Technical Monitoring Guideline: Groundwater and Surface Water

Belisama Gas Project

9 April 2026

J-H-AU0283-007-R-Rev1

HYDRO GEOCHEM GROUP

GREENROAD GROUP

HANCOCK ENERGY

Technical Monitoring Guideline: Groundwater and Surface Water

Belisama Gas Project

HGG Document Number: J-H-AU0283-007-R-Rev1

Hancock Energy Document Number: BGP-1000-HY-GUI-200001

Document Date: 9 April 2026

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REVISION	DATE	AUTHOR	RECORD OF REVIEW
RevA	23 March 2026	MH / JL	WG
Rev0	8 April 2026	MH / JL	WG
Rev1	9 April 2026	MH	WG

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1 INTRODUCTION

1.1 Background

Hydro Geochem Group Pty Ltd (HGG) has developed this technical monitoring guideline (TMG) in association with Hancock Energy (PBN) Pty Ltd (Hancock Energy) for the purpose of providing a structured framework for ongoing groundwater and surface water monitoring associated with the proposed Belisama Gas Project (BGP) being developed by Hancock Energy in the Mid-West region of Western Australia (the "Project"). The BGP involves the construction and operation of a Central Processing Facility (CPF) and associated underground pipeline infrastructure to collect and process gas from surrounding fields within the Northern Perth Basin. The BGP is a conventional gas development and does not involve hydraulic fracturing.

This guideline is a stand-alone document however supports the Inland Waters Assessment (IWA) (HGG, 2025).

1.2 Monitoring Plan Objectives

The objective of the TMG is to develop a set of monitoring guidelines in support to the previously completed Inland Waters Assessment (HGG, 2025). This includes specifying monitoring guidelines that will facilitate the establishment of baseline conditions, the early identification of impacts to groundwater (should they occur) and the protection of beneficial uses of water.

1.3 Overview of Site Operations

The proposed development will collect gas from surrounding upstream gas collection hubs (external to this report) and transfer it to the CPF for processing. Processed gas is planned to be routed via an export pipeline to the Dampier Bunbury Natural Gas Pipeline (DBNGP) for sale. Liquid hydrocarbons (condensate) generated as a by-product of the gas treatment process will be stored on site at the CPF prior to being transported by road for sale. The foundation project will be capable of producing up to 210 TJ/d sales gas (HGG, 2025).

The CPF will be located at 1906 Yandanooka West Rd, Milo (Lot 441 on Plan 2981) owned in freehold by Hancock Energy. Surrounding land is used for broadacre agriculture with a mixture of cropping and grazing. Rural residential homesteads are sparsely located in the surrounding area with the closest being approximately 3.5 km from the CPF and owned by Hancock Energy.

The key components of the BGP include (HGG, 2025):

- An infield gathering system comprising underground flowlines.
- A CPF, including on-site infrastructure to support the operations phase including power generation, administration and control rooms, warehousing, workshops, switch room infrastructure, sedimentation pond, evaporation ponds and accommodation buildings.
- An underground gas export pipeline connecting the CPF to the DBNGP.
- Condensate stabilisation, storage, and offloading system to support road transport of liquid product.

- This is a conventional gas project and therefore does not require hydraulic fracturing (fracking).

The underground gas export pipeline connecting the CPF to the DBNGP will be constructed, owned and operated by a third-party operator and is not considered further in this Guideline.

2 REGIONAL SETTING

2.1 Location

The BGP area is located approximately 23 km southwest of Mingenew, and 34 km southeast of Dongara, Western Australia. Pipeline infrastructure will extend approximately 30 km within the BGP area, with processed gas exported 12 km west of the CPF to the DBNGP. HGG has focused this scope on the CPF (including 2,000 m buffer surrounding the CPF) and the disturbance footprint location shown in Figure 1.

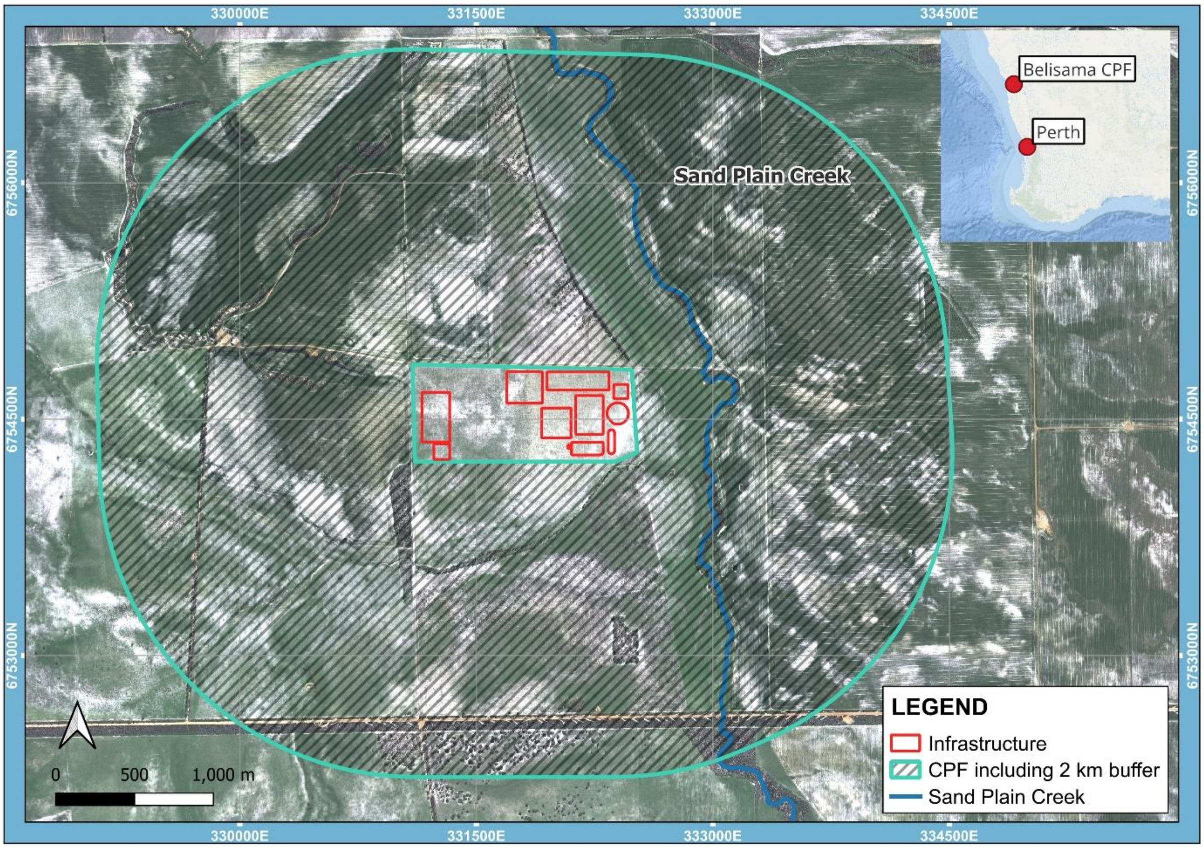

Figure 1: Site location and broader assessment area.

