Greater Bramfield Geophysical & Stratigraphic Analysis 2024-2025

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Department for Environment and Water
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Government of South Australia
Department for Environment and Water

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Acknowledgement of Country

The Department for Environment and Water acknowledges Aboriginal people as the First Peoples and Nations of the lands and waters we live and work upon and we pay our respects to their Elders past, present and emerging. We acknowledge and respect the deep spiritual connection and the relationship that Aboriginal and Torres Strait Islander people have to Country.

The Department works in partnership with the First Peoples of South Australia and supports their Nations to take a leading role in caring for their Country.

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Foreword

The Department for Environment and Water (DEW) is responsible for the management of the State's natural resources, ranging from policy leadership to on-ground delivery in consultation with government, industry and communities.

High-quality science and effective monitoring provide the foundation for the successful management of our environment and natural resources. This is achieved through undertaking appropriate research, investigations, assessments, monitoring and evaluation.

DEW's strong partnerships with educational and research institutions, industries, government agencies, Landscape Boards and the community ensures that there is continual capacity building across the sector, and that the best skills and expertise are used to inform decision making.

Ben Bruce
CHIEF EXECUTIVE
DEPARTMENT FOR ENVIRONMENT AND WATER

Acknowledgements

This report was prepared by Lahra Lanigan, Department for Environment and Water (DEW), as part of the National Water Grid Fund project *Ensuring water security, economic prosperity and nature-positive outcomes for the small coastal township of Elliston, Eyre Peninsula*.

This work was jointly funded by the Australian Government through the National Water Grid Fund and the Government of South Australia. The support of both governments in improving long-term water security for communities on the Eyre Peninsula is gratefully acknowledged.

The author gratefully acknowledges the contributions of colleagues from DEW who provided technical review, guidance and support throughout the development of this work. Technical reviews of the report were undertaken by Kent Inverarity, Kate Hyland and Peter Baker, whose expertise in groundwater science, hydrogeology and water resource management helped improve the technical quality and clarity of the report.

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The contributions of the Elliston/Bramfield National Water Grid Fund project team and all DEW staff involved in the collection, management and interpretation of geological, hydrogeological and geophysical data are also gratefully acknowledged. Their efforts provided the foundation for the analyses and interpretations presented in this report.

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Summary

This report improves understanding of the geology, hydrogeology and groundwater resource potential of the Greater Bramfield area near Elliston on western Eyre Peninsula. The work supports groundwater modelling being undertaken as part of the National Water Grid Fund project investigating the long-term security of the Bramfield groundwater resource. The assessment integrates geological interpretation, wireline geophysical logs, drilling sample descriptions and new Nuclear Magnetic Resonance (NMR) logging data from four observation wells.

The principal aquifers in the study area are the Quaternary Bridgewater Formation and the underlying Tertiary Poelpena Formation. Review of geophysical logs and drilling information refined formation boundaries across the area and led to the reinterpretation of several wells previously considered to intersect basement. These wells are now interpreted to contain Jurassic Polda Formation sediments, improving the geological framework for future groundwater modelling.

A significant outcome was the identification of a previously undifferentiated unit within the lower Bridgewater Formation, termed the Bridgewater Formation Clean Limestone. Characterised by very low gamma-ray responses, this unit is interpreted as a clean beach and shoreface deposit with higher porosity and permeability than the overlying Bridgewater sediments. It thickens towards the southwest near Elliston and is likely to have distinct aquifer properties and groundwater flow behaviour, warranting separate representation in future hydrogeological models.

The Poelpena Formation extends across most of the study area and thins towards the southwest. An upper shale or siltstone unit is commonly present in the eastern and northeastern areas but absent elsewhere. Available evidence suggests this unit provides only limited confinement, with recharge and groundwater movement still occurring between the Bridgewater and Poelpena formations. Its variable distribution is interpreted to reflect erosion associated with deposition of the Bridgewater Formation Clean Limestone.

Stratigraphic correlations and cross-sections indicate that the Bridgewater and Poelpena formations are hydraulically connected across much of the area. Dry wells in the eastern study area are interpreted to reflect shallow well construction on topographic highs rather than an absence of groundwater, with deeper wells likely to intersect the regional water table within the Poelpena Formation.

NMR logging provided estimates of porosity and hydraulic conductivity, although reliable results were obtained primarily from the Poelpena Formation because much of the Bridgewater Formation was unsaturated or affected by fractures and washouts. These results provide useful parameters for groundwater modelling but should be calibrated against pumping-test data where available.

Electrical conductivity and induction logging indicate groundwater salinity is generally consistent across the monitoring network, with conductivity values typically around 1,000 µS/cm and no clear evidence of increasing salinity or seawater intrusion. However, the existing monitoring network is too far inland and generally too shallow to conclusively assess coastal seawater intrusion risks near Elliston.

Overall, the revised geological interpretation significantly improves understanding of the Greater Bramfield groundwater system and provides a stronger basis for groundwater modelling. Key recommendations include installing deeper monitoring wells near the coast and in the eastern study area, acquiring additional geophysical logging data, continuing groundwater quality monitoring, and applying the improved geological framework to groundwater modelling and interpretation of surface geophysical surveys.

1. Introduction

In the Musgrave Prescribed Wells Area (PWA) on the western Eyre Peninsula, the Quaternary Bridgewater Formation and the Tertiary Poelpena Formation are the dominant groundwater aquifers (Figure 1-1). The majority of low salinity groundwater resources reside within the Bridgewater Formation across the PWA and are mainly used for town water supply. The extent of the fresh groundwater lenses have been delineated by the modelled 1,000 mg/L isohaline. The current status of groundwater levels within the Bramfield Consumptive Pool are 'below average or lower' (DEW, 2024).

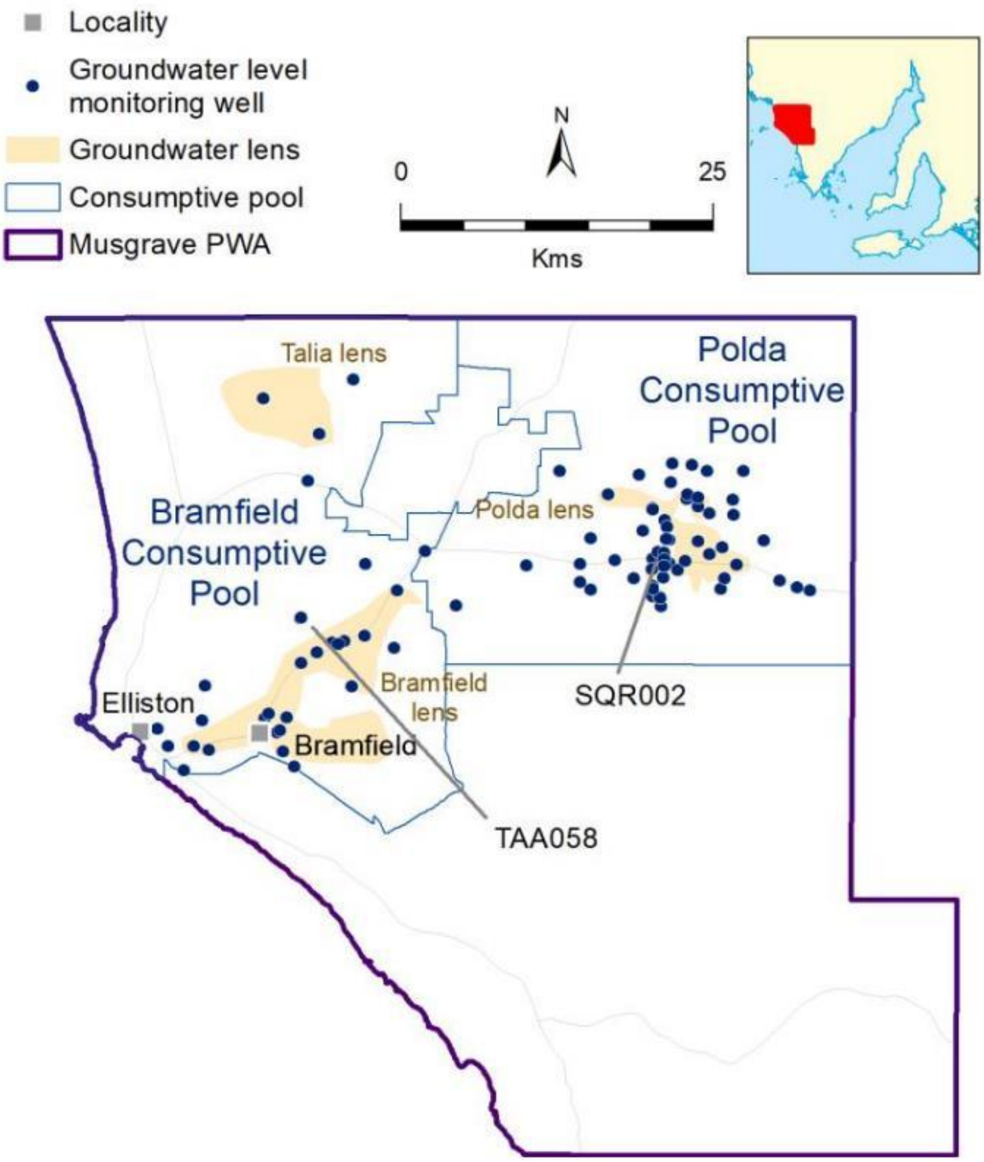


Figure 1-1.Musgrave PWA consumptive pools and fresh groundwater lenses (DEW, 2023).

Downhole geophysical information provides insight into subsurface characteristics and their spatial distribution, which can be used to support the subsurface modelling required to investigate the long-term viability of the Bramfield groundwater resource.

2. Project background

This work forms part of the Department for Environment and Water's project 'Ensuring water security, economic prosperity and nature-positive outcomes for the small coastal township of Elliston, Eyre Peninsula', in collaboration with the National Water Grid Fund. An Area of Interest (AOI) was defined to extend over Elliston, Bramfield and further inland to capture available data over the area where a freshwater lens is known to occur (Figure 2-1) – the extent of the freshwater lens will be modelled and presented separately as part of the broader project This study refers to this area as the 'Greater Bramfield AOI'.

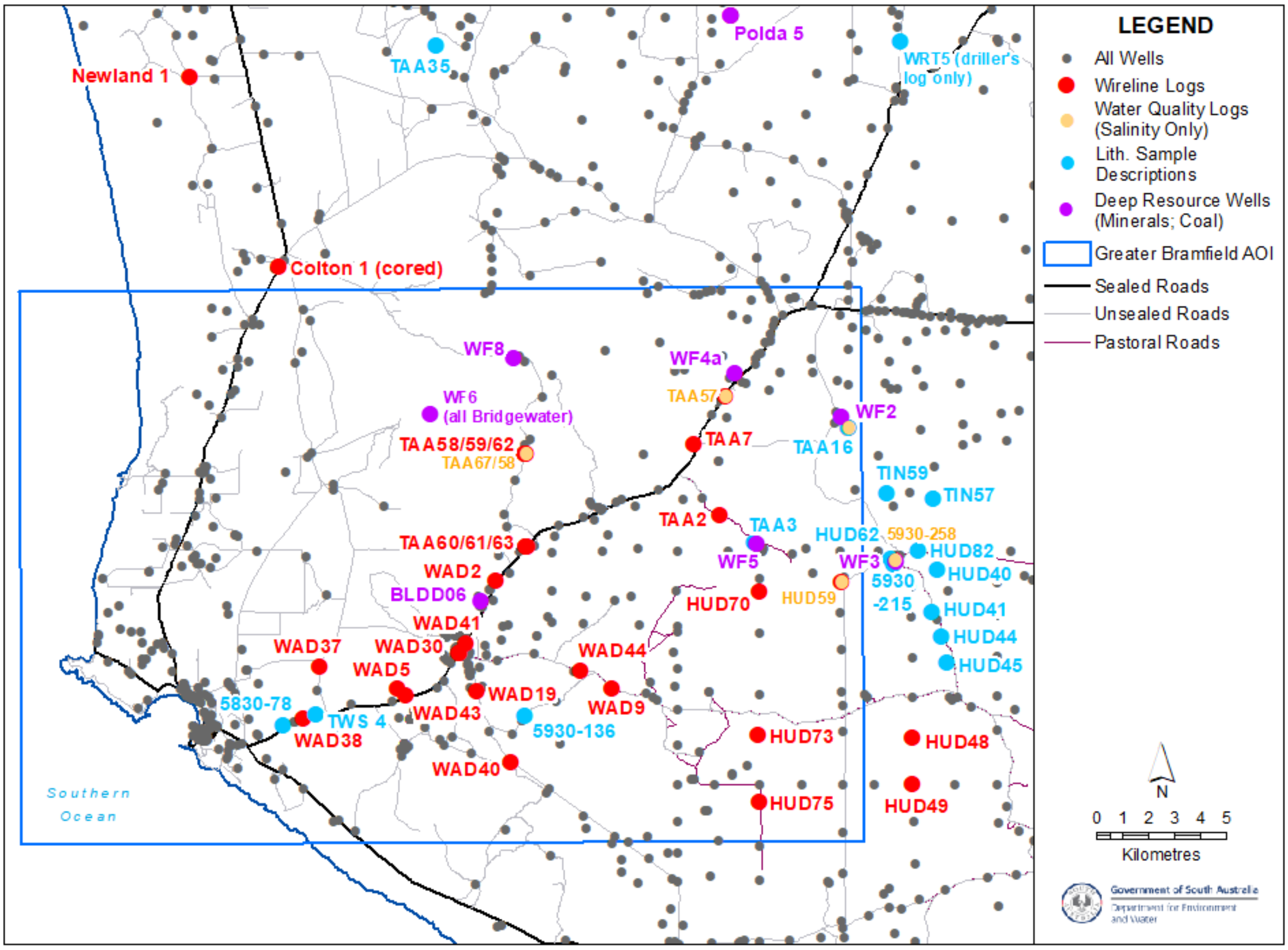


Figure 2-1. Greater Bramfield AOI showing the freshwater lens, well locations and downhole data availability.

The geophysical and geological analysis in this study is intended to support subsurface modelling by:

- defining stratigraphic correlations of formations across the study area, including a summary of geological units present and their depositional setting;
- assessing presence of basement and other pre-Tertiary rocks in the AOI to define the bottom bounding surface of the hydrogeological model;
- summarising nuclear magnetic resonance (NMR) logging results acquired in four (4) wells in late 2024 to define aquifer properties by formation;

- determining whether aquifer properties can be extrapolated to other wells across the AOI where only gamma ray (GR) logs are present to further help constrain the model; and
- assessing if logs have recorded any changes in salinity over time and/or spatially.

3. Geologic setting

The Musgrave PWA aquifers are the Quaternary Bridgewater Formation and the Tertiary Poelpena Formation of the eastern Eucla Basin (Figure 3-1). The Eucla Basin comprises up to 300 m of marine and coastal sediments and was fed by at least 16 major river networks (onshore systems) that discharged into the basin (Hou et al. 2022). The paleochannel systems are believed to host mineral deposits (e.g. uranium) that will not be discussed further in this analysis.

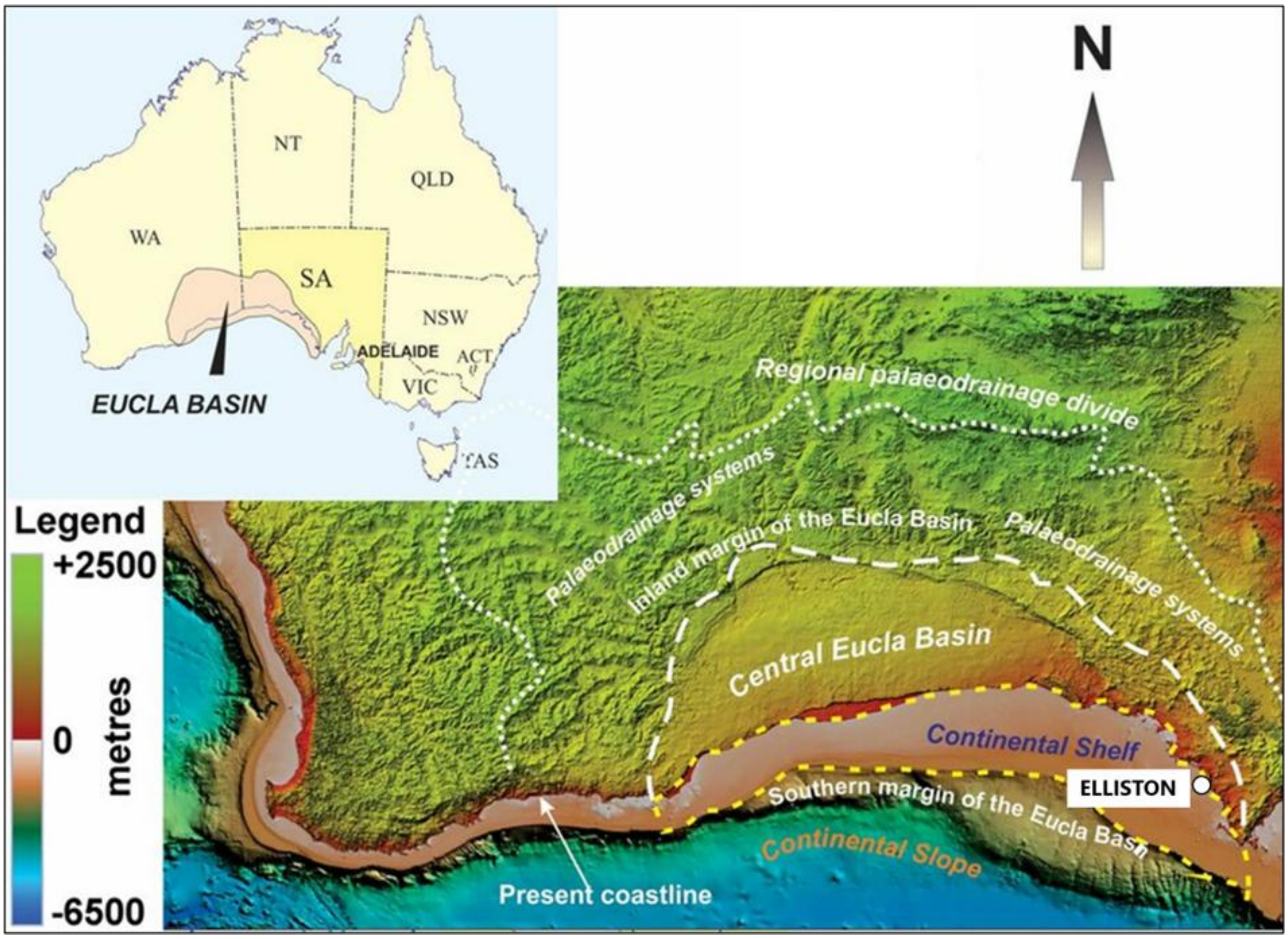


Figure 3-1. Eucla Basin distribution across southern Australia, showing the eastern margin of the basin extending over the western Eyre Peninsula (Hou *et al.*, 2022)

The underlying Neoproterozoic to Jurassic Kilroo, Coolardie and Polda formations make up the Polda Basin which extends from offshore to onshore of the western Eyre Peninsula (Figure 3-2). The Polda Basin sediments are fluvial, lacustrine and glacial in nature with some evaporites in the basal Neoproterozoic section (DEM; Figure 3-3). The South Australian Department for Energy and Mining is currently working on updating available information packages relating to the Polda Basin, including refining the depositional limit of the formation. As a result, there may be some minor difference between the edge of the legacy Polda Basin outline and where it is suspected Polda Basin sediments are present. Appendix 10.A outlines the geologic ages of these periods. Only the Polda Formation has been assessed in this study (i.e. the Kilroo Formation has not been differentiated given the limited number of deeper wells).

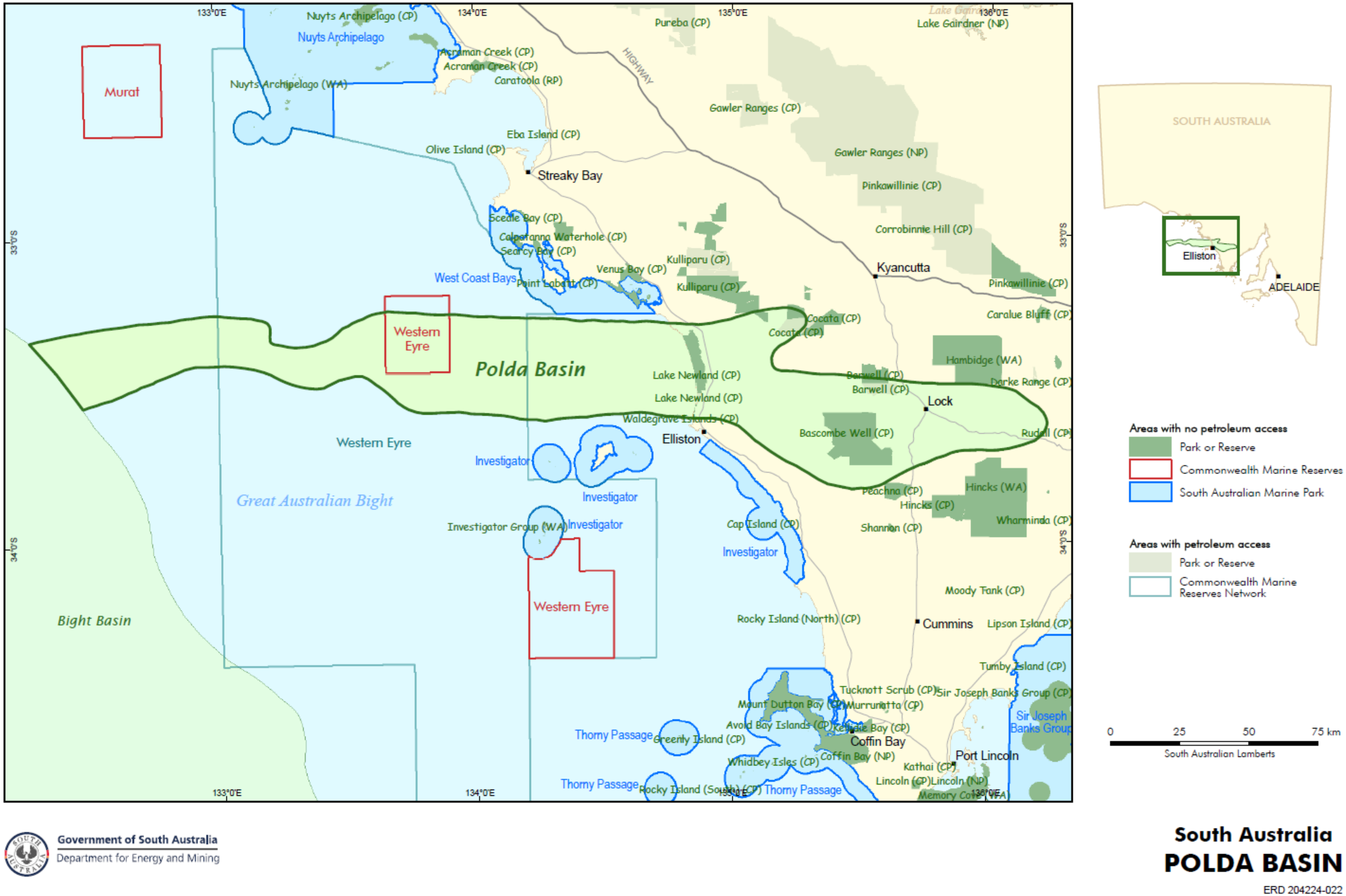


Figure 3-2 Map of the approximate distribution of the Polda Basin extending from offshore to onshore of the Eyre Peninsula (DEM).

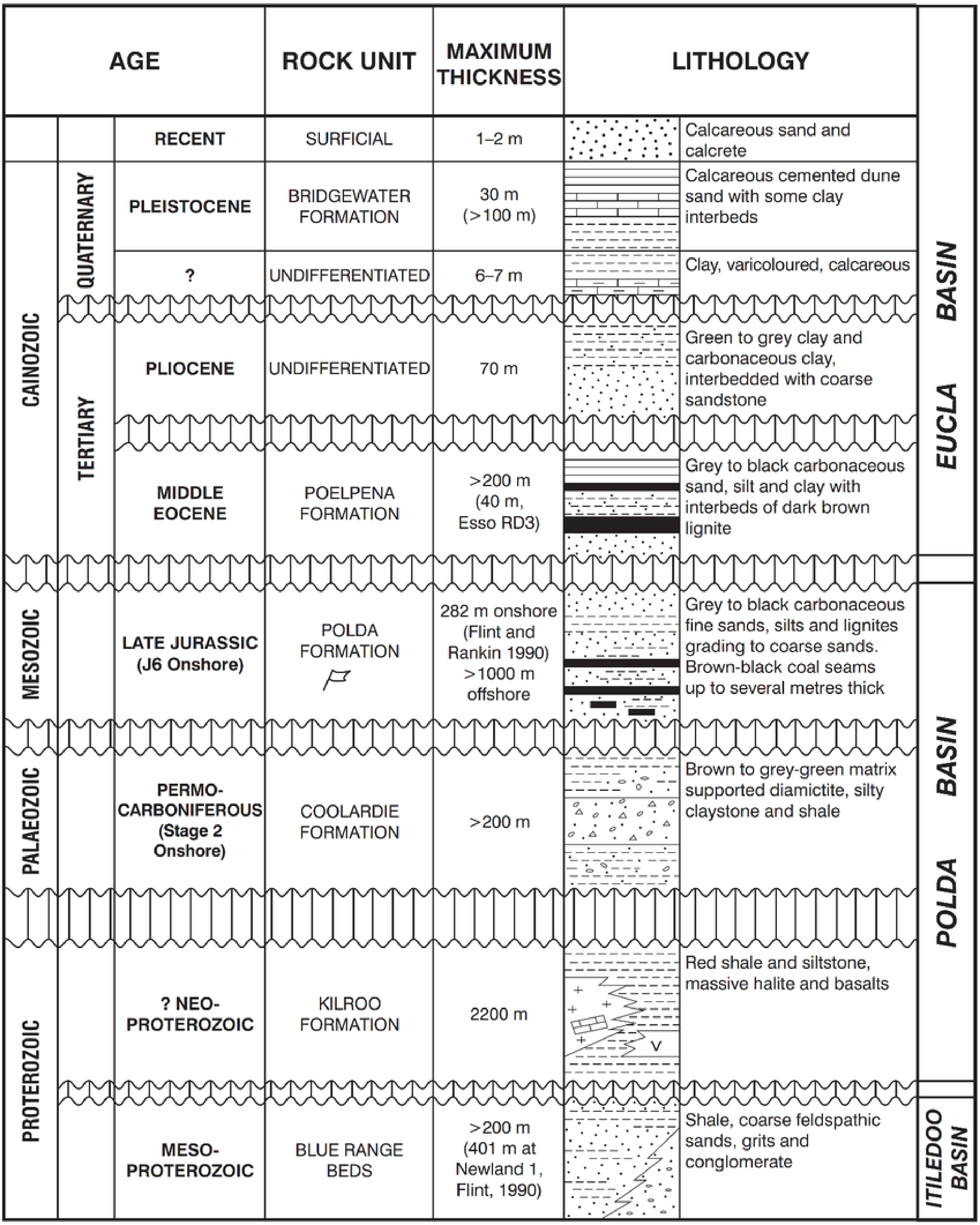


Figure 3-3. Stratigraphy of the Greater Bramfield Area, highlighting the Polda and Eucla basins (Wang et al. 2023).

The crystalline Precambrian basement predominantly consists of gneiss and granite with an overlying weathered zone and makes up the Gawler Craton (Figure 3-4). The Gawler Craton metamorphic complexes represent three main cycles of crustal deformation (Hou et al., 2022).

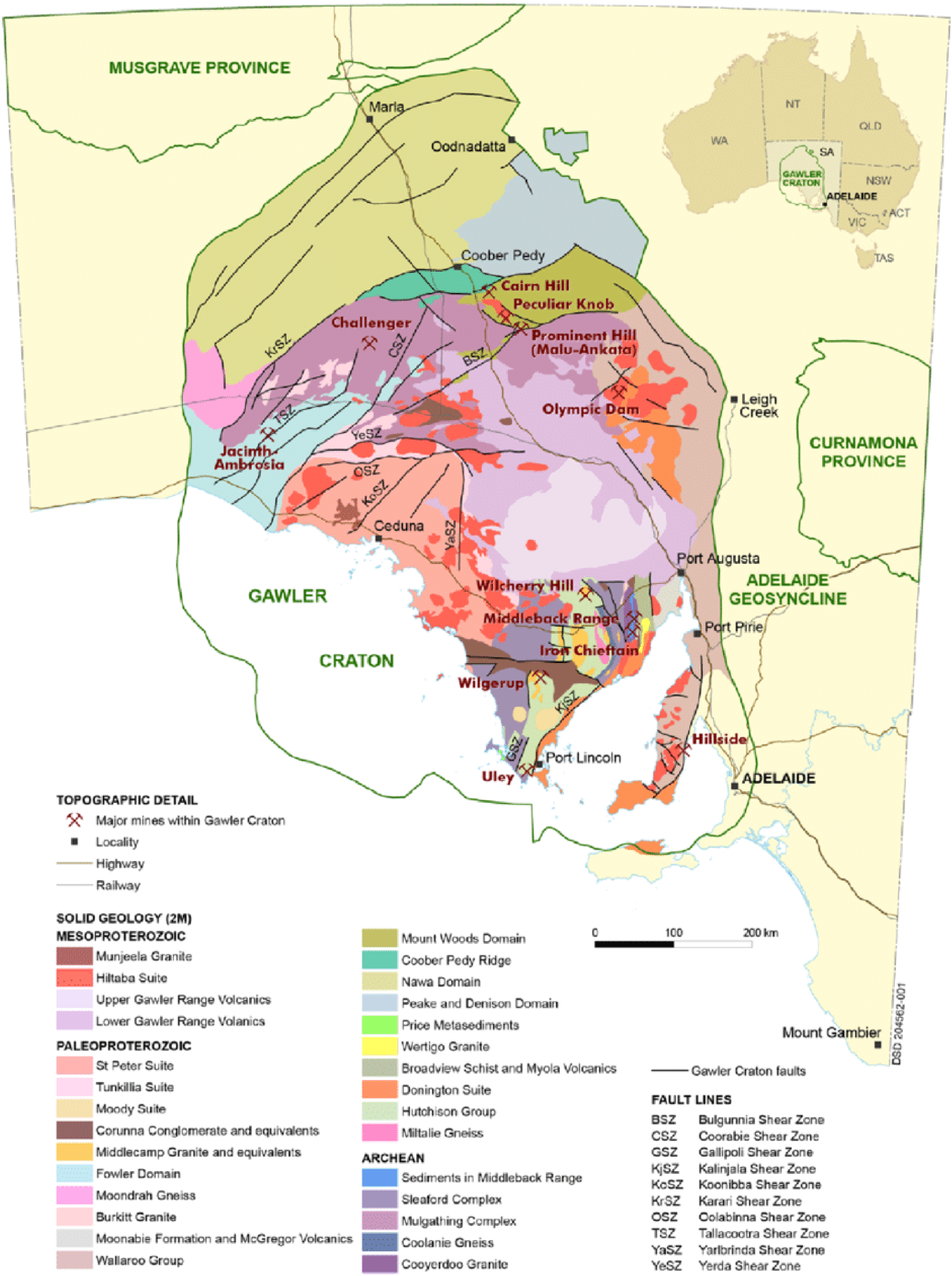


Figure 3-4. Interpreted geology of the Gawler Craton – key basement units in Musgrave PWA are the Sleaford Complex (Archean), Corunna Conglomerate (and equivalents) and St Peter Suite.

3.1. Pre-Jurassic units

Across the Greater Bramfield AOI the basement formations present are variable (Figure 3-5).

- Blue Range Beds of the Itiledoo Basin dominate in the northern AOI (equivalent to the Corunna Conglomerate; (Figure 3-5) that are Mesoproterozoic in age (1600 to 1000 million years, Ma); and
- St Peter Suite of Paleoproterozoic age (2500 to 1600 Ma) and Sleaford Complex of Archean age (4031 to 2500 Ma) are intersected in the southern AOI.

There is an outcrop of the Dutton Suite (felsic plutonic rocks) of the Sleaford Complex noted approximately 10 km east of Elliston (nearest observation well is WAD43, circled in Figure 3-5). All of these units are considered effective basement for the overlying Jurassic and younger strata as they are crystalline rocks that do not contain viable aquifers.

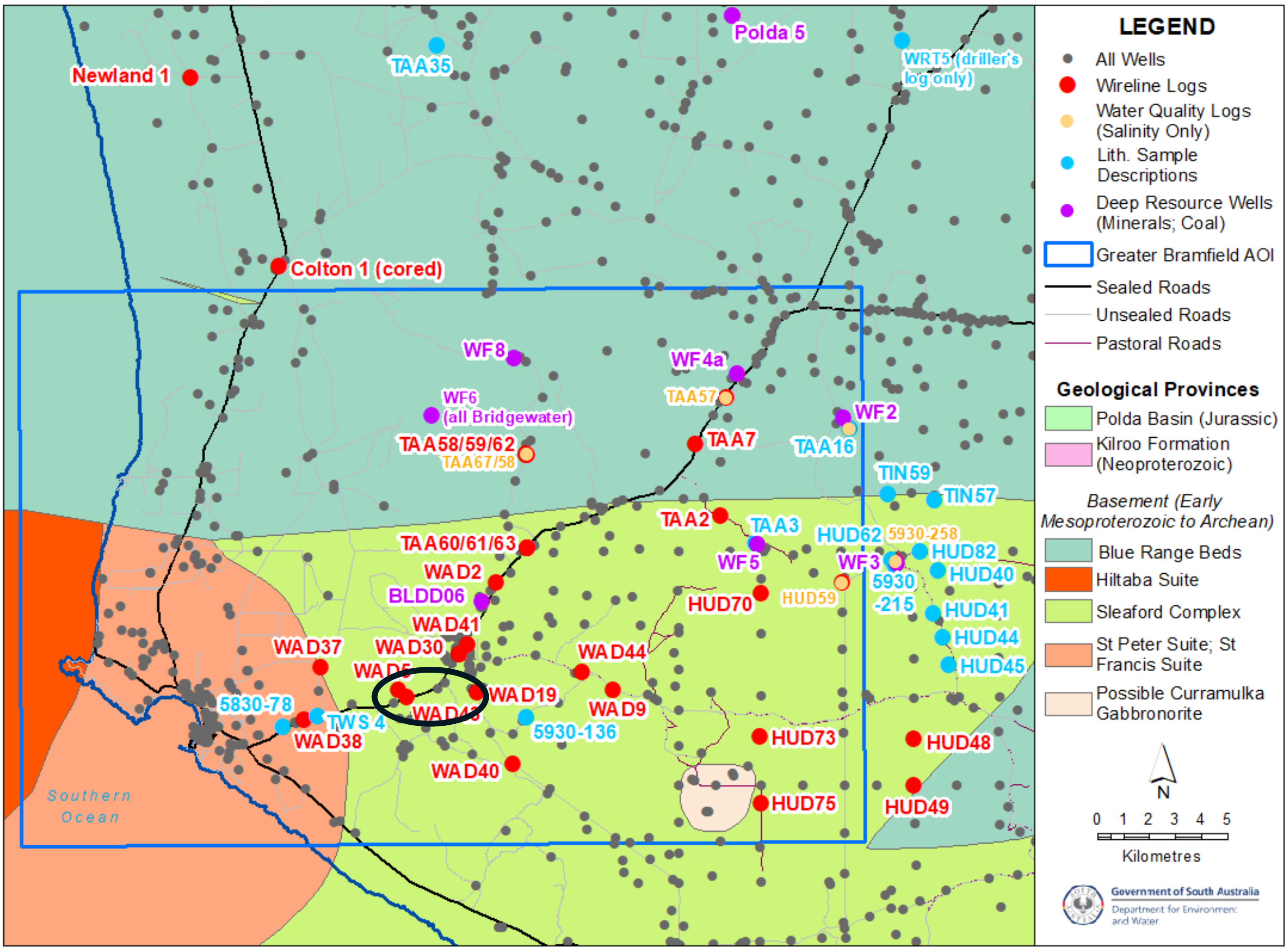


Figure 3-5. Basement geological provinces on the western Eyre Peninsula according to the Department for Energy and Mining – the Sleaford Complex is the oldest unit, and the Blue Range Beds are the youngest.

Lithology of the Sleaford Complex is predominantly gneiss and felsic to mafic igneous rocks, including granite and metamorphosed gneiss (Hou et al., 2022). The St Peter Suite (1647 to 1604 Ma) is made of both felsic and mafic magmatic rocks that are geochemically distinct from other Proterozoic magmatic suites – it is rich in copper, gold and potassium (Pawley et al., 2016). The Hiltaba Suite is one of the largest silicic igneous provinces in the world and is enriched in iron oxide, silver, gold, uranium and lead (Geoscience Australia, 1998). The Blue Range Beds/Corunna Conglomerate are fluvial conglomerates containing conglomerate, arkosic sandstone, siltstone and shale (McAveney & Reid, 2017).

Within the Polda Basin, the lowermost unit is the Neoproterozoic (1000 to 359 Ma) Kilroo Formation (Figure 3-6) which consists of shale, siltstone, halite and basalt. None of the wells analysed in this study have separated this unit from the Polda Formation as it is not a target formation or drastically different from other Polda Basin sediments.

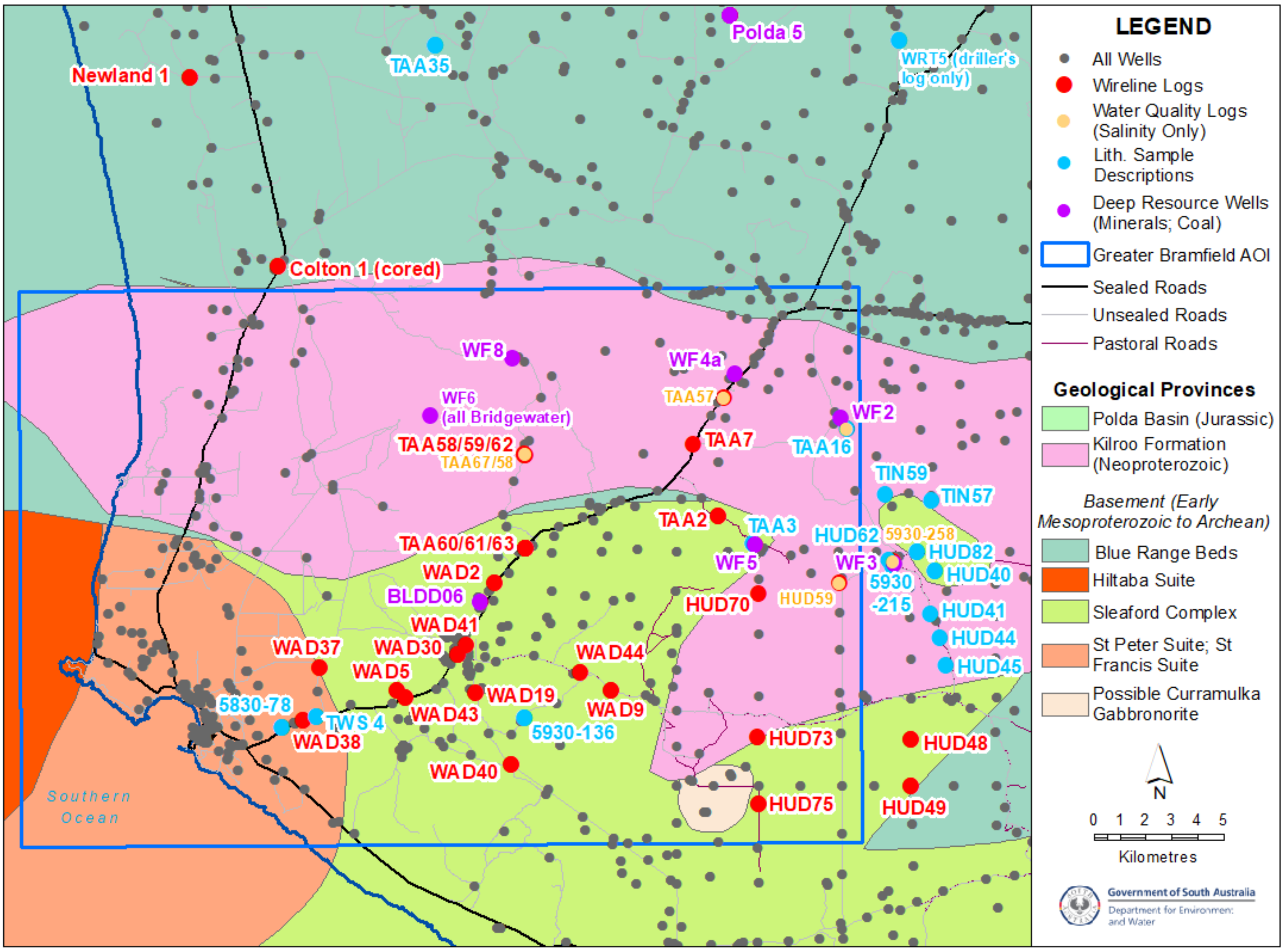


Figure 3-6. The Kilroo Formation overlies older basement formations within the Polda Basin, but no wells in this study have differentiated this unit from other Polda sediments.

