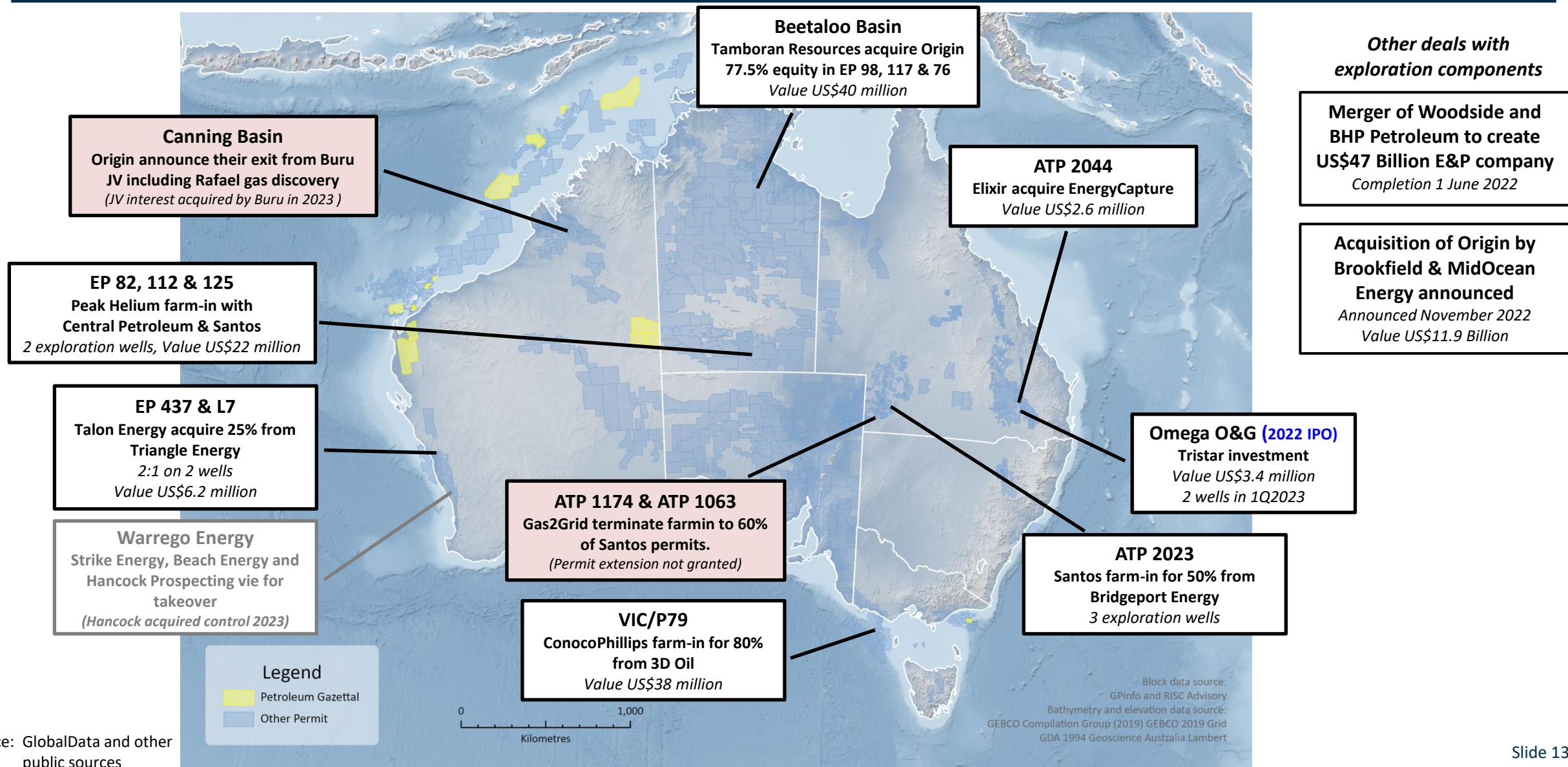
Seismic Surveys Acquired 2022



	2022	2021	% Change
Total 2D (km)	4,819	1,460	
2D onshore	707	1,460	48% ↓
2D offshore	4,112	0	100% ↑
Total 3D (km2)	2,384	7,060	
3D onshore	727	280	260% ↑
3D offshore	1,657	6,780	24% ↓

- Only offshore 2D acquired in the Woodside operated NT/P86 exploration permit, Timor Sea. (2017 release, 2019 award)
- Santos acquired Keraudren 3D extension Phase II in Bedout Sub-basin (Dorado hub area)
- Significant 2D & 3D acquisition in the onshore Northern Perth Basin**

Exploration Deals 2022



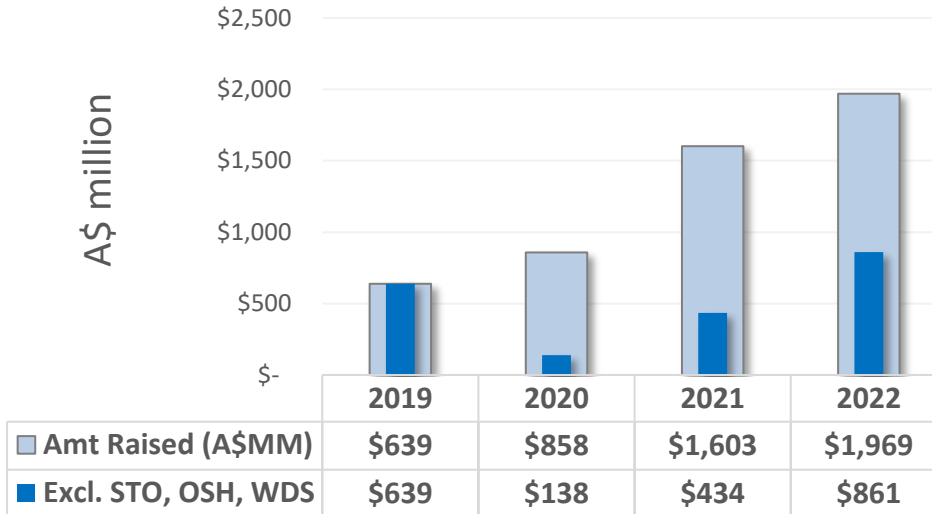
Source: GlobalData and other public sources

ASX IPO's and Capital Raisings



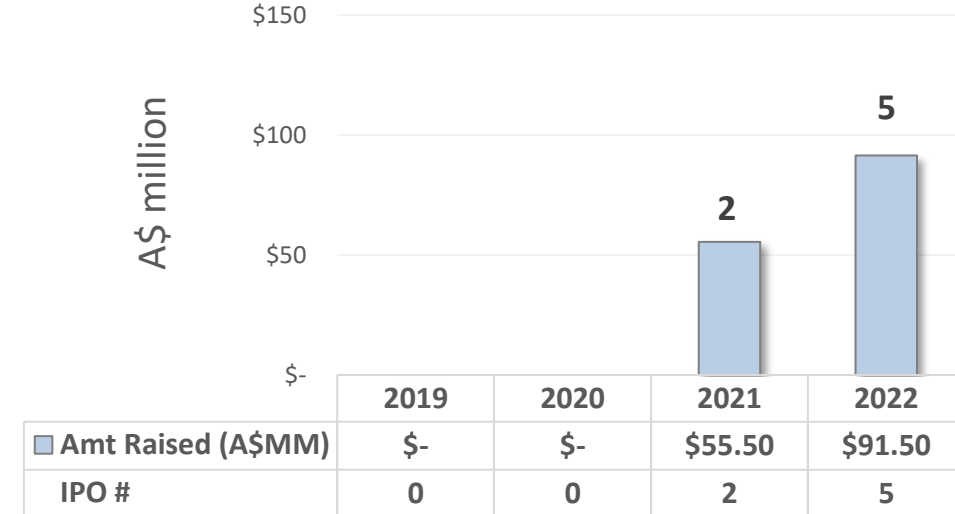
Litmus tests for the health of the O&G exploration industry