2.2 Climate

The Dongara and Mingenew area experiences a Mediterranean climate (Köppen Classification as subtropical) with mild, wet winters and hot dry summers. The mean monthly minimum temperature recorded at the Mingenew Bureau of Meteorology (BOM) station (station ID: 008088) ranges from 6.9°C in August to 19.2°C in February and the mean monthly maximum temperatures range from 19.1°C in July to 36.4°C in February. Temperature recording at this weather station occurred from 1965 to 1975. Currently, this station only records rainfall data.

Annual average rainfall reported for the Mingenew BOM station is 392 mm with the majority of rainfall occurring during the winter months (BOM, 2025). Rainfall exceeds potential evaporation across the Northern Perth Basin during May to September (DoW, 2017). Figure 2 presents the monthly rainfall statistics for Mingenew weather station.

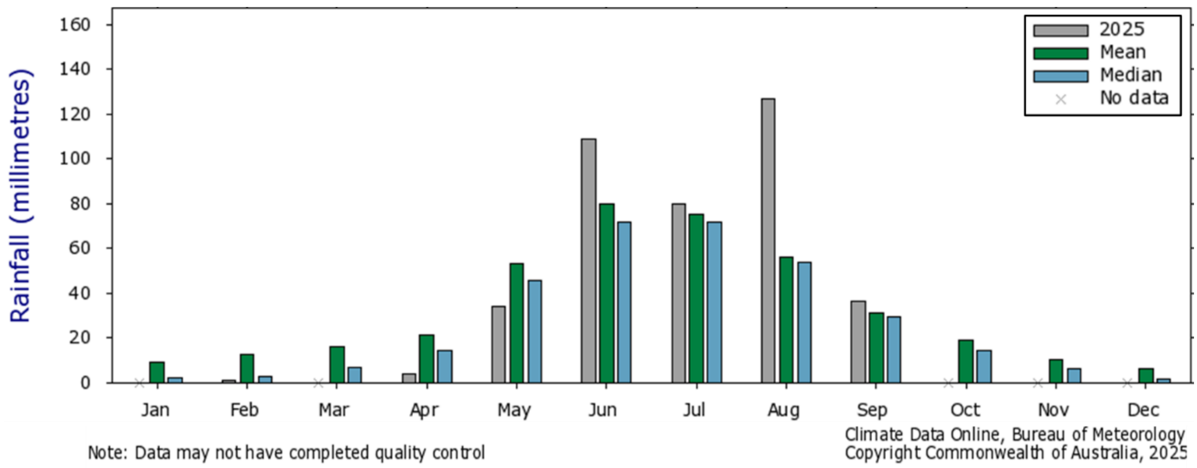

Figure 2: Mingenew weather station rainfall distribution (adapted from BOM, 2025).

2.3 Geology

2.3.1 Regional Geology

The regional geology of the BGP area as described in (DoW, 2017) is summarised below.

The CPF and associated infrastructure are situated within the Northern Perth Basin. This basin consists of a deep sequence of sedimentary units dipping in an easterly direction, bounded to the east by the north-south striking Darling Fault (Figure 3). The sequence shallows to the north, with depths to basement units approximately 3,000 m to 5,500 m below ground level.

The dominant near surface sedimentary sequence in the study area is the Jurassic Yarragadee Formation. The Formation generally dips eastwards and the regional strike is approximately north-south. The Yarragadee Formation consists of a multilayered sequence of sandstone beds with interbedded siltstone, claystone and shale. There are four units within the Yarragadee Formation, including Units A and C (consisting predominantly of unconsolidated sands) and Units B and D (consisting predominantly of siltstone, claystone and shale with interbedded sandstone). Unit D of the Yarragadee Formation outcrops in part at the surface, with thicknesses of the Unit approximately 400 m to 500 m in the study area. The Yarragadee Formation is underlain by the clay rich Cadda Formation, which has a maximum onshore thickness of 290 m.

The Kingia sandstone of Early Permian age (located > 4,000 m below ground surface) presents the gas reservoir that is being targeted for development, with the Irwin River Coal Measures presenting the capping/sealing unit of the gas reservoir system. Figure 3 shows the regional pre-Cenozoic geology of the Northern Perth Basin, with Figure 4 indicating the site surface geology, including cross-cutting faults through the BGP area.