3.2. Polda formation

The Jurassic interval in the western Eyre Peninsula is poorly defined as it is not commonly intersected. High salinity and low permeability make it a hydrogeologically unattractive interval. In the Musgrave PWA, the Jurassic interval is interpreted as the fluvio-lacustrine Polda Formation which infilled topographic lows of the Polda Basin (Figure 3-7). The Late Jurassic Polda Formation (~145 to 201 Ma) can be sub-divided into an upper and lower zone.

- The upper zone features sands that fine upwards and claystone/siltstone; and
- The lower zone is dominated by sand with coal and siltstone interbeds (Department for Energy and Mining).

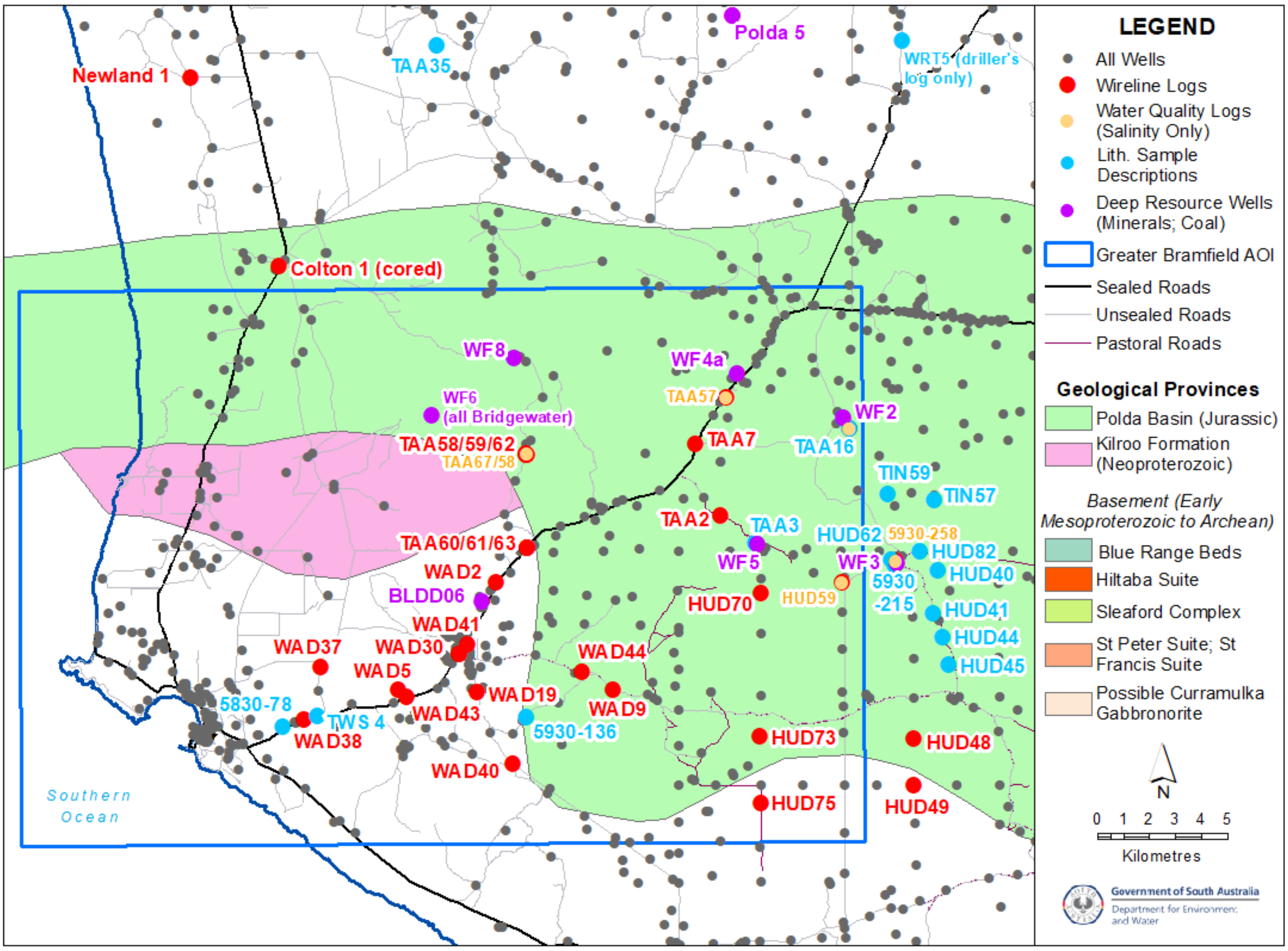


Figure 3-7. Distribution of the Polda Basin and related, underlying Kilroo Formation within the Greater Bramfield AOI.

3.3. Poelpena formation

Tertiary units along the Eyre Peninsula are generally poorly understood compared to the overlying Quaternary Bridgewater Formation and the underlying Jurassic and older units. In the Musgrave PWA the Tertiary sediments of the Eucla Basin are represented by the Poelpena Formation (Figure 3-3). The Tertiary Poelpena Formation was deposited from 48 to 35.5 Ma during the Middle to Late Eocene. Sediments contain a variety of spore-pollen assemblages used for age dating. Depositional environment is fluvial to paludal (marshy) with marginal marine indicators like sparse glauconite and bryozoa, echinoid and ostracod fragments (Twidale et al., 1985).

The Poelpena Formation is variably confined and unconfined across the Musgrave PWA – where the Poelpena is connected to the overlying Bridgewater Formation, water is generally observed to be of better quality as the aquifer is receiving more recharge from rainfall. Even where a top Poelpena shale is present in the Bramfield AOI Yes Figure 3-8) it is likely that diffuse downward recharge occurs. Physical aquifer properties (e.g. hydraulic conductivity) are highly variable, ranging from very poor to very good. This interval consists of unconsolidated, poorly sorted sandstones with variable silt and clay present (Dowie & Love, 1996).

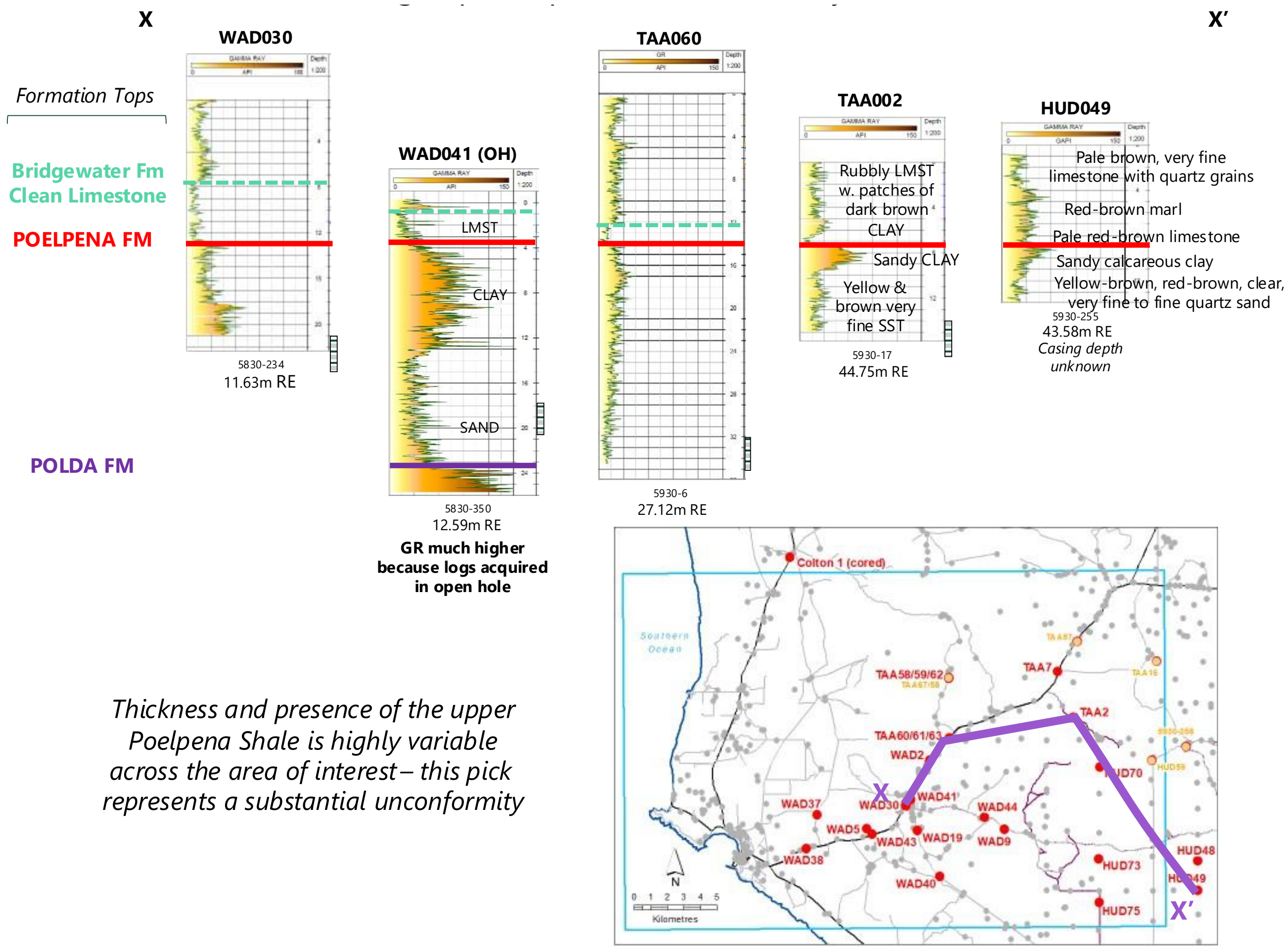


Figure 3-8. Examples of differing presence of upper Poelpena Formation shale across the AOI.

3.4. Bridgewater formation

The Bridgewater Formation was deposited from 0.77 to 0.12 Ma in the mid-late Pleistocene in a coastal depositional setting with a predominant dune facies containing a high percentage of calcium carbonate grains and a variable amount of quartz ('calcarenite'). These dunes were deposited during interglacial high stands when sea level was comparatively higher than the modern day. The prevalence of detrital limestone grains in the system is attributed to high bio-productivity on the continental shelf – sediments were moved landward through tidal and wave processes, before becoming wind-blown once on the beach (Bourman et al., 2016; Figure 3-9). Through dissolution and re-crystallisation, calcium carbonate can form cement within the formation which is quite hard and can result in calcrete layers between dune sets.

'Aeolianite' is the term used to describe calcium-carbonate rich dunes like those of the Bridgewater Formation which consist of ≥50% sand-sized calcium carbonate grains of physically reworked carbonate skeletons and fragments (molluscs, coral, etc.). The system also includes other grains such as quartz or heavier minerals and, in many instances, formations with <50% calcium carbonate are also described as aeolianite. With movement of water through lime-rich systems like this, karst zones (caverns) can be present (Bourman et al., 2016). Along the Elliston coastline, outcrops of the Bridgewater Formation show the cross-beds that are diagnostic of dune deposition. Aeolianites can be continuous for several kilometres and in the order of 150m thick.

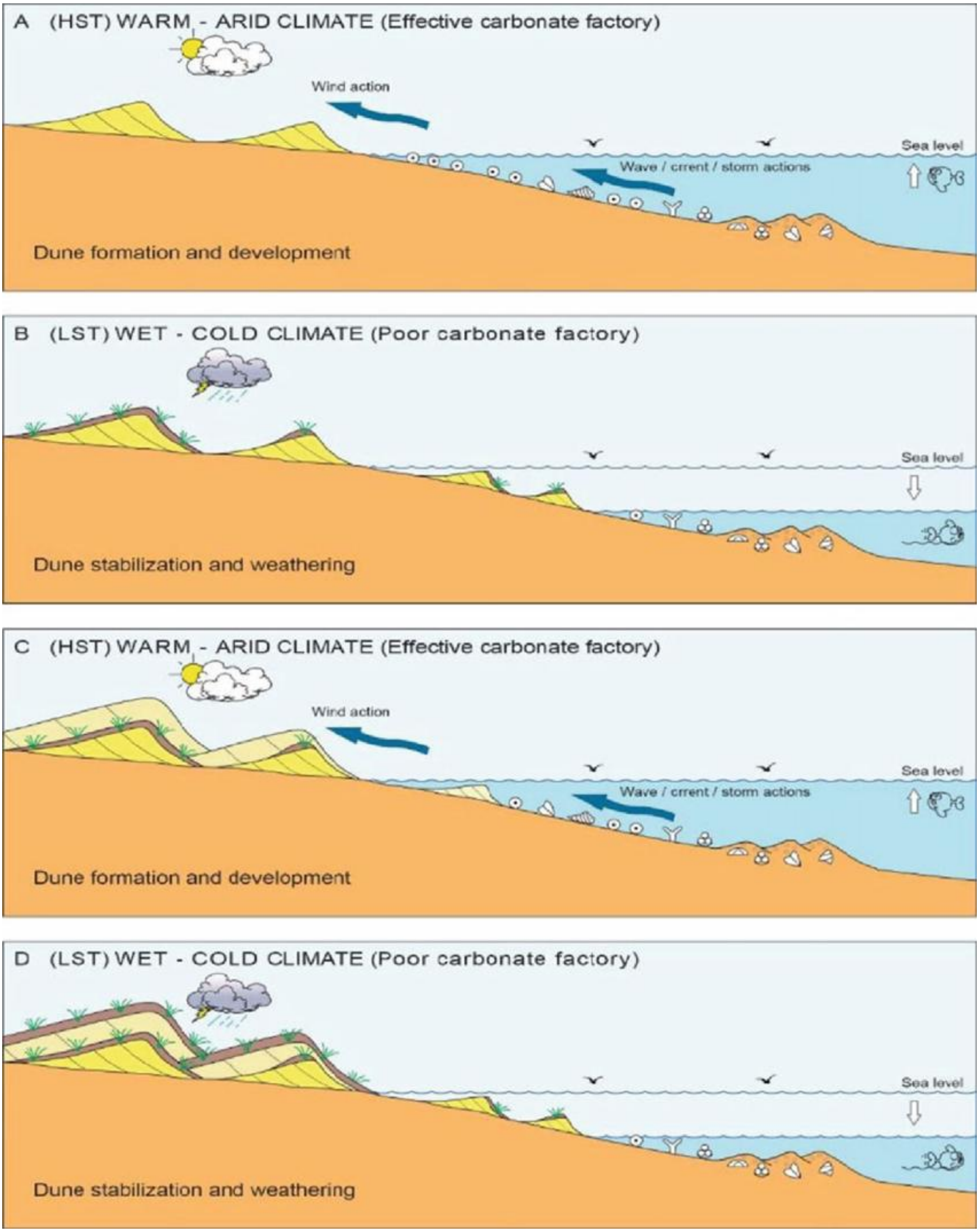


Figure 3-9. Development of carbonate-rich aeolian dunes in coastal environments – carbonate development during High stands (HST) and development of soils on dunes during Low stands (LST) (El-Asmar, 2023).

Modern analogues of this depositional environment can be found elsewhere on the Eyre Peninsula around Talia Beach (Figure 3-10), as well as the Younghusband Peninsula and south coast of Kangaroo Island in South Australia and Shark Bay, Western Australia.

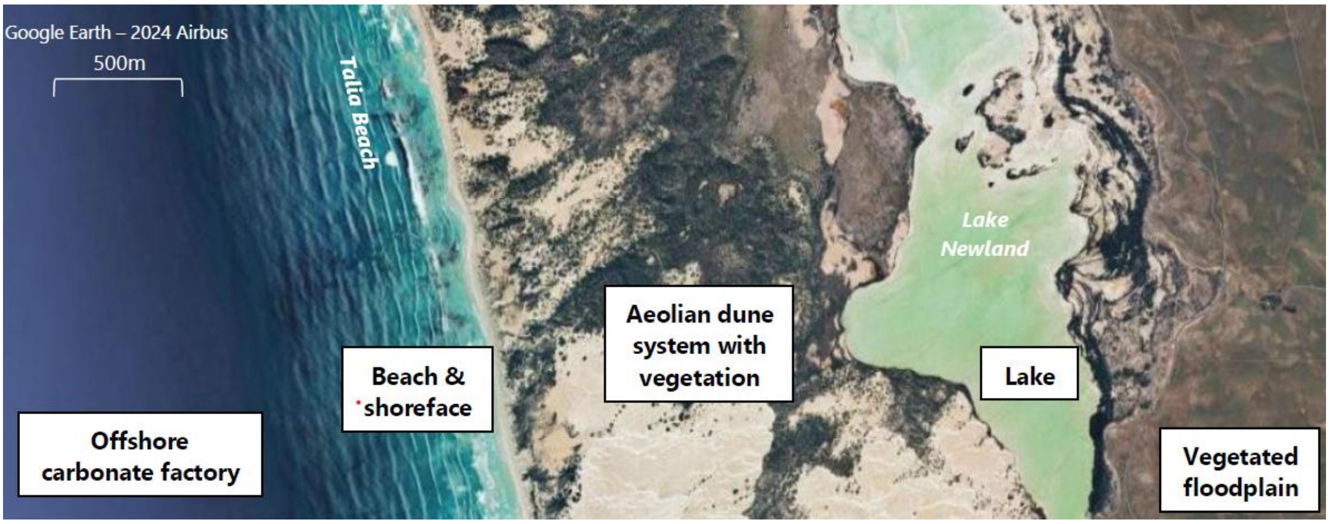


Figure 3-10. Modern aeolianite analogue showing offshore carbonate factory, beach and shoreface (rich in calcium carbonate), aeolian dunes, lake (more silt present) and a fully non-marine vegetate floodplain.

3.4.1. Bridgewater Clean Limestone (sub-lithology of Bridgewater Formation)

A zone of notably lower gamma ray (GR) is present in the lower Bridgewater Formation in the southwest of the Musgrave PWA around Elliston. This is interpreted to be particularly clean limestone with an unknown percentage of quartz and minimal silt or clay. In terms of the Bridgewater Formation depositional environment described above, this clean interval is interpreted as having been deposited in a beach/shoreface setting and possibly with a component of proximal dunes without vegetation. The base of this zone would be highly erosional given the high energy of the inferred depositional environment and is thicker to the southwest of the area of interest where the coastline would have been located. This zone is distinct from the overlying Bridgewater Formation due to its notably different log character, different lithology and probable differing physical properties (Figure 3-11).

The cleaner limestone is important to our conceptual groundwater model because it is inferred as having higher porosity and permeability compared to the rest of the Bridgewater Formation, making it a better aquifer material for groundwater storage and flow. To confirm the lithology of this zone (quartz vs. limestone) more information is needed – either detailed cuttings descriptions, full borehole core, or more electric logs (specifically open hole density and neutron). Detailed field investigations of outcrops would further develop understanding of the geology of the area and may allow the proposed interpretation to be further refined.

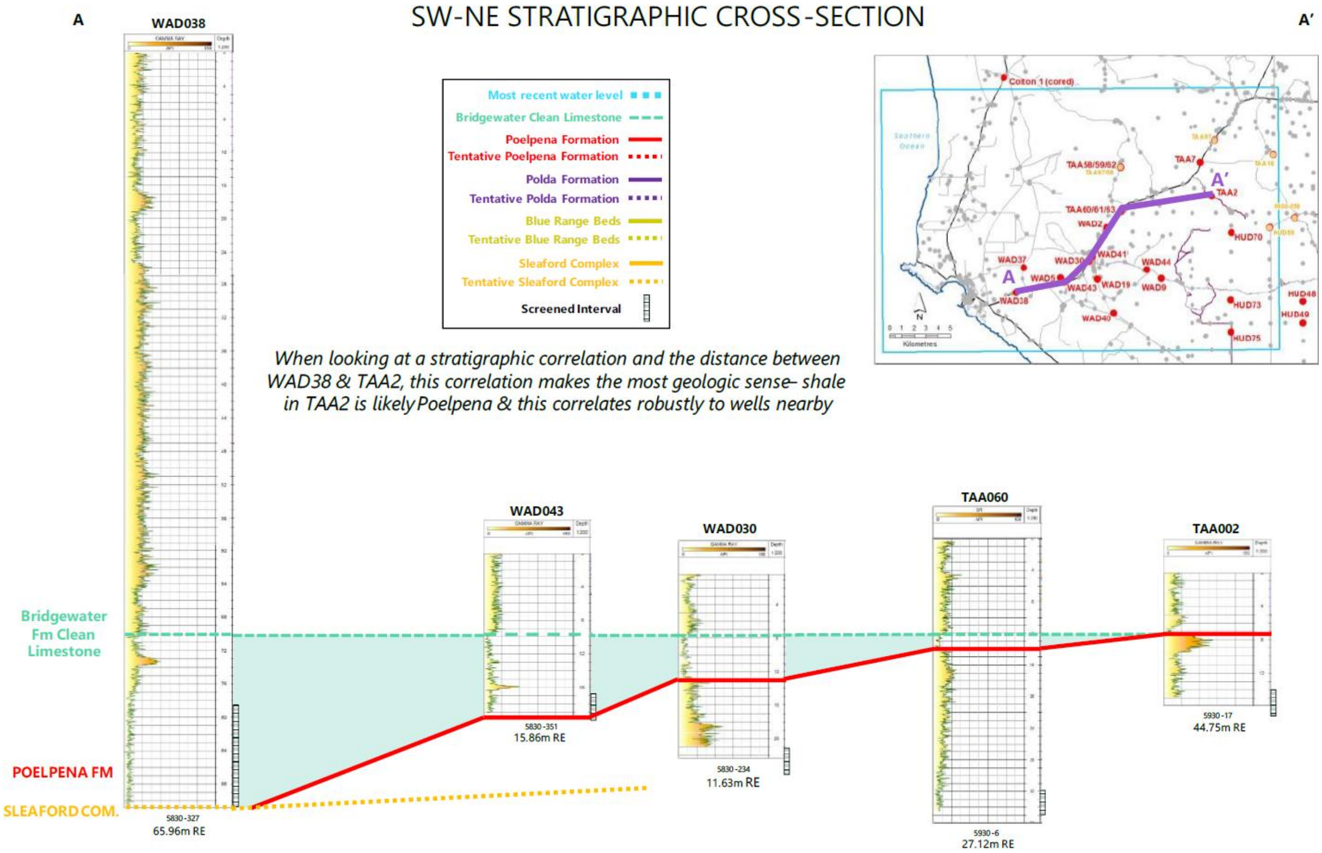


Figure 3-11. Stratigraphic cross-section highlighting the Bridgewater Formation Clean Limestone interval which is cleaner than the overlying Bridgewater Formation and may have different hydrogeologic properties. Labels to the left of image denote formation top picks and are colour coded with lines.

4. Downhole data availability

4.1. Available information

Of the 878 wells in and immediately around the Greater Bramfield AOI (Figure 2-1) there are 21 wells that have been logged with at least one wireline log. "Wireline logs" are defined here as including the gamma ray (GR), caliper, density, neutron, resistivity, induction and nuclear magnetic resonance (NMR) logs acquired by logging each probe up a borehole using a wireline cable. These logs provide invaluable subsurface information that can be used to characterise lithology and provide quantitative assessments of aquifer properties.

Of the 21 wells with GR logs, 10 have induction logs, 5 have neutron logs and 4 have NMR logs. No wells have logged caliper, density or resistivity curves. Only 3 wells have open hole suites (WAD41, WAD44, Colton 1) – the other wells were logged through casing. Due to the age of logs in Colton 1, counts per second (cps) units were used for the GR log instead of updated American Petroleum Institute (API) units (Table 4 1). Induction logs provide an indication of water quality by measuring the formation conductivity but should be interpreted with caution as conductivity response is related to both the rock composition (e.g. clays are conductive) and the nature of pore-filling fluids. Evaluation of change in water quality over time was not possible with electric logs as this would require repeat logging of a calibrated induction tool in several wells, but this was only undertaken in TAA59 (5930-28).

Conductivity, temperature, pH and salinity logs provide useful information about the water column in a borehole; however, they are not considered in this study as they cannot be readily used for petrophysical analyses.

After the initial stratigraphic analysis of the wells in Table 4-1, assessment was broadened to include deeper resource exploration wells and a series of wells noted as intersecting basement in SA Geodata (Table 4 2). The resource wells generally had detailed cuttings sample descriptions and GR logs in PDF format which were used for correlations and improving lithological understanding of deeper formations. Wells identified as intersecting one of the basement lithologies were evaluated to ensure that formation top selections were consistent with regional interpretations. These wells had no electric log data available.

Table 4-1 Available electric log geophysical data in and immediately surrounding the Greater Bramfield AOI.

OBS NO.	MAPNUM	GND ELEV (M)	REF. ELEV. (M)	STICK UP HGT (M)	DRILL TD (M)	GR	CAL	DEN	NEU	RES	IND	NMR
WAD 40	5930-1542	11.18	11.95	0.76	11.6	CH – 2024	–	–	–	–	CH – 2024	CH – 2024
TAA 60	5930-6	27.09	27.12	0.03	36.0	CH – 2024	–	–	–	–	CH – 2024	CH – 2024
TAA 59	5930-28	17.96	18.73	19.36	34.0	CH – 2024 & 2020	–	–	CH - 2020	–	CH – 2024 & 2020	CH – 2024
WAD 30	5830-234	11.45	11.63	0.18	24.0	CH – 2024 & 2020	–	–	CH - 2020	–	CH – 2024	CH – 2024
WAD 38	5830-327	65.15	65.96	0.81	90.5	CH – 2024	–	–	–	–	CH – 2024	–
WAD 37	5830-326	89.16	89.85	0.69	114.0	CH – 2024	–	–	–	–	CH – 2024	–
WAD 5	5830-112	29.43	29.73	0.30	27.7	CH – 2020	–	–	–	–	–	–
WAD 43	5830-351	15.19	15.86	0.67	19.4	CH – 2024	–	–	–	–	CH – 2024	–
WAD 41	5830-350	11.82	12.59	0.77	26.0	OH – 2020	–	–	–	–	OH APP. COND. – 2020	–
WAD 2	5930-102	19.36	19.36	0.00	18.3	CH – 1995	–	–	–	–	–	–
TAA 2	5930-17	44.11	44.75	0.64	18.0	CH – 2024	–	–	–	–	CH – 2024	–
WAD 44	5930-1543	25.85	26.51	0.66	20.0	OH – 2020	–	–	–	–	OH – 2020	–
TAA 7	5930-33	30.07	30.79	0.72	16.8	CH – 1995	–	–	CH – 1995	–	–	–
WAD 19	5930-129	12.49	13.18	0.69	11.0	CH – 1995	–	–	–	–	–	–
WAD 9	5930-125	38.91	39.64	0.73	24.4	CH – 2020	–	–	–	–	–	–
HUD 70	5930-197	52.14	53.14	1.01	19.2	CH – 1995	–	–	CH – 1995	–	–	–
HUD 73	5930-200	32.96	33.87	0.91	12.2	CH – 1995	–	–	–	–	–	–
HUD 75	5930-201	21.99	22.88	0.90	10.7	CH – 1995	–	–	–	–	–	–
HUD 48	5930-236	45.21	46.00	0.79	15.2	CH – 1995	–	–	–	–	–	–
HUD 49	5930-255	42.81	43.58	0.77	15.5	CH – 1995	–	–	–	–	–	–
COLTON 1	5831-345	34.14	–	–	124.7	OH (CPS) – 1975	–	–	OH (CPS) – 1975	–	–	–

Table 4-2 Additional wells assessed for stratigraphic correlations, including available information for each well

OBS NO.	MAPNUM	GND ELEV (m)	REF. ELEV. (m)	STICK UP HGT (m)	DRILL TD (m)	GR	CAL	DEN	NEU	RES	IND	NMR	NOTES
Polda 1	5930-1023	42.00	?	?	172.2	OH(cps)	–	–	–	–	–	–	PDF logs only – used as Polda Fm type-section
Polda 5	5931-369	44.00	?	?	94.0	OH (cps)	–	–	–	–	–	–	PDF logs only
WF2	5930-1207	?	38.00	?	148.0	OH	–	–	–	–	–	–	PDF logs only
WF3	5930-1208	?	65.00	?	127.0	OH	–	–	–	–	–	–	PDF logs only
WF4a	5930-1209	?	28.00	?	114.0	OH	–	–	–	–	–	–	PDF logs only
WF5	5930-1210	?	49.00	?	123.0	OH	–	–	–	–	–	–	PDF logs only
WF8	5830-1212	?	17.00	?	132.0	OH	–	–	–	–	–	–	PDF logs only
BLDD06	5930-1376	~21.00m	?	?	186.5	–	–	–	–	–	–	–	Sample descriptions only
TIN 6	5931-220	70.13	70.93	0.80	45.7	–	–	–	–	–	–	–	Sample descriptions only
TWS 4	5830-342	82.20	?	?	115.0	–	–	–	–	–	–	–	Sample descriptions only
–	5830-78	54.00	?	?	85.7	–	–	–	–	–	–	–	Sample descriptions only
–	5930-136	28.00	?	?	45.7	–	–	–	–	–	–	–	Sample descriptions only
KPW 28	5930-745	68.08	68.98	0.87	18.3	–	–	–	–	–	–	–	Sample descriptions only
TAA 35	5831-291	22.50	23.15	0.65	41.8	–	–	–	–	–	–	–	Sample descriptions only
TIN 4	5931-225	59.87	60.71	0.84	35.1	–	–	–	–	–	–	–	Sample descriptions only
TAA 3	5930-13	45.77	46.60	0.83	30.2	–	–	–	–	–	–	–	Sample descriptions only
HUD 82	5930-246	63.69	64.43	0.73	79.3	–	–	–	–	–	–	–	Sample descriptions only
HUD 40	5930-247	62.01	62.06	0.05	57.9	–	–	–	–	–	–	–	Sample descriptions only
HUD 41	5930-248	75.06	75.45	0.38	76.2	–	–	–	–	–	–	–	Sample descriptions only
HUD 44	5930-249	58.40	59.21	0.82	51.8	–	–	–	–	–	–	–	Sample descriptions only
HUD 45	5930-250	57.52	58.23	0.72	61.0	–	–	–	–	–	–	–	Sample descriptions only

OBS NO.	**MAPNUM**	**GND ELEV (m)**	**REF. ELEV. (m)**	**STICK UP HGT (m)**	**DRILL TD (m)**	**GR**	**CAL**	**DEN**	**NEU**	**RES**	**IND**	**NMR**	**NOTES**
TAA 16	5930-37	41.31	41.98	0.67	42.7	–	–	–	–	–	–	–	Sample descriptions only
–	5930-215	65.00	?	?	37.8	–	–	–	–	–	–	–	Sample descriptions only
HUD 62	5930-222	61.25	62.04	0.79	29.9	–	–	–	–	–	–	–	Sample descriptions only
HUD 82	5931-220	63.69	64.43	0.73	79.3	–	–	–	–	–	–	–	Sample descriptions only
TIN 57	5930-62	64.14	64.86	0.74	38.1	–	–	–	–	–	–	–	Sample descriptions only
TIN 59	5930-61	57.58	58.38	0.79	36.6	–	–	–	–	–	–	–	Sample descriptions only
TAA 16	5930-37	41.31	41.98	0.67	42.7	–	–	–	–	–	–	–	Salinity logs and sample descriptions only

4.2. GR log variation

The GR well logs analysed in this study were recorded over different years, using different tools with varying extents of calibration. Additionally, the state of the boreholes at the time of logging also varied. Open hole logging yields the highest absolute readings due to minimal signal obstruction to and from the tool with signal variations mainly caused by changes in hole size (especially washouts/fractures) and different logging tools. Cased holes have different degrees of signal attenuation depending on casing thickness, original hole size, washouts behind casing, cement and the logging tool used.

These factors result in notable variations in apparent GR from well to well, even when the formation is the same and wells are close together. This variation is particularly evident when assessing GR values by formation using a box and whisker plot (Figure 4-1 to Figure 4-4). Without normalising these logs, it is important that inferences from GR logs are not over-interpreted. That is, the absolute API values cannot be directly compared from one well to the other and some wells may look like they have higher or lower overall GR responses because of these artefacts.

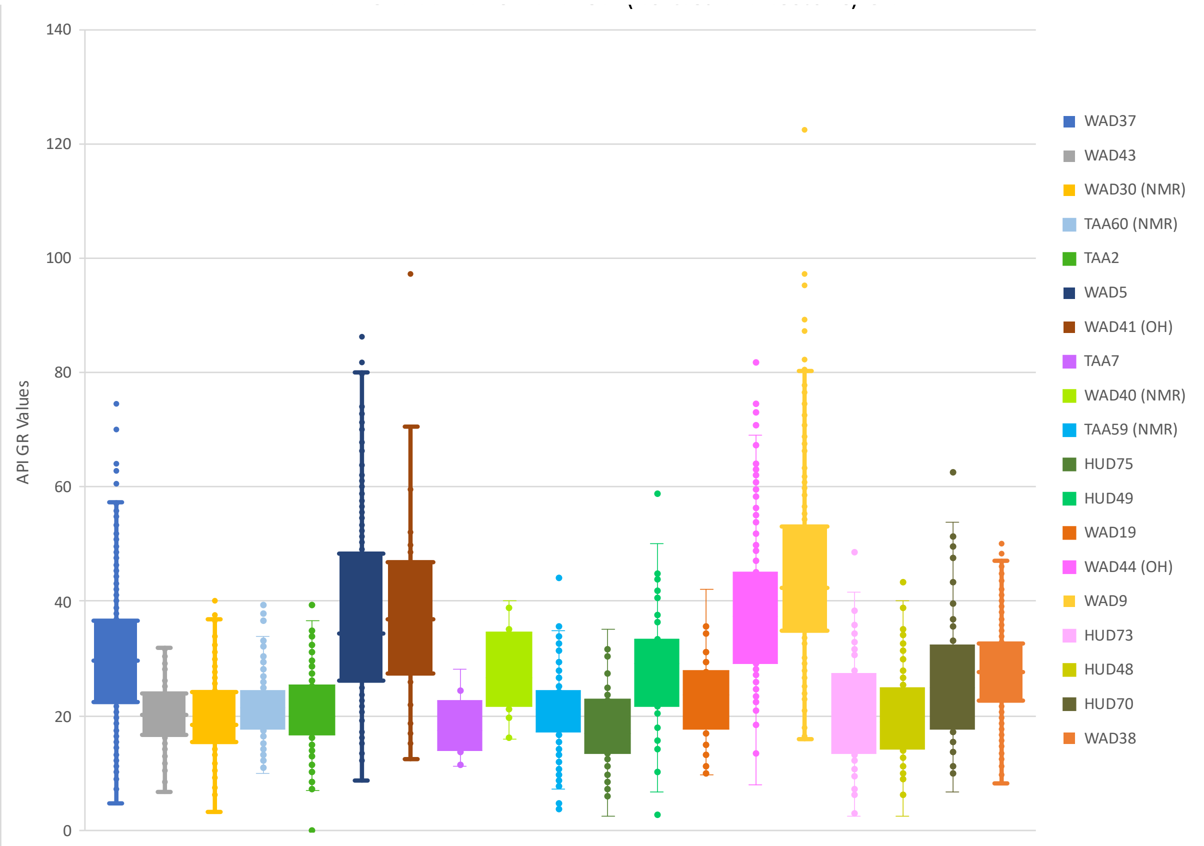


Figure 4-1. Bridgewater Formation GR box and whisker plot showing variation in values (excluding Bridgewater Formation Clean Limestone).

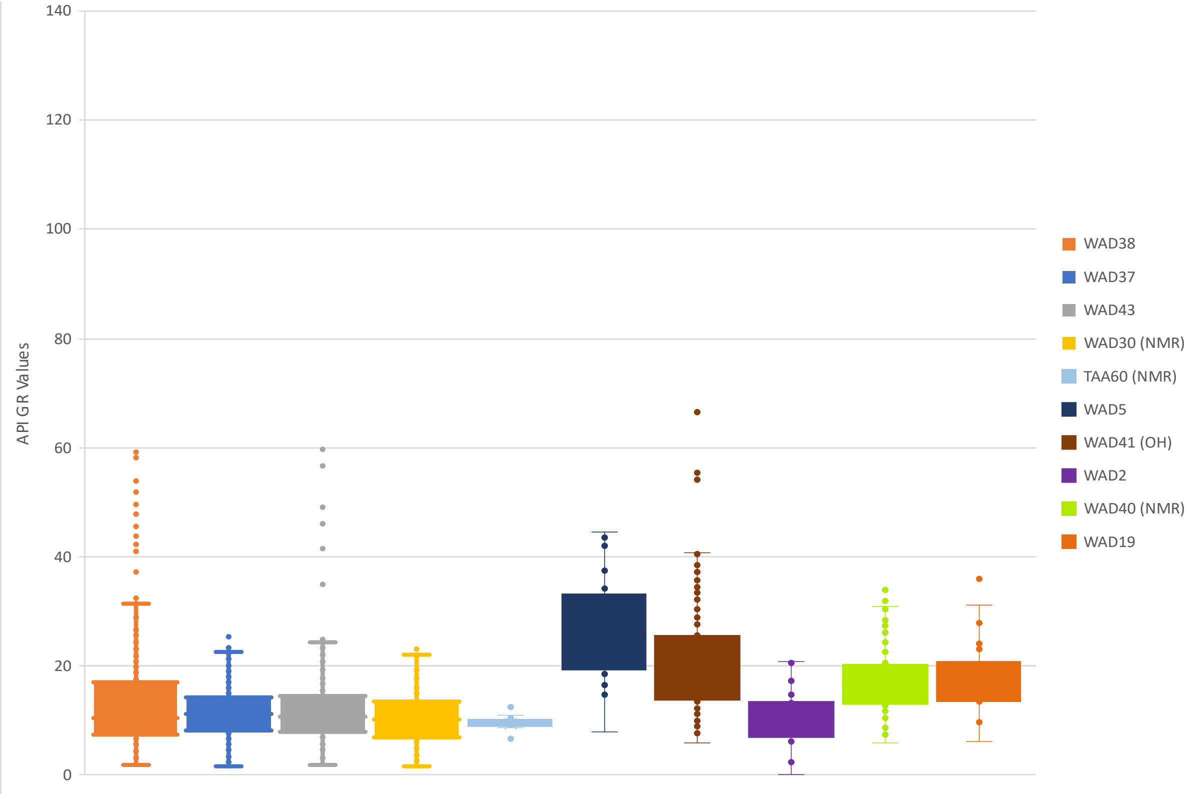


Figure 4-2. Bridgewater Formation Clean Limestone GR box and whisker plot showing variation in values.