IPO's, Capital Raises and Rights Issues



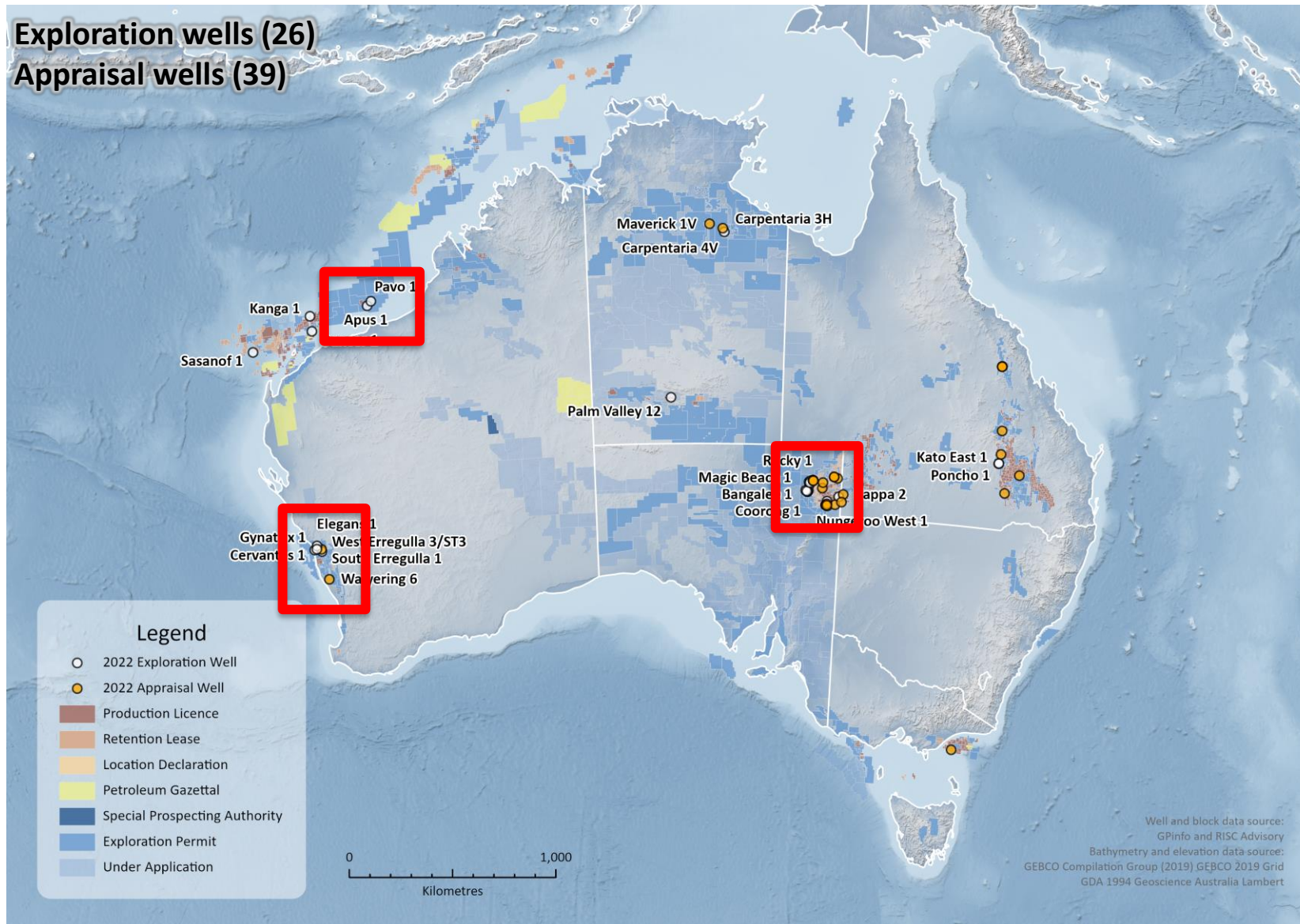
- Oil & gas companies on the Australian stock exchange ("ASX")
- Excluding large caps (Woodside, Santos, Oil Search, Origin) the ASX is dominated by **exploration** companies with assets and activities worldwide
- Capital raised on equities market is increasing since 2019/20**

IPO's

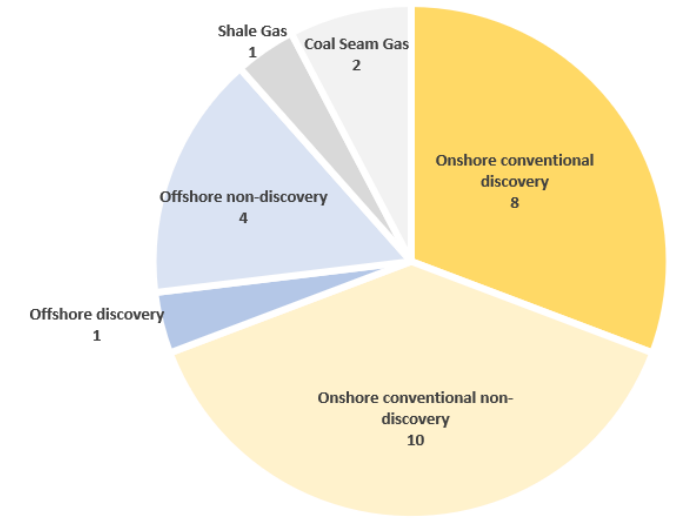


- Oil & gas company initial public offerings ("IPO") on the ASX have increased
- IPO's typically exploration focussed companies
- In 2022 Finder Energy, Noble Helium, Top End Energy, Omega O&G and Conrad Asia Energy floated on the ASX
- IPO's are an indicator of the investment health and investor appetite for oil & gas equities (and their returns)**