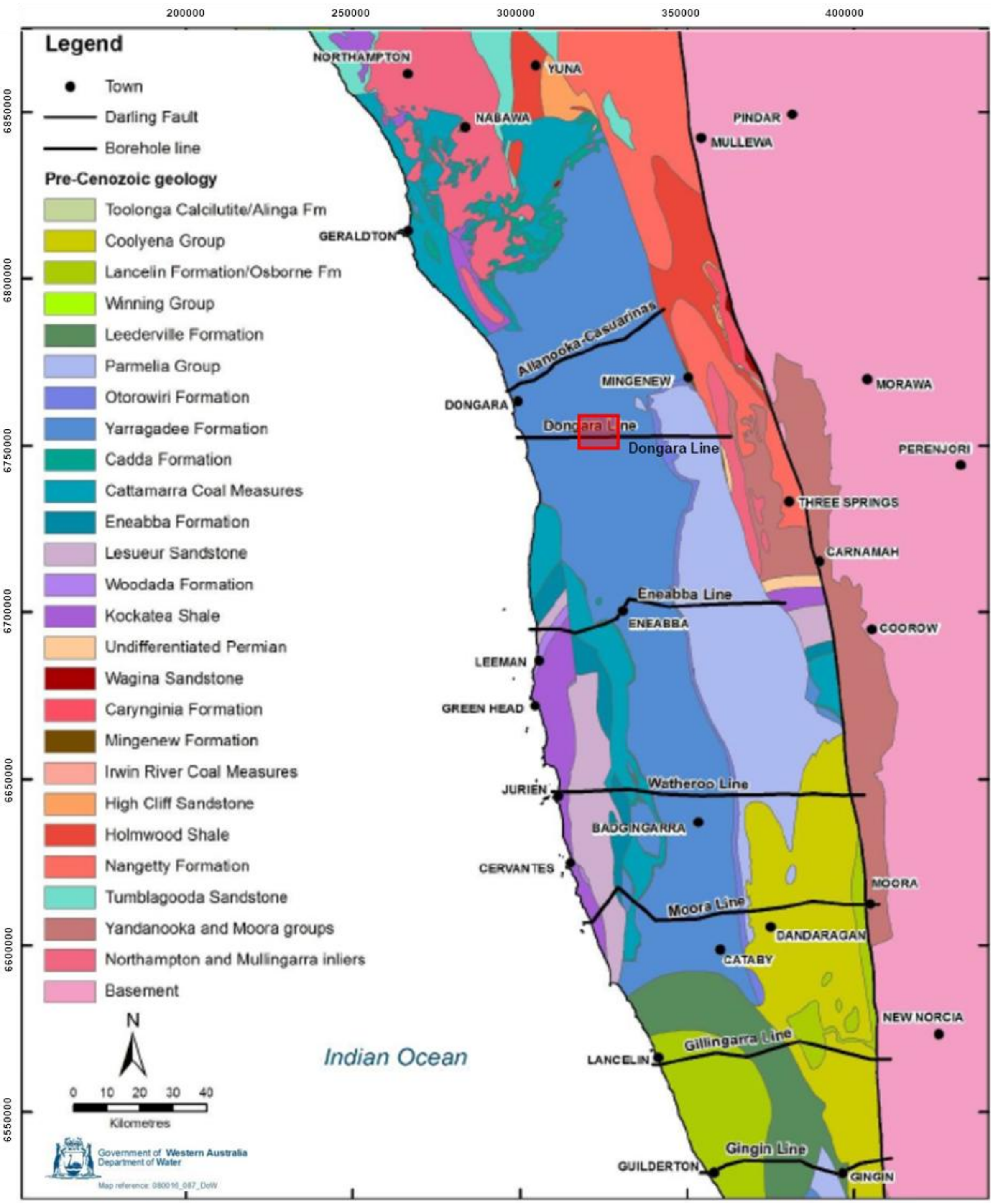

Figure 3: Regional pre-Cenozoic geology in outcrop or subcrop (DoW, 2017) (approximate site location shown as a red square).

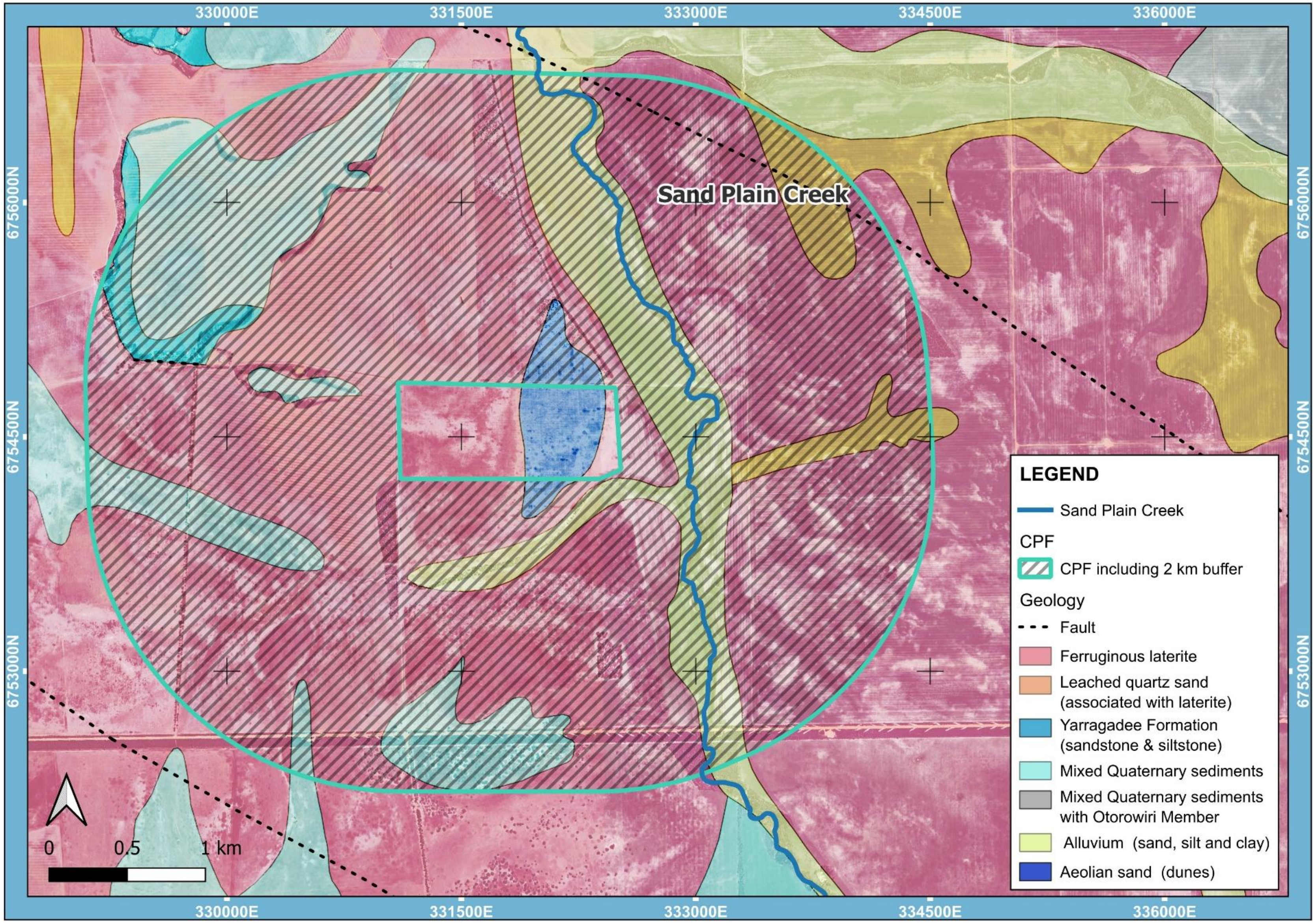

Figure 4: Surface geology for the project area (Mory and Lasky, 1995).