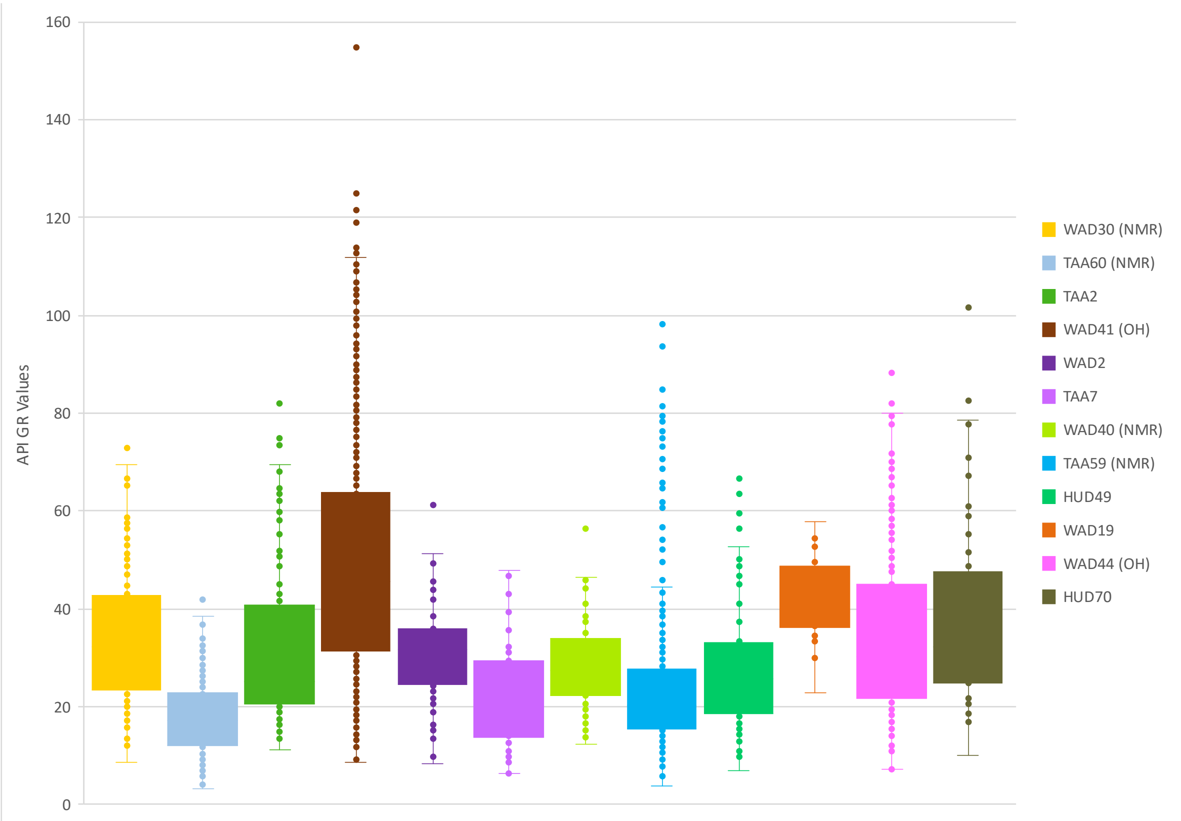


Figure 4-3. Poelpena Formation GR box and whisker plot showing variation in values.

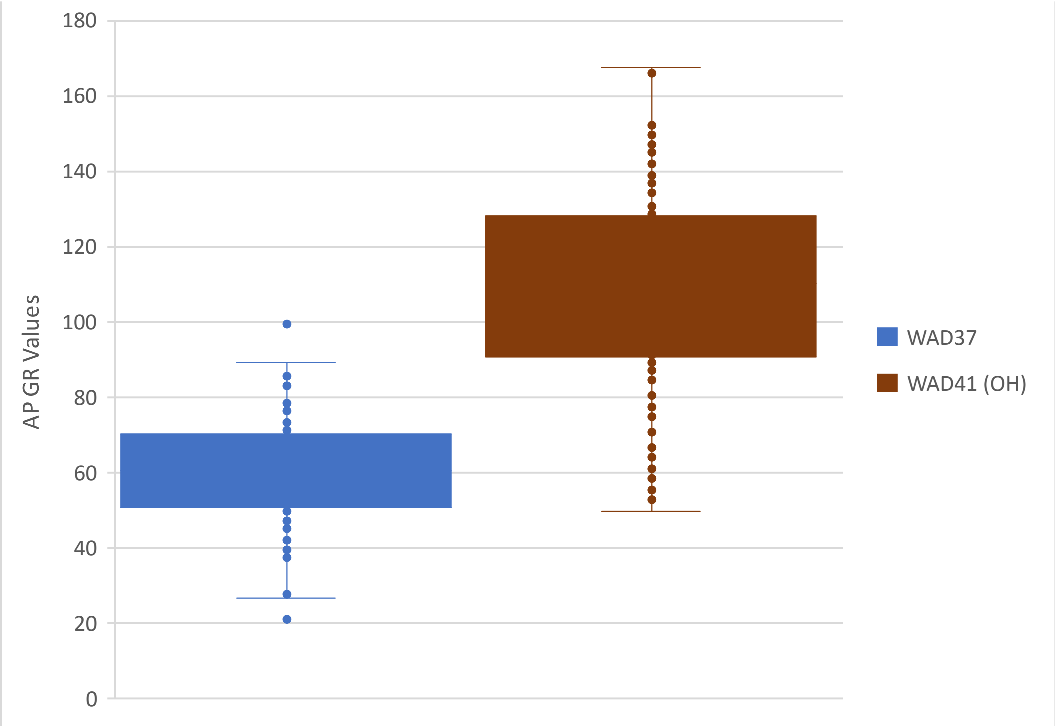


Figure 4-4. Sleaford Complex GR box and whisker plot showing variation in values.

5. Stratigraphic cross-sections and depositional edges

The GR log is the principal downhole log used to understand depositional environment (using log character/shape) and correlate formations across the AOI. Where available, lithologic sample descriptions were also considered to ensure reasonable correlations between wells. Correlating formations is important to understanding the relationship between the aquifers and aquitards present, as well as the confining nature of aquitards. These surfaces can be input to groundwater models as separate units and enables petrophysical relationships and rock properties to be examined by unit. In the Greater Bramfield area the surficial Bridgewater Formation aquifer has historically provided most of the extracted water in the area with some wells producing from the underlying Poelpena Formation. With reduced rainfall the Bridgewater Formation groundwater levels are decreasing due to lack of recharge, increasing the importance of understanding the Poelpena Formation and its distribution and salinity.

When considering geologic history and correlations between the Quaternary and Tertiary units, it is crucial to remember that there is on the order of 35 Ma separating their deposition (Figure 5-1). Differential erosion, non-deposition, and other factors over this time period have resulted in the top of the Poelpena Formation being variable in appearance, sometimes having a shale present. Consequently, the Poelpena Formation is variably confined or unconfined as discussed in Section 3.3.

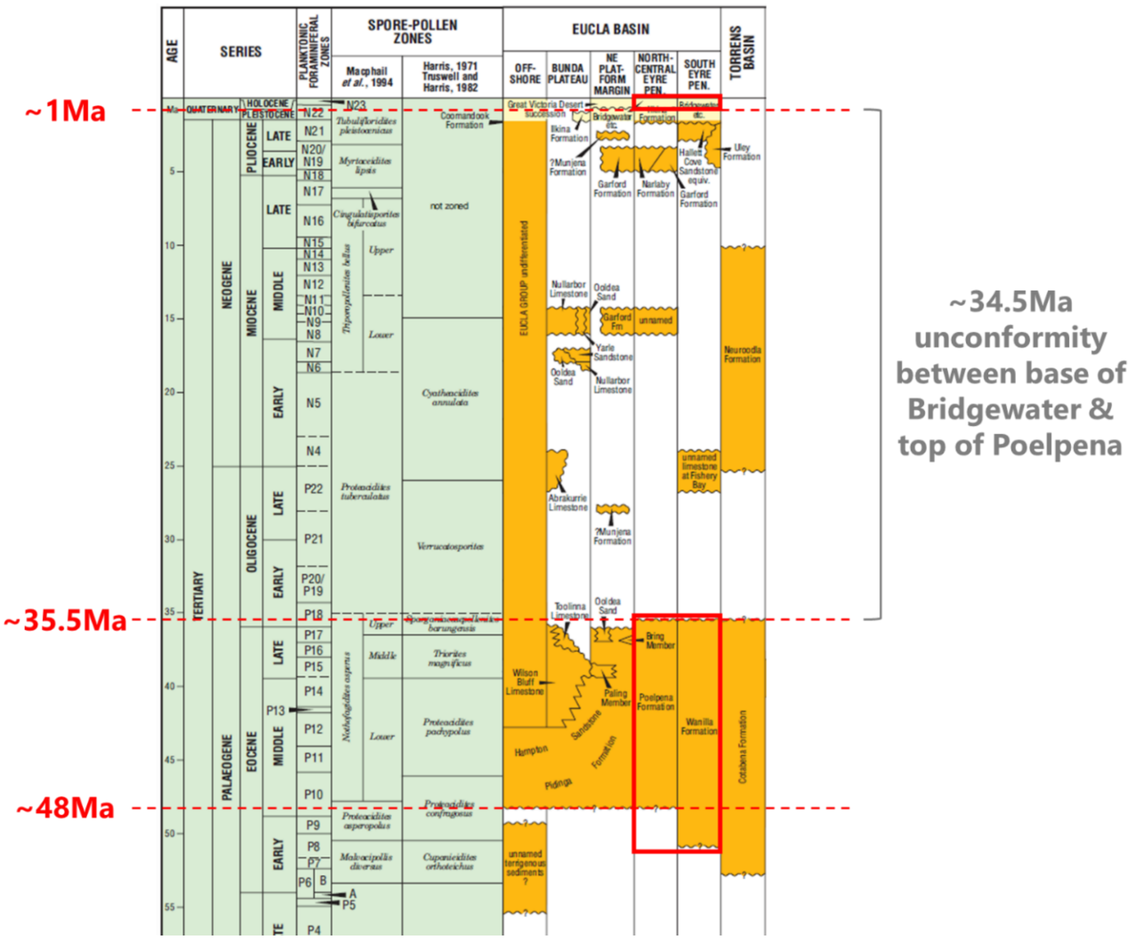


Figure 5-1. Stratigraphic chart of the Eucla Basin highlighting the difference in time between the upper Poelpena Formation and lower Bridgewater Formation.

5.1. Observation well cross-sections

Cross-sections were selected along eight (8) lines of DEW monitoring wells to enable a robust set of formation picks to be made and an understanding of the formation distribution to be defined as accurately as possible (Figure 5 -2). A “pick” efers to the interpreted top of a geological formation identified using downhole data (wireline logs, sample descriptions). Correlations were made using the GR logs available and sample descriptions – GR logs were generally cased hole (attenuated response compared to open hole logs) and of mixed vintages (variable tool response to the same formation). Sample descriptions were of variable quality and detail but provided useful information in many wells (particularly for shallow wells like HUD48 and HUD49) to support formation top picking. Most wells are less than 30 m deep. Sample descriptions are not displayed on subsequent cross-sections but are detailed in section 10.B.

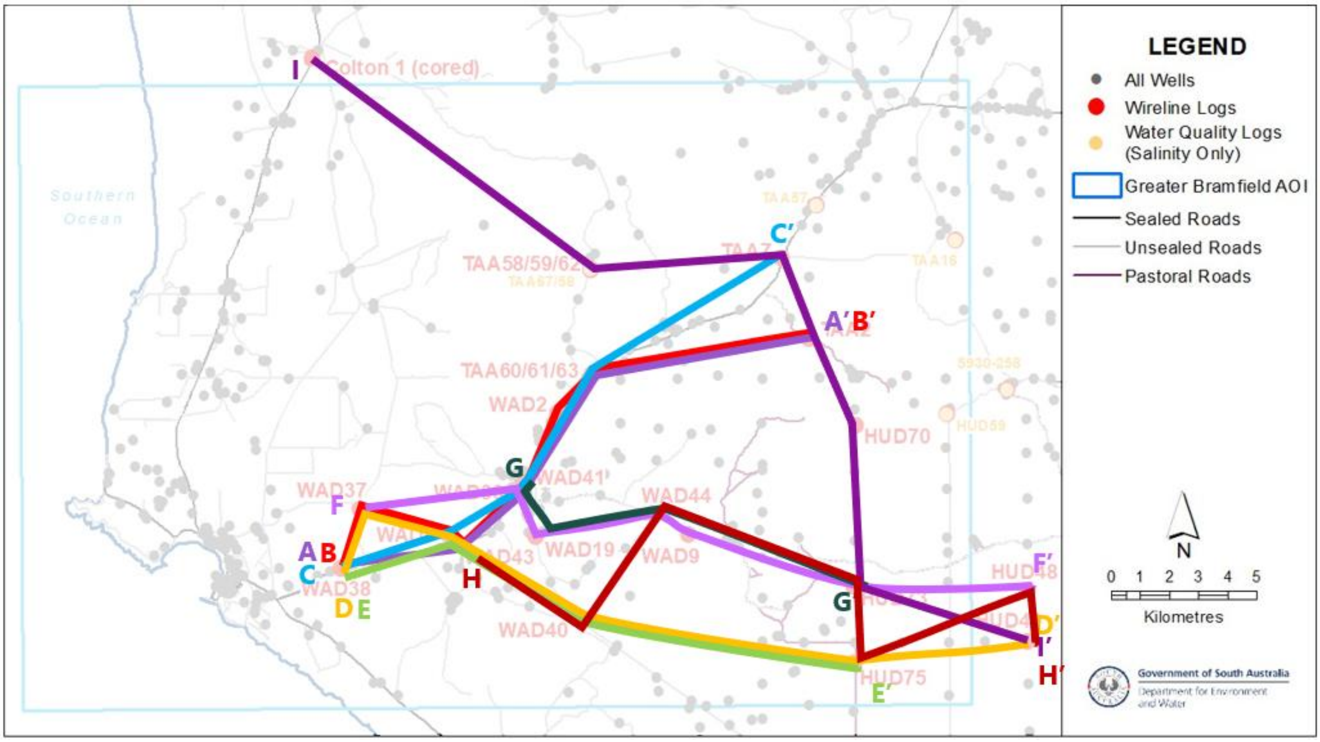


Figure 5-2. Cross-section lines modelled across the Greater Bramfield AOI.

Located in the southwest of the AOI near Elliston, there is a basal Bridgewater Formation zone present in some wells (WAD37 and WAD38). As discussed in Section 3.4.1 Bridgewater Clean Limestone (sub-lithology of Bridgewater Formation), this interval is interpreted to be a clean limestone (with some quartz) shoreface interval that is onlapping the coastal margin and differentially eroding the Poelpena Formation. Consequently, the Poelpena Formation is not present in the southwest towards Elliston and, as a result, the Bridgewater Formation is interpreted to unconformably overlie the Polda Formation in this area (Figure 5- 3). An alternative correlation of the top Poelpena Formation shown in

Figure 5- 4 is a less likely correlation than Figure 5- 3 given the distance (~19km) between WAD38 and TAA2 and the good correlation between TAA2 and other wells in later correlations (e.g. HUD49 in Figure 5- 12 has a similar log character above/below the top Poelpena pick and both wells have supporting sample descriptions). Colour-coded names on the left edge of cross-sections denote the formation top name for the lines of corresponding colour.

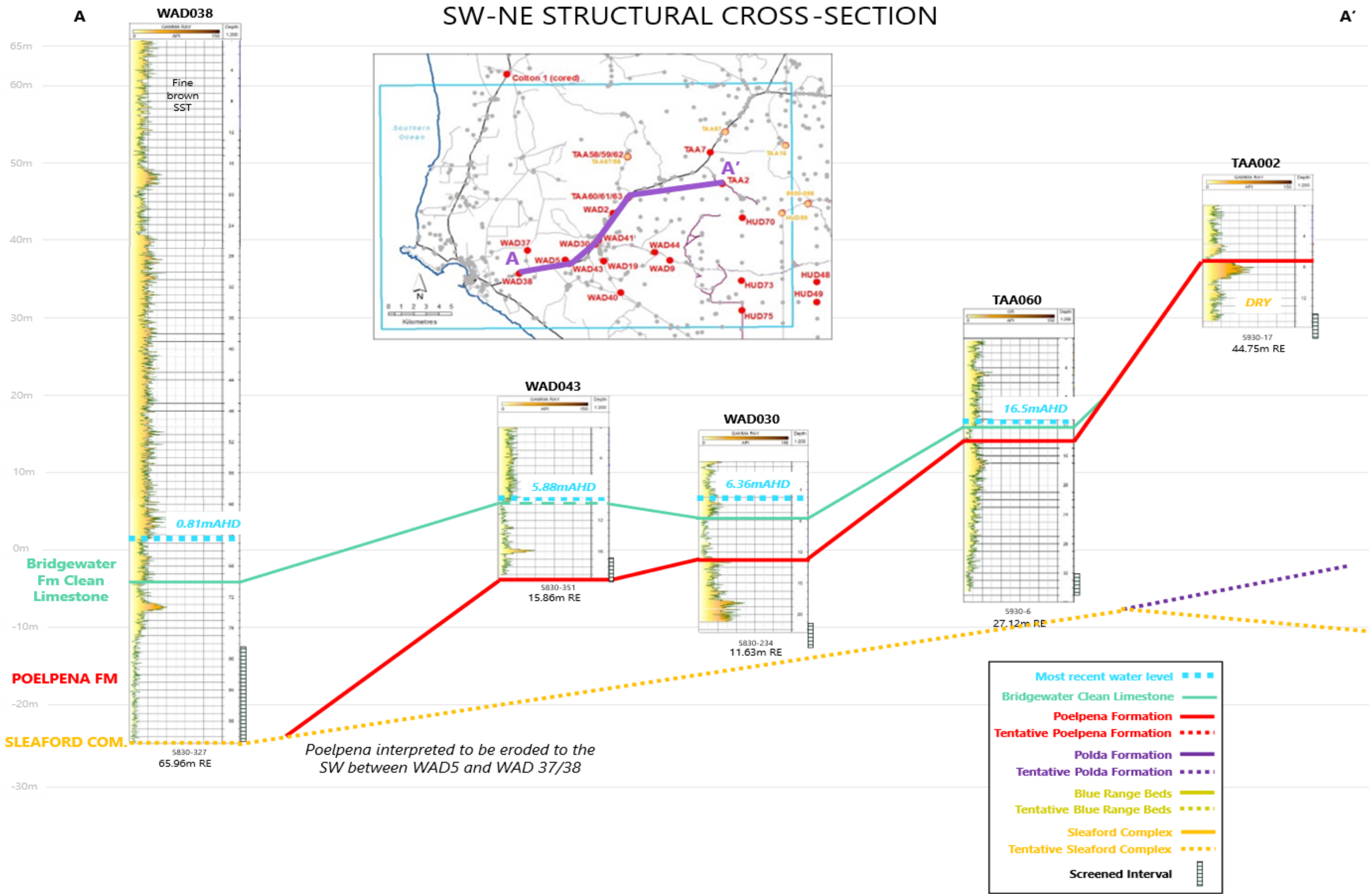


Figure 5-3. Southwest to northeast trending structural cross-section showing onlap of the Bridgewater Formation Clean Limestone onto the Poelpena Formation.

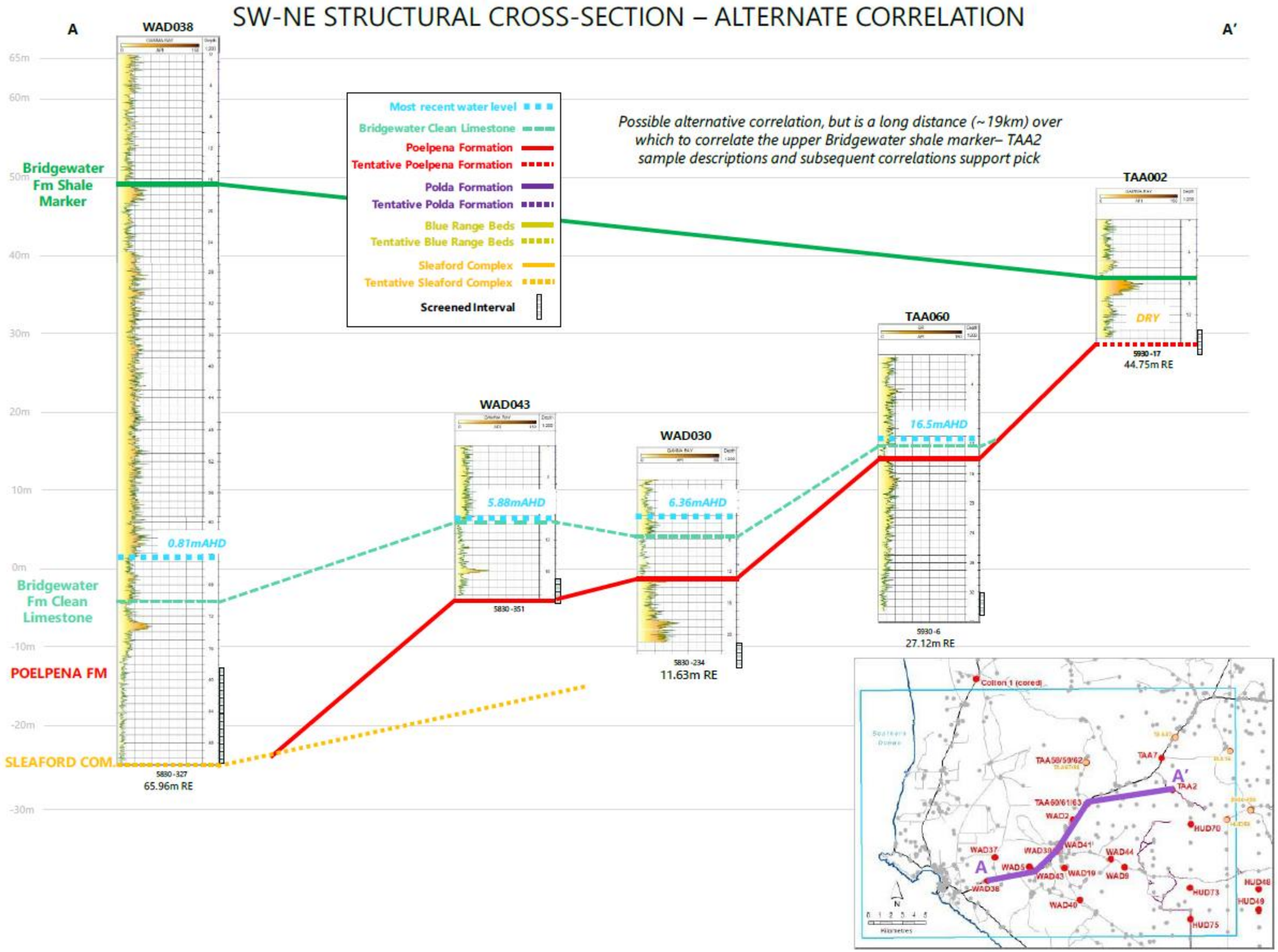


Figure 5-4. Alternative correlation of the top Poelpena Formation based on a shale marker log characteristic – distance between wells and similarity between TAA2 and wells in other correlations makes this a less likely correlation than Figure 5- 3.

Most wells drilled in the Greater Bramfield AOI are fairly shallow (< 30 m depth) and do not intersect the deeper units known to occur in the area. Additionally, the interpretation of a top Sleaford Complex in WAD37 and WAD41 is based on a high GR interval and correlative samples that have been interpreted to be gneiss (Figure 5-5). These sediments have not been interpreted as Polda Formation based on the available mapped extent of the Polda Basin (Figure 3-2). Preserved drill cutting samples from WAD41 were re-analysed and the top Sleaford gneiss (metamorphosed sedimentary rock) described as a pale grey to brown micaceous clay with minor silty to very fine sandstone grains present. Importantly, this has been correlated to WAD37 where the driller's sample description for the correlative interval is "granite" – given the GR signature at WAD37 and strong correlation to other wells (Figure 5-5Figure 5-5; Figure 5-6; Figure 5-7) this interval is interpreted to be Sleaford gneiss (possibly reworked gneiss) and not granite. Tentative basement lines displayed on cross-sections were inferred using mapped depositional edges (see Section 3) and deeper logs (discussed in Section 5.2).

Most wells have groundwater level measurements made in the period between 2022 and 2024, but some wells in the eastern AOI have been dry for some time (many have a most recent groundwater level recorded in 1995 – e.g. TAA7 and HUD49). If these eastern wells had a deeper total depth (TD) into the Poelpena Formation it is likely that they would have intersected the regional water table and still contain water.

As well as onlapping and thinning to the northwest, the Bridgewater Clean Limestone has also been interpreted as onlapping the western AOI. Wells are shallow in this area, and it is hard to make a confident interpretation of lithology and formations. However, by using the log signatures and understanding of depositional environment, combined with sample descriptions, a defensible interpretation has been made (Figure 5-7; Figure 5-8; Figure 5-9). Similar to the trend observed in the northeast, the western wells (e.g. HUD75 and HUD49) are shallow wells drilled on highs and are all confirmed or suspected to be dry given the well TD is above the SWL of other wells (Figure 5-8; Figure 5-11).

The top Poelpena Formation shale is differentially eroded across the Musgrave PWA, with a shale or siltstone generally being present in the northeastern AOI even if not substantially thick (Figure 5-12). Further discussion on shale presence is made in section 5.3.1. The similar groundwater levels of wells completed in the Bridgewater Formation versus Poelpena Formation intervals, as well as the inconsistent shale presence, support the hypothesis that the two formations are hydrologically connected both vertically and laterally. Between WAD19 (dry) and WAD44 (16.68 mAHD groundwater level) there may be some sort of baffling occurring as the groundwater level in WAD44 is above the TD of WAD19 (Figure 5-9). However, WAD19 does not penetrate the Poelpena Formation aquifer, screening only the shallow Bridgewater Formation interval (Figure 5-9; Figure 5-10) which may be the cause of the dry well. That is, wells that screen the Poelpena Formation are still producing water, but there is no substantial lateral flow between the Poelpena Formation around WAD44 and the dry Bridgewater Formation around WAD19.

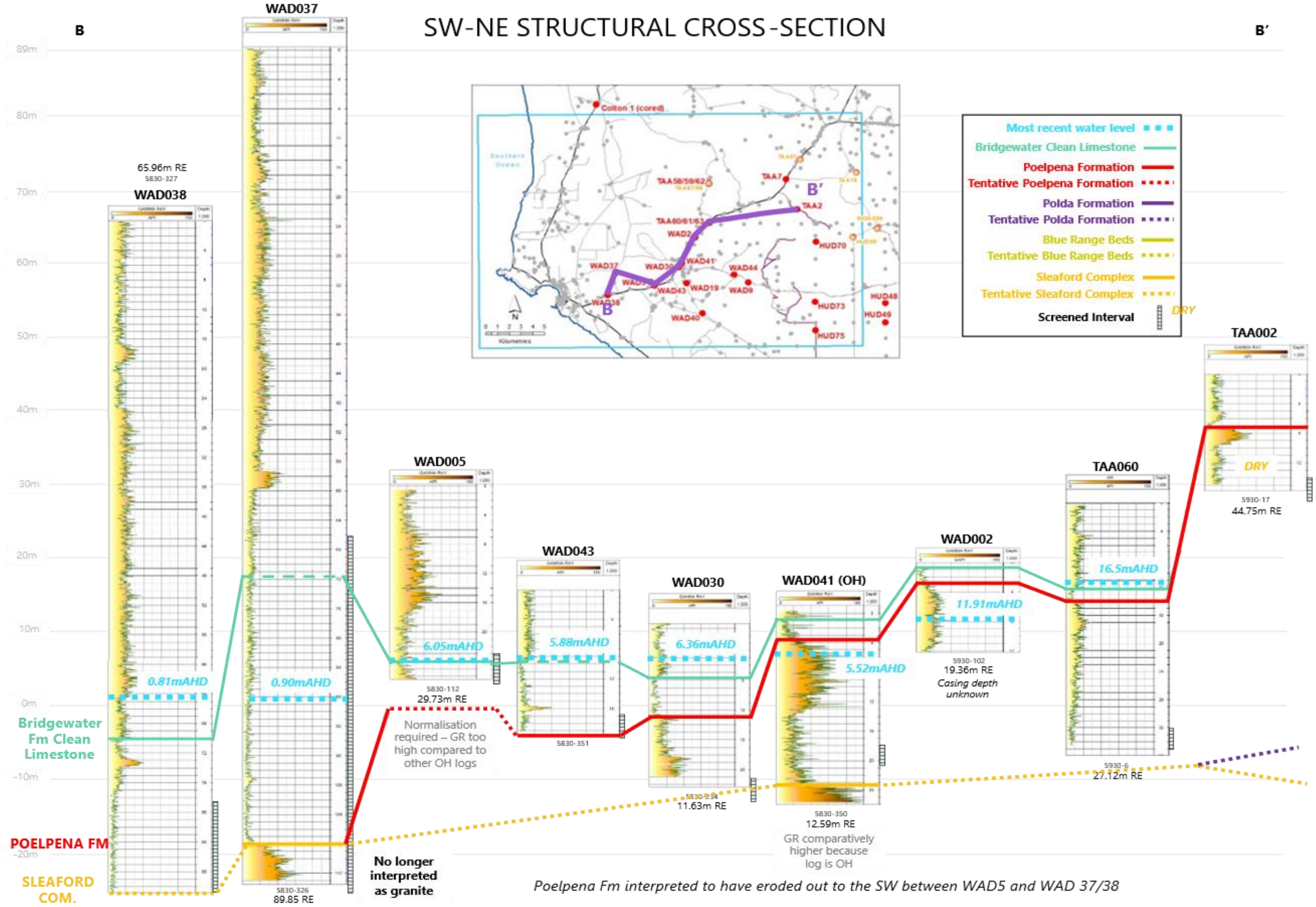


Figure 5-5. Southwest to northeast structural cross-section showing correlation between WAD37 and WAD41 of the top Polda Formation, changing the previous interpretation of granite in the base of WAD37.

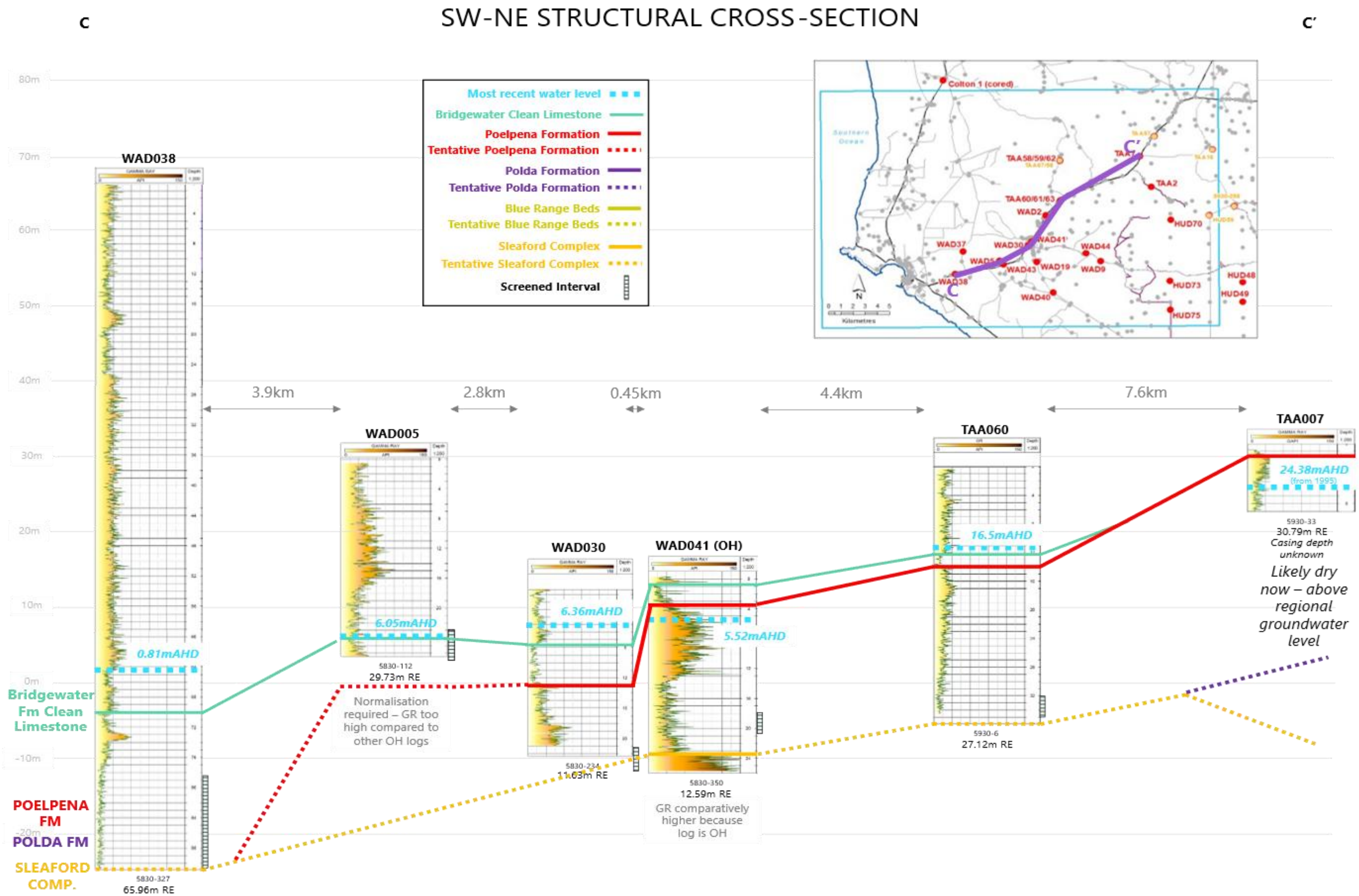


Figure 5-6. Southwest to northeast correlation with relative spacing between wells showing the interpreted formation tops relative to water level in mAHD.

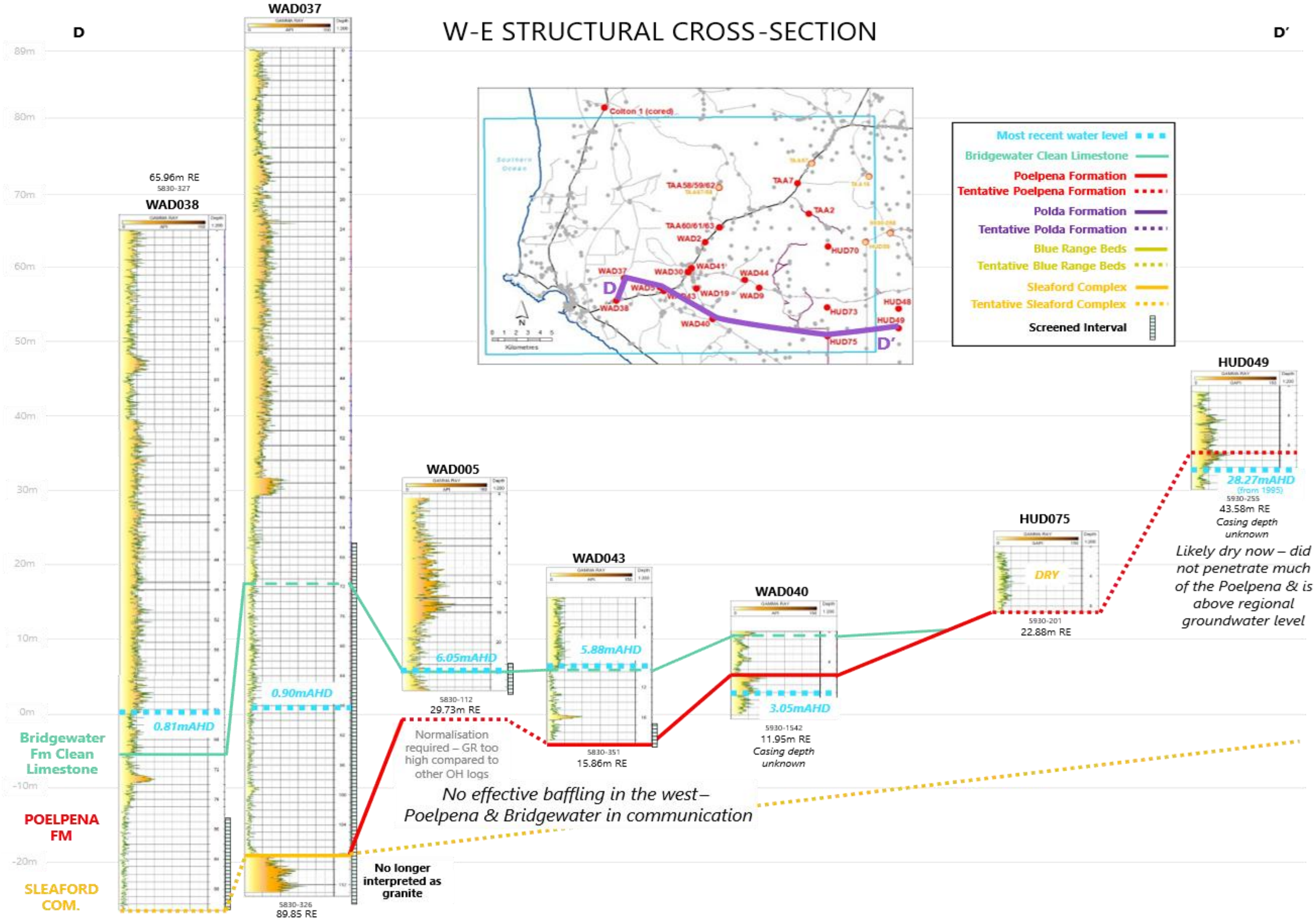


Figure 5-7. West to east cross-section highlighting onlap of the Bridgewater Formation Clean Limestone and dry nature of eastern wells that are structurally high and shallow.