Exploration & Appraisal Wells 2022

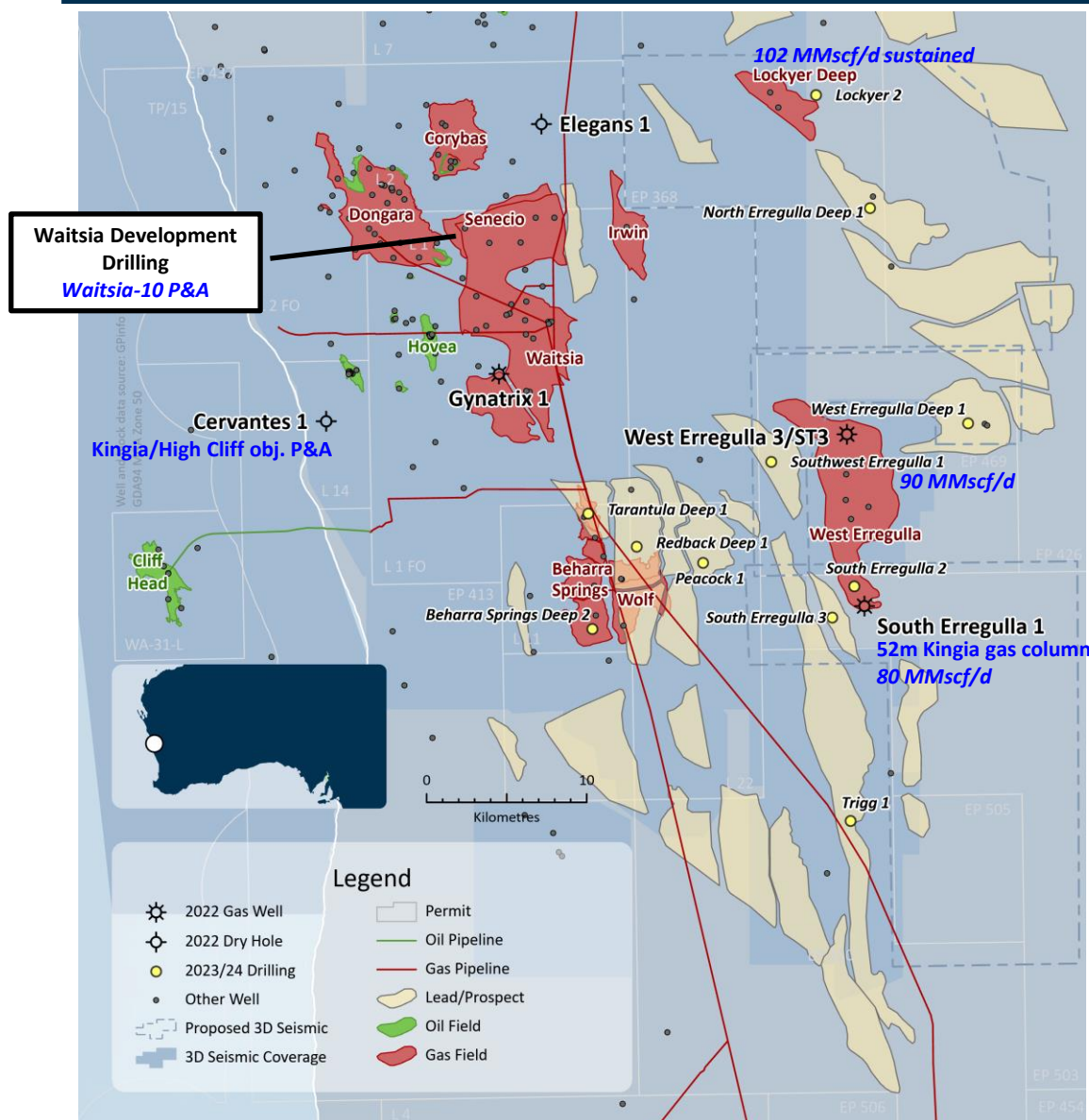


Exploration wells (n= 26)
(21 in 2021)



- Offshore exploration wells = 5
- Offshore discoveries = 1 (Pavo-1)
- Onshore exploration wells = 21
- Onshore conventional discoveries = 8

Exploration Hotspot – North Perth Basin



Exploration Drilling:

- RCMA, Vintage & Metgasco drilled the **Cervantes-1** well which was P&A'd as a dry-hole.
- Strike Energy drilled the **South Erregulla-1** exploration well in EP 503 (gas discovery).
 - Wagina sandstone 16m net.
 - Kingia Sandstone 52m gross gas column, 14m net.
 - 80 MMscf/d on test.
- Mitsui / Beach Energy Joint Venture drilled the **Elegans-1** and **Gynatrix-1** wells as part of the Waitsia development drilling campaign¹.
 - Elegans-1 was P&A'd as a dry-hole (17% gPOS pre-drill)
 - Gynatrix-1 intersected 6m net gas pay in Kingia sst. objective (24% gPOS pre-drill)

Appraisal Drilling:

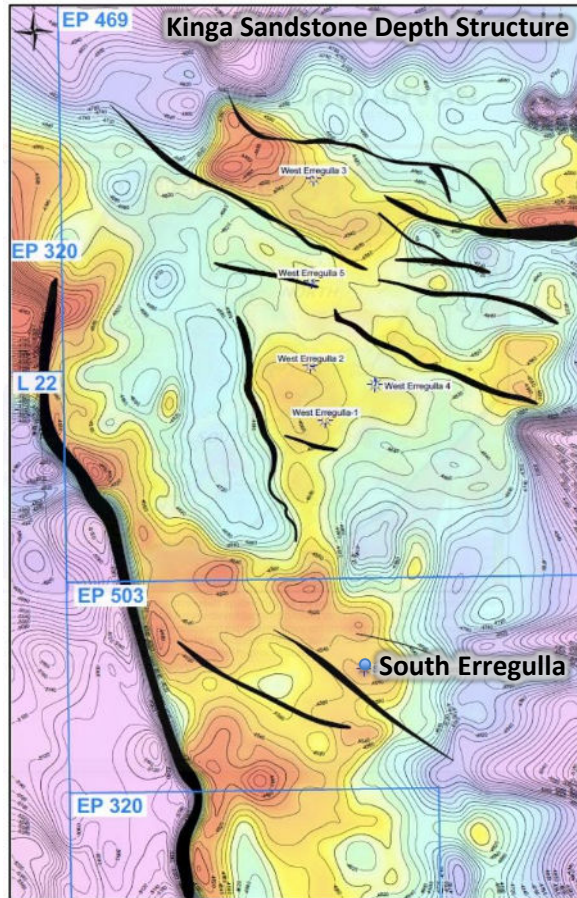
- Strike Energy operated EP 469 JV completed drilling the **West Erregulla-3ST3** well. 60 m gross gas column in Kingia sst. Tested at 90 MMscf/d

Future Drilling:

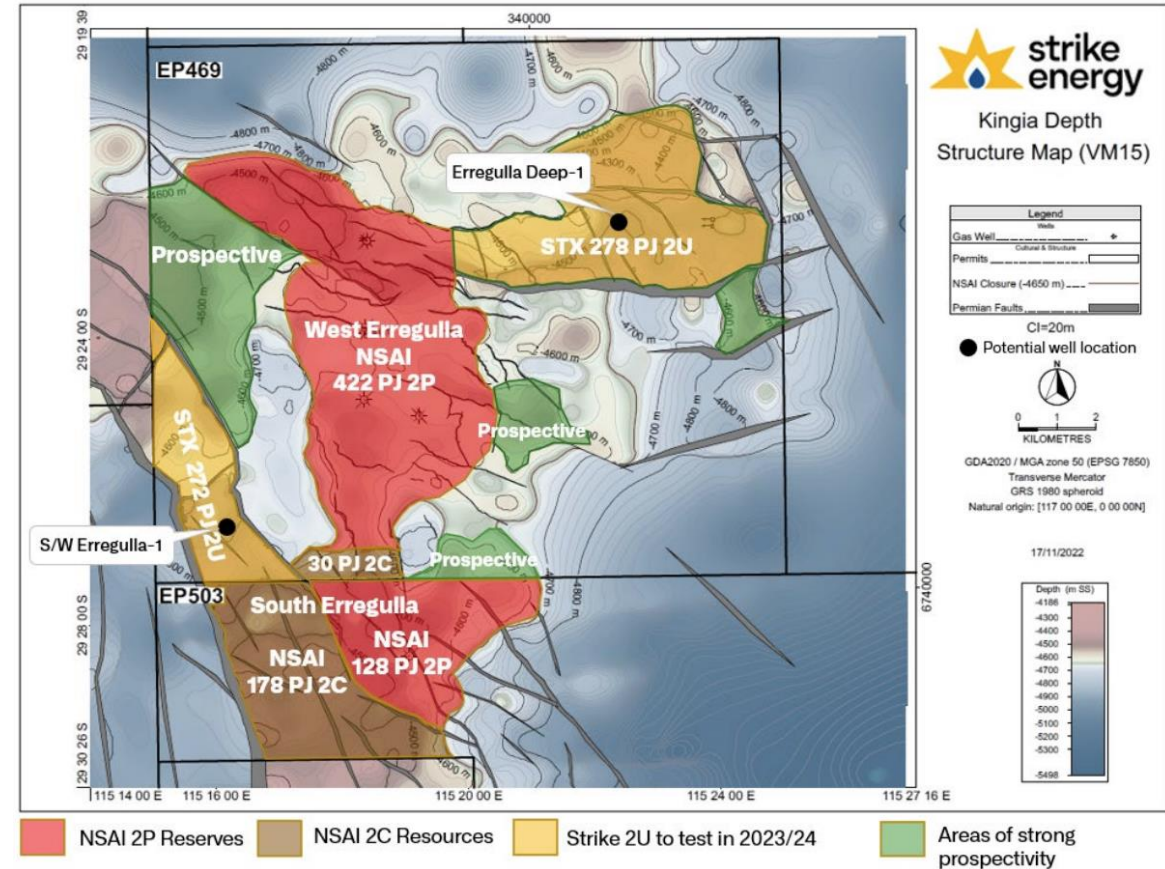
- Beach to drill Trigg-1, Tarantula Deep-1, Redback Deep-1 and Peacock-1 exploration wells and Beharra Springs Deep-2 appraisal well
- Energy Resources (MinRes) & Norwest Energy JV to drill 2 exploration/appraisal wells on the 2021 Lockyer Deep gas discovery
- Strike Energy to drill Southwest Erregulla-1 and West Erregulla Deep-1 exploration wells and South Erregulla- 2 & 3 exploration/appraisal wells