2.4 Regional Hydrogeology

The Groundwater Survey of Western Australia has undertaken a drilling program to investigate stratigraphy and map the hydrogeology of the northern Perth Basin (DoW, 2017). As part of the drilling program, six deep east-west lines were drilled in the northern Perth Basin approximately 50 km apart up to depths of 800 m.

This investigation confirmed the Yarragadee aquifer as a major groundwater resource in the area. The regional groundwater table in the area was found to vary and could be as deep as 181 m below ground level, the regional groundwater level trends westward (towards the Indian ocean), with potential localised variations in groundwater flow. Salinity in the aquifer increases with depth and towards coastal zones.

Figure 5 indicates the interpreted depths to the regional water table in 2015 (DoW, 2017). Elevated groundwater levels are seen generally near aquifer recharge points and surface water features such as rivers and tributaries, with structural geological features such as faults acting as aquifer boundaries.

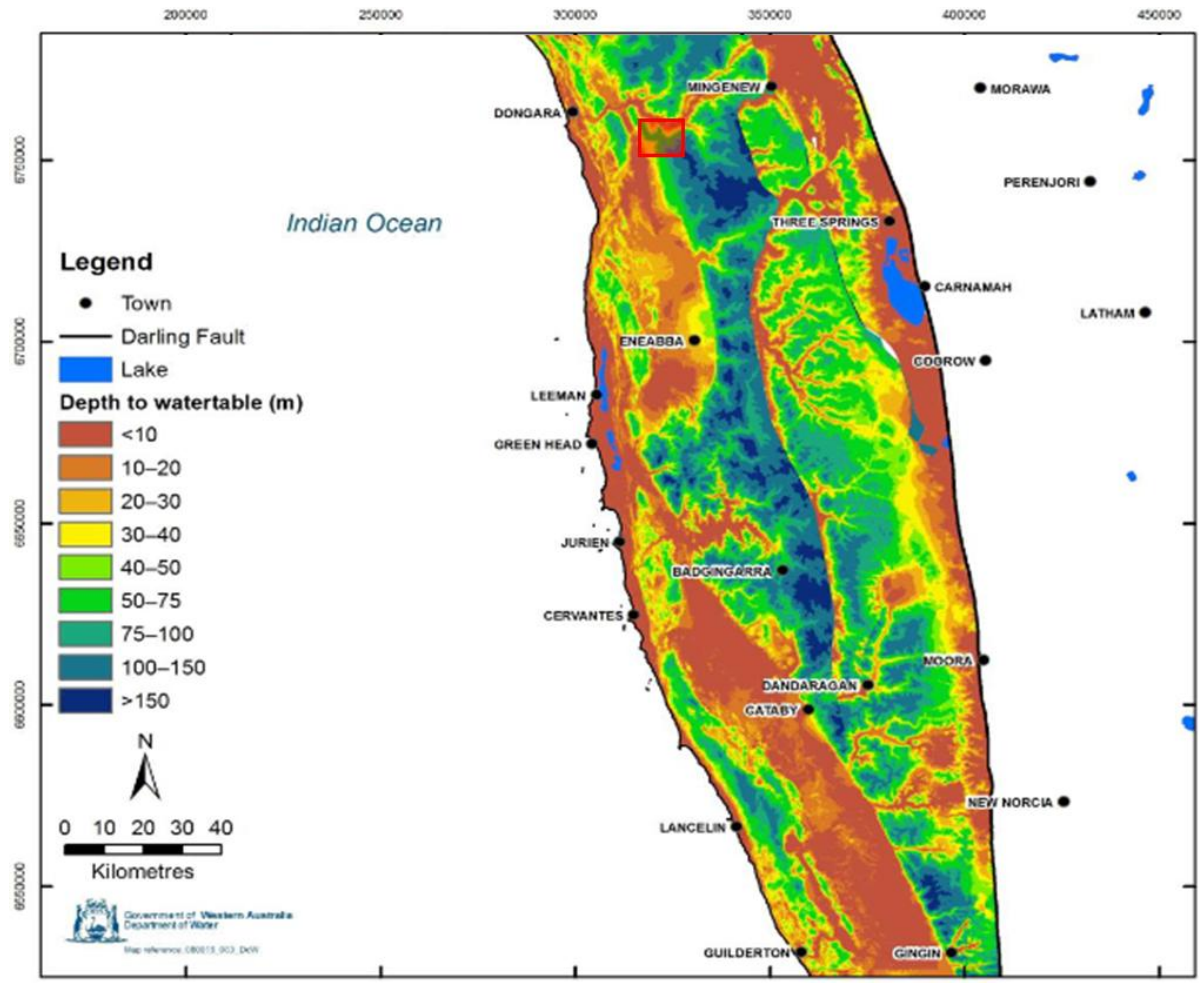

Figure 5: Representative depth to water table (DoW, 2017) (approximate site location shown as a red square).

2.5 Surface Water Drainages

The BGP area is located within the Irwin River catchment, with the catchment covering a surface area of 6,071 km^2. Mean annual flow at Mountain Bridge gauging station, with a catchment area of 5,264 km^2 was 16 gigalitres per annum (GL/a) between 2000 and 2015. Flow is generally highest during the winter months (DoW, 2017). The main surface water drainages in the project area are the Irwin River and the Sand Plain Creek (shown flowing south to north in Figure 1).

The ephemeral Sand Plain Creek acts as a minor tributary to the Irwin River, with the confluence of the surface water drainages located approximately 7 km from the northwestern boundary of the CPF. From the confluence, the Irwin River drains in a general westerly direction before entering into the Indian Ocean at Dongara. The Sand Plain Creek is seen as a localised recharge location within the BGP area.

3 MONITORING PROGRAMME

3.1 Monitoring Locations

3.1.1 Existing Locations

Existing surface water (SW) and groundwater (GW) locations within the BGP locality are provided in Table 1 and shown graphically in Figure 6. Note that BGP_MB05 is an existing stock watering bore on Hancock Energy's property that has been monitored opportunistically.

Table 1: Existing monitoring locations (MGA Z50).