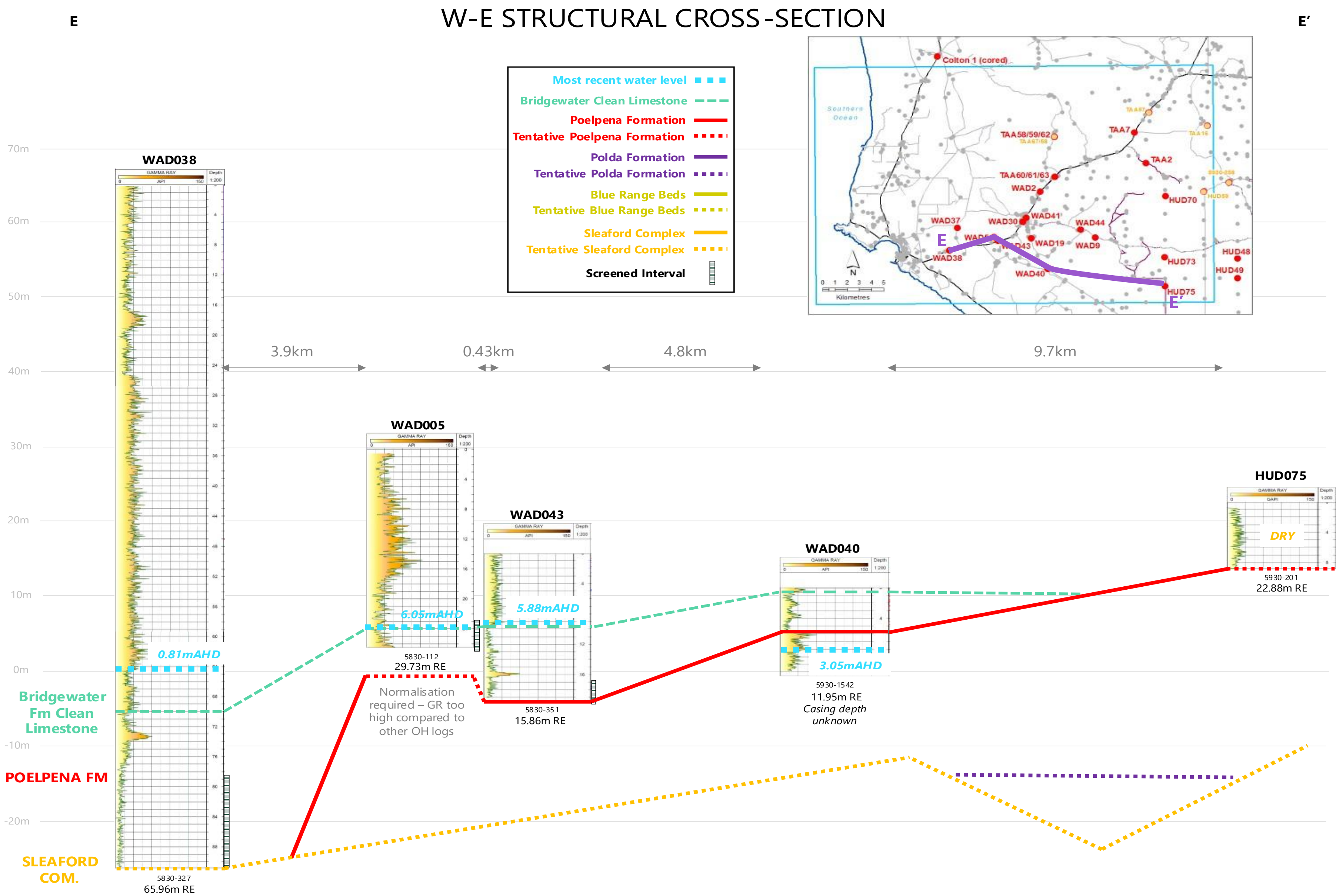


Figure 5-8. West to east structural cross-section with relative spacing of wells to highlight onlap of Bridgewater Formation Clean Limestone to the east.

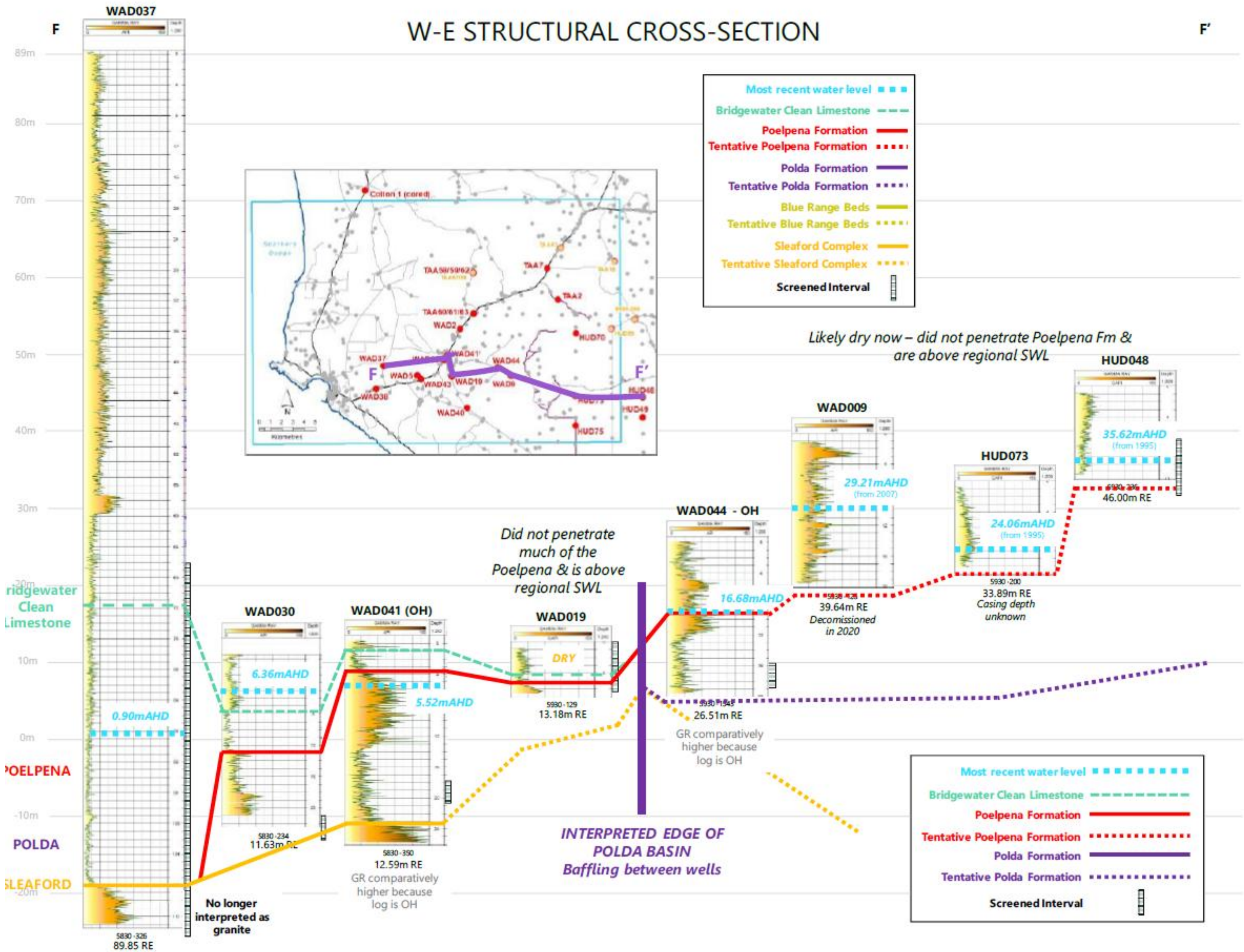


Figure 5-9. West to east cross-section highlighting the dry nature of the structurally higher and shallower eastern wells – WAD009 water level from 2007 is highly anomalous & data source is unreliable. Interpreted edge of Polda Basin is from regional geological maps.

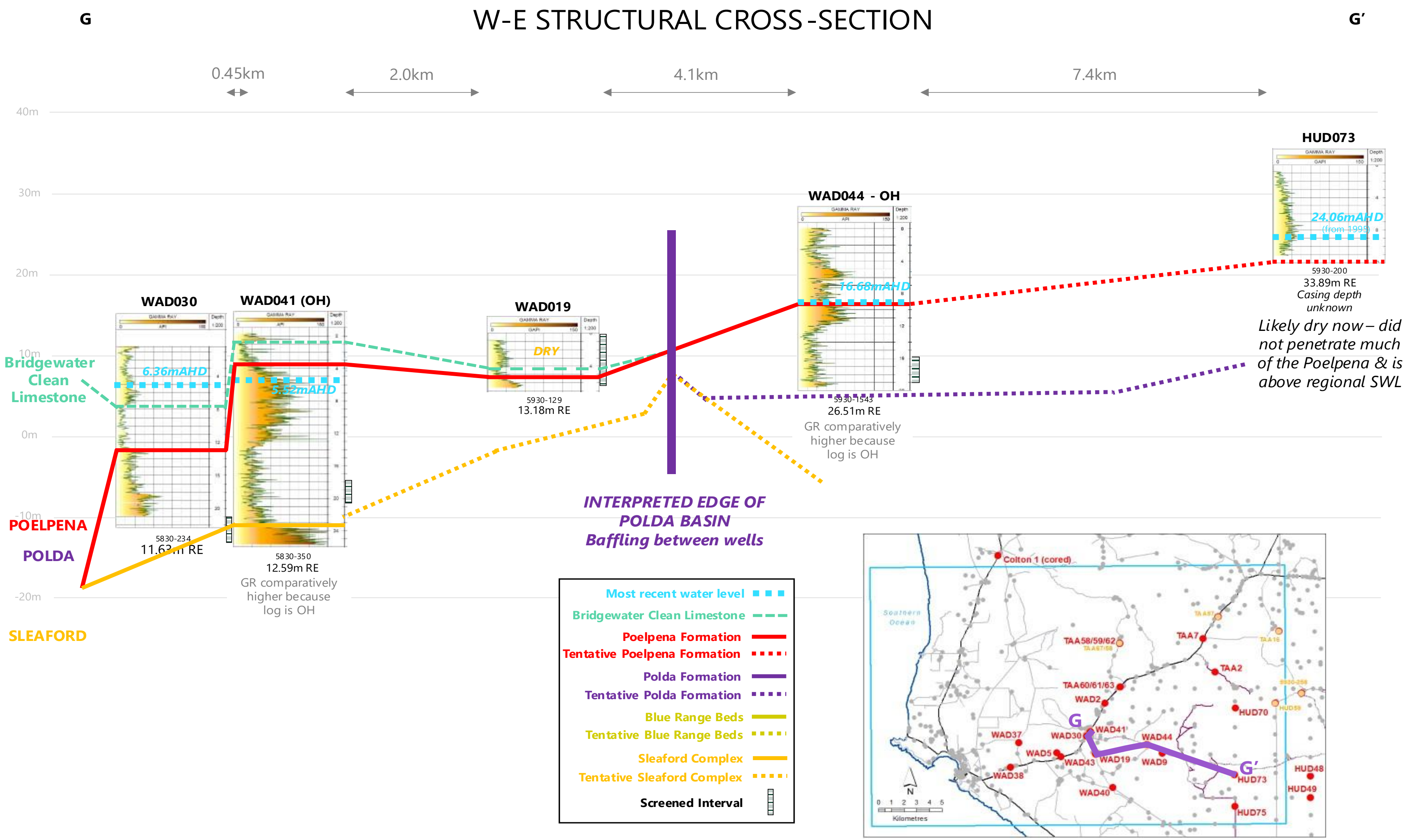


Figure 5-10. West to east cross-section with relative spacing of wells to highlight difference in SWL between the western and eastern wells. Interpreted edge of Polda Basin is from regional geological maps.

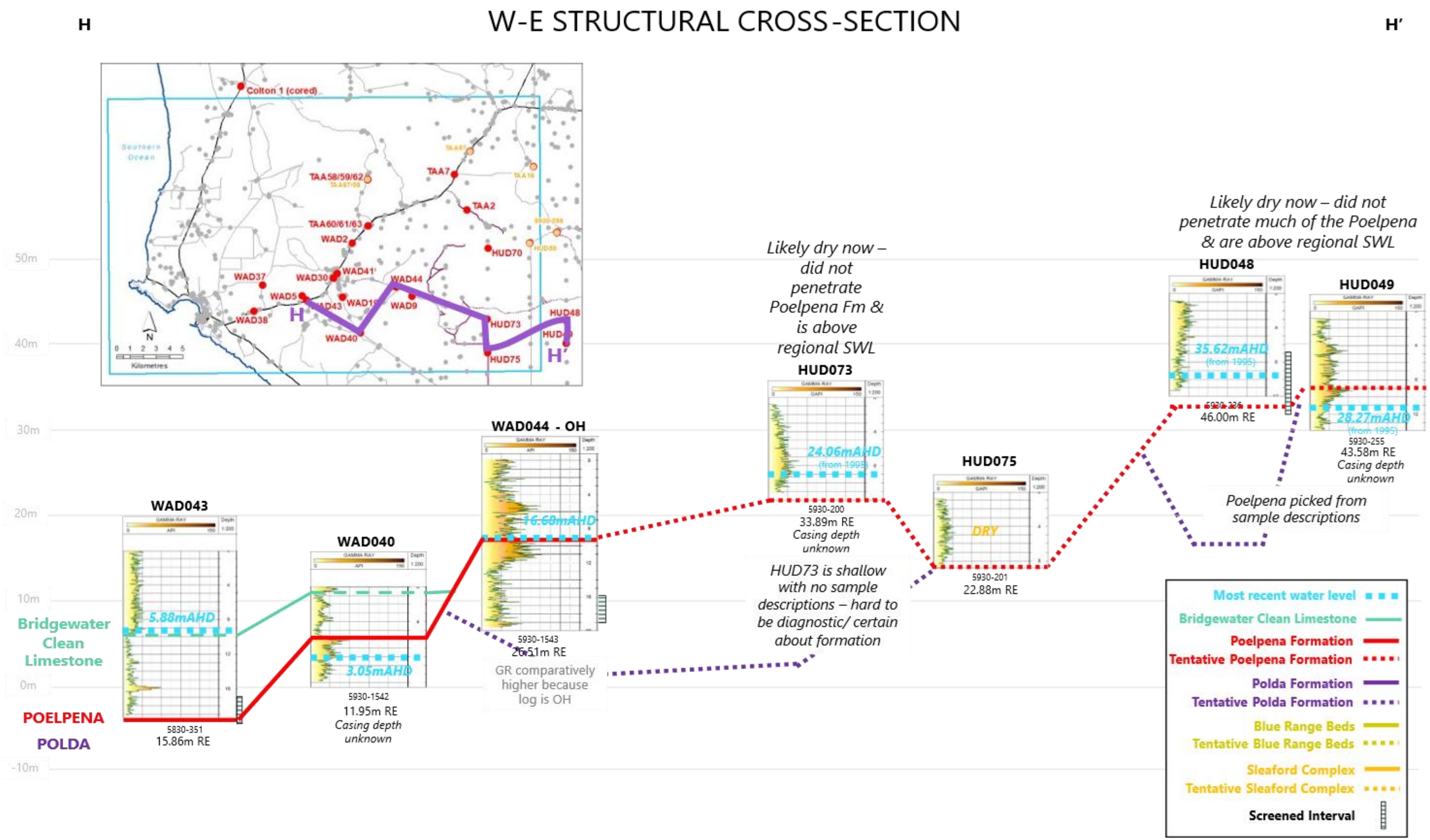


Figure 5-11. West to east cross-section comparing the shallow, structurally high eastern wells to those in the west.

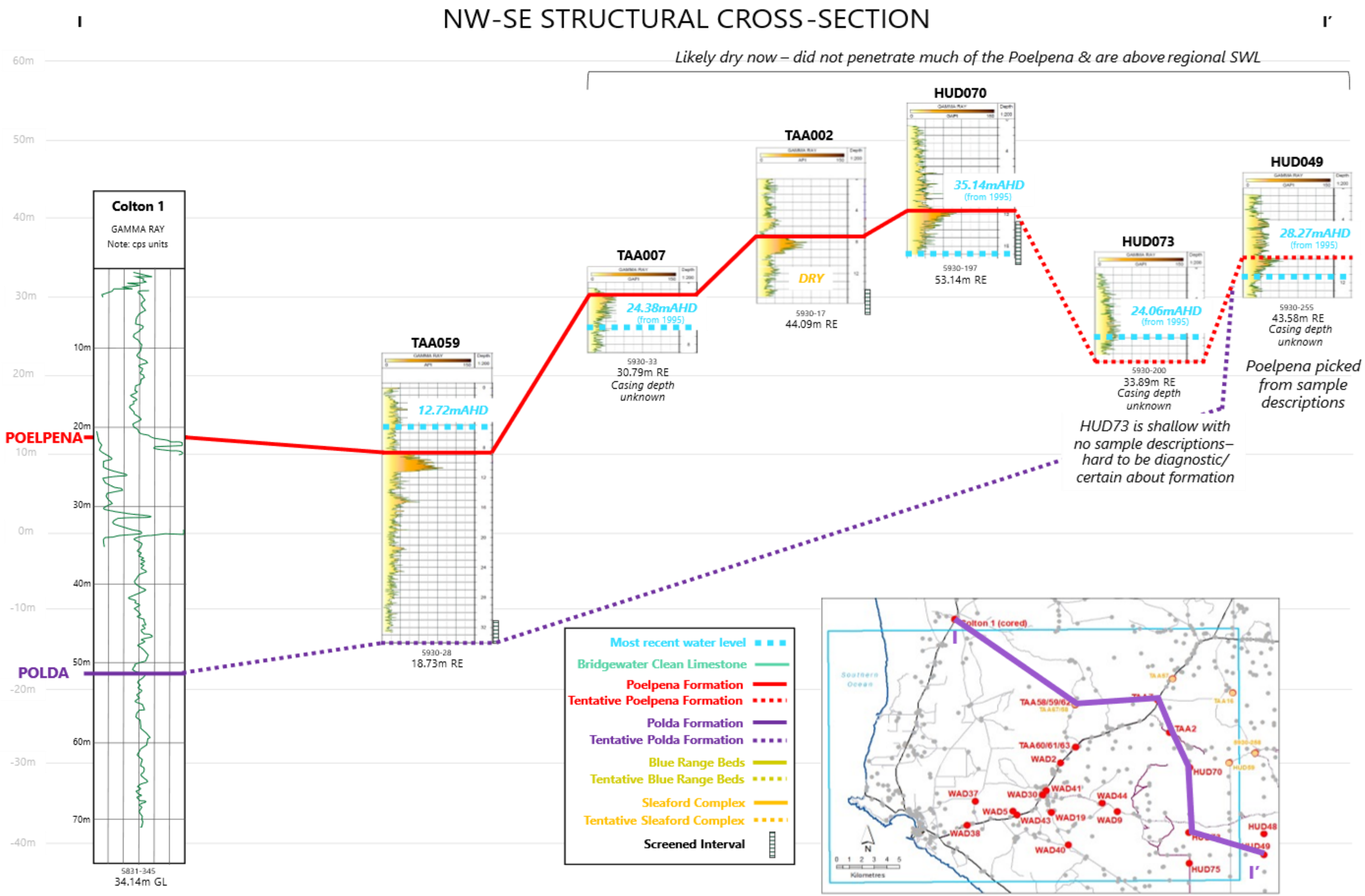


Figure 5-12. Northwest to southeast cross-section showing a common presence of a top Poelpena shale or siltstone – note Colton 1 GR units are in counts per second (CPS) and not American Petroleum Institute (API).

5.2. Analysis of deeper wells & previously interpreted basement

Given the shallow nature of the monitoring wells across the AOI, an additional five (5) cross-sections were produced which assessed deep mineral wells in and surrounding the AOI as well as wells previously interpreted to have intersected basement based on sample descriptions (Figure 5-13). Available in seven (7) wells, GR logs (images only, no digital files available) were used in association with sample descriptions to pick formation tops and refine understanding of the deeper stratigraphy. In 15 wells only cuttings descriptions were available, so a set of consistent criteria were used to pick formations. Based on review of all the available sample descriptions, colour was one of the primary descriptors used to differentiate formations:

- Bridgewater Formation sediments are off-white limestone or calcareous sandstone;
- Poelpena Formation sediments are generally brown to brown-grey in colour, differing slightly from the "grey to black" description in Figure 3-3; and
- Polda Formation sediments are generally grey in colour

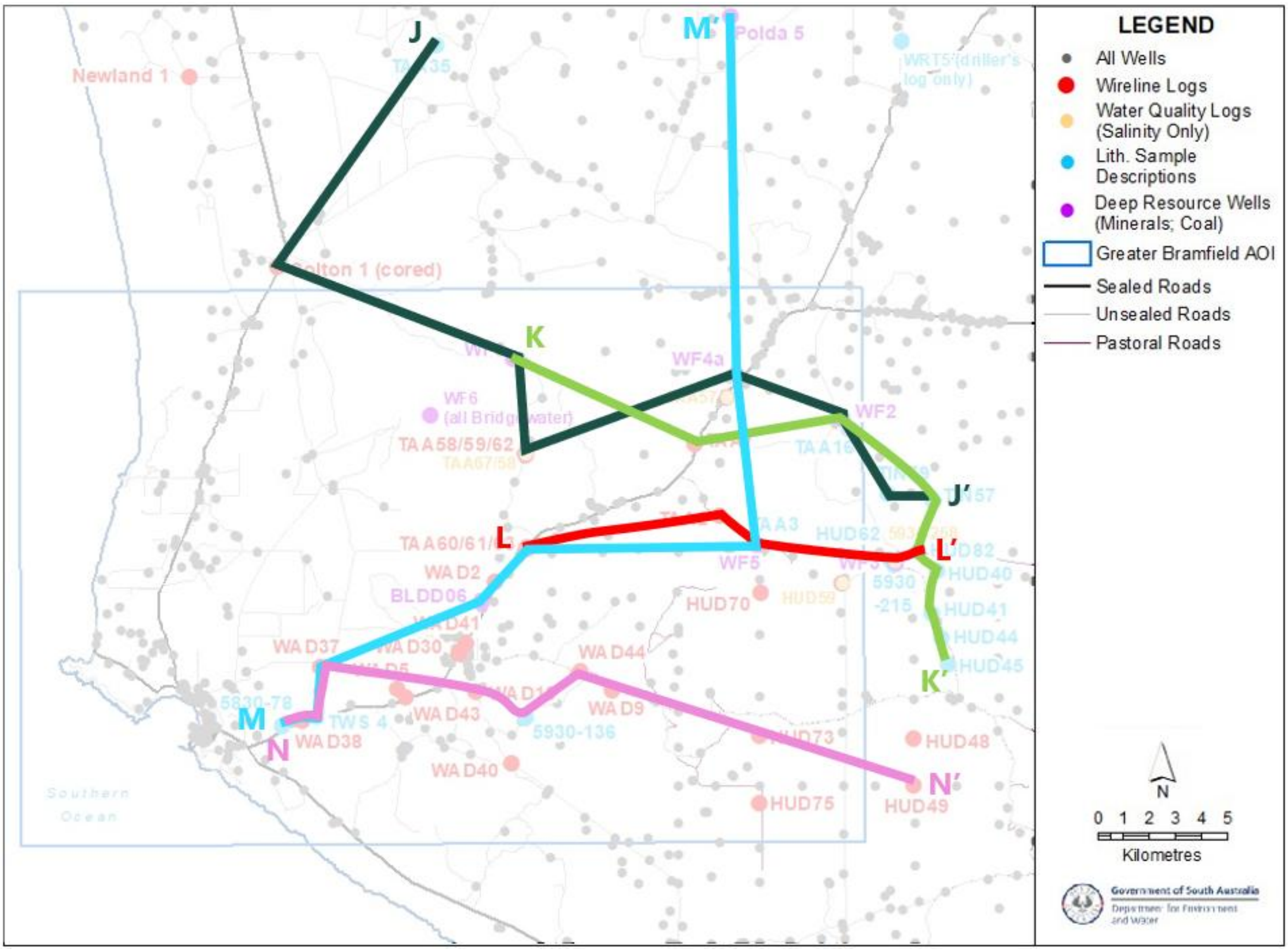


Figure 5-13. Expanded cross-section lines modelled across the Greater Bramfield AOI.

Previously discussed maps of basement and basin edges were also utilised to interpret the most likely basement configuration. Establishing a pick for the base of the Poelpena Formation using this expanded downhole information set enables a basal bounding surface for groundwater modelling to be defined and extrapolated away from well locations. Understanding basement highs is also important for assisting interpretation of surface geophysical surveys, as granite and gneiss are likely to be much higher resistivity than overlying sediments. Sample descriptions are not displayed in subsequent cross-sections, but descriptions are available in Section 10.C. The Polda Formation has not been differentiated from the underlying Kilroo Formation (still part of the Polda Basin) as this was not deemed relevant to this study. Sleaford Complex and Blue Range Bed intervals have been differentiated given the notable difference in lithology, composition and age between these units.

The shapes of GR logs through the Poelpena Formation support the previous interpretation of this formation top and have improved the understanding of the formation thickness across the AOI (generally ~ 15 m to 30 m thick). The previous interpretation of Sleaford Complex metasediments in the eastern AOI has been re-evaluated as Polda Formation given the correlations to other wells with logs and supporting sample descriptions (Figure 5-14;Figure 5-15; Figure 5-16).

Using the WAD37 GR log and the sample descriptions from nearby wells, the interpreted relative high of the Sleaford Complex in the southwestern AOI can be discerned (
Figure 5-17;
Figure 5-18). Based on the cuttings sample description of the correlative zone in WAD41 of a pale brown gneiss, it is interpreted that this lithology would be similar in all of these wells. This would imply metamorphism of sedimentary rocks by the underlying granitic intrusion. Without mineralogical analysis of the limited available samples, it is difficult to conclusively define the uppermost Sleaford Complex in the Greater Bramfield AOI and have certainty of both the picks and whether there is any spatial variation in the lithology. This interpretation should be compared with surface geophysical results to see if any further information can be discerned about the interpretation and distribution of basement lithologies across this area and whether there are likely to be any lithological variation not captured in this dataset.

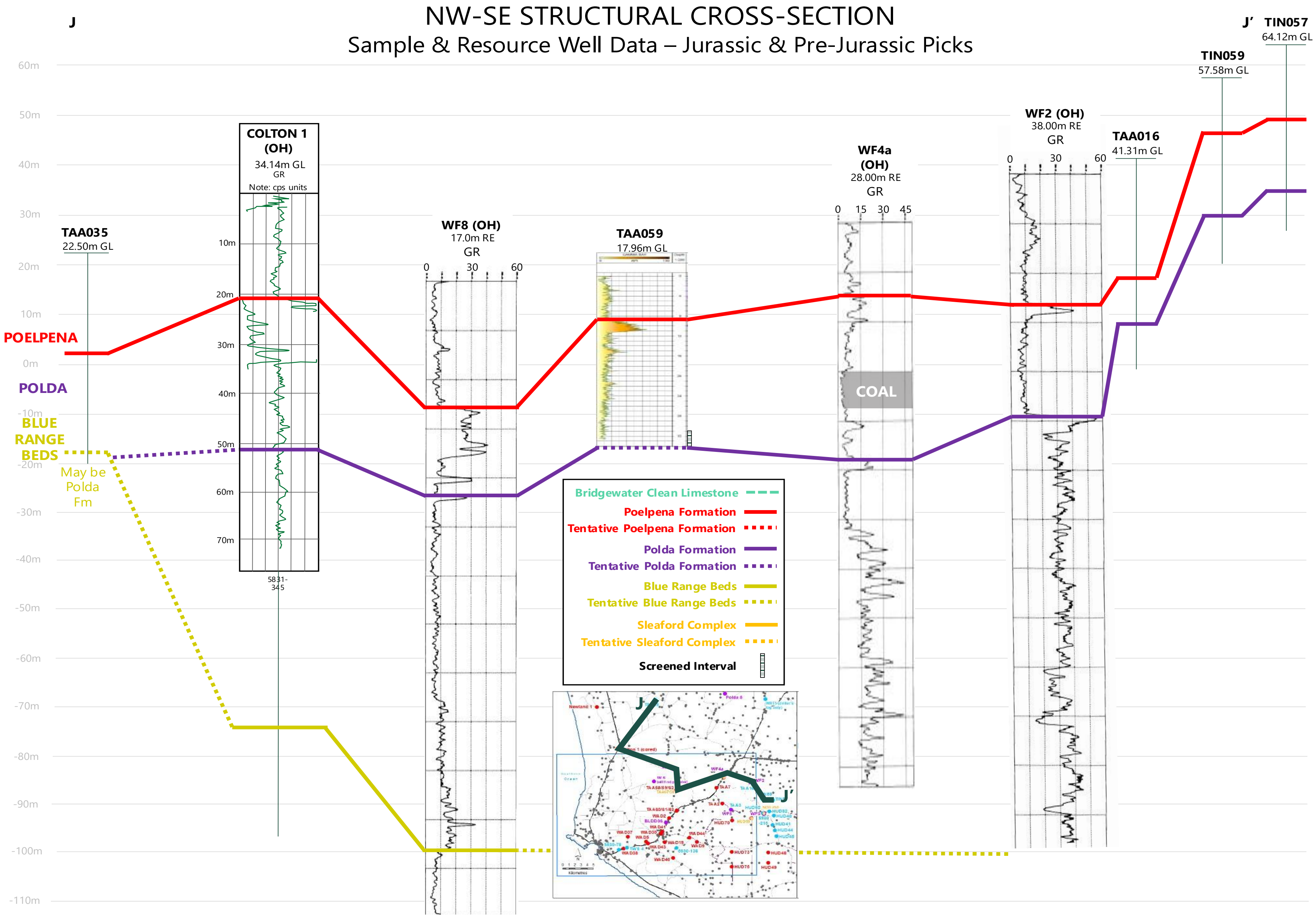


Figure 5-14. Northwest to southeast structural cross-section showing the Poelpena Formation thickness and variation in Polda Formation sediments towards the basin edge near TAA35.

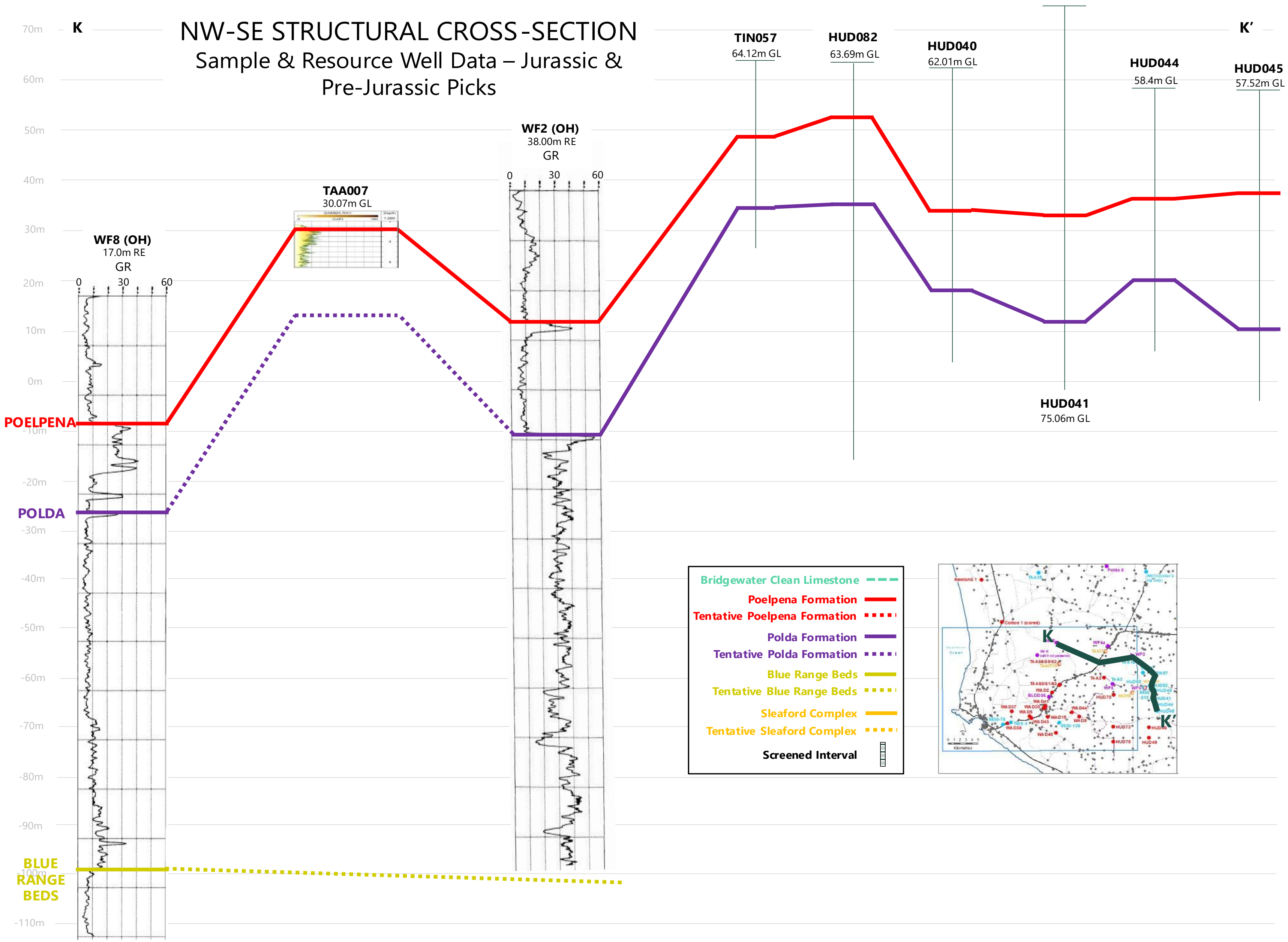


Figure 5-15. Northwest to southeast structural cross-section highlighting the distribution of the Poelpena Formation.

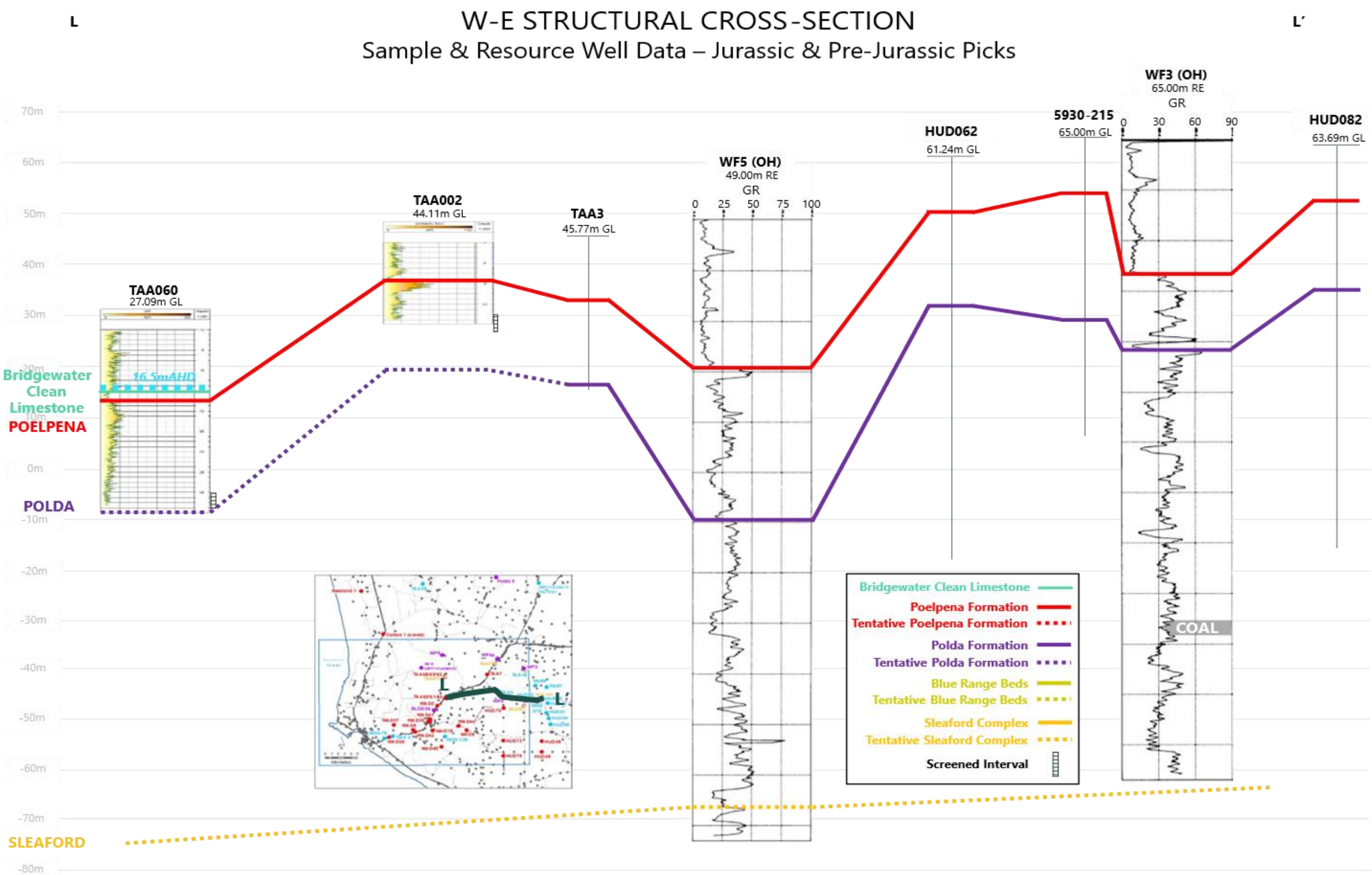


Figure 5-16. West to east structural cross-section highlighting the Poelpena Formation distribution in wells without sample descriptions.

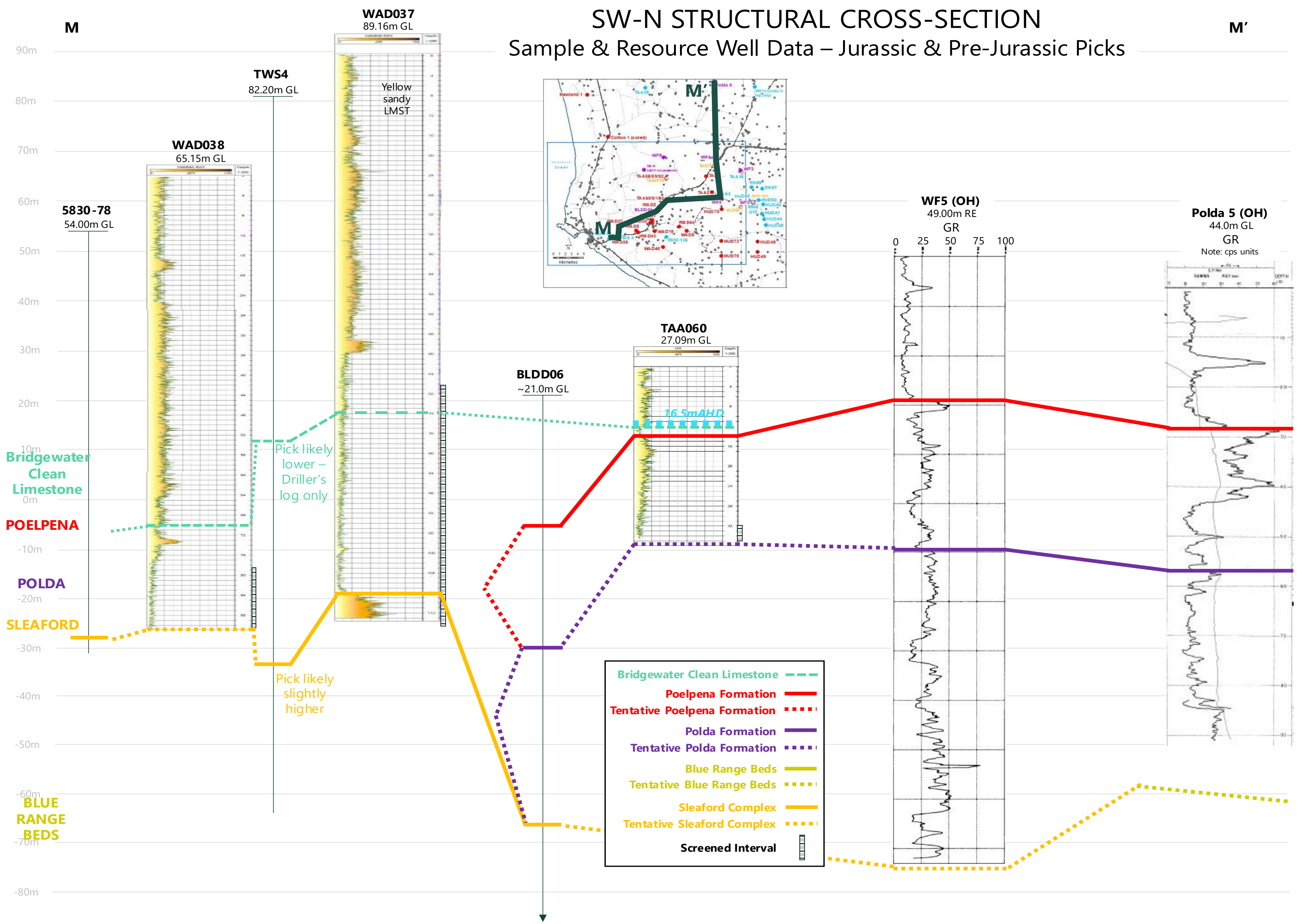


Figure 5-17. Southwest to north structural cross-section showing the approximate edges of the Poelpena and Polda formations, as well as the Sleaford Complex top depth in the southwest.