¹ Beach Energy FY23 2nd Qtr report released 31 Jan 2023

South Erregulla-1



Source: Strike ASX announcement 10 January 2022

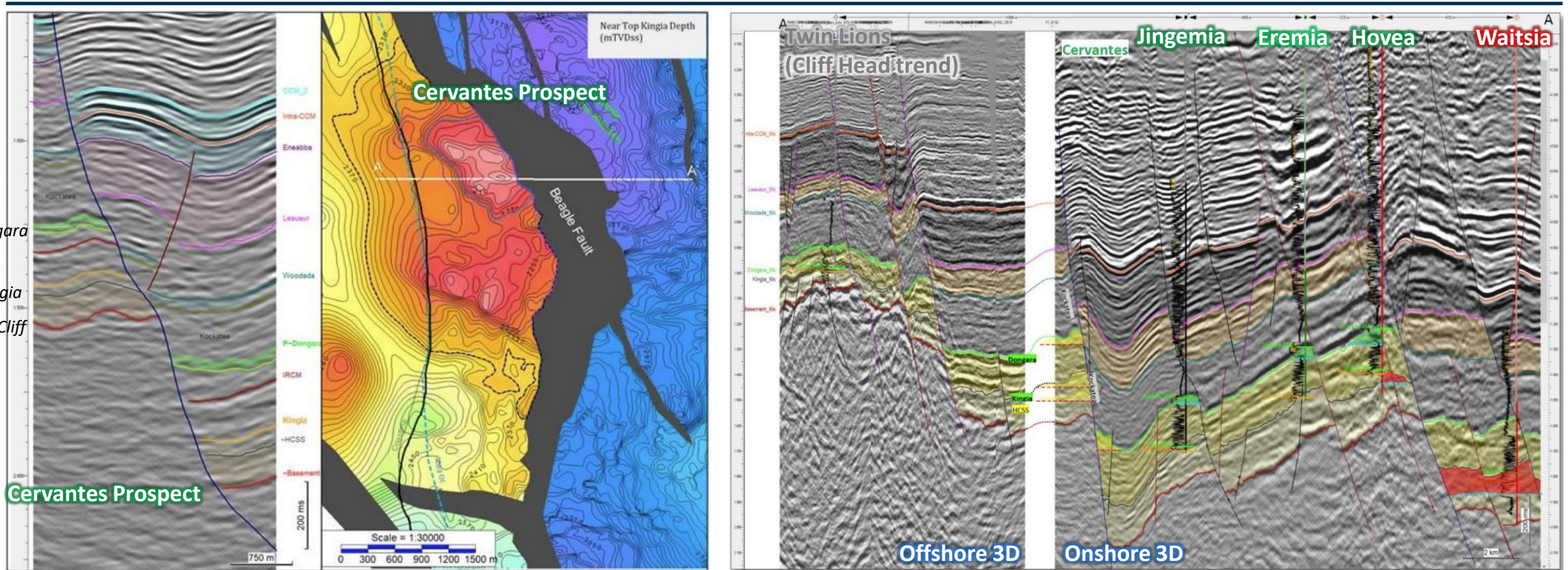


*resource polygons are for visualisation purposes only and well locations are preliminary and subject to additional analysis and joint venture processes

Source: Strike ASX announcement 16 Dec 2022

- South Erregulla-1 drilled January – March in EP 503 by Strike Energy 100%
- 16m net gas pay in Wagina Sandstone with porosity up to 14% (average 9%)
- 52m gross and 14m net gas pay in Kingia Sandstone with porosity up to 20% (average 13%) – tested at 80 MMscf/d