LOCATION ID	TYPE	ESTABLISHED	EASTING	NORTHING	ELEVATION	COMMENT
BGP_SW01	SW	2025	332955	6754838	120	Initial surface water sample location within the Sand Plain Creek, downstream of the CPF. Sample taken following prolonged rainfall that led to surface water flow.
BGP_MB05	GW	Unknown	331634	6754880	133	Lefroy's bore, an existing stock water bore.

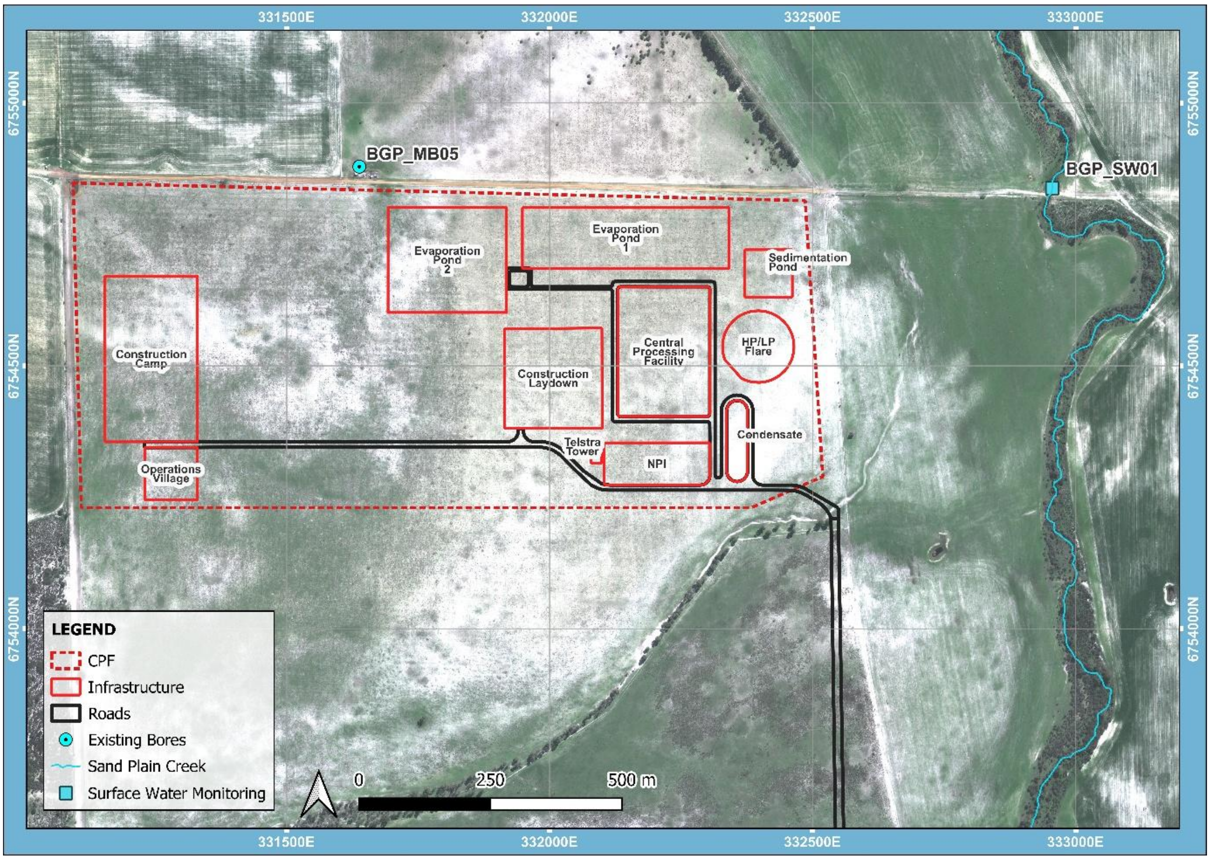

Figure 6: Existing monitoring network.

3.1.2 New Monitoring / Proposed Locations.

New monitoring locations are being proposed based on a source-pathway-receptor framework. Groundwater levels measured as part of the IWA (HGG, 2025) indicated localised groundwater flow in an east northeasterly direction from the site towards Sand Plain Creek. Based on this flow direction, three downgradient monitoring bores (located between the proposed CPF and Sand Plan Creek) are being proposed, along with one upgradient groundwater monitoring location. The location of proposed groundwater monitoring bores, along with new surface water sampling locations, are provided in Table 2 and illustrated in Figure 7.

Table 2: Additional monitoring locations (MGA Z50).

PLANNED ID	TYPE	EASTING	NORTHING	COMMENT / RATIONALE
BGP_SW02	SW	333062	6752661	Upgradient Sand Plain Creek
BGP_SW03*		332737	6754147	Downgradient CPF
BGP_SW04*		333179	6754076	Regional background pond
BGP_MB01	GW	332400	6755063	Downgradient CPF
BGP_MB02		332513	6754818	Downgradient CPF
BGP_MB03		332536	6754549	Downgradient CPF
BGP_MB04		331116	6754006	Upgradient CPF

**If drilling and installation of BHP_MB01 to MB04 indicate the presence of a hydrostratigraphic unit connected to these surface water features.*
BGP_SW03 is a naturally occurring pond, cross gradient (topography) of the proposed CPF location.

For surface water, the inclusion of BGP_SW02 will provide a sampling location within Sand Plain Creek that is located upgradient of the CPF. As per the footnote to Table 2, sampling locations BHP_SW03 and BHP_SW04 are only to be included if drilling and installation of BHP_MB01 to MB04 indicate the presence of a hydrostratigraphic unit potentially connected to these surface water features. Existing water level data from Lefroy's bore (BGP_MB05) shows a relatively deep water level at ~42 m below ground level (HGG, 2025), however if the drilling of the new monitoring bores identifies a shallower unit, a hydraulic connection to the westerly pond (at sampling location BGP_SW03) may exist and this would trigger inclusion of BGP_SW03 and BGP_SW04 for regional background sampling.