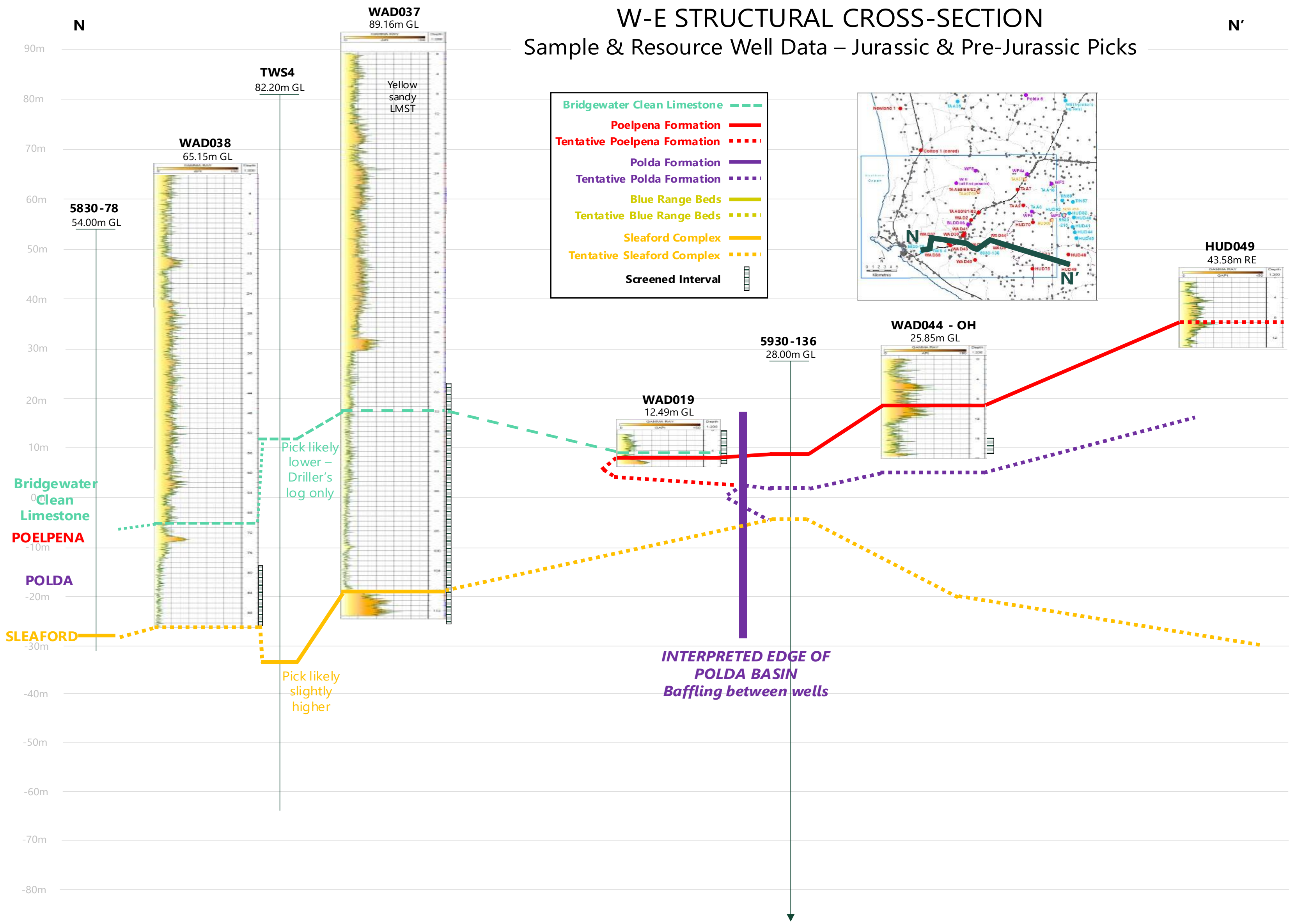


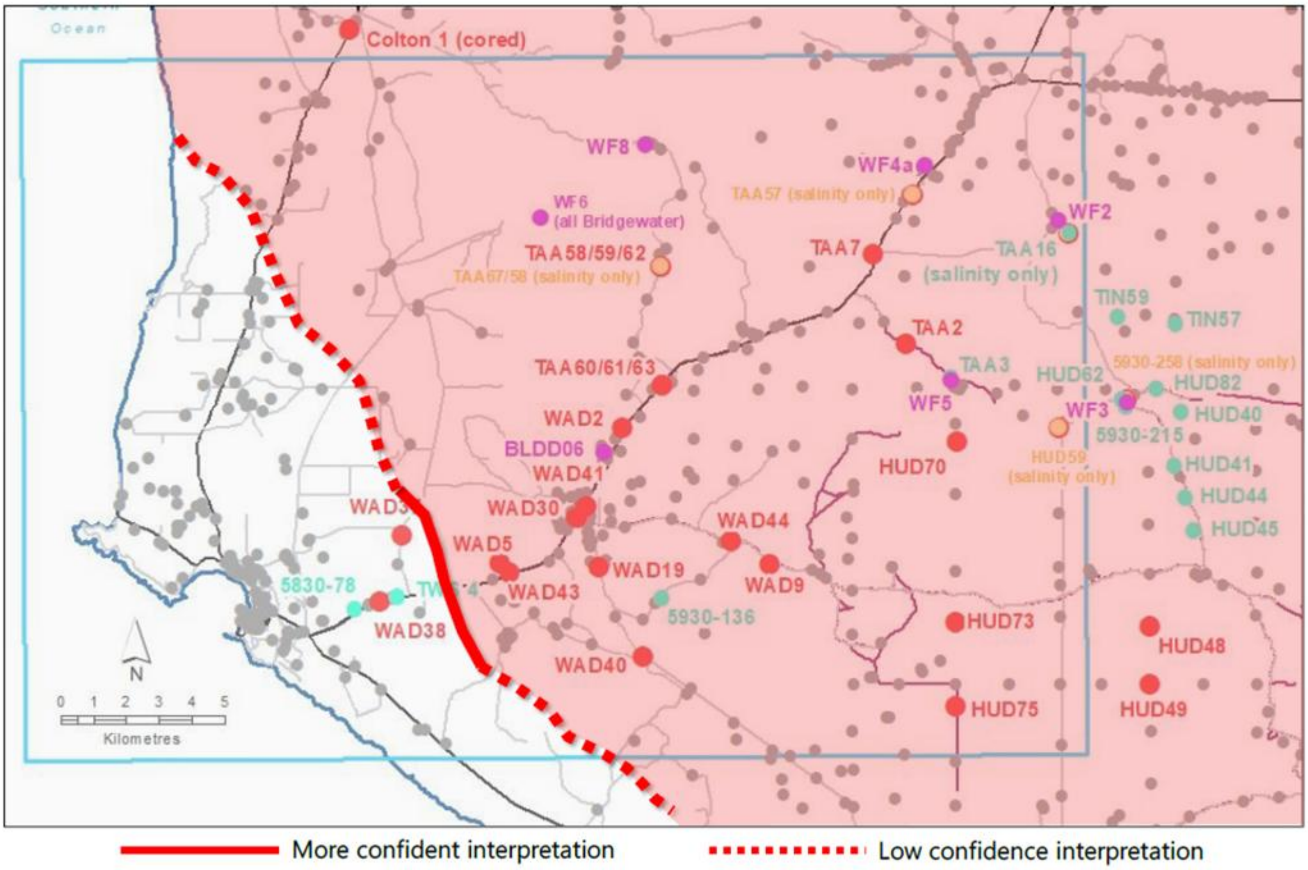
Figure 5-18. West to east structural cross-section showing the approximate edges of the Poelpena and Polda formations, erosional nature of the Bridgewater Formation Clean Limestone, and the Sleaford Complex top depth in the southwest. Edge of Polda Basin interpreted from regional geological maps.

5.3. Depositional edges

An alternative way of viewing the formation top picks is to convert them to a map showing a depositional edge of the formation. Given the overall paucity of data in the Greater Bramfield AOI, these need to be treated with caution. Interpretation of edges would be more refined if there were a greater number of wells with downhole electric log data and/or more wells that penetrated deeper to better determine stratigraphic relationships. To confirm the ages of strata and add certainty to these interpretations, palynological analyses would be required.

5.3.1. Poelpena formation depositional edge

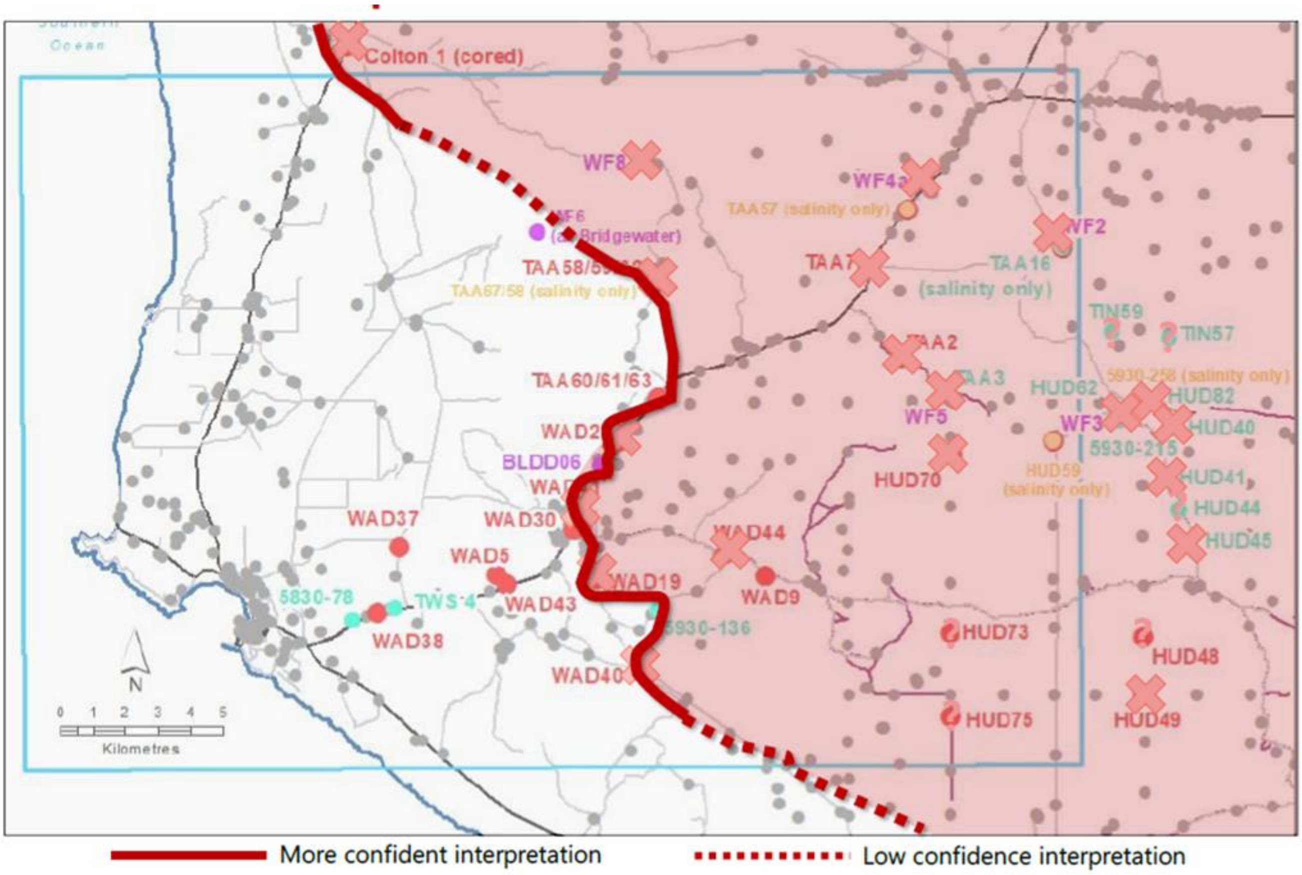
The Poelpena Formation is interpreted to be largely present across the AOI, pinching out to the southwest. More downhole electric log data would improve the understanding of formation presence/absence northeast and southwest of WAD37 (Figure 5-19).



Based on wells intersecting the Poelpena Formation, an approximate 'zero edge' can be interpreted- note that most wells have Poelpena sediments present, with **a pinch-out to the south-west which needs more downhole log data to accurately map.**

Figure 5-19. Approximate depositional edge of the Poelpena Formation based on cross-sections.

The top Poelpena Formation shale/siltstone is variably present but generally seems to be present in the eastern to northeastern AOI (Figure 5-20). Confining capacity of this interval is unclear and diffuse vertical flow is believed to occur through this bed even where it is present.



Based on wells intersecting the Poelpena Formation, an approximate 'zero edge' can be interpreted.
The sealing capacity of the upper shale/silt unit is difficult to assess without normalised geophysical logs, and its presence and quality between wells remain uncertain.

Figure 5-20. Approximate presence of the upper Poelpena Formation shale/siltstone. bed.

5.3.2. Bridgewater formation depositional edge

Given the geologically recent deposition of the Bridgewater Formation, the upper section is interpreted to be present across the entirety of the Greater Bramfield AOI in varying thickness. The top of the Bridgewater Formation Clean Limestone has been interpreted in several cross-sections and appears to onlap from the shoreface in the southwest AOI towards the terrestrial northeast (Figure 5-21).

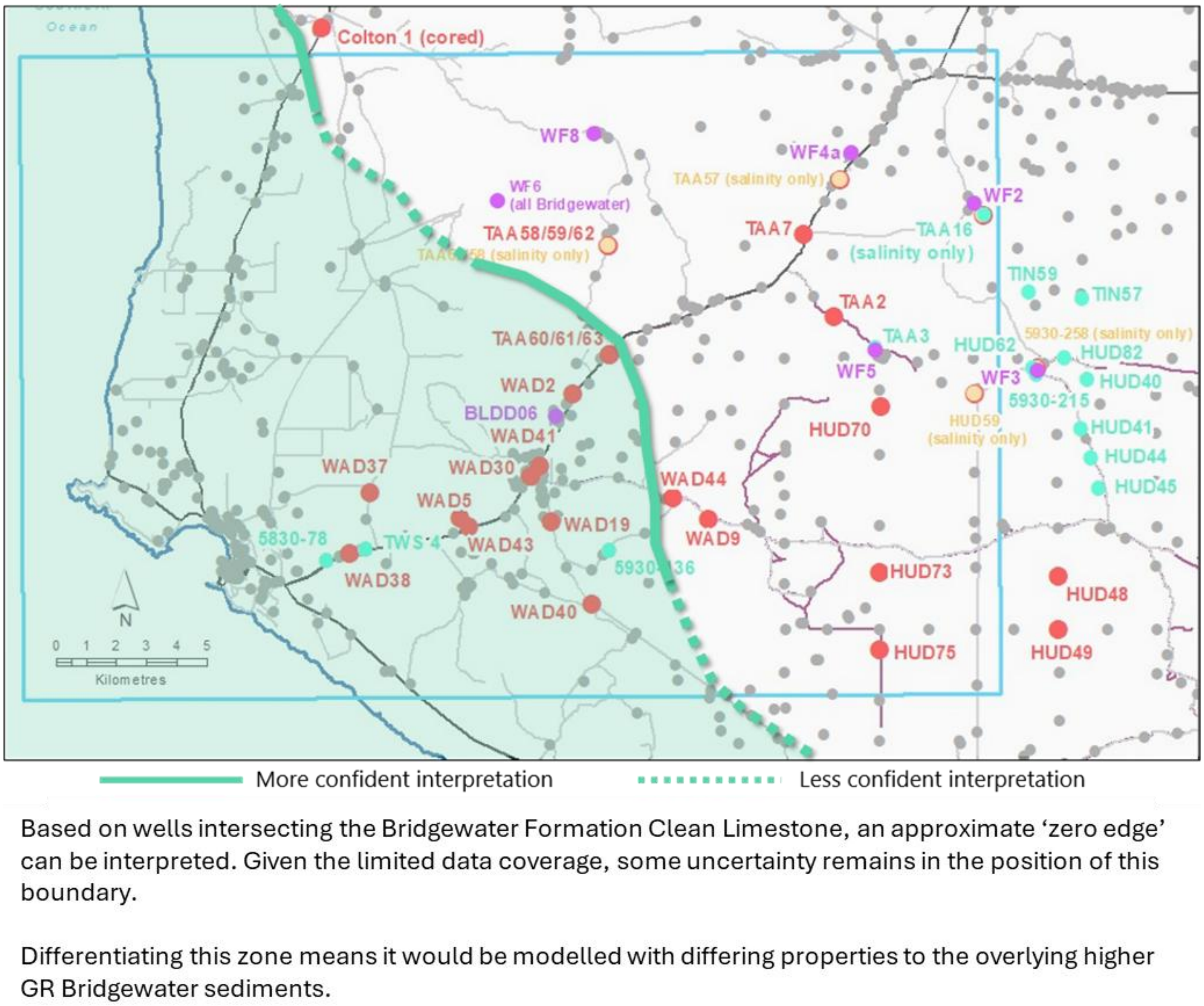
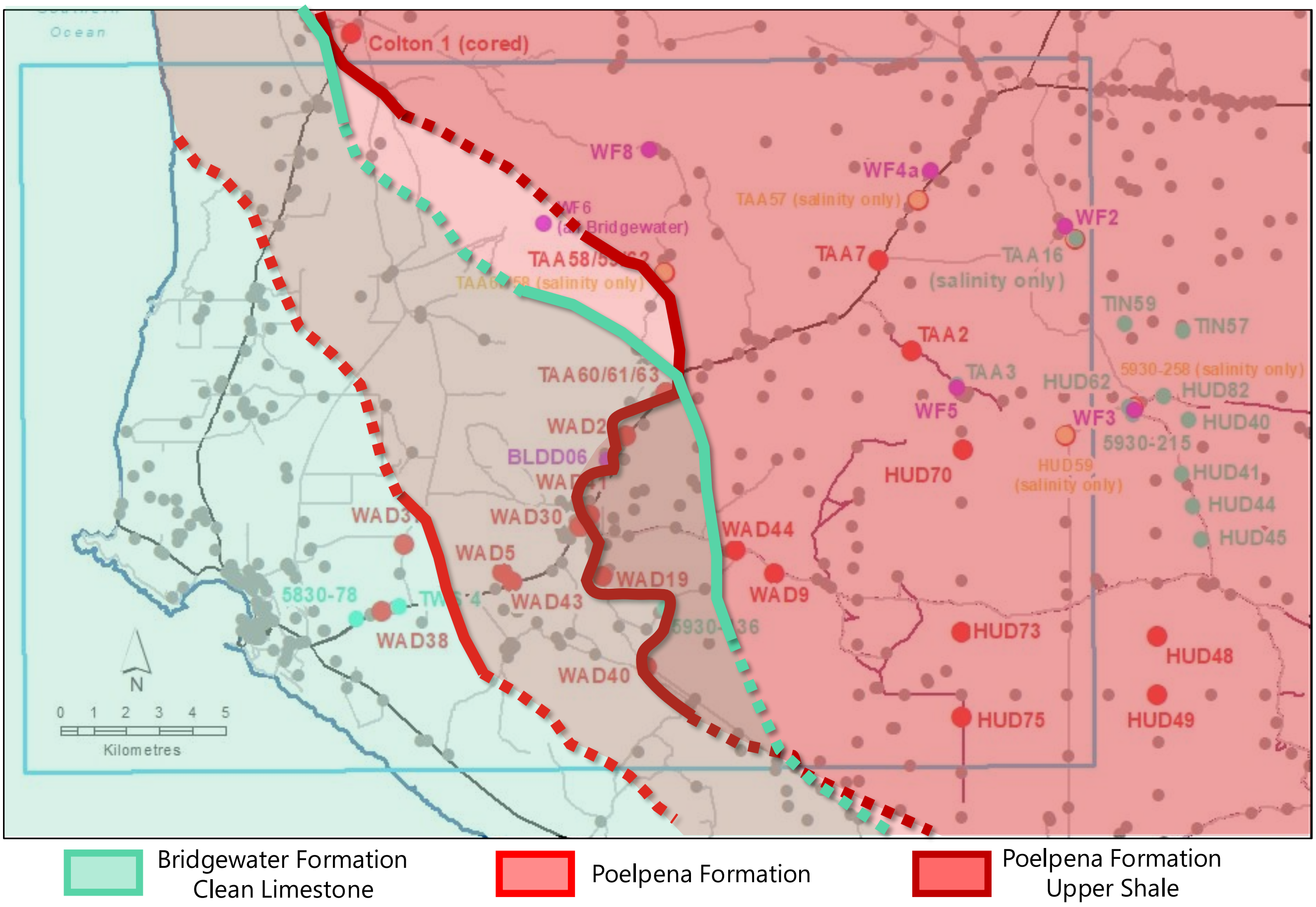


Figure 5-21. Approximate depositional edge of the Bridgewater Formation Clean Limestone based on cross-sections.

5.3.3. Relationship between Quaternary and Tertiary formations

Overlying the notional depositional edges of these units highlights the relationship between absence of the upper Poelpena Formation shale/siltstone and presence of the Bridgewater Formation Clean Limestone (Figure 5-22). The shoreface and beach depositional environment of the Bridgewater Formation Clean Limestone implies a high-energy depositional environment with strong wave- and wind-action processes acting. This would have eroded into any underlying strata and winnowed out any finer sediments (silt, clay).



Compilation of all lines to see inter-relationships

Bridgewater Formation Clean Limestone has eroded the upper Poelpena Formation in the south-west

Figure 5-22. Compilation of depositional edges to examine inter-relationships between units, particularly the Bridgewater Formation Clean Limestone and upper Poelpena Formation shale.

6. Nuclear Magnetic Resonance (NMR) logging for aquifer properties

6.1. NMR logging principles

NMR logging measures hydrogen associated with fluids present in the subsurface by magnetising hydrogen molecules. This polarises the hydrogen by using a strong magnetic pulse to align molecules in one direction and measures the magnitude of this polarisation. When the magnetic pulse is not being produced the hydrogen atoms will begin to realign to their original state. The amplitude of the measured magnetisation signal and the time taken for a response (decay time) are both measured and enable physical properties of the rock to be discerned. NMR equations were calculated for fully saturated formations and can be unreliable in semi-saturated or unsaturated intervals.

The amplitude of the measured NMR signal reflects the amount of hydrogen atoms contained in fluid in the formation; where the formation is fully saturated, this also gives the total porosity. The decay time (denoted by T2) correlates to the mobility of water – i.e. whether water is bound in small or large pores – and is used to calculate the amount of clay-bound, capillary-bound and mobile-water. Small pores give a short T2 and large pores have a large T2. Where multiple pore sizes are present in an interval, multiple T2 responses will be observed (Figure 6-1).

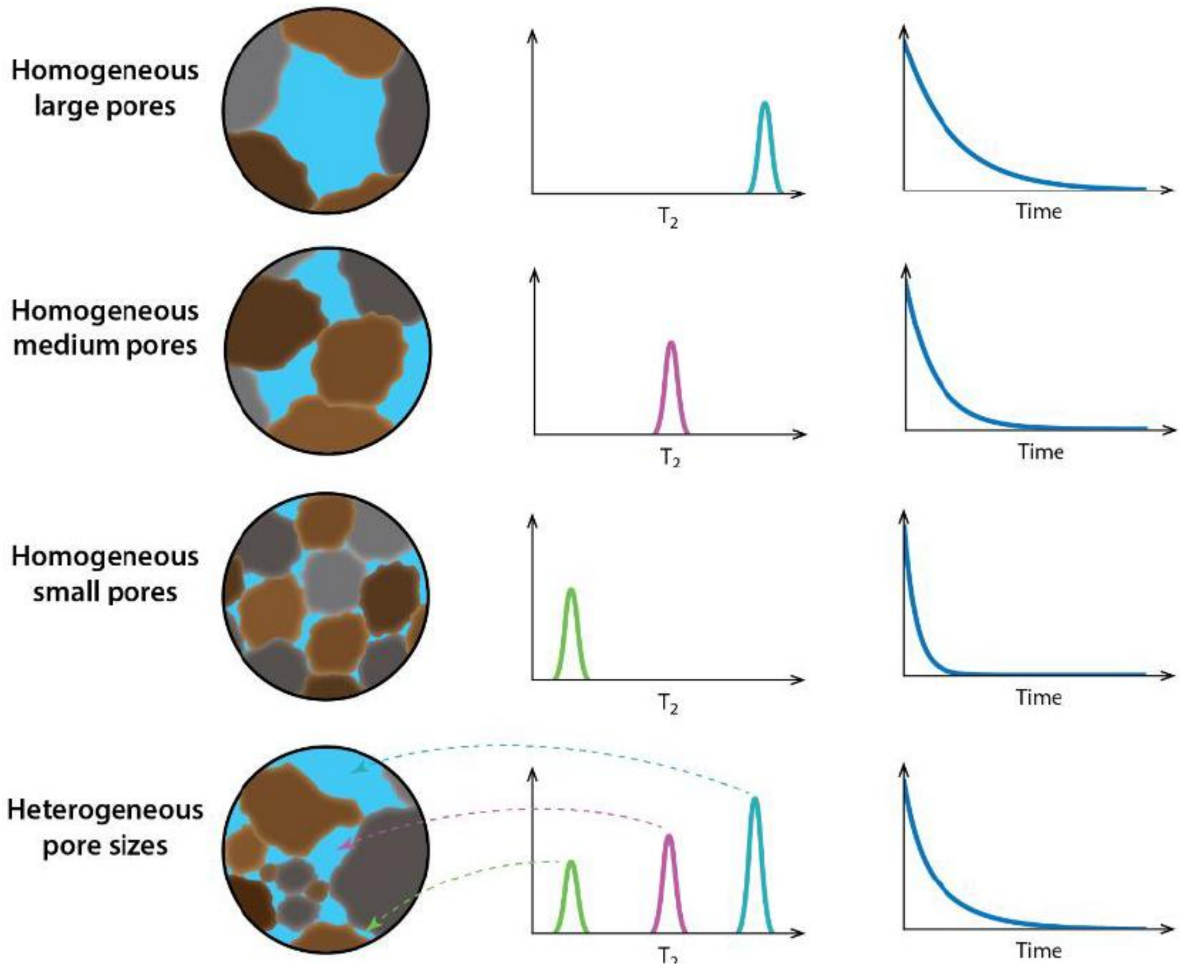


Figure 6-1. Idealised T_2 responses for different pore sizes (Vista Clara, 2024).

Given the strong relationships between water content and pore size that NMR measures, it is possible to estimate hydraulic conductivity. The shape of the T2 curve indicates the pore-size distribution of the formation. There are three well-known equations that can be used to calculate hydraulic conductivity from NMR measurements – these will only briefly be discussed here to provide some context for logging results. The common equations used to calculate hydraulic conductivity are:

- Schlumberger-Doll Research Equation (SDR) – uses porosity and the logarithmic mean of T2 (fairly simple calculation) to estimate permeability, so it is more strongly influenced by mean pore size and presence of clay fractions;
- Squared Mean-of-Echoes Equation (SOE) – not strongly influenced by presence of clay fractions; and
- Timur-Coates (TC) – uses porosity, moveable fluid saturation and irreducible fluid saturation to estimate permeability but needs a single T2 cut-off for this which is extremely difficult to calculate without core experiments/calibration.

The numerical constants in these equations should be calibrated to information such as pump test results. Due to lack of available pump test data that calibration was not done in this study and constants were applied based on results in unconsolidated sedimentary aquifers in the United States (Vista Clara, 2024).

In November 2024, 4 wells were logged with Vista Clara's NMR tool (full report in Vista Clara, 2024):

- TAA60 from 34.7 m to 3.6 m (31.1 m total);
- TAA59 from 33.3 m to 13.1 m and 8.1 m to 2.9 m (25.4 m total);
- WAD30 from 21.5 m to 16 m and 7.9 m to 3 m (20.4 m total); and
- WAD40 from 12 m to 3 m (9 m total).

Prior to using the NMR tool, each borehole was logged with GR and induction tools to complement the understanding of subsurface lithology and ensure any metallic zones in each cased well had been identified. Metallic sections were avoided due to the strong magnetisation of the NMR tool and are the primary cause of the above data gaps. More wells were planned to be logged but due to the failure of the tool in the field this could not be completed. Noise was very low for acquisition at all sites.

6.2. Recent NMR logging results

Overall, the log quality is good where recorded; however, it was difficult to obtain representative values for the Bridgewater Formation (including the Bridgewater Formation Clean Limestone) given the low water levels observed and the presence of fractures and washouts. The SDR and SOE hydraulic conductivity equations are presented graphically as these two methods of estimation are more robust in the absence of core data – both are valid calculations given the low noise observed during data acquisition. Timur-Coates numbers are only displayed numerically in subsequent tables, but their use in groundwater modelling is not recommended.

TAA60 NMR data is essentially only valid in the Poelpena Formation – only a very small number of data points in saturated, unfractured Bridgewater Formation were obtained (Figure 6-2). Only the Poelpena Formation was saturated and unfractured in TAA59 (Figure 6-3). WAD30 had a large amount of invalid data due to the presence of metallic casing and fractures/washouts – the valid Poelpena Formation data appears siltier than other Poelpena Formation intervals (Figure 6-5). Due to a large unsaturated zone and presence of fractures/washouts in WAD40, only a few valid data points in the Poelpena Formation were recorded (Figure 6-5).

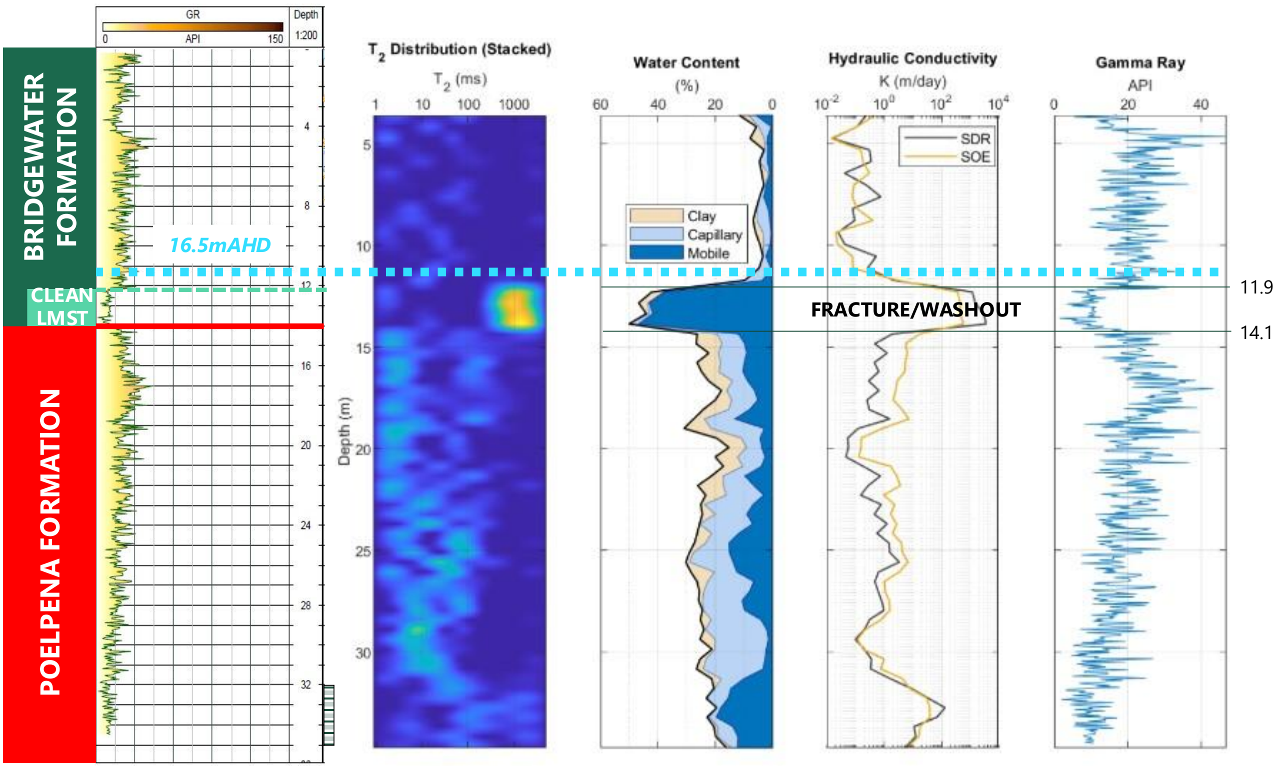


Figure 6-2. TAA60 NMR results showing most recent water level and fracture/washout zone.

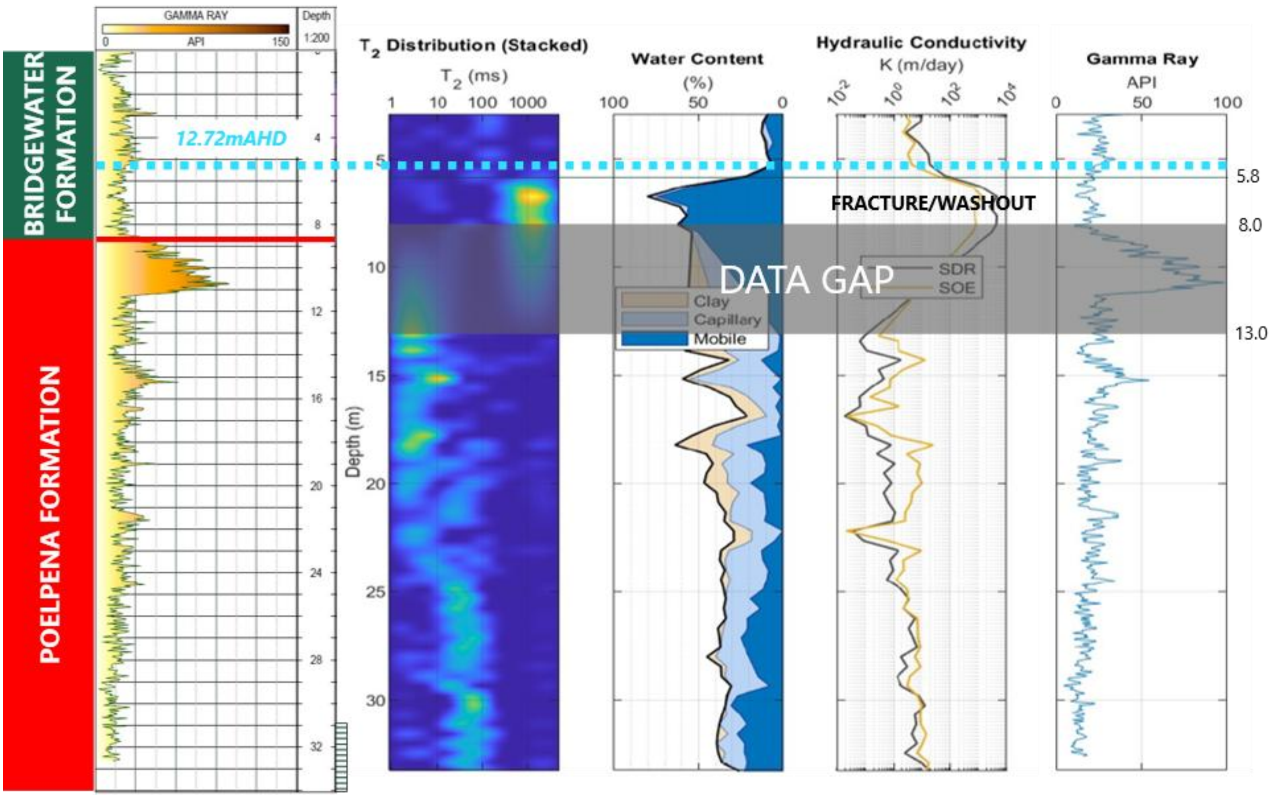


Figure 6-3. TAA59 NMR results showing most recent water level, fracture/washout zone and data gap (due to presence of metallic casing interval).

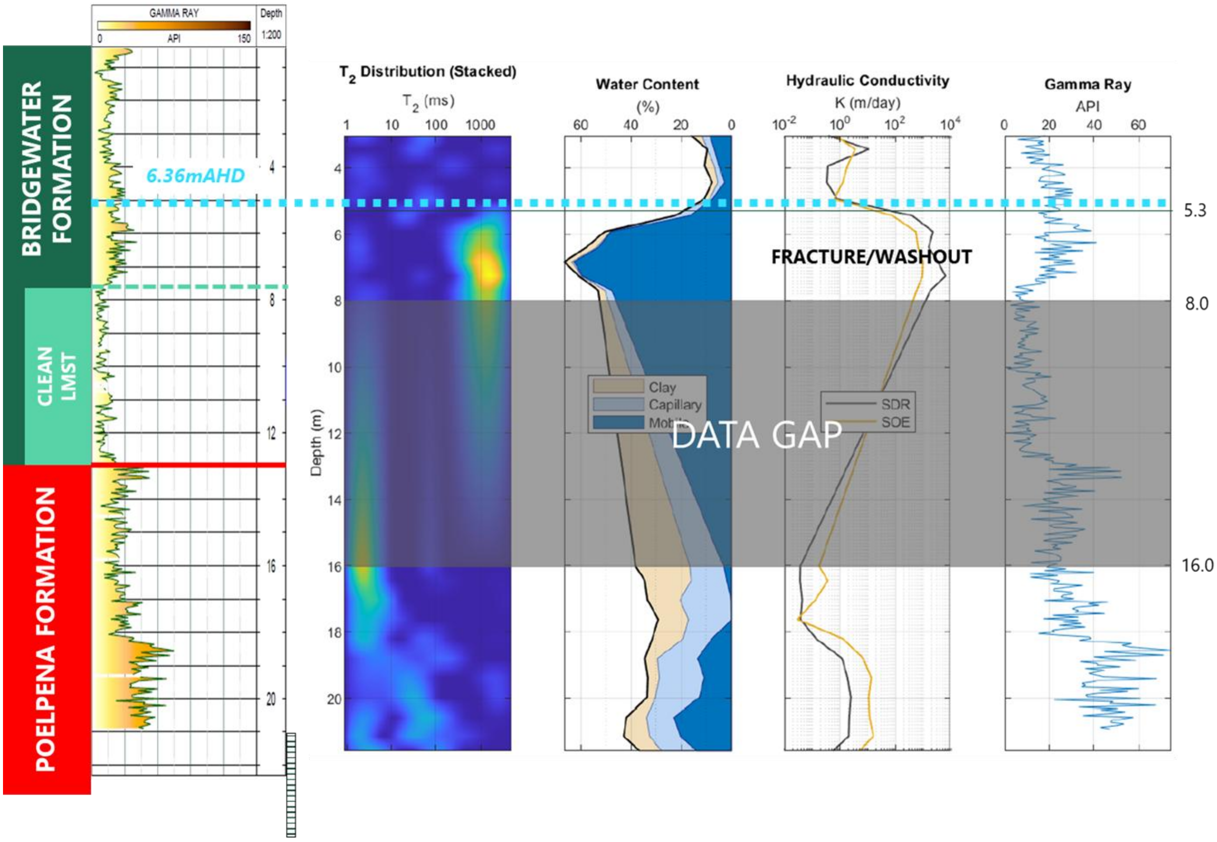


Figure 6-4. WAD30 NMR results showing most recent water level, fracture/washout zone and data gap (due to presence of metallic casing interval).