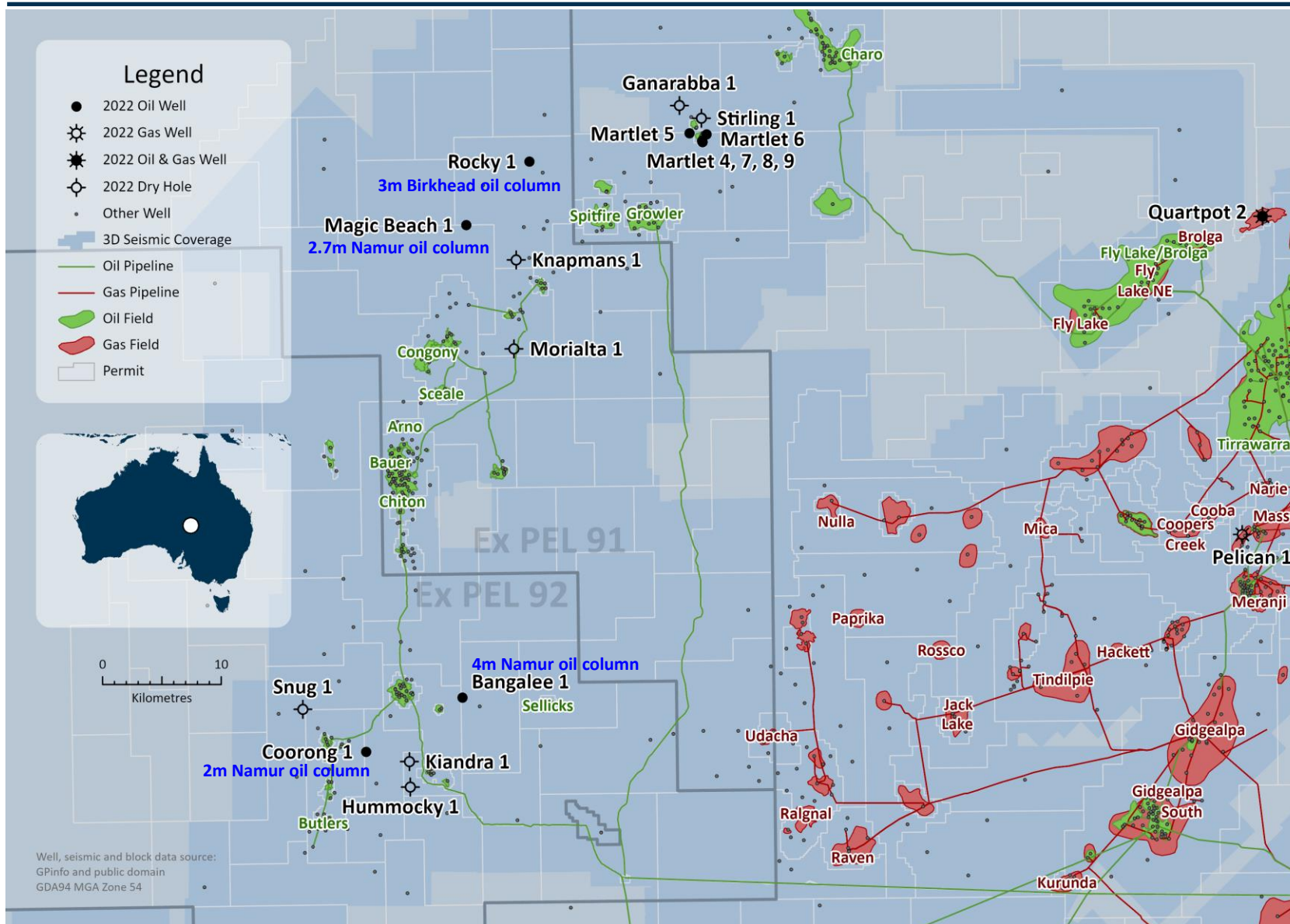
Cervantes-1



Source: Vintage Energy ASX announcements

- **Pre-drill estimate of 15.3 MMbbl Prospective Resources (2U) and 28% gPOS**
- Target Permian Kingia and High Cliff sandstones in a faulted 3-way structural trap
- Cervantes-1 drilled March – April in L14 (Jingemba production license) by RCMA - Vintage Energy & Metgasco farming in
- TD of 2,520m
- **Well failure attributed to poor access to oil charge**

Exploration Hotspot – Cooper/Eromanga Basin Western Flank



Exploration Drilling:

- Beach Energy drilled 13 exploration wells in the Cooper/Eromanga Basin (12 Operated wells)
- 11 exploration wells on the 'Western Flank'
- 4 successes (Bangalee-1, Coorong-1, Magic Beach-1 & Rocky-1)
- No material exploration on the Western Flank for 5-years
- Exploration success attributed to PSDM (re)processing of 3D seismic
- 'Western Flank' Namur and Birkhead plays have been extended north-west

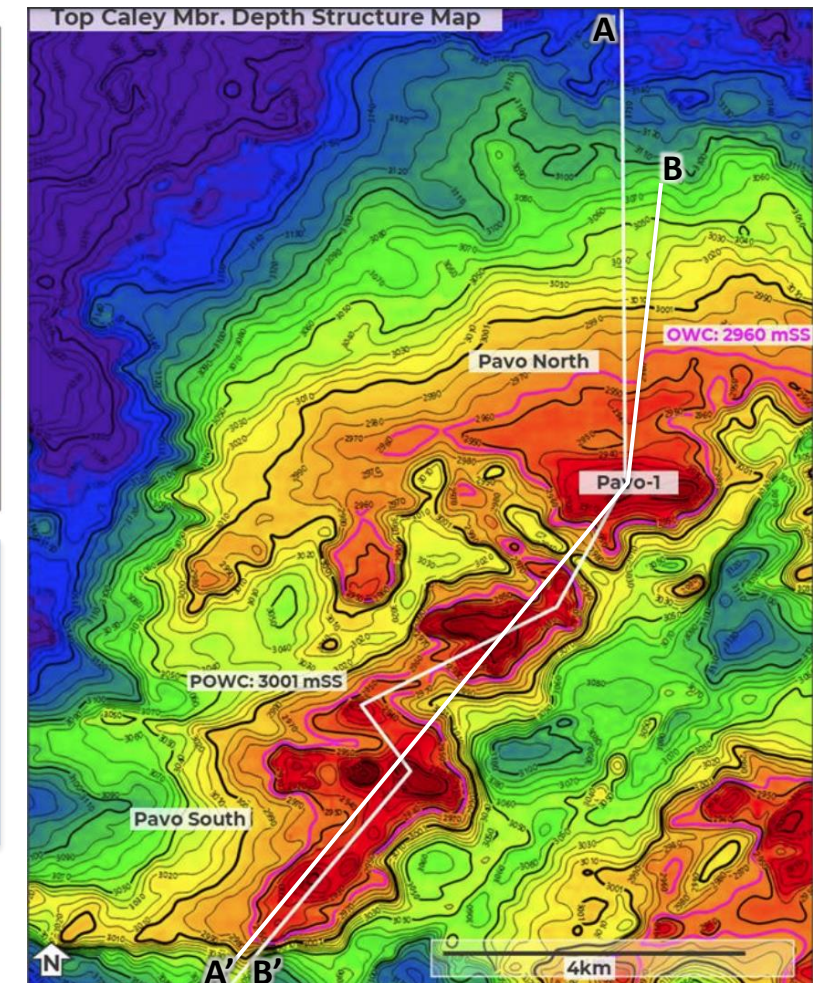
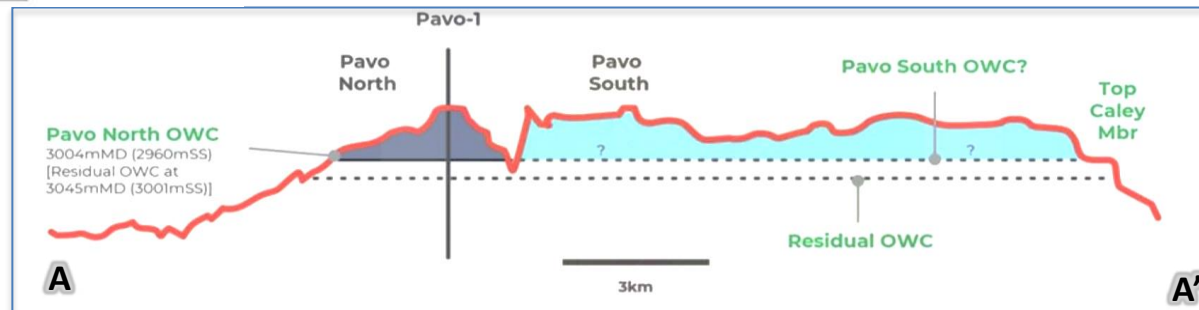
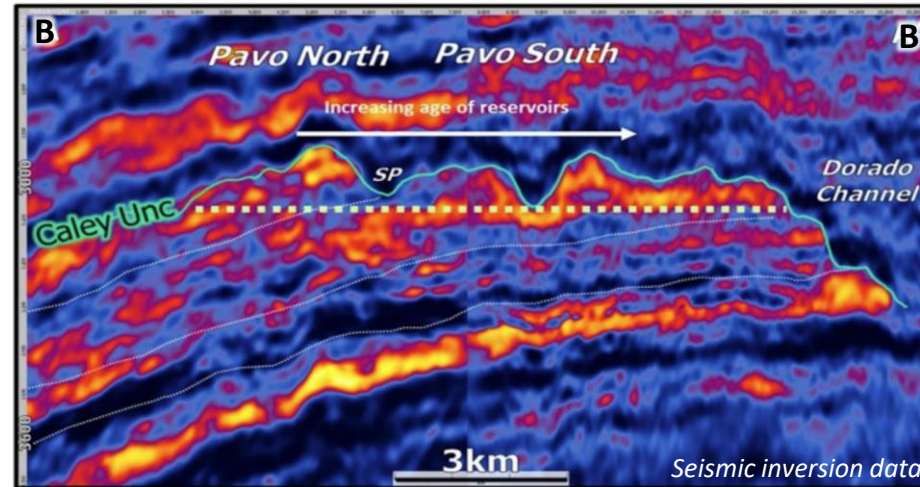
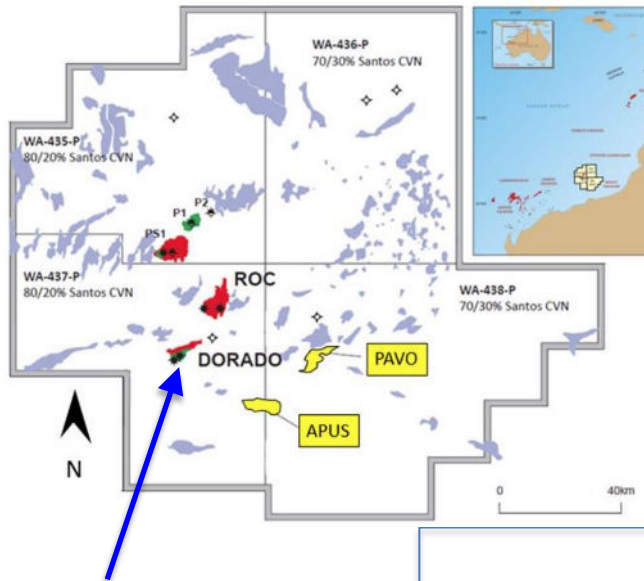
Appraisal Drilling:

- Beach Energy drilled Martlet-3 to 9 during 2022
- All wells successful

Future Drilling:

- 2023/24 exploration drilling planned

Exploration Hotspot - Bedout Sub-basin (Apus-1 & Pavo-1)

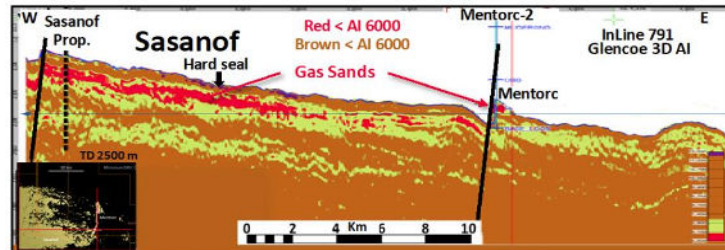
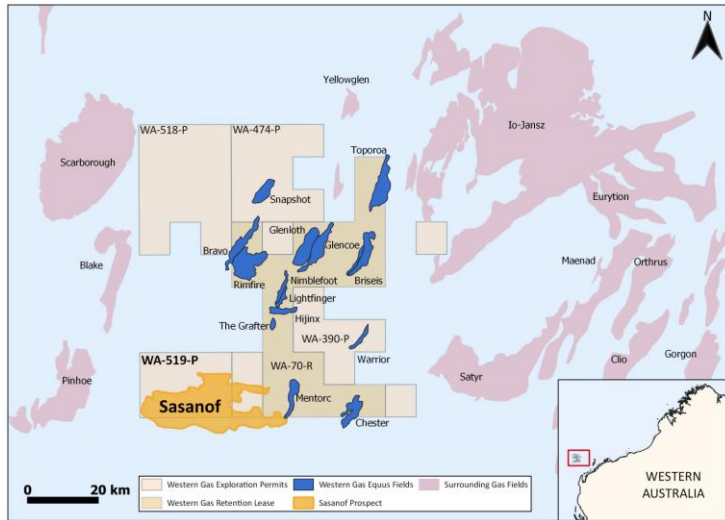


Sources: Carnarvon Energy ASX releases

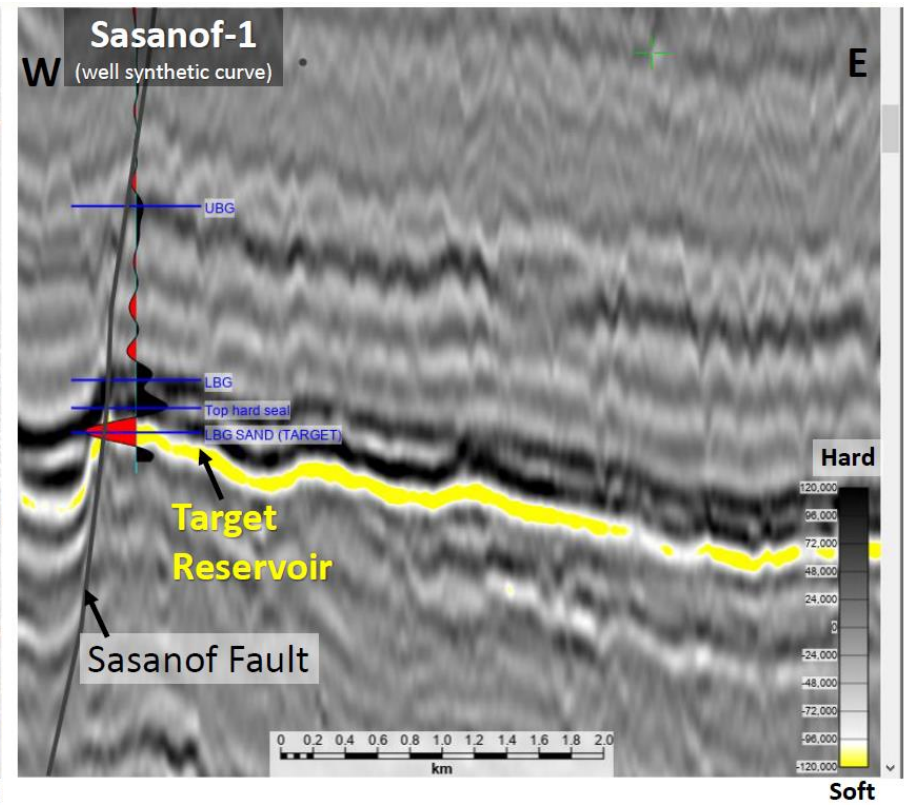
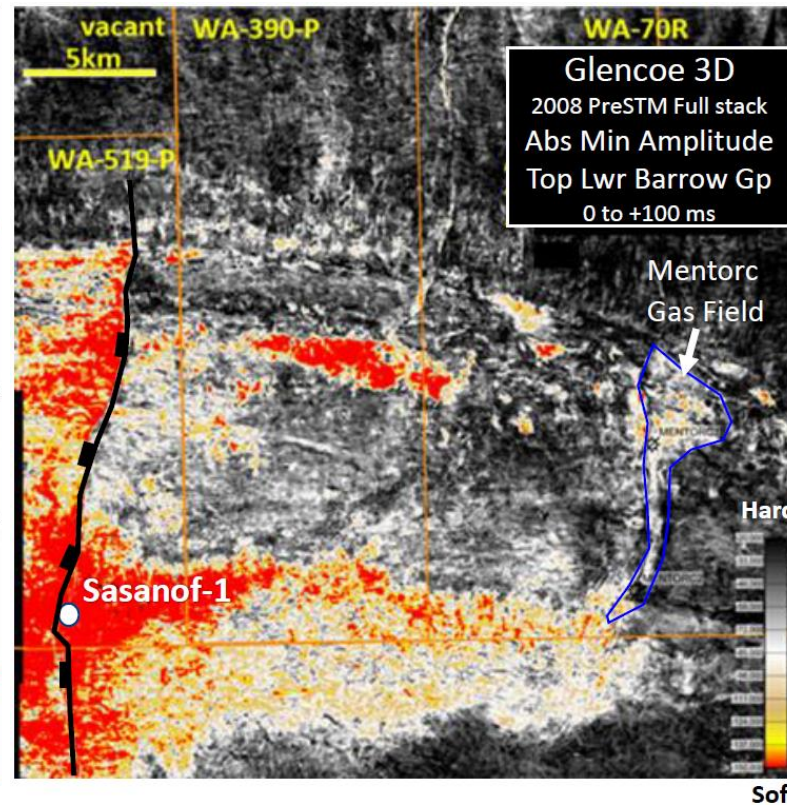
2018 Dorado-1 oil discovery
(~150 MMbbls)