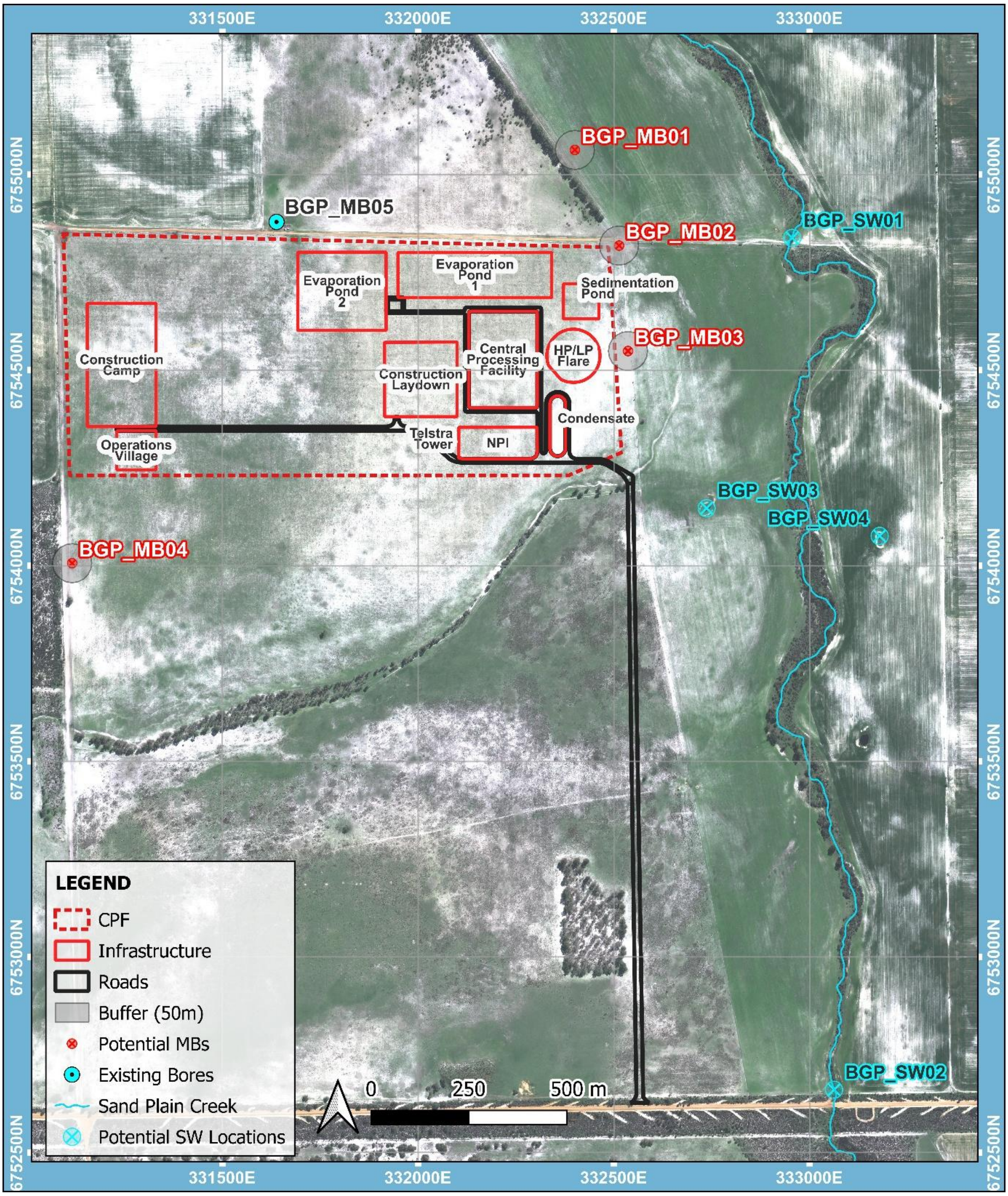

Figure 7: Proposed monitoring network.

HGG acknowledges that these locations are subject to site approvals and access, as well as highlighting that they are nominal locations, based on assessment of available data of the area. To this effect, each proposed monitoring bore has included a 50m buffer around the bore location.

3.2 Measurements and Sampling Methodology

Monitoring should be undertaken in general accordance with “Groundwater sampling and analysis, a field guide, 2nd Edition” published by Geoscience Australia (Sundaram et al., 2024).

3.2.1 Groundwater Level Measurements

- The groundwater level at a sampling location should be measured (gauged) before any sampling equipment is lowered into the monitoring bore water column. Once a safe work area has been established at a monitoring bore, the following tasks will be undertaken:
    - Opening the monitoring bore headworks and removing the monitoring bore cap.
    - Collars should always be measured during each monitoring round to ensure consistency.
    - Decontaminate the dip meter prior to use.
    - Lowering the groundwater level dip meter down the bore, measuring the depth to water from the top of the casing. If not previously identified on the casing, the measuring point will be marked (to facilitate consistency in the measurement point between gauging events).
    - Depth to water will then be captured on the relevant field form.
- Continue to lower the groundwater level dip meter, measuring the total depth of the monitoring bore from the top of the casing.
    - Capture the bore depth on the relevant field form.
    - Remove and decontaminate the dip meter prior to use at next sampling location.
- If there are any blockages within the bore, or the bore is dry, note this in the relevant field form (Appendix C).
- If the dip meter has the ability to measure electrical conductivity (EC) and temperature, these will be recorded within the screened section of a bore at a constant depth (e.g. middle of the screened section), as a minimum within the screened section of the bore.

3.2.2 Groundwater Sampling Measurement

This monitoring plan recommends that low-flow purging be applied for bore sampling, recognised as being the current best practice groundwater sampling methodology. The methodology for sampling of monitoring bores includes the following:

- All instruments used to take field water quality measurements shall be calibrated at the beginning of each monitoring round and the start of each field day of sampling. Groundwater samples should be collected using a low-flow pump (e.g. bladder pump).
- Exceptions can be made for sample collection, in the instance that the bladder pump specifications are insufficient (e.g. insufficient water column), in this case a single-use HydraSleeve may be used.
- Sample pumps should be placed at depths consistent with previous monitoring events, within the screened sections of the bores being sampled, as a minimum.
    - Field parameters should be measured in a throughflow cell as soon as the pump is started for bore purging purposes.
    - Field measurements will include pH, EC, oxidation reduction potential (ORP), dissolved oxygen (DO), and temperature as well as visual observation of turbidity and suspended solids.