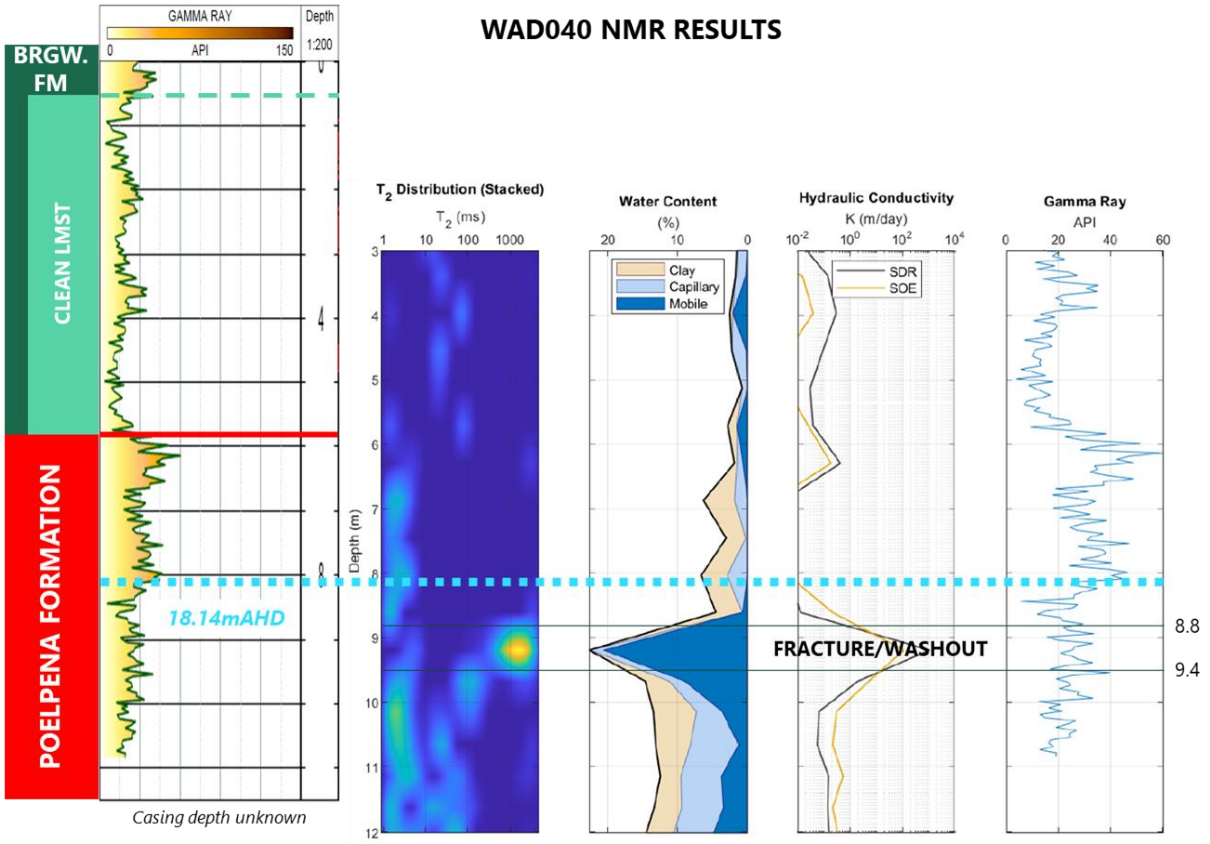


Figure 6-5. WAD40 NMR results showing most recent water level and fracture/washout zone.

Average properties have been extracted from the data by formation using the previously established formation tops picks, enabling each formation to be independently assigned the appropriate aquifer properties for groundwater flow modelling (Table 6- 1). As highlighted, the majority of valid data for saturated intervals excluding washouts are for the Poelpena Formation. Most of the information acquired for the Bridgewater Formation (and Bridgewater Formation Clean Limestone) is invalid due to the formation either being unsaturated and/or fractured. A very small interval in TAA60 seems to be valid, but is also largely one single data point with a small transition zone above/below.

The Average Total Water Fraction (or Percentage) is equivalent to the total porosity in saturated zones. Using both the SDR and SOE values in groundwater modelling should provide an uncertainty range of possible values – generally SDR gives higher values than SOE, except in WAD30 where the Poelpena Formation appears to be slightly siltier than elsewhere based on the GR log acquired at the time of NMR logging. If there is any pumping test data available. it could be used to calibrate/validate the NMR data to highlight the methodology best capturing aquifer properties. If a pumping test has been conducted for the Bridgewater Formation, this should be used to supplement NMR data in that interval to help inform modelling parameters.

It had been planned to attempt to propagate aquifer properties to other well with only GR logs by calculating a regression relationship between porosity or hydraulic conductivity and GR. However, given the lack of valid Bridgewater Formation data this was not attempted as results would be skewed by the very small interval of valid data.

Table 6-1 Average and median properties from NMR data for each interval, separating saturation and unsaturated zones – darker blue rows are data that should be considered in modelling, and bold font indicates good confidence in the acquired data. HC denotes Hydraulic Conductivity.

	Avg Total Water %	Avg Mobile Water %	HC – Avg SLB-Doll Rsrch	HC – Median SLB-Doll Rsrch	HC – Avg Sum of Echoes	HC – Median Sum of Echoes	HC – Avg Timur-Coates	HC – Median Timur-Coates
TAA60								
ALL BRIDGEWATER FORMATION ONLY *Unsaturated 0-11.35m below GL*	6.3	2.6	26.63	0.21	8.40	0.13	2.13	0.08
SATURATED BRIDGEWATER FORMATION ONLY *11.35-12.2m MD - lower half fractured*	16.2	10.7	264.27	83.55	82.61	27.86	19.81	6.22
Bridgewater Formation Clean Limestone *Appears fractured on NMR data - properties exaggerated*	45.1	41.4	2218.68	2160.40	442.06	441.96	262.75	260.30
ALL SATURATED BRIDGEWATER FORMATION *11.35-14.1mMD - includes fractured/washed-out zone*	36.1	31.8	1612.14	1407.20	330.51	408.06	187.36	172.80
POELPENA FORMATION	**23.8**	**8.9**	**17.09**	**0.62**	**7.61**	**2.63**	**4.08**	**0.28**
TAA59								
ALL BRIDGEWATER FORMATION ONLY *Unsaturated 0-5.25m below GL*	32.4	29.4	1355.23	39.23	355.62	17.59	42982.29	169.98
SATURATED BRIDGEWATER FORMATION ONLY *5.25-8.8m MD - appears fractured/washed out on NMR data*	51.1	47.5	2489.87	3001.70	652.45	748.92	78975.01	290.87
POELPENA FORMATION	**38.4**	**13.1**	**2.72**	**0.99**	**5.76**	**5.18**	**3.78**	**0.25**
WAD30								
ALL BRIDGEWATER FORMATION ONLY *Unsaturated 0-5.09m below GL*	30.8	26.6	1296.21	225.45	309.13	43.92	382.66	3.61
SATURATED BRIDGEWATER FORMATION ONLY *5.09-7.50m MD - all fractured/washed-out*	48.7	44.9	2425.22	2006.70	577.60	614.00	716.76	373.59
ALL SATURATED BRIDGEWATER FORMATION *5.09-8.0mMD - all fractured/washed-out*	33.1	28.8	1394.42	548.90	339.12	115.70	389.42	49.42
POELPENA FORMATION	**35.0**	**9.8**	**1.03**	**0.95**	**6.25**	**6.07**	**0.41**	**0.27**

	Avg Total Water %	Avg Mobile Water %	HC – Avg SLB-Doll Rsrch	HC – Median SLB-Doll Rsrch	HC – Avg Sum of Echoes	HC – Median Sum of Echoes	HC – Avg Timur-Coates	HC – Median Timur-Coates
WAD40								
Bridgewater Formation Clean Limestone *All unsaturated - 0-8.14m below GL*	1.9	0.7	0.12	0.09	0.02	0.01	0.33	0.07
ALL POELPENA FORMATION *Unsaturated 5.8-8.14m below GL*	9.7	3.7	90.04	0.14	9.99	0.24	5.65	0.04
SATURATED POELPENA FORMATION *Saturated 8.14-11.6m (TD); fracture/wash-out zone present*	13.0	5.7	142.93	0.15	15.83	0.42	8.96	0.06
SATURATED, UN-FRACTURED POELPENA FORMATION *Saturated 8.14-11.6m (TD); excluding wash-out 8.8-9.4mMD*	**12.1**	**4.0**	**38.06**	**0.15**	**4.89**	**0.32**	**2.50**	**0.06**

7. Salinity from downhole logs

Of the 20 monitoring wells in the Greater Bramfield AOI, 10 wells have electrical conductivity data available (Figure 7-1). Electrical conductivity measurement is a direct measurement of the properties of the water column and in most wells this logging has been repeated multiple times from as far back as 2008 up to as recently as 2024. Nine (9) of the wells, all except WAD41, were logged with GR and induction tools in October/November 2024 as part of the NMR logging program. It was necessary to acquire GR logs for the first time in several wells (i.e. previously had not been logged with GR) and induction logs were used to assess presence of any metallic completions for NMR wells and attempt to determine any relationship between induction response and formation water salinity. No resistivity logs are available to help confirm formation water quality or reliability of induction logs. The monitoring wells and, therefore, any downhole measurements of lithology, water quality, etc. do not extend to the southwest towards Elliston.

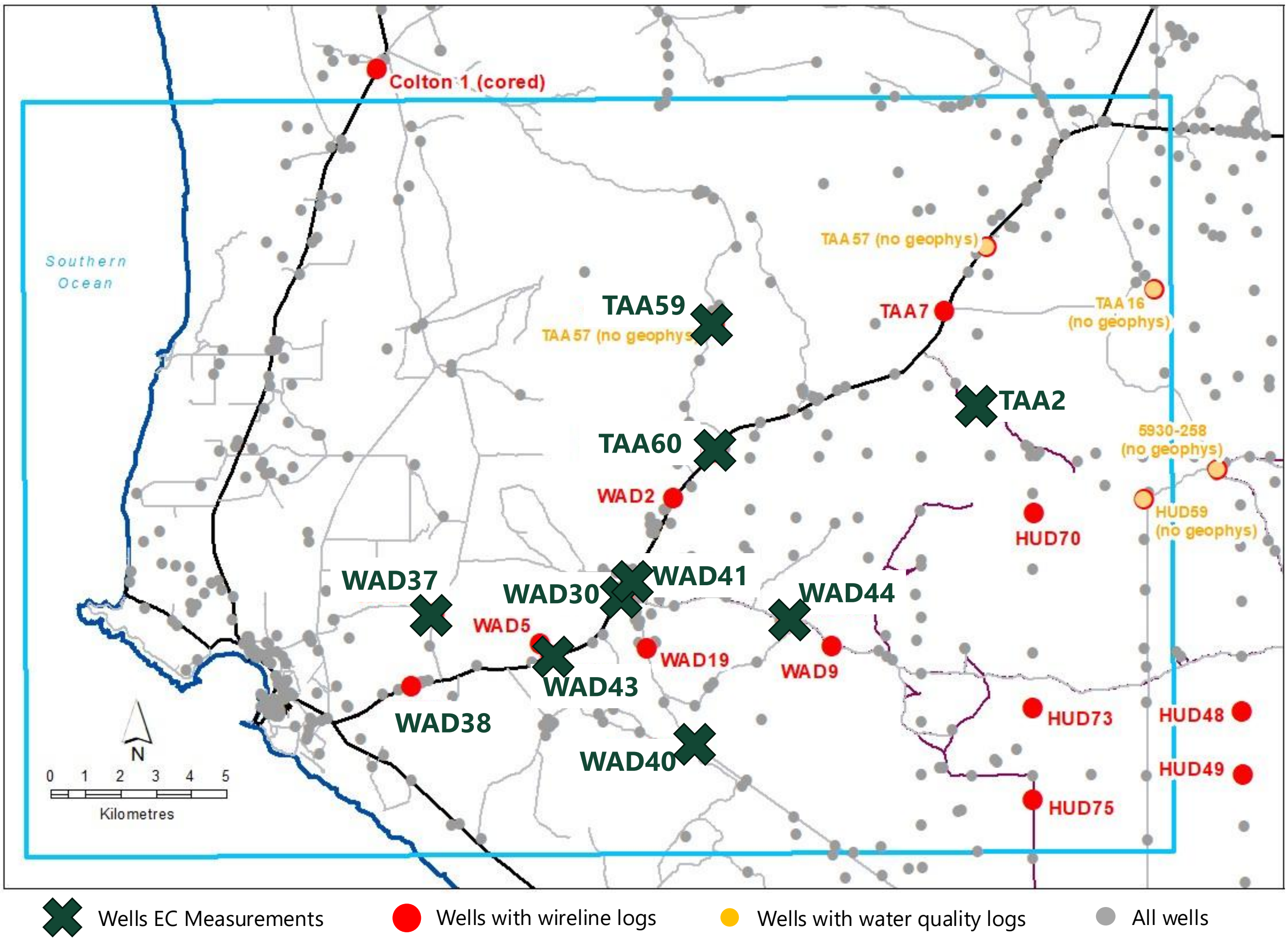


Figure 7-1. Monitoring well network and wells with electrical conductivity data acquired.

Generally, conductivity logs show the water column to be at around 1000 µS/cm (see section 10.D for log plots) with some variation ± 200 µS/cm and no consistent or notable change over time. Even with the observed variation, all wells have been interpreted to be at the lower end of "brackish" water. WAD43 has the lowest values at ~700 µS/cm conductivity; however, there is no identified spatial or geological reason for values to be lower here compared to elsewhere – this variation is not considered notably lower than values observed elsewhere. Where wells have been sampled (after pumping) the sampled electrical conductivity values are generally slightly higher than the downhole conductivity measurements but are overall in agreement.

When assessing the induction logs for information about water quality, there are several well construction variables to consider that can adversely impact data by causing "propagation effects". These factors include:

- original borehole size – larger drill diameters mean that there is more material (cement; casing; air) between the tool and the formation;
- casing diameter – larger casing size means there is more air between the tool and casing (large diameter will impact recorded values); and
- difference between original borehole size and casing size – a greater difference (i.e. small casing in a large borehole) will mean a larger cement volume behind casing.

Where the induction tool is reading the true value of the formation, it will be partially influenced by lithology and partially influenced by formation fluid salinity. That is, shalier lithologies where more clay is present will have an increased overall conductivity which can mask the true formation fluid response. In the shallow wells previously discussed in the eastern and northeastern AOI it is not possible to comment on the salinity of water as they are now dry. Whether or not any water intersected at greater depths would be fresher or more saline is not possible to comment on.

Given the variability in construction parameters, completion materials, etc. in the Greater Bramfield AOI monitoring wells, it is hard to draw a consistent relationship between induction log values and conductivity responses. This issue is compounded by an unknown induction tool calibration which needs to be tested and likely updated to further aid analysis. Variation in recorded values is as much as 5 mS/m to 45 mS/m – this range would be considered as "fresh" if measurement were deemed to be reflecting formation water salinity, however, these values do not match sampled water properties. Even a comparative assessment of general trends does not show any clearly identifiable spatial or geological trends between wells.

8. Summary and recommendations

8.1. Conclusions

This study highlights the value in using all available geological and geophysical data to define aquifer, aquitard and effective/true basement distribution across hydrogeologically important areas. This can improve the accuracy of surfaces used for groundwater modelling, inform aquifer parameters and build subsurface understanding to assist with interpretation of surface geophysical surveys.

Key findings for the Greater Bramfield AOI are that:

- there is an absence of monitoring wells with downhole wireline log or drilling sample data in the southwest of the study area around Elliston, meaning depth to basement and stratigraphy cannot be confirmed;
- there is a paucity of downhole data, specifically open hole wireline logs, and data are predominantly limited to cased hole gamma ray (GR) and some cased hole induction logs – there are no existing logs that can be used to calculate petrophysical properties (i.e. density logs for porosity calculation);
- GR values are highly variable due to mixed vintages of data, use of different logging tools of unknown calibration status and different hole construction sizes (i.e. some boreholes are larger diameter and mute the tool response);
- analysis of GR logs supports the conclusions of a newly differentiated 'Bridgewater Formation Clean Limestone' that is interpreted to likely be depositionally and petrophysically distinct from the rest of the Bridgewater Formation;
- formation picks enable definition of more robust groundwater modelling surfaces and has led to reinterpretation for several wells in the eastern AOI to have Polda Formation sediments rather than being basement, which are geologically and geophysically quite distinct units;
- variable geology across the AOI adds complexity to any interpretations, including of surface geophysical surveys, particularly in the southwest where there is a lateral transition between 2 distinct granitic suites and the Sleaford Complex;
- correlations can be used to interpret possible depositional edges of the Poelpena Formation, upper Poelpena Formation shale and Bridgewater Formation Clean Limestone and suggests the Bridgewater Formation Clean Limestone deposition may be the key erosional process responsible for the varied distribution of the upper Poelpena Formation shale;
- basement lithologies are not commonly intersected by wells and limited data are available to improve confidence in this interpretation;
- wells in the northeastern and eastern AOI are on topographic highs and generally shallow, meaning they have not penetrated the Poelpena Formation and are interpreted to be dry because their total depth (TD) is above the local water table – water quality in deeper intervals in these areas cannot be determined as fresh or brackish;
- NMR data was acquired in 4 monitoring wells, but robust porosity and hydraulic conductivity parameters to inform groundwater modelling were only able to be calculated for the Poelpena Formation due to the Bridgewater Formation being primarily unsaturated and fractured/washed out;

- no attempt was made to propagate petrophysical properties to wells with GR only given the absence of robust data for the primary Bridgewater Formation target; and
- downhole electric logs do not show any notable change in water quality over the last few years, but without well data around Elliston it is not possible to comment on the presence or extent of any seawater intrusion.

General findings are that:

- cross-sections utilising available monitoring wells and deeper resource exploration wells, including wells that only have drilling sample descriptions and pre-defined geological maps of basement and basin distributions, have improved stratigraphic understanding in the area and provided a consistent set of picks for the Poelpena Formation, Polda Formation, Blue Range Beds and Sleaford Complex; and
- understanding the depositional setting of formations assists with making correlations and understanding stratigraphic relationships even where data availability is limited.

8.2. Recommendations

Based on the information analysed there are some technical recommendations that can be made which are intended to highlight considerations for future project planning to improve subsurface understanding. Recommendations to improve this analysis are:

- having at least one monitoring well near the coast (ideally two) in order to assess, detect and monitor any saltwater intrusion and rate of movement, plus define deep stratigraphy and depth to basement – current wells are too far inland and too shallow to see this yet;
- to drill a deeper well in the east and/or northeast where wells are very shallow (and therefore dry) to test the quality of Poelpena Formation water and determine Jurassic and basement stratigraphy – using a full suite of wireline logs, especially density and NMR, would also help calculation of aquifer petrophysical properties and definition of the freshwater lens;
- to use the understanding of the stratigraphy and lithological properties of formations to help interpret surface geophysical surveys and build the subsurface geological model;
- ensuring for any repeat logging of correlated wells that the induction tool is properly calibrated to reduce uncertainty of readings to gain better insight of fresh vs. saline water quality;
- to continue repeat logging of electrical conductivity as values are aligning with pumped water samples – quick way to monitor water quality in multiple wells;
- notwithstanding the NMR tool failure in the field, future NMR logging programs should consider stratigraphy and current water levels in detail to help obtain as many valid logs as possible for each formation (i.e. saturated and unfractured rock) and be compared with conventional quantitative logs (e.g. density porosity); and
- pumping test results should be used to calibrate hydraulic conductivity calculations where possible.

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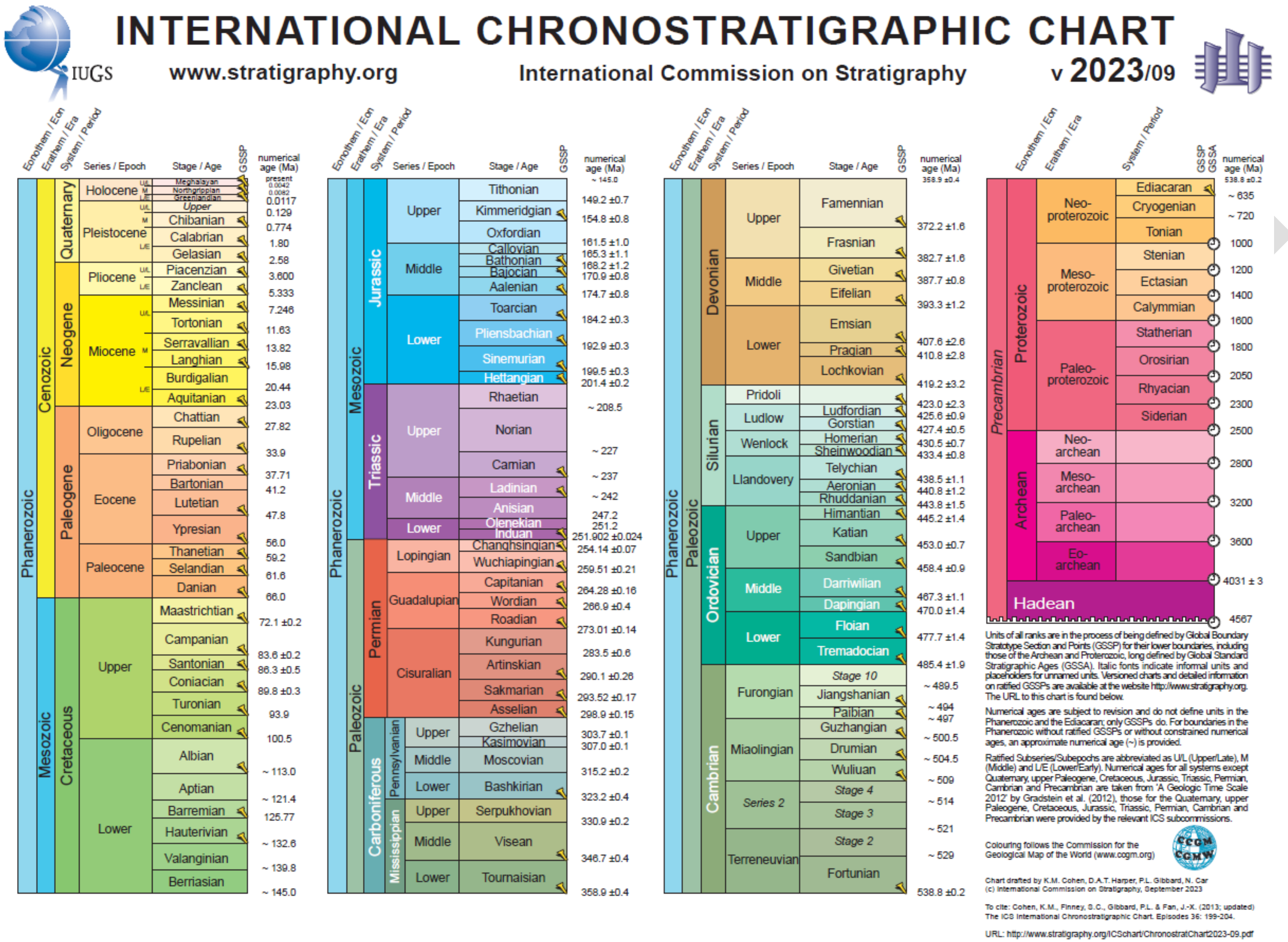
10. Appendices

A. International Chronostratigraphic Chart of Geologic Age



B. Monitoring wells basic information and new formation top picks

WELL I.D.		ELEVATION & DEPTH				UPDATED PICKS FROM DECEMBER 2024				
OBS NO.	MAPNUM	GND ELEV. (m)	REF. ELEV. (m)	STICK UP HGT (m)	DRILL TD (m)	FM TOP NAME	FM TOP DEPTH (mMD)	FM BASE (mMD)	THICKNESS (m)	FM TOP REL. TO AHD (+/- m)
WAD 40	5930-1542	**11.18**	11.95	0.77	11.6	**BRIDGEWATER FORMATION**	**0.0**	5.8	5.8	**11.2**
						Bridgewater Fm Clean Limestone	**0.9**	5.8	4.9	**10.3**
						POELPENA FORMATION	**5.8**	–	5.8+	**5.4**
TAA 60	5930-6	**27.09**	27.12	0.03	36.00	**BRIDGEWATER FORMATION**	**0.0**	14.1	14.1	**27.1**
						Bridgewater Fm Clean Limestone	**12.2**	14.1	1.9	**14.9**
						POELPENA FORMATION	**14.1**	–	21.9+	**13.0**
TAA 59	5930-28	**17.96**	18.73	0.77	34.0	**BRIDGEWATER FORMATION**	**0.0**	8.8	8.8	**18.0**
						POELPENA FORMATION	**8.8**	–	25.2+	**9.2**
WAD 30	5830-234	**11.45**	11.63	0.18	24.0	**BRIDGEWATER FORMATION**	**0.0**	12.9	12.9	**11.5**
						Bridgewater Fm Clean Limestone	**7.5**	12.9	5.4	**4.0**
						POELPENA FORMATION	**12.9**	–	11.2+	**-1.5**
WAD 38	5830-327	**65.15**	65.96	0.81	90.5	**BRIDGEWATER FORMATION**	**0.0**	91.0	91+	**65.2**
						Bridgewater Fm Clean Limestone	70.2	91.0	20.8+	**-5.0**
						SLEAFORD COMPLEX	**91.0+**	–	–	**–**
WAD 37	5830-326	**89.16**	89.85	0.69	114.0	**BRIDGEWATER FORMATION**	**0.0**	108.1	108.1	**89.2**
						Bridgewater Fm Clean Limestone	**71.5**	108.1	36.6	**17.7**
						SLEAFORD COMPLEX	**108.1**	–	5.9+	**-18.9**
WAD 5	5830-112	**29.43**	29.73	0.30	27.7	**BRIDGEWATER FORMATION**	**0.0**	27.7	27.7+	**29.4**
						Bridgewater Fm Clean Limestone	**24.0**	3.7	3.7+	**5.4**
						POELPENA FORMATION	**Deeper than well, likely on the order of ~32mMD**			
WAD 43	5830-351	**15.19**	15.86	0.67	19.4	**BRIDGEWATER FORMATION**	**0.0**	19.0	19.0+	**15.2**
						Bridgewater Fm Clean Limestone	**9.8**	19.0	9.6+	**5.4**
						POELPENA FORMATION	**19.4+**	–	–	**-4.2**

WELL I.D.		ELEVATION & DEPTH				UPDATED PICKS FROM DECEMBER 2024				
OBS NO.	MAPNUM	**GND ELEV. (m)**	REF. ELEV. (m)	STICK UP HGT (m)	DRILL TD (m)	**FM TOP NAME**	**FM TOP DEPTH (mMD)**	FM BASE (mMD)	THICKNESS (m)	**FM TOP REL. TO AHD (+/- m)**
WAD 41	5830-350	**11.82**	12.59	0.77	26.0	**BRIDGEWATER FORMATION**	**0.0**	3.6	3.6	**11.8**
						Bridgewater Fm Clean Limestone	**0.7**	3.6	2.9	11.1
						POELPENA FORMATION	**3.6**	23.3	19.7	**8.2**
						SLEAFORD COMPLEX	**23.3**	–	2.7+	**-11.5**
TAA 2	5930-17	**44.11**	44.75	0.64	18.0	**BRIDGEWATER FORMATION**	**0.0**	7.3	7.3	**44.1**
						POELPENA FORMATION	**7.3**	–	10.7+	**36.8**
WAD 2	5930-102	**19.36**	19.36	0.00	**18.3**	**BRIDGEWATER FORMATION**	**0.0**	2.8	2.8	**19.4**
						Bridgewater Fm Clean Limestone	**0.0**	2.8	2.8	**19.4**
						POELPENA FORMATION	**2.8**	–	6.0+	**16.6**
WAD 44	5930-1543	**25.85**	26.51	0.66	20.0	**BRIDGEWATER FORMATION**	**0.0**	9.3	9.3	**25.9**
						POELPENA FORMATION	**9.3**	–	10.7+	**16.6**
WAD 9	5930-125	**38.91**	39.64	0.73	**24.4**	**BRIDGEWATER FORMATION**	**0.0**	21.3	21.3	**38.9**
						POELPENA FORMATION	**21.3**	24.4+	3.1+	**17.6**
HUD 73	5930-200	**32.96**	33.87	0.91	**12.2**	**BRIDGEWATER FORMATION**	**0.0**	12.2	12.2+	**33.0**
						POELPENA FORMATION	**12.2**	–	–	**20.8**
HUD 48	5930-236	**45.21**	46.00	0.79	**15.2**	**BRIDGEWATER FORMATION**	**0.0**	13.4	13.4	**45.2**
						POELPENA FORMATION	**13.4**	–	–	**31.8**
WAD 19	5930-129	**12.49**	13.18	0.69	**11.0**	**BRIDGEWATER FORMATION**	**0.0**	5.6	5.6	**12.5**
						Bridgewater Fm Clean Limestone	**4.3**	5.6	1.3	**8.2**
						POELPENA FORMATION	**5.6**	–	5.4+	**6.9**

WELL I.D.		ELEVATION & DEPTH				UPDATED PICKS FROM DECEMBER 2024				
OBS NO.	MAPNUM	**GND ELEV. (m)**	REF. ELEV. (m)	STICK UP HGT (m)	DRILL TD (m)	**FM TOP NAME**	**FM TOP DEPTH (mMD)**	FM BASE (mMD)	THICKNESS (m)	**FM TOP REL. TO AHD (+/- m)**
HUD 49	5930-255	**42.81**	43.58	0.77	**15.5**	**BRIDGEWATER FORMATION**	**0.00**	9.0	9.0	**42.8**
						POELPENA FORMATION	**9.0**	15.5	6.5+	**33.9**
HUD 70	5930-197	**52.14**	53.14	1.01	**19.2**	**BRIDGEWATER FORMATION**	**0.0**	11.7	11.7	**52.1**
						POELPENA FORMATION	**11.7**	–	7.5+	**40.5**
HUD 75	5930-201	**21.99**	22.88	0.90	**10.7**	**BRIDGEWATER FORMATION**	**0.0**	10.7	10.7+	**22.0**
						POELPENA FORMATION	**10.7**	–	–	**11.3**
TAA 7	5930-33	**30.07**	30.79	0.72	**16.8**	**BRIDGEWATER FORMATION**	**0.0**	1.7	1.7	**30.1**
						POELPENA FORMATION	**1.7**	–	15.1+	**28.4**
Colton 1	5831-345	**34.14**	?	?	**124.7**	**BRIDGEWATER FORMATION**	0.0	21.3	21.3	34.1
						POELPENA FORMATION	21.3	59.0	37.7	12.8
						POLDA FORMATION	51.5	110.0	58.5	-17.4
						No sample returns 18-110mMD and no wireline logs over this zone				
						BLUE RANGE BEDS	110.0	–	14.7+	-75.9

C. Monitoring wells existing formation top picks and sample descriptions

WELL I.D.		LITHOLOGY PICKS & DESCRIPTIONS IN SAGEODATA / SARIG						
OBS NO.	MAPNUM	FORMATION TOP NAME	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD (+/-m)	SAMPLE TOP (m)	SAMPLE BASE (m)	LITH CODE	DESCRIPTION
WAD 40	5930-1542	BRIDGEWATER	0.0	11.2	No sample descriptions			
		Bridgewater Clean Limestone	–	–				
		POELPENA	6.1	5.1				
TAA 60	5930-6	BRIDGEWATER	0.0	27.1	No sample descriptions			
		Bridgewater Clean Limestone	–					
		POELPENA	14.5	12.6				
TAA 59	5930-28	BRIDGEWATER	0.0	18.7	No sample descriptions			
		POELPENA	8.8	9.2				
WAD 30	5830-234	BRIDGEWATER	0.0	11.5	No sample descriptions			
		Bridgewater Clean Limestone	–	–				
		POELPENA	13.0	-1.6				
WAD 38	5830-327	BRIDGEWATER	NEW PICKS		0.0	11.0	SAND	Fine brown sand
					11.0	78.5	LMST	Brown & yellow sandy limestone
		Bridgewater Clean Limestone			11.0	78.5	LMST	Brown & yellow sandy limestone
		SLEAFORD COMPLEX			78.5	91.0	LMST	Brown & yellow fractured limestone
WAD 37	5830-326	BRIDGEWATER	NEW PICKS		0.0	12.0	LMST	Yellow sandy limestone
					12.0	23.0	LMST	Yellow sandy limestone with hard layers
					23.0	102.0	LMST	Yellow & brown sandy limestone
		Bridgewater Clean Limestone			23.0	102.0	LMST	Yellow & brown sandy limestone
		SLEAFORD COMPLEX			102.0	115.0	GRAN	Granite hard

WELL I.D.		UPDATED PICKS FROM DECEMBER 2024	LITHOLOGY PICKS & DESCRIPTIONS IN SAGEODATA / SARIG					
OBS NO.	MAPNUM	FORMATION TOP NAME	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD (+/- m)	SAMPLE TOP (m)	SAMPLE BASE (m)	LITH CODE	DESCRIPTION
WAD 5	5830-112	BRIDGEWATER	0.0	29.4	No sample descriptions			
		Bridgewater Clean Limestone	–	–				
		POELPENA	27.4	2.0				
WAD 43	5830-351	BRIDGEWATER	0.0	15.2	0.0	5.0	SAND	Pale brown sandy soil with limestone frags
					5.0	11.0	SAND	Yellow-brown fine-grained calcareous sandstone with grey fine limestone
		Bridgewater Clean Limestone	–	–	11.0	23.0	LMST	Brown-yellow fine-grained calcareous sandstone with some limestone & less fines
		POELPENA	20.0	-4.8				
WAD 41	5830-350	BRIDGEWATER	0.0	11.8	0.0	5.0	LMST	Calcareous white m-c sand 0.1-2mm
		Bridgewater Clean Limestone	–	–				
		POELPENA	5.0	6.8	5.0	8.0	CLAY	Light yellow brown sandy clay with occasional limestone up to 30mm
					8.0	11.0	SAND	Red clayey sand with occ sandstone gravel. More clayey from 8-10
					11.0	12.0	SAND	Red fine sand
					12.0	14.0	CLAY	Brown sandy plastic clay
					14.0	15.0	SAND	Fine sand and sandstone
					15.0	18.0	SAND	Light brown fine sand. More brown w depth
					18.0	22.0	SAND	Yellow fine sand and white sandstone fine gravel
					22.0	25.0	SAND	Clayey f-m sand with occ sandstone (20mm)
					25.0	26.0	CLAY	Brown sandy clay
		SLEAFORD COMPLEX	NEW PICK					

WELL I.D.		LITHOLOGY PICKS & DESCRIPTIONS IN SAGEODATA / SARIG						
OBS NO.	MAPNUM	FORMATION TOP NAME	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD (+/- m)	SAMPLE TOP (m)	SAMPLE BASE (m)	LITH CODE	DESCRIPTION
TAA 2	5930-17	BRIDGEWATER	0.0	44.1	0.0	3.4	LMST	Rubbly limestone with minor clay
					3.4	4.9	CLAY	Hard clay with limestone rubble
					4.9	7.6	CLAY	Hard dark brown clay
		POELPENA	7.6	36.5	7.6	9.4	CLAY	Yellow-brown sandy clay with fine to coarse, sub-ang quartz
					9.4	12.2	CLAY	Yellow-brown sandy clay with limestone rubble
					12.2	15.2	SAND	Yellow-brown very fine to medium sandstone
WAD 2	5930-102	BRIDGEWATER	NEW PICKS		No sample descriptions			
		Bridgewater Clean Limestone						
		POELPENA						
WAD 44	5930-1543	BRIDGEWATER	NEW PICKS		0.0	5.0	LMST	Off-white fine to medium clastic limestone
					5.0	7.0	CLAY	Brown-grey mottled clay and limestone (stiff clay)
					7.0	10.0	LMST	Gravel size limestone with sand and clay - clay content increases downwards
					10.0	14.0	CLAY	Very stiff brown-grey mottled clay, fine-crs sand
		POELPENA			14.0	16.0	SAND	Red-dark brown fine-coarse sand
					16.0	20.0	SAND	Fine-coarse sand and abundance of medium-coarse ferruginous sandstone
WAD 9	5930-125	BRIDGEWATER	0.0	38.9	0.0	12.5	LMST	Very hard limestone, calcrete near surface, buff to pale brown
					12.5	15.5	LMST	Buff limestone, alternating hard and soft bands
					15.5	21.3	LMST	Buff limestone, alternating hard and soft bands, becoming very marly with depth
		POELPENA	21.3	17.6	21.3	24.4	CLAY	Stiff clay - abundant fine to very coarse, yellow-brown mottled sandstone, subangular to subrounded quartz with rare iron staining

WELL I.D.		LITHOLOGY PICKS & DESCRIPTIONS IN SAGEODATA / SARIG						
OBS NO.	MAPNUM	FORMATION TOP NAME	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD (+/- m)	SAMPLE TOP (m)	SAMPLE BASE (m)	LITH CODE	DESCRIPTION
HUD 73	5930-200	BRIDGEWATER	0.0	33.0	No sample descriptions			
		POELPENA	NOT ENTERED – BELOW TD					
HUD 48	5930-236	BRIDGEWATER	0.0	45.21	0	0.3	CALC	Calcrete - buff, very hard & rubbly with some clay
					0.3	2.4	LMST	Brown, fairly hard consolidated limestone, slightly clayey
					2.4	4.3	LMST	Light yellow-brown limestone, fairly hard, rubbly, some clay
					4.3	5.5	CLAY	Light red-brown, fairly stiff, abundant (~40%) very fine quartz, rare limestone fragments
					5.5	7	CLAY	Yellow-brown, slightly calcareous stiff clay, abundant (~40%) fine to medium calcareous sand, rare quartz sand
					7	10.7	SAND	Off-white very fine to medium, well-rounded quartz and lime grains, marly in part
					10.7	13.4	SAND	Yellow-brown to grey, very fine to fine, well-rounded quartz sand (drillers log notes silt)
		POELPENA	10.7	34.5	13.4	14.6	SAND	As above, some ferruginous sandstone gravel
					14.6	15.2	SAND	Pink very fine to fine, well-rounded quartz sand
WAD 19	5930-129	BRIDGEWATER	0.0	12.5	No sample descriptions			
		Bridgewater Clean Limestone	–	–				
		POELPENA	5.6	6.9				

WELL I.D.		LITHOLOGY PICKS & DESCRIPTIONS IN SAGEODATA / SARIG						
OBS NO.	MAPNUM	FORMATION TOP NAME	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD (+/- m)	SAMPLE TOP (m)	SAMPLE BASE (m)	LITH CODE	DESCRIPTION
HUD 49	5930-255	BRIDGEWATER	0.0	42.8	0.0	4.6	LMST	Grey-brown to pale brown, very fine, clayey aolenite
					4.6	9.1	MARL	Red-brown marl with some fine limestone frags
					9.1	11.0	LMST	Pale red-brown rubbly limestone with some very calcareous clay
					11.0	12.2	CLAY	Brown clay with some grey mottling, calcareous, fine to medium lime and quartz grains present
					12.2	13.8	CLAY	Brown clay with some grey mottling, calcareous, fine lime and quartz grains present
		POELPENA	NEW PICK		13.8	15.5	SAND	Yellow-brown, red-brown, grey-mottled sand, very fine to fine clear, well-rounded quartz
HUD 70	5930-197	BRIDGEWATER	0.0	52.1	No sample descriptions			
		POELPENA	11.2	40.9				
HUD 75	5930-201	BRIDGEWATER	0.0	22.0	No sample descriptions			
		POELPENA	–	–				
TAA 7	5930-33	BRIDGEWATER	0.0	30.1	No sample descriptions			
		POELPENA	10.7	19.4				
Colton 1	5831-345	BRIDGEWATER	0.0	34.1	0.0	2.0	SOIL	Brown, fine-grained, calcareous
					2.0	7.0	LMST	White calcrete with 5-10% quartz as rounded, frosted grains
					7.0	18.0	LMST	White aeolianite, fine-medium calcite fragments, rounded, unconsolidated with red oxidised grains
		No sample returns 18-110mMD and no wireline logs below 71m						
		BLUE RANGE BEDS	110.0	-75.9	110	112	SAND	White and red, hard, medium grained sandstone
					112	122	SAND	Red and white sandstone with minor silty flat-lying beds and small, unconsolidated grains - CORE DESCRIPTION
					122	124	SAND	White and Red sandstone with silty cross-beds - CORE DESCRIPTION
					124	125	SAND	Red and white sandstone with silt