- **Pavo-1** drilled February – April in WA-438-P in 88 m water depth by Santos and Carnarvon Energy JV to a TD of 4,235m by the jackup Noble Tom Prosser
- **60 m gross oil column** in Triassic Caley Formation sandstones, **net pay of 46m**
- 52° API oil with low GOR
- **2C Resources of 43 MMbbl**
- Pavo South Prospective Resource estimate 66 MMbbl (mean) and 51% gPOS
- **Apus-1** drilled during April (WA-437-P) in 80m water depth to a TD of 2,900m – P&A as dry-hole (access to charge main reason for failure)

Sasanof-1

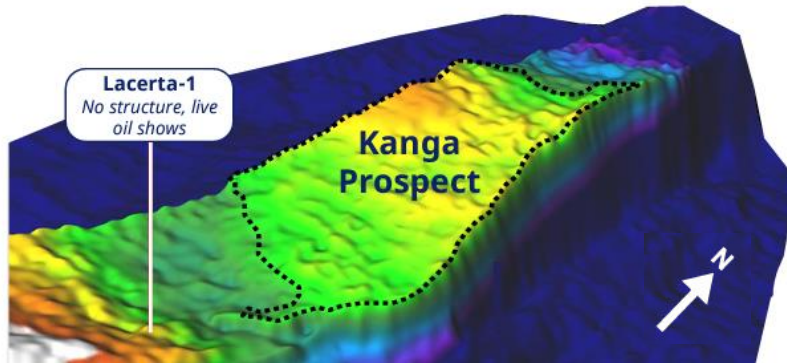
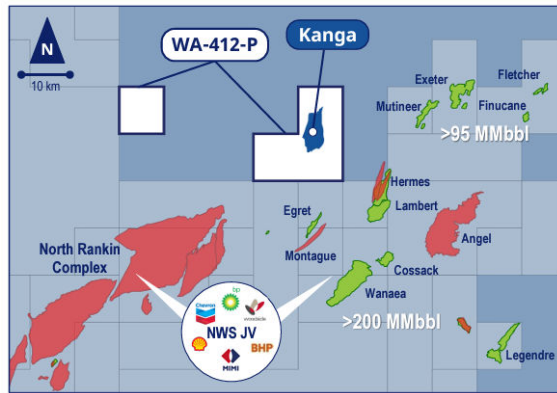


Source: Western Gas

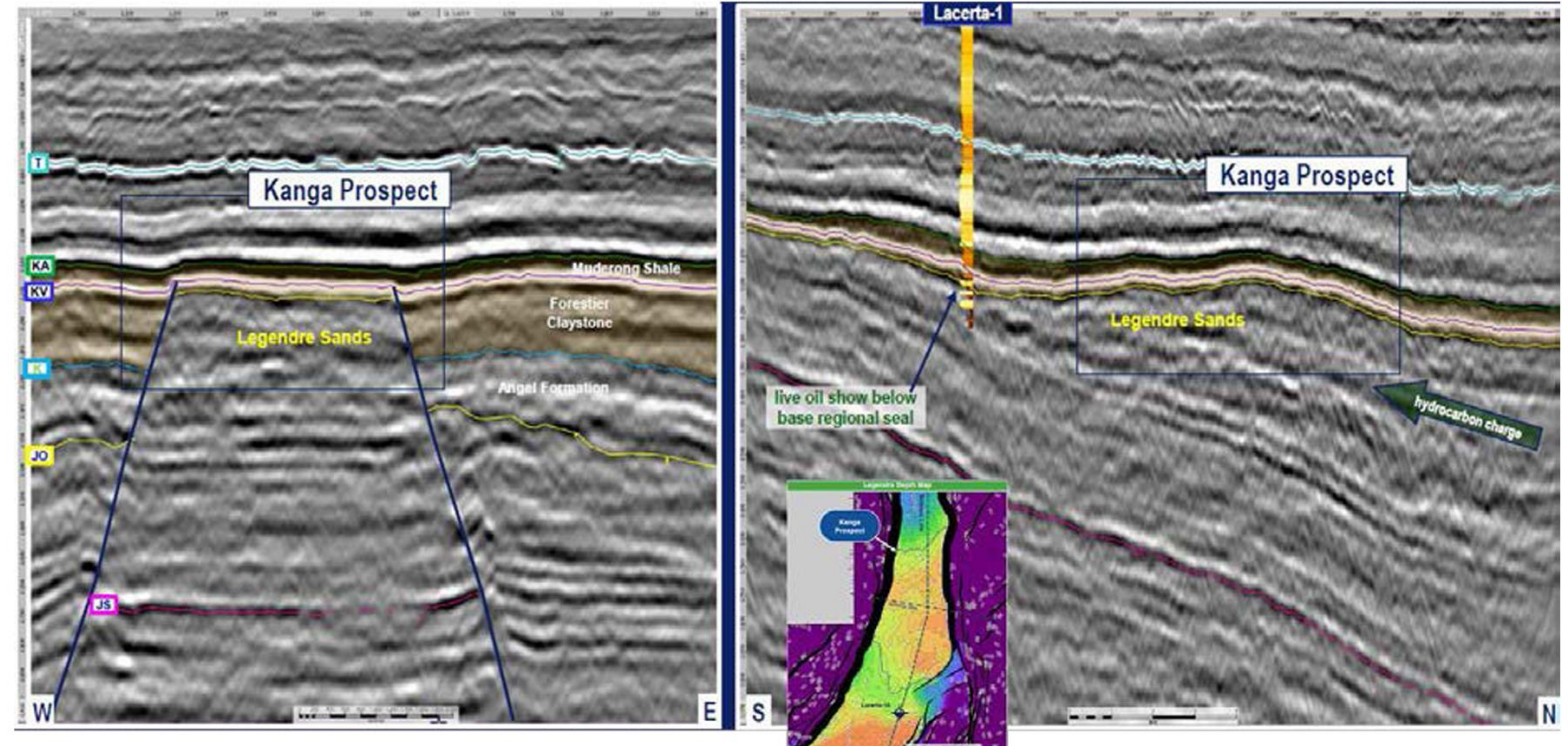


- **Sasanof Prospect pre-drill estimate of 7.2 Bcf Prospective Resources (2U) and 32% gPOS**
- Target Upper Barrow Group sandstones in a combination (structural/stratigraphic) trap
- Sasanof-1 drilled May – June in WA-519-P by Western Gas (Prominence Energy & Global Oil & Gas farming in)
- 1,070 m water depth and to a TD of 2,390 m
- Well failure attributed to lateral seal failure and/or limited gas charge