    - For low flow purging and sampling, the flow rate should be ≤0.5 L/minute. If at a purging rate of 0.5 L/minute the groundwater level continues to lower during purging, the rate should be adjusted with the goal of achieving stable drawdown. This confirms that water is being drawn in from the aquifer and not the water column within the monitoring bore.
- Groundwater samples shall only be collected once purging is complete and field parameter measurements are consistent (within 10%) over three consecutive measurements, taken 5 - 10 minutes apart.
    - Parameters should not be seen as stable after the first three to four measurements following the commencement of purging, as this could reflect water chemistry within the monitoring bore water column. Stabilisation should be considered from five measurements onwards and groundwater level drawdown also considered (with low-flow sampling seeking to have stabilisation of drawdown as noted earlier). Monitoring bores will be purged until field parameters (measured in a through-flow cell) have stabilised, after which samples will be collected for laboratory analysis.
- Field filtering should take place immediately after the sample has been taken and before chemical preservation. Direct in-line filtering is recommended, a process that entails attaching the filter directly to the pump discharge line. This method is preferable as it minimises exposure to atmospheric conditions during filtering.
    - The appointed laboratory should always be consulted with respect to sample collections.
- Appropriately labelled samples should be securely packed into a chilled cooler directly after sampling, with the cooler temperature maintained at approximately 4 degrees Celsius as far as possible.
    - Samples must be sent to the contractor laboratory under COC documentation, and within the holding times that apply to the specific laboratory analysis being undertaken.
- All field data must be documented and recorded in the field at the time of measurement.

3.2.3 Surface Water Monitoring

Surface water monitoring locations have been categorised according to their hydrological setting and monitoring objective in alignment with this document. The applicable categories include:

- Ephemeral Watercourse – Upstream Sand Plain Creek (BGP_SW03).
- Ephemeral Watercourse – Downstream Sand Plain Creek (BGP_SW01).
- Shallow surface water features downgradient of the proposed CPF as well as a background comparison (BGP_SW02 and BGP_SW03).
- Regional Receiving Environment (Irwin River).
    - The Irwin River should only be sampled if both upstream and downstream samples of the Sand Plain Creek are collected. If sampling of the Irwin River is triggered, samples should be taken upstream and immediately downstream of the confluence of the river and Sand Plain Creek.

3.2.4 Surface Water Sampling Measurement

- This monitoring plan recommends that surface water samples be collected using grab sampling techniques under prolonged (greater than 1 week) flowing conditions (i.e. only if there is visible flowing water).
- The methodology for surface water sampling includes the following:
- All field instruments used to measure water quality parameters shall be calibrated at the beginning of each monitoring round and at the start of each field day.
  - Field probes should be calibrated using the manufacturer instructions, with measurements of reference solutions taking on a daily basis (with both calibration and reference solution measurements documented).
- Sampling locations shall be selected to ensure representative conditions of the waterway. Stagnant backwaters, localised ponds from rainfall, surface films, and areas of excessive macrophytes or algal accumulation should be avoided.
- Surface water samples should be collected either by directly filling the sample bottle or vial from the feature being sampled or by decanting water from a clean collection device into a sample bottle (EPA, 2023)
  - The use of a collection device provides better (and safer) access to sample areas within a surface water feature and provides greater control when filling sample bottles or vials that contain sample preservative.
- Using the grab pole sampler, collect a water quality sample approximately 10 cm below the surface of the surface water feature (DoW, 2009) Water samples should not be taken directly at the surface as residue or films floating on the surface may affect analytical results of laboratory testing.
  - Water quality in-situ measurements can be taken directly from the surface water feature (if the sample location is safely accessible). Water quality measurements to be taken in the field include pH, temperature, EC, ORP and DO.
  - Record measurements for water quality parameter values and any visual (such as extent of turbidity) and field observations, such as the degree of flow and biological activity within the surface water feature.

3.2.5 Sample Collection, Preservation and Submission

Sample bottle preparation can be completed prior to the site visit. Sample bottles must be labelled with the sample location name, site name, thereafter date and time of sample collection. Sampling collection must include appropriate quality assurance/quality control (QA/QC) procedures including decontamination of equipment between sampling locations and recovery of quality control samples (such as blind duplicate and rinsate samples). Further guidance on QA/QC procedures are available in *Groundwater Sampling and Analysis – A Field Guide* (Sundaram et al., 2024).

At the time of sampling, field water chemistry parameters must be measured and recorded including the time. These include temperature, EC, ORP, pH and DO, captured into an appropriate field form (Appendix C).

Samples must be placed in their correct sampling container (as per guidance from the laboratory) and kept cool in the correct manner prior to submission to a NATA accredited laboratory for analysis. The sample method and preservation must be discussed with the laboratory prior to sampling; it is highly encouraged that the laboratory be consulted with respect to sample preservation and collection as it may reduce the potential for errors.

3.3 Sample Parameters for Water Quality Monitoring

Table 3 outlines the proposed water sample analysis suite to be collected across all monitoring sites (i.e. both groundwater and surface water).

Table 3: Proposed sample laboratory analysis suite (both groundwater and surface water).

ANALYSIS TYPE	SPECIFICS*	
Field	• Electrical conductivity (µS/cm) • Oxidation reduction potential (mV) • Dissolved oxygen (mg/L and %)	• pH • Temperature (°C)
Physico-chemical	• Electrical conductivity (µS/cm) • pH	• Total dissolved solids (mg/L) • Total alkalinity (as $CaCO_3$) (mg/L)
Major and trace ions (mg/L)	• Calcium (Ca) • Magnesium (Mg) • Sodium (Na) • Potassium (K) • Carbonate (CO_3)	• Bicarbonate (HCO_3) • Chloride (Cl) • Sulfate (SO_4) • Silica (SiO_2)
Trace metals (total and dissolved) (mg/L)	• Aluminium (Al) • Arsenic (As) • Cadmium (Cd) • Chromium (Cr) • Iron (Fe) • Vanadium (V)	• Manganese (Mn) • Mercury (Hg) • Selenium (Se) • Zinc (Zn) • Lead (Pb) • Hexavalent Chromium (Cr^{6+})
Nutrients (mg/L)	• Total Kjeldahl nitrogen (TKN) • Nitrate (NO_3) • Nitrite (NO_2)	• Ammonia (NH_3) • Total phosphorus (TP) • Phosphate (PO_4)
Petroleum Hydrocarbons	• Benzene • Toluene • Ethylbenzene • M+p- xylene • O-xylene • Naphthalene • C6-C10 (less BTEX)	• >C10-C16 (less Naphthalene) • >C16-C34 • >C34-C40 • Methyl tert-butyl ether (MTBE) • Methane • Ethane

**Preservation notes may vary between laboratories and the sampling team are encouraged to follow guidance from the chosen laboratory(s).*

3.4 Sampling Schedule

Once the sampling network has been established (see Section 3.1), a regular sampling schedule should be implemented. HGG has listed the proposed sampling schedule in Table 4 as per correspondence with Hancock Energy.