D. Monitoring wells new vs. existing formation top picks and upper Poelpena Formation shale presence

WELL I.D.			UPDATED PICKS		PICKS IN SAGEODATA / SARIG		Δ	COMMENTS	CONFINEMENT
OBS NO.	MAPNUM	FM TOP NAME	FM TOP DEPTH (mMD)	FM TOP REL TO AHD (+/- m)	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD (+/-m)	PICK DIFF. (m)	COMMENTS	TOP POELPENA FM SHALE PRESENT?
WAD 40	5930-1542	BRIDGEWATER	0.0	11.2	0.0	11.2	0.0		Y ~2.5m thick
		Bridgewater Clean Limestone	0.9	10.3	–	–	–		
		POELPENA	5.8	5.4	6.1	5.1	0.3		
TAA 60	5930-6	BRIDGEWATER	0.0	27.1	0.0	27.1	0.0		N Eroded away
		Bridgewater Clean Limestone	12.2	14.9	–		–		
		POELPENA	14.1	13.0	14.5	12.6	0.4		
TAA 59	5930-28	BRIDGEWATER	0.0	18.0	0.0	18.7	0.8	No evidence of Bridgewater Fm Clean Limestone	Y ~2.5m thick
		POELPENA	8.8	9.2	8.8	9.2	0.0		
WAD 30	5830-234	BRIDGEWATER	0.0	11.5	0.0	11.5	0.0		N Eroded away
		Bridgewater Clean Limestone	7.5	4.0	–	–	–		
		POELPENA	12.9	-1.5	13.0	-1.6	0.1		
WAD 38	5830-327	BRIDGEWATER N	0.0	65.2	NEW PICKS		NEW PICK		N Poelpena not intersected
		Bridgewater Clean Limestone	70.2	-5.0			–		
		SLEAFORD COMPLEX	91.0+	–			–	Assumes Poelpena Fm erosion; picked at well TD	
WAD 37	5830-326	BRIDGEWATER	0.0	89.2	NEW PICKS		NEW PICK		Y Possibly older than Poelpena
		Bridgewater Clean Limestone	71.5	17.7			–		

WELL I.D.			UPDATED PICKS		PICKS IN SAGEODATA / SARIG		Δ	COMMENTS	CONFINEMENT
OBS NO.	MAPNUM	FM TOP NAME	FM TOP DEPTH (mMD)	FM TOP REL TO AHD (+/- m)	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD (+/-m)	PICK DIFF. (m)	COMMENTS	TOP POELPENA FM SHALE PRESENT?
		SLEAFORD COMPLEX	108.1	-18.9			NEW PICK	Assumes Poelpena pinch-out; don't trust granite pick based on lower GR API response	
WAD 5	5830-112	BRIDGEWATER	0.0	29.4	0.0	29.4	0.0		? Poelpena not logged
		Bridgewater Clean Limestone	24.0	5.4	–	–	–		
		POELPENA	Deeper than well, likely on the order of ~32mMD		27.4	2.0	–	Poelpena somewhere below bottom of well	
WAD 43	5830-351	BRIDGEWATER	0.0	15.2	0.0	15.2	0.0	Well is all Bridgewater	? Poelpena not intersected
		Bridgewater Clean Limestone	9.8	5.4	–	–	–		
		POELPENA	19.4+	-4.2	20.0	-4.8	0.6	Poelpena somewhere below bottom of well	
WAD 41	5830-350	BRIDGEWATER	0.0	11.8	0.0	11.8	0.0		Y ~9m thick
		Bridgewater Clean Limestone	0.7	11.1	–	–	NEW PICK		
		POELPENA	3.6	8.2	5.0	6.8	-1.4		
		SLEAFORD COMPLEX	23.3	-11.5	NEW PICK		NEW PICK		
TAA 2	5930-17	BRIDGEWATER	0	44.1	0	44.1	0		Y ~2m thick
		POELPENA FORMATION	7.3	36.8	7.6	36.5	-0.3		
WAD 2	5930-102	BRIDGEWATER FORMATION	0.0	19.4	NEW PICK		NEW PICK		Y ~7m thick, likely siltstone/ silty sand
		Bridgewater Fm Clean Limestone	0.0	19.4			–		
		POELPENA FORMATION	2.8	16.6			NEW PICK	Correlates well to adjacent wells	

WELL I.D.			UPDATED PICKS		PICKS IN SAGEODATA / SARIG		Δ	COMMENTS	CONFINEMENT
OBS NO.	MAPNUM	FM TOP NAME	FM TOP DEPTH (mMD)	FM TOP REL TO AHD (+/- m)	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD (+/- m)	PICK DIFF. (m)	COMMENTS	TOP POELPENA SHALE PRESENT?
WAD 9	5930-125	BRIDGEWATER FORMATION	0.0	38.9	0.0	38.9	0.0		Y Poelpena Fm not logged – sample desc suggest thin shale present
		POELPENA FORMATION	21.3	17.6	21.3	17.6	0.0	Recent logs don't extend to this depth - sample descriptions in SAGEODATA support existing pick	
HUD 73	5930-200	BRIDGEWATER FORMATION	0.0	33.0	0.0	33.0	0.0		? Poelpena not logged
		POELPENA FORMATION	12.2	20.8	NOT ENTERED – BELOW TD		–	Formation top below base of well	
HUD 48	5930-236	BRIDGEWATER FORMATION	0.0	45.2	0.0	45.21	0.0	Last sample sounds more similar to Poelpena in other wells than Bridgewater	N Sample desc suggest Bridgewater to Poelpena transition without shale
		POELPENA FORMATION	13.4	31.8	10.7	34.5	2.7	Picked from samples - formation top below base of wireline logs, but can't see original pick on logs	
WAD 19	5930-129	BRIDGEWATER FORMATION	0.0	12.5	0.0	12.5	0.0		Y ~1.2m thick, but possibly thicker
		Bridgewater Fm Clean Limestone	4.3	8.2	–	–	–		
		POELPENA FORMATION	5.6	6.9	5.6	6.9	0.0		
HUD 49	5930-255	BRIDGEWATER FORMATION	0.00	42.8	0.0	42.8	0.00		Y ~1m thick
		POELPENA FORMATION	9.0	33.9	NEW PICK		NEW PICK	Sample description similar to elsewhere - log character similar to TAA2 & HUD70	
HUD 70	5930-197	BRIDGEWATER FORMATION	0.0	52.1	0.0	52.1	0.0		Y ~2m thick
		POELPENA FORMATION	11.7	40.5	11.2	40.9	0.5		

WELL I.D.			UPDATED PICKS		PICKS IN SAGEODATA / SARIG		Δ	COMMENTS	CONFINEMENT
OBS NO.	MAPNUM	FM TOP NAME	FM TOP DEPTH (mMD)	FM TOP REL. TO AHD (+/- m)	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD (+/- m)	PICK DIFF. (m)	COMMENTS	TOP POELPENA SHALE PRESENT?
HUD 75	5930-201	BRIDGEWATER FORMATION	0.0	22.0	0.0	22.0	0.0		? Not intersected
		POELPENA FORMATION	10.7	11.3	–	–	–	Formation top below base of well	
TAA 7	5930-33	BRIDGEWATER FORMATION	0.0	30.1	0.0	30.1	0.0		Y ~1m thick
		POELPENA FORMATION	1.7	28.4	10.7	19.4	-9.0		
Colton 1	5831-345	BRIDGEWATER FORMATION	0.0	34.1	0.0	34.1	0.0		? No samples recovered
		POELPENA FORMATION	21.3	12.8	NEW PICK		NEW PICK		
		POLDA FORMATION	51.5	-17.4	NEW PICK		NEW PICK	Not sure on actual base depth - top picked on GR	
		No sample returns 18-110mMD and no wireline logs below 71m						No cuttings samples or logs	
		BLUE RANGE BEDS	110.0	-75.9	110.0	-75.9	0.0	No electric logs over this zone	

E. Resource wells and monitoring wells with previous basement picks – basic information and new formation top picks

WELL I.D.		ELEVATION & DEPTH				UPDATED PICKS FROM DECEMBER 2024				
OBS NO.	MAPNUM	GND ELEV (m)	REF. ELEV. (m)	STICK UP HGT (m)	DRILL TD (m)	FM TOP NAME	FM TOP DEPTH (mMD)	FM BASE (mMD)	THICKNESS (m)	FM TOP REL TO AHD (+/- m)
Polda 1	5930-1023	42.00	?	?	172.2	BRIDGEWATER FORMATION	0.0	11.6	11.6	42.0
						POELPENA FORMATION	11.6	32.0	20.4	30.4
						POLDA FORMATION	32.0	156.4	124.4	10.0
						SLEAFORD COMPLEX	156.4	–	15.8+	-114.4
TIN 6	5931-220	70.13	70.93	0.80	45.7	BRIDGEWATER FORMATION	0.0	10.7	10.7	70.1
						POELPENA FORMATION	10.7	41.5	30.8	59.4
						SLEAFORD COMPLEX	41.5	–	4.2+	28.6
TWS 4	5830-342	82.20	?	?	115.0	BRIDGEWATER FORMATION	0.0	114.0	114.0	82.2
						Bridgewater Clean Limestone	70.0	114.0	44.0	12.2
						SLEAFORD COMPLEX	114.0	–	1.0+	-31.8
–	5830-78	54.00	?	?	85.7	BRIDGEWATER FORMATION	0.0	81.7	81.7	54.0
						Bridgewater Clean Limestone	66.4	81.7	15.3	-12.4
						SLEAFORD COMPLEX	81.7	–	4.0+	-27.7
–	5930-136	28.00	?	?	45.7	BRIDGEWATER FORMATION	0.0	18.6	18.6	28.0
						POELPENA FORMATION	18.6	26.2	7.6	9.4
						POLDA FORMATION	26.2	32.6	6.4	1.8
						SLEAFORD COMPLEX	32.6	–	13.1+	-4.6
WF5	5930-1210	?	49.00	?	123.0	BRIDGEWATER FORMATION	0.0	29.3	29.3	49.0
						POELPENA FORMATION	29.3	59.5	30.2	19.7
						POLDA FORMATION	59.5	117.0	57.5	-10.5
						SLEAFORD COMPLEX	117.0	–	6.0+	-68.0
BLDD06	5930-1376	~21.0m Triangulated from nearby wells	?	?	186.5	BRIDGEWATER FORMATION	0.0	26.0	26.0	21.0
						POELPENA FORMATION	26.0	51.0	25.0	-5.0
						POLDA FORMATION	51.0	87.3	36.3	-30.0
						SLEAFORD COMPLEX	87.3	–	99.2+	-66.3

WELL I.D.		ELEVATION & DEPTH				UPDATED PICKS FROM DECEMBER 2024				
OBS NO.	MAPNUM	GND ELEV (m)	REF. ELEV. (m)	STICK UP HGT (m)	DRILL TD (m)	FM TOP NAME	FM TOP DEPTH (mMD)	FM BASE (mMD)	THICKNESS (m)	FM TOP REL TO AHD (+/- m)
KPW 28	5930-745	68.08	68.95	0.87	18.3	BRIDGEWATER FORMATION	0.0	7.6	7.6	68.1
						POELPENA FORMATION	7.6	18.0	10.4	60.5
						SLEAFORD COMPLEX Seems high for Basement (?)	18.0	–	0.3+	50.1
Colton 1	5831-345	34.14	?	?	124.7	BRIDGEWATER FORMATION	0.0	21.3	21.3	34.1
						POELPENA FORMATION	21.3	59.0	37.7	12.8
						POLDA FORMATION	51.5	110.0	58.5	-17.4
						No sample returns 18-110mMD and no downhole logs over this zone				
						BLUE RANGE BEDS	110.0	–	14.7+	-75.9
TAA 35	5831-291	22.50	23.15	0.65	41.8	BRIDGEWATER FORMATION	0.0	20.4	20.4	22.5
						POELPENA FORMATION	20.4	40.4	20.0	2.1
						BLUE RANGE BEDS May be Polda Fm (?)	40.4	–	1.4+	-17.9
TIN 4	5931-225	59.87	60.71	0.84	35.1	BRIDGEWATER FORMATION	0.0	9.8	9.8	59.9
						POELPENA FORMATION	9.8	27.4	17.6	50.1
						BLUE RANGE BEDS May be Polda Fm (?)	27.4	–	7.7	32.5
WF 8	5830-1212	?	17.00	?	132.0	BRIDGEWATER FORMATION	0.0	26.0	26.0	17.0
						POELPENA FORMATION	26.0	43.5	17.5	-9.0
						POLDA FORMATION	43.5	116.4	72.9	-26.5
						BLUE RANGE BEDS	116.4	–	15.6+	-99.4
Polda 5	5931-369	44.00	?	?	94.0	BRIDGEWATER FORMATION	0.0	28.2	28.2	44.0
						POELPENA FORMATION	28.2	56.9	28.7	15.8
						POLDA FORMATION	56.9	–	37.1+	-12.9
WF4a	5930-1209	?	28.00	?	114.0	BRIDGEWATER FORMATION	0.0	14.5	14.5	28.0
						POELPENA FORMATION	14.5	48.0	33.5	13.5
						POLDA FORMATION	48.0	–	66.0+	-20.0

WELL I.D.		ELEVATION & DEPTH				UPDATED PICKS FROM DECEMBER 2024				
OBS NO.	MAPNUM	GND ELEV (m)	REF. ELEV. (m)	STICK UP HGT (m)	DRILL TD (m)	FM TOP NAME	FM TOP DEPTH (mMD)	FM BASE (mMD)	THICKNESS (m)	FM TOP REL. TO AHD (+/- m)
WF2	5930-1207	?	38.00	?	148.0	BRIDGEWATER FORMATION	0.0	26.0	26.0	38.0
						POELPENA FORMATION	26.0	48.5	22.5	12.0
						POLDA FORMATION	48.5	–	99.5+	-10.5
WF3	5930-1208	?	65.00	?	127.0	BRIDGEWATER FORMATION	0.0	27.0	27.0	65.0
						POELPENA FORMATION	27.0	42.0	-27.0	38.0
						POLDA FORMATION	42.0	–	85+	23.0
TAA 3	5930-13	45.77	46.60	0.83	30.2	BRIDGEWATER FORMATION	0.0	12.8	12.8	45.8
						POELPENA FORMATION	12.8	29.6	16.8	33.0
						POLDA FORMATION	29.6	–	0.6+	16.2
HUD 82	5930-246	63.69	64.43	0.73	79.3	BRIDGEWATER FORMATION	0.0	11.3	11.3	63.7
						POELPENA FORMATION	11.3	25.9	14.6	52.4
						POLDA FORMATION	25.9	–	53.4+	37.8
HUD 40	5930-247	62.01	62.06	0.05	57.9	BRIDGEWATER FORMATION	0.0	28.0	28.0	62.0
						POELPENA FORMATION	28.0	43.6	15.6	34.0
						POLDA FORMATION	43.6	–	14.3+	18.4
HUD 41	5930-248	75.06	75.45	0.38	76.2	BRIDGEWATER FORMATION	0.0	0.0	0.0	75.1
						POELPENA FORMATION	42.1	62.2	20.1	33.0
						POLDA FORMATION	62.2	–	14.0+	12.9
HUD 44	5930-249	58.40	59.21	0.82	51.8	BRIDGEWATER FORMATION	0.0	21.9	21.9	58.4
						POELPENA FORMATION	21.9	38.1	16.2	36.5
						POLDA FORMATION	38.1	–	13.7+	20.3
HUD 45	5930-250	57.52	58.23	0.72	61.0	BRIDGEWATER FORMATION	0.0	20.1	20.1	57.5
						POELPENA FORMATION	20.1	46.9	26.8	37.4
						POLDA FORMATION	46.9	–	14.1+	10.6
TAA 16	5930-37	41.31	41.98	0.67	42.7	BRIDGEWATER FORMATION	0.0	24.4	24.4	41.3
						POELPENA FORMATION	24.4	33.2	8.8	16.9
						POLDA FORMATION	33.2	–	9.5+	8.1

WELL I.D.		ELEVATION & DEPTH				UPDATED PICKS FROM DECEMBER 2024				
OBS NO.	MAPNUM	GND ELEV (m)	REF. ELEV. (m)	STICK UP HGT (m)	DRILL TD (m)	FM TOP NAME	FM TOP DEPTH (mMD)	FM BASE (mMD)	THICKNESS (m)	FM TOP REL. TO AHD (+/- m)
–	5930-215	65.00	?	?	37.8	BRIDGEWATER FORMATION	0.0	11.3	11.3	65.0
						POELPENA FORMATION	11.3	36.0	24.7	53.7
						POLDA FORMATION	36.0	–	1.8+	29.0
HUD 62	5930-222	61.25	62.04	0.79	29.9	BRIDGEWATER FORMATION	0.0	10.7	10.7	61.3
						POELPENA FORMATION	10.7	29.3	18.6	50.6
						POLDA FORMATION	29.3	–	0.6+	32.0
HUD 82	5931-220	63.69	64.43	0.73	79.3	BRIDGEWATER FORMATION	0.0	11.3	11.3	63.7
						POELPENA FORMATION	11.3	25.9	14.6	52.4
						POLDA FORMATION	25.9	–	53.4+	37.8
TIN 57	5930-62	64.12	64.86	0.74	38.1	BRIDGEWATER FORMATION	0.0	15.2	15.2	64.1
						POELPENA FORMATION	15.2	29.6	14.4	48.9
						POLDA FORMATION	29.6	–	8.5+	34.5
TIN 59	5930-61	57.58	58.38	0.79	36.6	BRIDGEWATER FORMATION	0.0	10.7	10.7	57.6
						POELPENA FORMATION	10.7	27.4	16.7	46.9
						POLDA FORMATION	27.4	–	9.2+	30.2

F. Resource wells and monitoring wells with previous basement picks – existing formation top picks and sample descriptions

WELL I.D.		LITHOLOGY PICKS & DESCRIPTIONS IN SAGEODATA / SARIG						
OBS NO.	MAPNUM	FM TOP NAME	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD (+/- m)	SAMPLE TOP (m)	SAMPLE BASE (m)	LITH CODE	DESCRIPTION
Polda 1	5930-1023	BRIDGEWATER FORMATION	0.0	42.0	0.0	4.6	LMST	Limestone, buff, sandy and clayey (aeolianitic)
					4.6	11.6	LMST	Limestone, light brown, sandy and clayey (aeolianitic)
		POELPENA FORMATION	10.4	31.6	11.6	16.8	CLAY	Clay, orange brown, sandy, calcareous
					16.8	19.8	SAND	Sand, brown, fine-grained, slightly clayey
					19.8	30.5	SAND	Sand, dark brown, medium-grained, slightly clayey, well-sorted, well-rounded with good sphericity
					30.5	32.0	SAND	Sand, very dark brown to black, medium grained, slightly clayey, well-sorted and well-rounded grains
		POLDA FORMATION	30.5	11.5	32.0	35.0	SAND	Very dark brown to black, fine to medium grained with a few coarse grains, well rounded, well sorted grading to poorly sorted, carbonaceous, micaceous
					35.0	37.5	SILT	Dark to pale brown siltstone, carbonaceous, micaceous, occasional coal-y fragments, minor sand interbed 35.6-37.2m of fine-grained to silty, brown sand - CORE DESC.
					37.5	48.2	SAND	Fine to medium grained quartz sandstone, sub-angular to sub-rounded, occ. carbonaceous & micaceous
					48.2	52.4	LIGN	Dark brown lignite grading to black, occasional medium grained quartz sand pockets - CORE DESC.
					52.4	57.0	SAND	Medium grained, sub-angular to rounded quartz grains, ligntitic in part - CORE DESC.
					57.0	59.1	LIGN	Dark brown lignite, grading to pyritic and slightly clayey silt from 58.4-59.1m - CORE DESC.
					59.1	98.2	SAND	Brown, medium to coarse, sub-angular to sub-rounded quartz grains
					98.2	117.3	CLAY	Grading between clay and silt, very dark brown to grey, carbonaceous, occasionally lignitic - carbonaceous shale; CORE DESC.
					117.3	127.4	SAND	Grey, medium grained, sub-angular quartz sand, silty and clayey in part

WELL I.D.		LITHOLOGY PICKS & DESCRIPTIONS IN SAGEODATA / SARIG						
OBS NO.	MAPNUM	FM TOP NAME	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD (+/- m)	SAMPLE TOP (m)	SAMPLE BASE (m)	LITH CODE	DESCRIPTION
					127.4	151.2	CLAY	Very dark grey clay, occasionally silty, carbonaceous - carbonaceous shale; CORE DESC.
					151.2	154.8	SAND	Grey, coarse sand, occasionally silty in part, sub-angular quartz grains
					154.8	156.4	SILT	Grey, silt, clayey, carbonaceous
		SLEAFORD COMPLEX	156.4	-114.4	156.4	161.2	GNEI	Green-grey, slightly sandy silt with gneissic fragments showing relict foliation, abundant weathered feldspar (kaolinitic), occasional angular quartz grains - CORE DESC.
					161.2	162.8	SAND	Brown, medium grained sub-angular to sub-rounded quartz, clayey and silty in part, occasional gravel-sized granitic fragments
					162.8	172.2	CLAY	Grey-green to brown, sandy, occasional weather igneous and metamorphic fragments - CORE DESC.
TIN 6	5931-220	BRIDGEWATER FORMATION	0.0	70.1	0.0	0.6	SOIL	Brown sandy limey soil
					0.6	10.7	LMST	Brown clayey limestone with quartz pebbles
		POELPENA FORMATION	41.5	28.6	10.7	25.6	SAND	Red brown silty limey sand
					25.6	29.0	SAND	Fine yellow silty sand, slightly calcareous
					29.0	29.9	SAND	Yellow brown fine to coarse silty pebbly sand
					29.9	41.5	SAND	Pale pinkish medium grained sand
		SLEAFORD COMPLEX	41.5	28.6	41.5	45.7	CLYU	Grey, gritty/silty clay
TWS 4	5830-342	BRIDGEWATER FORMATION	0.0	82.2	0.0	6.0	SAND	White sandy top soil, white loose sand
					6.0	7.5	LMST	Well cemented limestone, some sand bands
					7.5	18.0	SAND	Loose sands
					18.0	70.0	SDST	Brown coloured sandstone
		Bridgewater Fm Clean Limestone	–	–	70.0	114.0	LMST	Cavernous limestone - sandstone
		SLEAFORD COMPLEX	114.0	-31.8	114.0	115.0	GRNT	Granite basement

WELL I.D.		LITHOLOGY PICKS & DESCRIPTIONS IN SAGEODATA / SARIG						
OBS NO.	MAPNUM	FM TOP NAME	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD. (+/-m)	SAMPLE TOP (m)	SAMPLE BASE (m)	LITH CODE	DESCRIPTION
–	5830-78	BRIDGEWATER FORMATION	0.0	54.0	0.0	13.7	SDST	Buff friable, fine grained calcareous sandstone
					13.7	20.4	SDST	Buff medium grained dense calcareous sandstone with cream dense limestones containing dark grey nodules
					20.4	22.6	SDST	Pale brown medium grained, dense calcareous sandstone with some sandy limestone
					22.6	25.3	SDST	Cream fine grained friable calcareous sandstone
					25.3	28.7	SDST	Buff dense fine grained calcareous sandstone with some limestone
					28.7	29.0	SDST	Cream fine grained friable calcareous sandstone
					29.0	50.0	SDST	Buff fine grained friable calcareous sandstone with shell fragments
					50.0	66.4	SDST	Yellow-brown fine to medium grained, friable calcareous sandstone, containing shell fragments
		Bridgewater Fm Clean Limestone	–	–	66.4	70.1	SDST	Cream dense, fine grained, calcareous sandstone and limestone
					70.1	76.5	SDST	Pale pink, dense fine grained, calcareous sandstone
					76.5	81.7	SDST	Buff, fine grained, calcareous sandstone and dense pale grey limestone
–	5930-136	BRIDGEWATER FORMATION	0.0	28.0	0.0	2.1	SAND	Pale brown, medium-grained, friable calcareous sandstone
					2.1	10.4	SAND	Buff, fine-grained, sense calcareous sandstone with limestone and shell fragments
					10.4	12.5	SAND	Cream, fine-grained sand
					12.5	14.3	CLAY	Mottled yellow-brown sandy clay with fragments of dense limestone
					14.3	18.6	LMST	Buff, dense limestone and brown, sandy clay
		POELPENA FORMATION	18.6	9.4	18.6	24.7	SAND	Pale brown, fine, clayey sand with quartz grit
					24.7	25.3	SAND	Pink, medium-grained sand with some lateritic gravel and brown clay
					25.3	26.2	SAND	Yellow-brown, medium-grained sand with quartz grit
		POLDA FORMATION	NEW PICK		26.2	32.6	CLAY	Grey clay with abundant mica and quartz

WELL I.D.		LITHOLOGY PICKS & DESCRIPTIONS IN SAGEODATA / SARIG						
OBS NO.	MAPNUM	FM TOP NAME	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD. (+/-m)	SAMPLE TOP (m)	SAMPLE BASE (m)	LITH CODE	DESCRIPTION
		SLEAFORD COMPLEX	26.2	1.8	32.6	45.7	CLAY	Grey clay with mica, quartz and fragments of weathered gneiss
WF5	5930-1210	BRIDGEWATER FORMATION	0.0	49.0	0.0	0.5	LMST	Light orange, fine to medium grained, sandy, calcrete capping, extremely hard
					0.5	29.0	SAND	Light to medium grey-orange, fine to medium grained, calcareous sand, moderately hard
		POELPENA FORMATION	29.0	20.0	29.0	32.0	CLAY	Light to medium red-brown clay, soft
					32.0	38.0	SAND	Light to medium grey-orange, medium to coarse grained, quartz sand, pyritic, moderately soft to loose
					38.0	47.0	CLAY	Light to medium grey clay, moderately soft
					47.0	55.0	SAND	Light to medium grey-brown, very coarse grained quartzose sand, pyritic, moderately hard, loose in part
		POLDA FORMATION	55.0	-6.0	55.0	58.0	CLAY	Light to medium grey clay, moderately soft
					58.0	60.0	SAND	Light to medium grey-brown, very coarse grained quartzose sand, pyritic, moderately hard, loose in part
					60.0	78.0	CLAY	Light to medium grey micaceous clay, moderately soft
					78.0	85.0	SAND	Light to medium grey-brown, medium to coarse grained quartzose sand, pyritic, moderately hard
					85.0	89.5	CLAY	Light to medium grey micaceous clay
					89.5	92.0	SAND	Light to medium grey-brown, medium to coarse grained quartzose sand, pyritic, moderately hard, loose in part
					92.0	97.0	SAND	Medium to dark grey-brown, quartzose, clayey, moderately hard
					97.0	113.0	CLAY	Light to medium grey, micaceous clay
					113.0	117.0	SAND	Medium to dark grey-brown, quartzose, pyritic, moderately hard
		SLEAFORD COMPLEX	117.0	-68.0	117.0	123.0	GNEI	Possible gneissic Basement below 117m
KPW 28	5930-745	BRIDGEWATER FORMATION	0.0		0.0	1.5	LMST	Limestone - kunkarised (calcrete?) at surface
					1.5	4.9	LMST	Light grey, very hard limestone
					4.9	7.6	LMST	Light grey, very hard limestone, yellow-brown stiff clay in part
		POELPENA FORMATION	7.6		7.6	8.5	CLAY	Yellow-brown, stiff clay, abundant limestone gravel
					8.5	9.1	CLAY	Buff, stiff clay, fine-grained sand in part

WELL I.D.		LITHOLOGY PICKS & DESCRIPTIONS IN SAGEODATA / SARIG						
OBS NO.	MAPNUM	FM TOP NAME	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD. (+/-m)	SAMPLE TOP (m)	SAMPLE BASE (m)	LITH CODE	DESCRIPTION
					9.1	12.5	CLAY	Red-brown, yellow-red, grey mottled stiff clay, fine to medium lime and quartz grains in part
					12.5	18.0	SAND	Light grey, very fine to coarse ferruginous sandstone, silty and clayey in part
		SLEAFORD COMPLEX Seems high for Basement (?)	18.0		18.0	18.3	CLAY	Very stiff clay, minor red-brown sand
Colton 1	5831-345	BRIDGEWATER FORMATION	0.0	34.1	0.0	2.0	SOIL	Brown, fine-grained, calcareous
					2.0	7.0	LMST	White calcrete with 5-10% quartz as rounded, frosted grains
					7.0	18.0	LMST	White aeolianite, fine-medium calcite fragments, rounded, unconsolidated with red oxidised grains
		POELPENA FORMATION	NEW PICK		No sample returns 18-110mMD & no downhole logs			
		POLDA FORMATION	NEW PICK					Not sure on actual base depth - top picked on GR
		BLUE RANGE BEDS	110.0	-75.9	110	112	SAND	White and red, hard, medium grained sandstone
					112	122	SAND	Red and white sandstone with minor silty flat-lying beds and small, unconsolidated grains - CORE DESC.
					122	124	SAND	White and Red sandstone with silty cross-beds - CORE DESCRIPTION
					124	125	SAND	Red and white sandstone with silt
BLDD06	5930-1376	BRIDGEWATER FORMATION	NEW PICK		0.0	5.0	LMST	Creamy, light brown, hard calcrete
					5.0	16.0	SAND	Variably geothitic and calcareous sand with some think calcrete hard bands
					16.0	18.0	SILT	Thin, silcrete sand layers, partly calcareous and geothitic with some sandy interbeds
					18.0	26.0	SAND	Variably geothitic and calcareous sand with some think calcrete hard bands, weakly calcareous with calcrete base at 25.3m
		POELPENA FORMATION	NEW PICK		26.0	29.0	SAND	Light grey, fine grained, qtz rich sand, weakly geothitic
					29.0	34.0	SAND	Vf to f grained, weakly geothitic qtz sand, partly clayey

WELL I.D.		LITHOLOGY PICKS & DESCRIPTIONS IN SAGEODATA / SARIG						
OBS NO.	MAPNUM	FM TOP NAME	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD. (+/-m)	SAMPLE TOP (m)	SAMPLE BASE (m)	LITH CODE	DESCRIPTION
					34.0	37.0	SAND	Vf to f grained, weakly geothitic qtz sand, partly clayey
					37.0	51.0	CLAY	Dark brownish grey, very fine sandy clay, weakly lignitic
		POLDA FORMATION	NEW PICK		51.0	68.0	SAND	Medium grey, fine to coarse grained quartz sand with numerous brownish-grey clay interbeds
					68.0	70.0	SAND	Grey, fine to med grained, quartz-rich sand, coal frags
					70.0	86.0	CLAY	Medium to dark brownish grey, partly coal-y and very fine sandy clay
					86.0	87.3	COAL	Medium brown, clay-rich saprolite
		SLEAFORD COMPLEX	NEW PICK		87.3	91.6	SAND	Magnetite/haematite/quartz sandstone textured iron formation, strongly magnetic and partly weathered, highly porous and granular, some greenish chloritic veins, becomes more chloritic and haematitic below 90m with extensive fractures (but still strongly magnetic - CORE DESC.
					91.6	97.3	CLAY ?	Dark green, very soft chlorite riock, some secondary silica veining, rare haematite grains, strong shearing evident on fracture surfaces - CORE DESC.
					97.3	125.1		Red-brown magnetite/haematite/qutz rocks, sandy textured, strongly chloritic 97.3-97.6m - CORE DESC.
								Deeper descriptions not included as irrelevant to this study & Basement pick is confident
TAA 35	5831-291	BRIDGEWATER FORMATION	0.0	22.5	0.0	0.3	SOIL	Fine sand, silty, calcareous, organic rich, grey-brown to red-brown
					0.3	0.9	CALC	Crypto-crystalline carbonate, pink and pale brown, occ. grey
					0.9	1.8	CALC	Fine grained, slightly silty, weakly to moderately cemented, calcite and grey carbonate grains, mainly less than 0.2mm, pale red-brown
					1.8	5.5	CALC	Aeolianite, med. grained, moderately to strongly cemented, grains are calcite and shell fragments, some grey carbonate up to 0.5mm, whitish brown, numerous bands of calcrete to 0.3m thick

WELL I.D.		LITHOLOGY PICKS & DESCRIPTIONS IN SAGEODATA / SARIG						
OBS NO.	MAPNUM	FM TOP NAME	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD. (+/-m)	SAMPLE TOP (m)	SAMPLE BASE (m)	LITH CODE	DESCRIPTION
					5.5	6.7	CALC	Aeolianite as above, silty, pale reddish brown
					6.7	7.5	CALC	Mainly aeolianite fine grained, strongly cemented, some crypto-crystalline carbonate
					7.5	14.3	CALC	Aeolianite, fine to medium grained, silty weakly to moderately cemented. Few thin bands of calcrete, grains are calcite, shell fragments and grey carbonate to 2mm, pale reddish brown
					14.3	17.1	CALC	Aeolianite, as above but silty and clayey, disseminated and in discrete pockets. Light brown at top grades to yellow-brown at base
					17.1	20.4	CALC	Aeolianite and limestone, bands of aeolianite med. grained, moderately to strongly cemented, pale yellow - brown; bands of limestone fine grained, crystalline whitish, ironstained yellow brown in places, grades to limestone at base
		POELPENA FORMATION	20.4	2.1	20.4	26.2	SAND	Fine grained clayey uncemented, quartz grains, clear, subangular to subrounded, mainly 0.1 to 0.2mm, clay up to 20%, mainly disseminated in few discrete sandy blebs, yellow to yellow-brown
					26.2	32.3	SAND	As above, some strongly cemented bands with siliceous cemented quartz pale grey to dark grey, ironstained
					32.3	40.4	SDST	Fine grained variably cemented, weakly to strongly in bands, generally very clayey; grains are quarzt less than 0.2mm, some to 3mm, cement is siliceous, clay is disseminated, discrete red and purple blebs; pale yellow-brown
		BLUE RANGE BEDS May be Polda Fm (?)	SLEAFORD COMPLEX IN (40.4m) SA GEODATA		40.4	41.8	CLYU	Stiff, sandy grains of quartz less than 0.1mm, some mica and sandstone fragments, purple to red brown
TIN 4	5931-225	BRIDGEWATER FORMATION	0.0	59.9	0.0	0.6	SOIL	Brown soil and hard kunkar
					0.6	7.6	LMST	Hard pale pinkish brown limestone
					7.6	9.8	LMST	Off white medium to coarse sandy limestone
		POELPENA FORMATION	9.8	50.1	9.8	10.7	SAND	Yellow brown clayey limey medium to coarse sand

WELL I.D.		LITHOLOGY PICKS & DESCRIPTIONS IN SAGEODATA / SARIG						
OBS NO.	MAPNUM	FM TOP NAME	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD. (+/-m)	SAMPLE TOP (m)	SAMPLE BASE (m)	LITH CODE	DESCRIPTION
					10.7	27.4	SAND	Very fine yellow sand
		BLUE RANGE BEDS May be Polda Fm (?)	SLEAFORD COMPLEX (27.4m) IN SA GEODATA		27.4	35.1	SILT	Dark grey - brown silt
WF 8	5830-1212	BRIDGEWATER FORMATION	0.0	17.0	0.0	16.0	SAND	Light to medium brown-grey, moderately soft to friable, fine to mediumg rained calcareaous sandstone
					16.0	25.5	SAND	Light grey, white, soft, friable fine-grained sandstone, clayey in part
		POELPENA FORMATION	25.5	-8.5	25.5	36.0	CLAY	Light to medium orange-grey clay, soft
					36.0	39.5	SAND	Light to medium yellow-grey, very coarse grained, well sorted, subangular quartz sand
					39.5	41.0	CLAY	Medium to dark grey, orange, soft clay
					41.0	43.5	SAND	Light grey, very coarse grained, well sorted, subangular, quartz sandstone, moderately hard to friable
		POLDA FORMATION	44.5	-27.5	43.5	44.5	CLAY	Medium to dark grey, soft clay
					44.5	116.4	SAND	Light grey, very coarse grained, well sorted, subangular, quartz sand, pyritic, moderately hard to friable
		BLUE RANGE BEDS	NEW PICK		116.4	132.0	SAND	Light to medium pink, medium to coarse grained, poorly sorted, subangular feldspathic to quartzose sand, hard

WELL I.D.		LITHOLOGY PICKS & DESCRIPTIONS IN SAGEODATA / SARIG						
OBS NO.	MAPNUM	FM TOP NAME	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD. (+/-m)	SAMPLE TOP (m)	SAMPLE BASE (m)	LITH CODE	DESCRIPTION
Polda 5	5931-369	BRIDGEWATER FORMATION	0.0	44.0	0.0	11.2	LMST	Pale grey and pale brown indurated, concretionary calcrete, 20-30% sub-angular to sub-rounded quartz sand, overlying pale brown, partly cemented, fine to coarse grained calcite grains, with fine to medium grained quartz sand, minor clay in part

WELL I.D.		LITHOLOGY PICKS & DESCRIPTIONS IN SAGEODATA / SARIG						
OBS NO.	MAPNUM	FM TOP NAME	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD. (+/-m)	SAMPLE TOP (m)	SAMPLE BASE (m)	LITH CODE	DESCRIPTION
					11.2	26.0	SAND	Reddish bronw, ferruginous, fine grained sandstone and minor siltstone, ovelrying yellow, grey and white mottled fine to medium grained sandy clay and white and yellow medium to coarse grained sand and rounded granules, including pebbles up to 5mm in size
		POELPENA FORMATION	26.0	18.0	26.0	49.6	CLAY	Black to dark brownish grey, carbonacoues sandy/silty clays and clayey silts, white and grey, soft to moderately hard, micaceous, very fine to medium grained sandstone, grades downwards to clean, mediuim to coarse grained sand and minor quartz granules
					49.6	63.1	CLAY	Interbreded brown, carbonaceous clay, brown clayey (10-20%) very fine grained sandstone and brown, carbonaceous to clean, fine to medium grained sand with rounded to well-rounded grains
		POLDA FORMATION	84.4	-40.4	63.1	84.4	SAND	Medium to very coarse grained, sub-rounded to well-rounded quartz sand and minor quartz granules, minor white to pale grey clay and minor brown, woody coal
					84.4	94.0	CLAY	Pale to bluish grey, micaceous, soft to indurate claystone and shale with fine-grained sand

WELL I.D.		LITHOLOGY PICKS & DESCRIPTIONS IN SAGEODATA / SARIG						
OBS NO.	MAPNUM	FM TOP NAME	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD. (+/-m)	SAMPLE TOP (m)	SAMPLE BASE (m)	LITH CODE	DESCRIPTION
WF4a	5930-1209	BRIDGEWATER FORMATION	0.0	28.0	0.0	0.5	LMST	Light brown, grey, extremely hard limestone calcrete, sandy in part
					0.5	8.0	SAND	Light grey, orange, fine to medium grained, sub rounded, calcareous sand, loose
					8.0	8.3	CLAY	Dark grey-green, sandy clay, very soft