Kanga-1



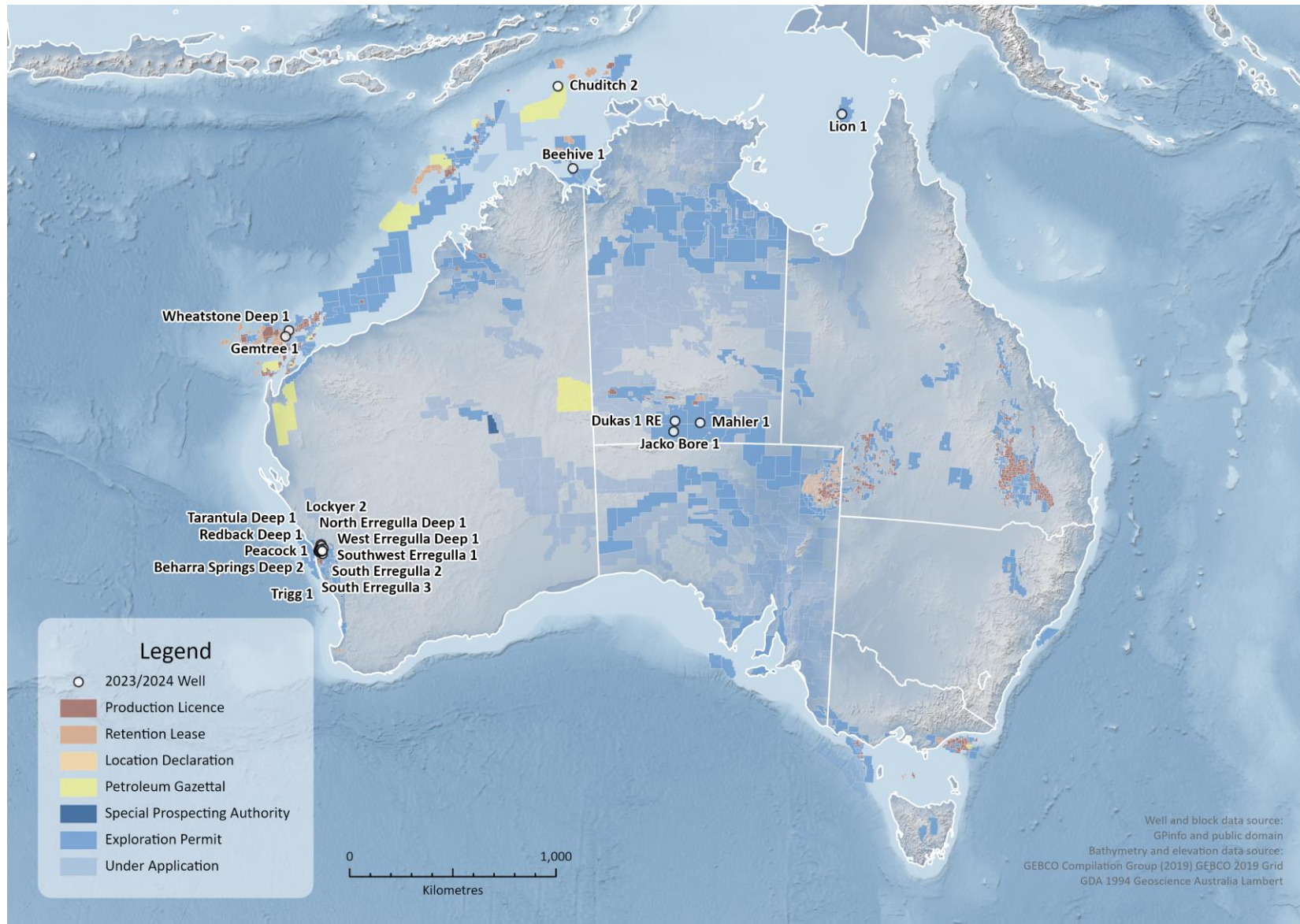
Source: Finder Energy Investor Presentation



Source: Finder Energy Prospectus

- **Kanga Prospect pre-drill estimate of 170 MMbbl Prospective Resources (2U) and 36% gPOS**
- Target Jurassic Legendre Formation sandstones in a combination (structural/stratigraphic) trap - depth conversion play
- Kanga-1 drilled May – June in WA-412-P by Finder Energy (SapuraOMV farming in)
- *“Kanga-1 was drilled to test the hydrocarbon potential of Middle to Upper Jurassic sandstones within a horst block, fault-dependent closure below the ‘Valanginian Unconformity’ at the northern extension of the Rankin Trend. The well was drilled to a total depth of 3,400 metres however did not intersect any hydrocarbons. **Well failure has been attributed to no trap being present due to an increase in thickness of the Forestier Claystone shales than was interpreted pre-drill.**” (SapuraOMV)*

Exploration & Appraisal Wells planned for 2023+



- **Wheatstone Deep-1** (Chevron Op) and **Gemtree-1** (Woodside Op) exploration tiebacks to Wheatstone LNG project
- In the North Perth Basin
 - Beach to drill **Trigg-1, Tarantula Deep-1, Redback Deep-1 & Peacock-1** exploration wells, in addition to **Beharra Springs Deep-2** appraisal well
 - Strike to drill the **Southwest Erregulla-1 & West Erregulla-1** deep exploration wells, and **South Erregulla-2 & 3** exploration/appraisal wells
 - Energy Resources to drill **Lockyer-2 & North Erregulla Deep-1** exploration/appraisal wells on Lockyer Deep discovery
- **Beehive-1** (EOG Resources) in WA-488-P, Bonaparte Gulf targeting 416 MMboe 2U Prospective Resources
- Re-entry of the suspended **Dukas-1** and **Mt Kitty (Jacko Bore-1) & Mahler-1** are planned to test sub-salt prospects with TCF potential (hydrocarbons, He and H2)
- **Lion-1** is a well commitment in Q/23P in the Gulf of Carpentaria. Subject to farmout and likely to be delayed.

- **Petroleum exploration spend is decreasing, flat at best.** *Onshore exploration spend has exceeded offshore since 2019. Petroleum exploration spend lags behind mineral exploration spend, and the gap is growing.*
- **Total area under petroleum exploration title is ever decreasing.** *14 Australian Federal offshore exploration permit titles surrendered in 2022.*
- 4 Federal offshore exploration permits were awarded in 2022, with 2 firm exploration wells.
- 5 Federal offshore GHG assessment permits were awarded in 2022, with 3 firm wells.
- 9 petroleum exploration permits were awarded in state jurisdictions of WA, SA & QLD.
- 10 areas released in the 2022 Federal offshore petroleum exploration acreage release round.
- No Federal offshore GHG acreage release in 2022.
- 26 exploration wells (5 offshore) and 39 appraisal wells (all onshore)
- **1 offshore and 8 onshore conventional petroleum discoveries.**

Key take-aways

- Petroleum exploration release areas, area under title and new petroleum exploration title awards are decreasing.
- However, recent Federal offshore release round bids contained an increase in exploration commitments and firm wells.
- GHG assessment permits are attracting larger work programs than petroleum exploration titles
- Petroleum exploration is very much focussed on the onshore basins.
- Petroleum exploration spend is 1/3 of minerals exploration.
- Onshore Perth Basin is an exploration hot-spot
- The Cooper – Eromanga continues to yield exploration discoveries.
- Bedout Sub-basin yields another oil discovery
- Capital raisings and IPO's are increasing – an indicator of exploration health
- The return of the 2:1 farmin promote ?

- Simon Barber (RISC)
- Craig Gumley (Consultant)
- Will Barker & Phil Woods (Western Gas)
- Sam Algar & Carrie Trembath (Beach Energy)
- Alex Wunderlich (Sapura-OMV)
- Danny Burns (Vintage Energy)
- Matthew Quinn (IHS)
- Rhys Simpson (EurozHartleys)
- Peter Cameron (Australian Oil & Gas Research)

- Data compiled from Gpinfo, GlobalData and public sources



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