WELL I.D.		LITHOLOGY PICKS & DESCRIPTIONS IN SAGEODATA / SARIG						
OBS NO.	MAPNUM	FM TOP NAME	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD. (+/-m)	SAMPLE TOP (m)	SAMPLE BASE (m)	LITH CODE	DESCRIPTION
					8.3	14.0	SAND	Light grey-orange, medium to coarse grained, well sorted, rounded quartzose sand, secondary carbonate cement
		POELPENA FORMATION	14.0	14.0	14.0	20.0	CLAY	Light grey-orange, sandy clay, very soft
					20.0	22.0	CLAY	Light grey, sand clay, very soft
					22.0	30.5	SAND	Light grey, very coarse grained, sub-rounded, quartz sand, hard
					30.5	37.0	COAL	Dark brown, very soft (cored 31-31.5m)
					37.0	40.0	SAND	Light to medium brown, grey, medium to coarse grained, subrounded quartzose sand, pyritic, interbedded with dark brown to black, very soft lignite
					40.0	43.0	SAND	Light to medium brown, grey, very coarse grained, sub-rounded, quartzose sand, pyritic, hard, interbedded with dark brown to black, very soft lignite
					43.0	50.0	SAND	Light to medium brown, grey, medium to coarse grained, subrounded quartzose sand, pyritic, interbedded with dark brown to black, very soft lignite
		POLDA FORMATION	50.0	-22.0	50.0	57.0	SAND	Light to medium brown, grey, granular, sub-angular quartzose sand, pyritic, hard
					57.0	98.5	SAND	Light to medium brown, grey, very coarse grained, sub-angular, quartzose sand, pyritic
					98.5	101.0	SAND	Light green-grey, fine grained, sand, clayey, soft
					101.0	114.0	SAND	Light to medium brown, grey, very coarse grained, sub-angular, quartzose sand

WELL I.D.		LITHOLOGY PICKS & DESCRIPTIONS IN SAGEODATA / SARIG						
OBS NO.	MAPNUM	FM TOP NAME	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD. (+/-m)	SAMPLE TOP (m)	SAMPLE BASE (m)	LITH CODE	DESCRIPTION
WF2	5930-1207	BRIDGEWATER FORMATION	0.0	38.0	No samples above 37m			
		POELPENA FORMATION	37.0	1.0	37.0	49.0	SAND	Light grey, very coarse grained, well-sorted, subangular, quartzose sand, hard, pyritic
		POLDA FORMATION	49.0	-11.0	49.0	52.0	CLAY	Dark grey, micaceous clay
					52.0	54.5	SAND	Light grey, very coarse grained, well-sorted, subangular, quartzose sand, moderately hard, pyritic
					54.5	109.0	CLAY	Medium to dark grey, micaceous clay, moderately soft to firm
					109.0	112.0	SAND	Light to medium grey, very coarse-grained, well-sorted, subangular, quartzose sand, pyritic moderately hard to friable
					112.0	127.0	CLAY	Medium to dark grey, micaceous clay, moderately soft to firm, sandy
					127.0	130.0	SAND	Light to medium grey, very coarse-grained, well-sorted, subangular, quartzose sand, pyritic moderately hard to friable
					130.0	133.5	CLAY	Medium to dark grey, micaceous clay, moderately soft to firm
					135.5	135.0	SAND	Light to medium grey, very coarse-grained, well-sorted, subangular, quartzose sand, pyritic moderately hard to friable
					135.0	148.0	CLAY	Medium to dark grey, micaceous clay, moderately soft to firm

WELL I.D.		LITHOLOGY PICKS & DESCRIPTIONS IN SAGEODATA / SARIG						
OBS NO.	MAPNUM	FM TOP NAME	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD. (+/-m)	SAMPLE TOP (m)	SAMPLE BASE (m)	LITH CODE	DESCRIPTION
WF3	5930-1208	BRIDGEWATER FORMATION	0.0	65.0	0.0	27.0	SAND	Light orange-grey, fine to medium grained, calcareous sand, moderately hard
		POELPENA FORMATION	27.0	38.0	27.0	40.0	CLAY	Medium to dark orange-grey clay, soft

WELL I.D.		LITHOLOGY PICKS & DESCRIPTIONS IN SAGEODATA / SARIG						
OBS NO.	MAPNUM	FM TOP NAME	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD. (+/-m)	SAMPLE TOP (m)	SAMPLE BASE (m)	LITH CODE	DESCRIPTION
					40.0	42.0	SAND	Light orange-grey, very coarse grained, well-sorted quartzose sand, friable to moderately hard
		POLDA FORMATION	51.0	14.0	42.0	51.0	CLAY	Medium to dark grey clay, soft
					51.0	55.0	SAND	Light grey, very coarse grained, well-sorted quartzose sand, pyritic, friable to moderately hard
					55.0	60.5	CLAY	Medium to dark grey micaceous clay, soft
					60.5	62.0	SAND	Light grey, very coarse grained, well-sorted quartzose sand, pyritic, friable to moderately hard
					92.0	77.0	CLAY	Medium to dark grey micaceous clay, soft
					77.0	79.0	SAND	Light grey, very coarse grained, well-sorted quartzose sand, pyritic, friable to moderately hard
					79.0	85.5	CLAY	Medium to dark grey micaceous clay, soft
					85.5	87.5	COAL	Black coal
					87.5	104.5	CLAY	Medium to dark grey micaceous clay, soft, becoming sandy towards base
					104.5	111.0	CLAY	Medium to dark grey micaceous clay, soft
					111.0	121.0	SAND	Light grey, very coarse grained, well-sorted quartzose sand, pyritic, friable to moderately hard
					121.0	127.0	CLAY	Medium to dark grey micaceous clay, soft, occasional very coarse sand grains
TAA 3	5930-13	BRIDGEWATER FORMATION	0.0	45.8	0.0	0.3	SOIL	Clay soil
					0.3	1.5	SAND	Fine to coarse sand, well rounded quartz grains some clay - red-brown
					1.5	6.4	LMST	Limestone rubbly with some aeolianite and marl - pale yellow
		POELPENA FORMATION	12.8	33.0	6.4	12.2	SAND	Fine to coarse sand, well rounded quartz grains slightly clayey, some grit pale red-brown
					12.2	12.8	SAND	Very fine to medium sand, -angular to subrounded clean quartz grains pale yellow-brown and grey mottled

WELL I.D.		LITHOLOGY PICKS & DESCRIPTIONS IN SAGEODATA / SARIG						
OBS NO.	MAPNUM	FM TOP NAME	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD. (+/-m)	SAMPLE TOP (m)	SAMPLE BASE (m)	LITH CODE	DESCRIPTION
					12.8	15.9	SAND	Sand as above, contains common ferruginous quartzite pebbles to 51mm diameter, yellow-brown
					15.9	17.1	CLYU	Sandy clay - sand fraction as above some quartzite pebbles to 13mm grey-brown and yellow mottled
					17.1	20.7	SAND	Sand, very fine to medium, angular to subrounded quartz grains. Pale yellow-brown.
					20.7	21.3	SAND	Sand as above, some ferruginous sandstone pebbles to 51mm diameter, yellow-brown
					21.3	22.3	SAND	Sand as above - pink
					22.3	29.0	SAND	Sand as above - pale yellow-brown
					29.0	29.6	SAND	Sand - fine-coarse well rounded iron stained quartz grains, red-brown
		POLDA FORMATION	SLEAFORD COMPLEX (29.6m) IN SA GEODATA		29.6	30.2	CLYU	Clay - stiff some fine quartz grains, abundant mica - grey and red-brown mottled
HUD 82	5930-246	BRIDGEWATER FORMATION	0.0	63.7	0.0	0.6	SOIL	Brown soil and kunkar
					0.6	4.9	LMST	Pale brown clastic limestone
					4.9	11.3	CLAY	Pale yellow-brown limey clay
		POELPENA FORMATION	11.3	52.4	11.3	15.8	SAND	Grey and yellow slightly limey and clayey fine sand
					15.8	23.2	SAND	Pinkish-brown fine sand
					23.2	24.4	SAND	Yellow, fine sand
					24.4	25.9	SAND	Red, fine sand
		POLDA FORMATION	25.9	37.8	25.9	44.5	CLAY	Grey clay, slightly micaceous
					44.5	58.5	SILT	Grey, angular quartz grit

WELL I.D.		LITHOLOGY PICKS & DESCRIPTIONS IN SAGEODATA / SARIG						
OBS NO.	MAPNUM	FM TOP NAME	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD. (+/-m)	SAMPLE TOP (m)	SAMPLE BASE (m)	LITH CODE	DESCRIPTION
					58.5	67.1	CLAY	Grey, micaceous clay
			SLEAFORD COMPLEX (58.5m) IN SA GEODATA		67.1	79.2	CLAY	Grey, micaceous clay, silty in part

WELL I.D.		LITHOLOGY PICKS & DESCRIPTIONS IN SAGEODATA / SARIG						
OBS NO.	MAPNUM	FM TOP NAME	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD. (+/-m)	SAMPLE TOP (m)	SAMPLE BASE (m)	LITH CODE	DESCRIPTION
HUD 40	5930-247	BRIDGEWATER FORMATION	0.0	62.0	0.0	0.6	SOIL	Brown soil with kunkar
					0.6	4.0	MARL	Pale brown marl (limestone?)
					4.0	5.8	LMST	Pale yellow limestone
					5.8	15.2	CLAY	Yellow sandy and slightly limey clay
					15.2	25.6	SAND	Yellow fine-grained sand
					25.6	28.0	SAND	Off white, fine-grained sand
		POELPENA FORMATION	5.8	56.2	28.0	29.6	SILT	Red-yellow, grey, gritty clay
					29.6	30.5	SAND	Pale brown and yellow gritty sand
					30.5	35.1	SAND	Off-white, grey, angular quartz sand with grit (silt?)
					35.1	43.6	SAND	Light grey gritty and clayey sand
		POLDA FORMATION	35.1	27.0	43.6	47.5	CLAY	Black,ligntitic clay - carbonaceous shale
			SLEAFORD COMPLEX (47.5m) in SA GEODATA		47.5	57.9	CLAY	Grey, micaceous clay
		BRIDGEWATER FORMATION	0.0	75.1	0.0	0.6	SOIL	Dary grey clay and kunkar rubble

WELL I.D.		LITHOLOGY PICKS & DESCRIPTIONS IN SAGEODATA / SARIG						
OBS NO.	MAPNUM	FM TOP NAME	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD. (+/-m)	SAMPLE TOP (m)	SAMPLE BASE (m)	LITH CODE	DESCRIPTION
HUD 41	5930-248				0.6	5.2	LMST	Slightly clayey limestone, rare pinkish quartz grains
					5.2	20.7	LMST	Slightly clayey, pinkish, partitially cemented lime sand
					20.7	28.7	SAND	Yellow-brown, very calcareous, clayey fine to medium sand
					28.7	42.1	SAND	Pale yellow, very-fine to medium sand, silty in part, sub-rounded to well-rounded quartz sand
		POELPENA FORMATION	42.1	33.0	42.1	44.8	CLAY	Mottled light to medium grey, slightly sandy, stiff, calcareous clay, some ferruginous staining
					44.8	49.7	SAND	Pale yellow; very fine to medium sand, clayey in part, abundant mica
					49.7	57.3	SAND	Pale yellow-brown, very fine to coase quartz sandstone, sub-rounded, slightly clayey
					57.3	62.2	SAND	Pale yellow-grey, very fine to medium, sub-angular to sub-rounded quartz sand
		POLDA FORMATION	42.1 SLEAFORD COMPLEX (62.2m) in SA GEODATA	33.0	62.2	76.2	CLAY	Light grey, slightly micaceous stiff clay, silty in part
HUD 44	5930-249	BRIDGEWATER FORMATION	0.0	58.4	0.0	2.1	LMST	Pale reddish, bouldery limestone
					2.1	9.8	LMST	Pale yellow, slightly clayey and sandy limestone
					9.8	13.7	CLAY	Yellow grey, greenish clay, calcareous fine to medium sand in part
					13.7	21.9	SAND	Light brown, very fine to fine quartz sand with some calcareous grains, slightly claye and silty
		POELPENA FORMATION	9.8	48.6	21.9	25.6	SAND	Pale yellow, very fine to fine quartz sand, slightly clayey and silty

WELL I.D.		LITHOLOGY PICKS & DESCRIPTIONS IN SAGEODATA / SARIG						
OBS NO.	MAPNUM	FM TOP NAME	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD. (+/-m)	SAMPLE TOP (m)	SAMPLE BASE (m)	LITH CODE	DESCRIPTION
					25.6	31.4	SAND	Pink, very fine to fine quartz sand, some clear, coarse and well-rounded quartz grains
					31.4	38.1	SAND	Pale yellow, coarse quartz grains with very fine to fine sandy clay, rare mica
		POLDA FORMATION	38.1	20.3	38.1	44.8	CLAY	Grey, stiff clay, abundant coarse, well-rounded quartz grains
			SLEAFORD COMPLEX (44.8m) in SAGEODATA		44.8	51.8	CLAY	Grey, silty stiff clay, common micromicaceous

WELL I.D.		LITHOLOGY PICKS & DESCRIPTIONS IN SAGEODATA / SARIG						
OBS NO.	MAPNUM	FM TOP NAME	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD. (+/-m)	SAMPLE TOP (m)	SAMPLE BASE (m)	LITH CODE	DESCRIPTION
HUD 45	5930-250	BRIDGEWATER FORMATION	0.0	57.5	0.0	5.5	LMST	Slightly ferruginous kunkar rubble
					5.5	10.7	CLAY	Red-brown calcareous clay, very sandy (fine to medium), abundant white fine to coarse limestone fragments
					10.7	20.1	SAND	Yellow-brown, fine to medium grained sub-rounded to well-rounded quartz sand, slightly calcareous and clayey in part, some small clay layers and laterite fragments up to 0.7cm diameter
		POELPENA FORMATION	10.7	46.8	20.1	23.8	SAND	Pale yellow, very fine to fine, subrounded quartz sand
					23.8	25.3	SAND	Grey, fine to coarse, gravel in part, rounded quartz sand
					25.3	31.7	SAND	Light yellow-brown, fine to coarse, subangular to subrounded quartz sand, clayey in part
					31.7	37.2	SAND	Light grey, fine to coarse, subrounded quartz sand, clayey in part

WELL I.D.		LITHOLOGY PICKS & DESCRIPTIONS IN SAGEODATA / SARIG						
OBS NO.	MAPNUM	FM TOP NAME	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD. (+/-m)	SAMPLE TOP (m)	SAMPLE BASE (m)	LITH CODE	DESCRIPTION
					37.2	42.7	SAND	Light grey, fine to coarse, subrounded quartz sand
					42.7	46.9	SAND	Yellow-brown, very fine to coarse, subangular quart sand, clayey in part
		POLDA FORMATION	SLEAFORD COMPLEX (46.9m) in SA GEODATA)		46.9	61.0	CLAY	Grey clay with abundant micromica, slightly fine sand and silt in aprt
TAA 16	5930-37	BRIDGEWATER FORMATION	0.0	41.3	0.0	0.9	LMST	Clastic Limestone
					0.9	13.4	LMST	Yellow-brown friable limestone
					13.4	19.8	CLAY	Red-brown limey clay
					19.8	24.4	LMST	Pink, silty limestone
		POELPENA FORMATION	13.4	27.9	24.4	25.3	SAND	Light yellow, fine sand
					25.3	27.7	SAND	Pink, fine sand
					27.7	29.9	SAND	Pink sand with coarse grit and gravel
					29.9	33.2	SAND	Coarse quartz grit and gravel with a few rounded pebbles
		POLDA FORMATION	SLEAFORD COMPLEX (33.2m) IN SA GEODATA		33.2	42.7	CLAY	Grey micaceous clay
–	5930-215	BRIDGEWATER FORMATION	0.0	65.0	0.0	0.2	LMST	Travertine crust
					0.2	2.3	LMST	Soft, white limestone
					2.3	5.5	LMST	Hard, white travertine limestone (calcrete?)
					5.5	10.1	LMST	Yellowish traverine limestone (calcrete?)
					10.1	11.3	SAND	Medium-coarse quartz sand and travertine (calcrete?)

WELL I.D.		LITHOLOGY PICKS & DESCRIPTIONS IN SAGEODATA / SARIG						
OBS NO.	MAPNUM	FM TOP NAME	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD. (+/-m)	SAMPLE TOP (m)	SAMPLE BASE (m)	LITH CODE	DESCRIPTION
		POELPENA FORMATION	11.3	53.7	11.3	13.7	CLAY	Pale yellow, calcareous, sandy clay
					13.7	15.2	SAND	White, medium, rounded quartz grains, occasionally calcareous grains
					15.2	18.3	SAND	White, fine quartz sand with gravel-size quartz
					18.3	19.8	SAND	Coarse quartz sand with fine sand
					19.8	28.3	SAND	Pale yellow, very fine sand with minor white clay and gravel-sized quartz
					28.3	30.5	SAND	Fine to medium quartz sand
					30.5	31.1	SAND	Red, fine-grained sand with coarse, rounded quartz fragments and shale fragments
					31.1	36.0	SAND	Yellow, fine-grained, clayey sand with coarse, founded quartz grains
		POLDA FORMATION	SLEAFORD COMPLEX (36.0m) in SA GEODATA		36.0	37.8	CLAY	Grey-blue micaceous clay with medium-coarse, rounded quartz grains

WELL I.D.		LITHOLOGY PICKS & DESCRIPTIONS IN SAGEODATA / SARIG						
OBS NO.	MAPNUM	FM TOP NAME	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD. (+/-m)	SAMPLE TOP (m)	SAMPLE BASE (m)	LITH CODE	DESCRIPTION
HUD 62	5930-222	BRIDGEWATER FORMATION	0.0	61.3	0.0	0.3	CLAY	Brown, stiff clay with some limestone fragments
					0.3	6.7	CLAY	Brown sandy clay with with fine-medium sized calcareous grains
					6.7	10.7	LMST	Pale brown sandy marl (limestone?) with very-fine to fine calcacreous grains, some pale brown clay streaks

WELL I.D.		LITHOLOGY PICKS & DESCRIPTIONS IN SAGEODATA / SARIG						
OBS NO.	MAPNUM	FM TOP NAME	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD. (+/-m)	SAMPLE TOP (m)	SAMPLE BASE (m)	LITH CODE	DESCRIPTION
		POELPENA FORMATION	10.7	50.6	10.7	18.3	CLAY	Red-brown sandy clay with very-fine to meidum, sub-angular to well-rounded clear quartz grains
					18.3	22.9	SAND	Clear, very fine to medium, well-rounded, quartz grains, slight buff clay
					22.9	29.3	SAND	Yellow-brown, very fine to medium, sub-angular to well-rounded quartz grains
		POLDA FORMATION	SLEAFORD COMPLEX (29.3m) in SA GEODATA		29.3	29.9	CLAY	Grey and brown mottled clay with very fine quartz grains and rare small mica flakes
HUD 82	5931-220	BRIDGEWATER FORMATION	0.0	63.7	0.0	0.6	SOIL	Brown soil and kunkar
					0.6	4.9	LMST	Pale brown clastic limestone
					4.9	11.3	CLAY	Pale yellow-brown limey clay
		POELPENA FORMATION	11.3	52.4	11.3	15.8	SAND	Grey and yellow, slightly limey and clayey fine-grained sand
					15.8	23.2	SAND	Pink-ish brown, fine-grained sand
					23.2	24.4	SAND	Yellow, fine-grained sand
					24.4	25.9	SAND	Red, fine-grained sand
		POLDA FORMATION	25.9	37.8	25.9	44.5	CLAY	Grey clay, slightly micaceous
					44.5	58.5	SAND	Grey, angular quartz grit
			SLEAFORD COMPLEX (58.5m) in SA GEODATA		58.5	67.1	CLAY	Grey clay with fine mica flakes
					67.1	79.2	CLAY	Grey micaceous and silty clay

WELL I.D.		LITHOLOGY PICKS & DESCRIPTIONS IN SAGEODATA / SARIG						
OBS NO.	MAPNUM	FM TOP NAME	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD. (+/-m)	SAMPLE TOP (m)	SAMPLE BASE (m)	LITH CODE	DESCRIPTION
TIN 57	5930-62	BRIDGEWATER FORMATION	0.0	64.1	0.0	4.0	LMST	Grey, coarse-grained lime sand and soil
					4.0	15.2	CLAY	Yellow-brown, calcareous, silty clay
		POELPENA FORMATION	15.2	48.9	15.2	20.4	SAND	Pale pink, medium to coarse grained calcareous sand, silty in part
					20.4	25.6	SILT	Red-brown silt
					25.6	29.6	SILT	Yellow to red silt
		POLDA FORMATION	SLEAFORD COMPLEX (29.6m) in SA GEODATA		29.6	35.1	CLAY	Grey Clay
TIN 59	5930-61	BRIDGEWATER FORMATION	0.0	57.6	0.0	0.6	SOIL	Brown kunkar soil
					0.6	1.8	SAND	Brown, fine-grained lime-sand
					1.8	4.0	LMST	Hardened lime-sand (calcrete?)
					4.0	10.7	CLAY	Yellow-brown silty clay with a fair amount of lime
		POELPENA FORMATION	4.0	53.6	10.7	17.7	SAND	Light yellow, fine-grained sand
					17.7	21.0	SAND	Yellow, coarse-grained silty sand
					21.0	27.4	SAND	Quartz grit with some large pebbles
		POLDA FORMATION	SLEAFORD COMPLEX (27.4m) in SA GEODATA		27.4	36.6	CLAY	Grey clay

G. Resource wells and monitoring wells with previous basement picks – existing formation top picks and sample descriptions

WELL I.D.			UPDATED PICKS		PICKS IN SAGEODATA / SARIG		Δ	COMMENTS	CONFINEMENT
OBS NO.	MAPNUM	FM TOP NAME	FM TOP DEPTH (mMD)	FM TOP REL. TO AHD (+/- m)	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD (+/-m)	PICK DIFF. (m)	COMMENTS	TOP POELPENA FM SHALE PRESENT?
Polda 1	5930-1023	BRIDGEWATER FORMATION	0.0	42.0	0.0	42.0	0.0		Y
		POELPENA FORMATION	11.6	30.4	10.4	31.6	1.2		
		POLDA FORMATION	32.0	10.0	30.5	11.5	1.5	Uppermost descriptions support pick of Polda formation rather than some form of Basement in other wells (e.g. WAD37) Numerous palynological samples for biostratigraphic analysis	
		SLEAFORD COMPLEX	156.4	-114.4	156.4	-114.4	0.0	Several palynological samples for biostratigraphic analysis	
TIN 6	5931-220	BRIDGEWATER FORMATION	0.0	70.1	0.0	70.1	0.0		? Silty sand described, but may be siltstone (?)
		POELPENA FORMATION	10.7	59.4	41.5	28.6	-30.8		
		SLEAFORD COMPLEX	41.5	28.6	41.5	28.6	0.0	Describes clay and mica, but no other igneous/metamorphic minerals PICK BASED OFF MAP (could be Blue Range Beds)	

WELL I.D.			UPDATED PICKS		PICKS IN SAGEODATA / SARIG		Δ	COMMENTS	CONFINEMENT
OBS NO.	MAPNUM	FM TOP NAME	FM TOP DEPTH (mMD)	FM TOP REL. TO AHD (+/- m)	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD (+/-m)	PICK DIFF. (m)	COMMENTS	TOP POELPENA FM SHALE PRESENT?
TWS 4	5830-342	BRIDGEWATER FORMATION	0.0	82.2	0.0	82.2	0.0		N/A No Poelpena in SW
		Bridgewater Fm Clean Limestone	70.0	12.2	–	–	–	Based off description & similarity to WAD37	
		SLEAFORD COMPLEX	114.0	-31.8	114.0	-31.8	0.0		
–	5830-78	BRIDGEWATER FORMATION	0.0	54.0	0.0	54.0	0.0		N/A No Poelpena in SW
		Bridgewater Fm Clean Limestone	66.4	-12.4	–	–	–	Picked on sample description similarity and thickness similarity to WAD37/38	
		SLEAFORD COMPLEX	81.7	-27.7	POELPENA FM IN SA GEODATA		-3.3		
					85.0	-31.0			
–	5930-136	BRIDGEWATER FORMATION	0.0	28.0	0.0	28.0	0.0		? Possibly a thin silt present?
		POELPENA FORMATION	18.6	9.4	18.6	9.4	0.0		
		POLDA FORMATION	26.2	1.8	NEW PICK		NEW PICK	Well is on the boundary of the Polda Basin - grey colour usually indicates Polda sediments	
		SLEAFORD COMPLEX	32.6	-4.6	26.2	1.8	6.4	More detail to confirm presence of gneiss would be preferred as rest of description sounds like Polda - BASEMENT OUTCROP ~3.2km to the WEST	
WF5	5930-1210	BRIDGEWATER FORMATION	0.0	49.0	0.0	49.0	0.0		Y
		POELPENA FORMATION	29.3	19.7	29.0	20.0	0.3		

WELL I.D.			UPDATED PICKS		PICKS IN SAGEODATA / SARIG		Δ	COMMENTS	CONFINEMENT
OBS NO.	MAPNUM	FM TOP NAME	FM TOP DEPTH (mMD)	FM TOP REL. TO AHD (+/- m)	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD (+/-m)	PICK DIFF. (m)	COMMENTS	TOP POELPENA FM SHALE PRESENT?
		POLDA FORMATION	59.5	-10.5	55.0	-6.0	4.5		
		SLEAFORD COMPLEX	117.0	-68.0	117.0	-68.0	0.0	Possible pick, but lacks sample description	
BLDD06	5930-1376	BRIDGEWATER FORMATION	0.0	21.0	NEW PICK		NEW PICK		N? Description is more silty
		POELPENA FORMATION	26.0	-5.0	NEW PICK		NEW PICK		
		POLDA FORMATION	51.0	-30.0	NEW PICK		NEW PICK		
		SLEAFORD COMPLEX	87.3	-66.3	NEW PICK		NEW PICK	Sleaford units not differentiated as not relevant to this study	
KPW 28	5930-745	BRIDGEWATER FORMATION	0.0	68.1	0.0	68.1	0.0		Y? But likely not thick?
		POELPENA FORMATION	7.6	60.5	7.6	60.5	0.0	Descriptions lacking information to refine picks	
		SLEAFORD COMPLEX Seems high for Basement (?)	18.0	50.1	18.0	50.1	0.0	Description needs more detail - far outside AOI so not analysed in great detail here	
Colton 1	5831-345	BRIDGEWATER FORMATION	0.0	34.1	0.0	34.1	0.0		? No samples recovered
		POELPENA FORMATION	21.3	12.8	NEW PICK		NEW PICK		
		POLDA FORMATION	51.5	-17.4	NEW PICK		NEW PICK	Not sure on actual base depth - top picked on GR	
		No sample returns 18-110mMD and no downhole logs over this zone							
		BLUE RANGE BEDS	110.0	-75.9	110.0	-75.9	0.0	No electric logs over this zone	

WELL I.D.			UPDATED PICKS		PICKS IN SAGEODATA / SARIG		Δ	COMMENTS	CONFINEMENT
OBS NO.	MAPNUM	FM TOP NAME	FM TOP DEPTH (mMD)	FM TOP REL. TO AHD (+/- m)	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD (+/-m)	PICK DIFF. (m)	COMMENTS	TOP POELPENA FM SHALE PRESENT?
TAA 35	5831-291	BRIDGEWATER FORMATION	0.0	22.5	0.0	22.5	0.0		Y? But thin
		POELPENA FORMATION	20.4	2.1	20.4	2.1	0.0		
		BLUE RANGE BEDS May be Polda Fm (?)	40.4	-17.9	SLEAFORD COMPLEX IN (40.4m) SA GEODATA		NEW PICK	Colour is wrong for Polda formation, but Blue Range Beds pick seems fairly high (there is Basement outcrop 15km to the SE)	
TIN 4	5931-225	BRIDGEWATER FORMATION	0.0	59.9	0.0	59.9	0.0		Y? Silty sand described, but may be siltstone (?)
		POELPENA FORMATION	9.8	50.1	9.8	50.1	0.1		
		BLUE RANGE BEDS May be Polda Fm (?)	27.4	32.5	SLEAFORD COMPLEX (27.4m) IN SA GEODATA		NEW PICK	Describes clay and mica, but no other igneous/ metamorphic minerals; Blue Range Beds pick seems fairly high (basement outcrop 15km to the SW PICKED FROM MAP	
WF 8	5830-1212	BRIDGEWATER FORMATION	0.0	17.0	0.0	17.0	0.0		Y
		POELPENA FORMATION	26.0	-9.0	25.5	-8.5	0.5	Sample lines up with GR log	
		POLDA FORMATION	43.5	-26.5	44.5	-27.5	-1.0	Sample lines up with GR log	
		BLUE RANGE BEDS	116.4	-99.4	NEW PICK		NEW PICK	GR looks low for a feldspathic sandstone (?)	

WELL I.D.			UPDATED PICKS		PICKS IN SAGEODATA / SARIG		Δ	COMMENTS	CONFINEMENT
OBS NO.	MAPNUM	FM TOP NAME	FM TOP DEPTH (mMD)	FM TOP REL. TO AHD (+/- m)	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD (+/-m)	PICK DIFF. (m)	COMMENTS	TOP POELPENA FM SHALE PRESENT?
Polda 5	5931-369	BRIDGEWATER FORMATION	0.0	44.0	0.0	44.0	0.0		Y
		POELPENA FORMATION	28.2	15.8	26.0	18.0	2.2		
		POLDA FORMATION	56.9	-12.9	84.4	-40.4		North of mapped Polda Basin edge, but desc. matches Polda sediments elsewhere – DEM currently updating Polda Basin Maps	

WELL I.D.			UPDATED PICKS		PICKS IN SAGEODATA / SARIG		Δ	COMMENTS	CONFINEMENT
OBS NO.	MAPNUM	FM TOP NAME	FM TOP DEPTH (mMD)	FM TOP REL. TO AHD (+/- m)	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD (+/-m)	PICK DIFF. (m)	COMMENTS	TOP POELPENA FM SHALE PRESENT?
WF4a	5930-1209	BRIDGEWATER FORMATION	0.0	28.0	0.0	28.0	13.5		Y
		POELPENA FORMATION	14.5	13.5	14.0	14.0	0.5		
		POLDA FORMATION	48.0	-20.0	50.0	-22.0	-2.0		
WF2	5930-1207	BRIDGEWATER FORMATION	0.0	38.0	0.0	38.0	0.0		Y
		POELPENA FORMATION	26.0	12.0	37.0	1.0	-11.0	Pick from GR	
		POLDA FORMATION	48.5	-10.5	49.0	-11.0	-0.5		
WF3	5930-1208	BRIDGEWATER FORMATION	0.0	65.0	0.0	65.0	0.0		Y
		POELPENA FORMATION	27.0	38.0	27.0	38.0	0.0		
		POLDA FORMATION	42.0	23.0	51.0	14.0	-9.0	Confirmed on samples and logs	
TAA 3	5930-13	BRIDGEWATER FORMATION	0.0	45.8	0.0	45.8	0.0		Y But would be
		POELPENA FORMATION	12.8	33.0	12.8	33.0	0.0		

WELL I.D.			UPDATED PICKS		PICKS IN SAGEODATA / SARIG		Δ	COMMENTS	CONFINEMENT
OBS NO.	MAPNUM	FM TOP NAME	FM TOP DEPTH (mMD)	FM TOP REL. TO AHD (+/- m)	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD (+/-m)	PICK DIFF. (m)	COMMENTS	TOP POELPENA FM SHALE PRESENT?
		POLDA FORMATION	29.6	16.2	SLEAFORD COMPLEX (29.6m) IN SA GEODATA		NEW PICK	Describes clay and mica, but no other igneous/ metamorphic minerals WELL IS WITHIN POLDA BASIN & POLDA FM IS GENERALLY GREY	thin as only minor silt described
HUD 82	5930-246	BRIDGEWATER FORMATION	0.0	63.7	0.0	63.7	0.0		Y? Silty sand described, but may be siltstone (?)
		POELPENA FORMATION	11.3	52.4	11.3	52.4	0.0		
		POLDA FORMATION	25.9	37.8	25.9	37.8	NEW PICK	Well is within Polda Basin, descriptions match Polda elsewhere & depth is correct compared to offsets	

WELL I.D.			UPDATED PICKS		PICKS IN SAGEODATA / SARIG		Δ	COMMENTS	CONFINEMENT
OBS NO.	MAPNUM	FM TOP NAME	FM TOP DEPTH (mMD)	FM TOP REL. TO AHD (+/- m)	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD (+/-m)	PICK DIFF. (m)	COMMENTS	TOP POELPENA FM SHALE PRESENT?
HUD 40	5930-247	BRIDGEWATER FORMATION	0.0	62.0	0.0	62.0	0.0		Y
		POELPENA FORMATION	28.0	34.0	5.8	56.2	22.2	Formation top depth makes sense with top Poelpena depth in the area	
		POLDA FORMATION	43.6	18.4	35.1 SLEAFORD COMPLEX (47.5m) in SA GEODATA	27.0	8.6	Well is within Polda Basin, descriptions match Polda elsewhere & depth is correct compared to offsets	

WELL I.D.			UPDATED PICKS		PICKS IN SAGEODATA / SARIG		Δ	COMMENTS	CONFINEMENT
OBS NO.	MAPNUM	FM TOP NAME	FM TOP DEPTH (mMD)	FM TOP REL. TO AHD (+/- m)	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD (+/-m)	PICK DIFF. (m)	COMMENTS	TOP POELPENA FM SHALE PRESENT?
HUD 41	5930-248	BRIDGEWATER FORMATION	0.0	75.1	0.0	75.1	0.0		Y
		POELPENA FORMATION	42.1	33.0	42.1	33.0	0.0	Formation top depth makes sense with top Poelpena depth in the area	
		POLDA FORMATION	62.2	12.9	42.1 SLEAFORD COMPLEX (62.2m) in SA GEODATA	33.0	20.1	Well is within Polda Basin, descriptions match Polda elsewhere & depth is correct compared to offsets	
HUD 44	5930-249	BRIDGEWATER FORMATION	0.0	58.4	0.0	58.4	0.0		Y? May be present as a thin silt?
		POELPENA FORMATION	21.9	36.5	9.8	48.6	12.2	Upper Poelpena Fm descriptions need more detail to refine pick	
		POLDA FORMATION	38.1	20.3	38.1 SLEAFORD COMPLEX (44.8m) in SAGEODATA	20.3	0.0	No Sleaford	
HUD 45	5930-250	BRIDGEWATER FORMATION	0.0	57.5	0.0	57.5	0.0		N?
		POELPENA FORMATION	20.1	37.4	10.7	46.8	9.4		
		POLDA FORMATION	46.9	10.6	SLEAFORD COMPLEX (46.9m) in SA GEODATA)		NEW PICK		

WELL I.D.			UPDATED PICKS		PICKS IN SAGEODATA / SARIG		Δ	COMMENTS	CONFINEMENT
OBS NO.	MAPNUM	FM TOP NAME	FM TOP DEPTH (mMD)	FM TOP REL. TO AHD (+/- m)	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD (+/-m)	PICK DIFF. (m)	COMMENTS	TOP POELPENA FM SHALE PRESENT?
TAA 16	5930-37	BRIDGEWATER FORMATION	0.0	41.3	0.0	41.3	0.0		

WELL I.D.			UPDATED PICKS		PICKS IN SAGEODATA / SARIG		Δ	COMMENTS	CONFINEMENT
OBS NO.	MAPNUM	FM TOP NAME	FM TOP DEPTH (mMD)	FM TOP REL. TO AHD (+/- m)	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD (+/-m)	PICK DIFF. (m)	COMMENTS	TOP POELPENA FM SHALE PRESENT?
		POELPENA FORMATION	24.4	16.9	13.4	27.9	11.0	Upper Poelpena descriptions need more detail to refine pick	N ?
		POLDA FORMATION	33.2	8.1	SLEAFORD COMPLEX (33.2m) IN SA GEODATA		NEW PICK	Describes clay and mica, but no other igneous/ metamorphic minerals WELL IS WITHIN POLDA BASIN & POLDA FM IS GENERALLY GREY	
–	5930-215	BRIDGEWATER FORMATION	0.0	65.0	0.0	65.0	0.0		Y
		POELPENA FORMATION	11.3	53.7	11.3	53.7	0.0	Upper Poelpena descriptions need more detail to refine pick	
		POLDA FORMATION	36.0	29.0	SLEAFORD COMPLEX (36.0m) in SA GEODATA		NEW PICK	Describes clay and mica, but no other igneous/ metamorphic minerals WELL IS WITHIN POLDA BASIN & POLDA FM IS GENERALLY GREY	
HUD 62	5930-222	BRIDGEWATER FORMATION	0.0	61.3	0.0	61.3	0.0		Y
		POELPENA FORMATION	10.7	50.6	10.7	50.6	0.0		
		POLDA FORMATION	29.3	32.0	SLEAFORD COMPLEX (29.3m) in SA GEODATA		NEW PICK	Describes clay and mica, but no other igneous/ metamorphic minerals WELL IS WITHIN POLDA BASIN & POLDA FM IS GENERALLY GREY	

WELL I.D.			UPDATED PICKS		PICKS IN SAGEODATA / SARIG		Δ	COMMENTS	CONFINEMENT
OBS NO.	MAPNUM	FM TOP NAME	FM TOP DEPTH (mMD)	FM TOP REL. TO AHD (+/- m)	SAGEODATA TOP DEPTH (m)	SAGEODATA TOP AHD (+/-m)	PICK DIFF. (m)	COMMENTS	TOP POELPENA FM SHALE PRESENT?
HUD 82	5931-220	BRIDGEWATER FORMATION	0.0	63.7	0.0	63.7	0.0		Y? May be present but quite thin?
		POELPENA FORMATION	11.3	52.4	11.3	52.4	0.0	Upper Poelpena descriptions need more detail to refine pick	
		POLDA FORMATION	25.9	37.8	25.9 SLEAFORD COMPLEX (58.5m) in SA GEODATA	37.8	0.0	Describes clay and mica, but no other igneous/ metamorphic minerals WELL IS WITHIN POLDA BASIN & POLDA FM IS GENERALLY GREY	
TIN 57	5930-62	BRIDGEWATER FORMATION	0.0	64.1	0.0	64.1	0.0	Descriptions very coarse - some questions over accuracy	? May be present as a thin silt?
		POELPENA FORMATION	15.2	48.9	15.2	48.9	0.0	Poor quality of descriptions	
		POLDA FORMATION	29.6	34.5	SLEAFORD COMPLEX (29.6m) in SA GEODATA		NEW PICK	WELL IS WITHIN POLDA BASIN & POLDA FM IS GENERALLY GREY	
TIN 59	5930-61	BRIDGEWATER FORMATION	0.0	57.6	0.0	57.6	0.0	Descriptions very coarse - don't believe 4-10.7m is a clay	Y? but depends on pick depth...

H. Final well plots for monitoring wells

Final well plots presented as concatenated PDF as a separate file.

11. Units of measurement

11.1. Units of measurement commonly used (SI and non-SI Australian legal)

Name of unit	Symbol	Definition in terms of other metric units	Quantity
day	day	24 h	time interval
gigalitre	GL	10^6 m^3	volume
gram	g	10^{-3} kg	mass
hectare	ha	10^4 m^2	area
hour	h	60 min	time interval
kilogram	kg	base unit	mass
kilolitre	kL	1 m^3	volume
kilometre	km	10^3 m	length
litre	L	10^{-3} m^3	volume
megalitre	ML	10^3 m^3	volume
metre	m	base unit	length
microgram	µg	10^{-6} g	mass
microlitre	µL	10^{-9} m^3	volume
milligram	mg	10^{-3} g	mass
millilitre	mL	10^{-6} m^3	volume
millimetre	mm	10^{-3} m	length
minute	min	60 s	time interval
second	s	base unit	time interval
tonne	t	1000 kg	mass
year	y	365 or 366 days	time interval

11.2. Shortened forms

API American Petroleum Institute API

AOI Area of Interest

DEM Department for Energy and Mining

DEW Department for Environment and Water

GR Gamma Ray

HC Hydraulic Conductivity.

HST High stands

LST Low stands

NMR Nuclear Magnetic Resonance

pH	Acidity
PWA	Prescribed Wells Area
SDR	Schlumberger-Doll Research Equation
SOE	Squared Mean-of-Echoes Equation
TC	Timur-Coates
TD	Total depth

Government
of South Australia

Department for
Environment and Water