Table 4: Sampling schedule.

SAMPLE CATEGORY	LOCATION	FREQUENCY/COMMENTS
Surface Water	BGP_SW01 BGP_SW02	As and when the Sand Plain Creek is flowing continuously for period greater than 7 days. Up to six monthly if flows allow.
	BGP_SW03 BGP_SW04	Six-monthly (if construction of bores of BHP_MB01 to MB04 indicate the presence of a hydrostratigraphic unit connected to these surface water features.
Groundwater	BGP_MB01 BGP_MB02 BGP_MB03 BGP_MB04	Six-monthly (wet and dry seasons), during the months of March and September of each calendar year. Monthly water level dipping (recorded in the first week of a new month).
	BGP_MB05	Six monthly for the first year. Following the first two sampling rounds, Hancock Energy to re-assess the utility of continued sampling of this stock water bore. Factors to consider will include an updated understanding of the hydrostratigraphy once the new monitoring bores have been constructed and a years' worth of data are available from these locations (for comparison against BHP_MB05 data). Monthly water level dipping (recorded in the first week of a new month).

3.5 Data Storage and Collation

All collected data, field measurements and laboratory results must be captured into an appropriate database and kept up to date.

4 ASSESSMENT CRITERIA

4.1 Groundwater Quality

As per the IWA, HGG proposes the following default guideline values (DGVs) be used for the future sampling assessment criteria. These criteria are:

- Australian Drinking Water Guidelines (NHMRC, 2011 - as amended in 2025).
- Livestock Drinking Water Guidelines (ANZG, 2023).
- 95% species protection levels (SPLs) for freshwater aquatic ecosystems for Australia and New Zealand (ANZG, 2018).
- Long-term irrigation water trigger values (ANZECC, 2000).
- Domestic non-potable groundwater use guidelines (DWER, 2021).
- Health screening levels for recreational water use (HSL C [Sand]) – Vapour intrusion (NEPC, 2013).

The specific values for guidance area listed in Table 5. HGG notes that these are default guidelines, and once two years of monitoring data have been collected the development of site-specific trigger values (SSTVs) can be considered, taking into account background baseline data that will be collected as part of the monitoring programme.

Table 5: Guideline concentrations (all units shown in mg/L).

PARAMETER	DRINKING WATER (NHMRC, 2011)		LIVESTOCK WATERING (ANZG, 2023)	95% DGV FRESHWATER SPLS (ANZG, 2018)	LONG-TERM IRRIGATION WATER (ANZECC, 2000)	DOMESTIC NON-POTABLE GROUNDWATER USE (DWER, 2021)	HYDROCARBON HEALTH SCREENING LEVELS C (NEPC, 2013)
	Health	Aesthetic					
Aluminium	-	0.2	5.0	0.55	5	0.2	-
Arsenic[1]	0.01	-	0.5	0.013	0.1	0.1	-
Calcium	-	-	1000	-	-	-	-
Cadmium	0.002	-	0.01	0.0002	0.01	0.02	-
Chromium (as VI)	0.05	-	1	0.001	0.1	-	-
Copper	2	1	0.5 (sheep), 1 (cattle), 5 (pigs/poultry)	0.0014	0.2	0.1	-
Chloride	-	250	-	-	-	-	-
Iron	-[4]	0.3	-	0.28	0.2	0.3	-
Lead	0.005	-	0.1	0.0034	2	0.1	-
Magnesium	-	-	500 (ruminants), 250 (cattle), 125 (poultry)	-	-	-	-
Manganese	0.1	0.05	-	1.9	0.2	5	-
Mercury	0.001	-	0.002	0.0006	0.002	0.01	-
Phosphorus	-	-	-	-	0.05	-	-
Selenium	0.004	-	0.02	0.011	0.02	0.1	-
Silica	-	80	-	-	-	-	-
Sodium	-	180	-	-	-	-	-
Zinc	-[4]	3.0	20	0.008	2	3	-
Vanadium	-	-	-	-	0.1	-	-
Ammonia (as NH3)	-[4]	0.5	-	0.72	-	0.5	-
Nitrite (as N)[2]	3	-	9 – 30	-	-	30	-
Nitrate (as N)[2]	50	-	90	1.1 - 2.9	-	500	-
pH	-	6.5–8.5	-	-	6.5 – 8.5	-	-
Sulfate	-[4]	250	1000	0.65	-	1000	-
TDS[3]	-	600	13,000	-	-	-	-

PARAMETER	DRINKING WATER (NHMRC, 2011)		LIVESTOCK WATERING (ANZG, 2023)	95% DGV FRESHWATER SPLS (ANZG, 2018)	LONG-TERM IRRIGATION WATER (ANZECC, 2000)	DOMESTIC NON-POTABLE GROUNDWATER USE (DWER, 2021)	HYDROCARBON HEALTH SCREENING LEVELS C (NEPC, 2013)
	Health	Aesthetic					
Dissolved Oxygen	-	>85%	-	-	-	-	-
Hardness as $CaCO_3$	-	200	-	-	-	-	-
Benzene	0.001	-	-	0.95	-	0.01	NL[5]
Toluene	0.025	0.8	-	0.18	-	0.025	NL
Ethylbenzene	0.3	0.003	-	0.08	-	0.003	NL
M+p- xylene	0.6	0.02	-	0.075	-	0.02	NL
0-xylene	0.6	0.02	-	0.35	-	0.02	NL
Naphthalene	-	-	-	0.016	-	-	NL
C6-C10 (less BTEX)	-	-	-	-	-	-	NL
>C10-C16 (Less Naphthalene)	-	-	-	-	-	-	NL
>C16-C34	-	-	-	-	-	-	-
>C34-C40	-	-	-	-	-	-	-
MTBE	-	-	-	-	-	0.02	-
Methane	-	-	-	-	-	-	-
Ethane	-	-	-	-	-	-	-

– = No default guideline values available.

1Arsenic guideline values are based on total arsenic concentrations.

[2]Nitrate guideline values vary depending on water hardness (expressed as $CaCO_3$)

[3]The highest livestock tolerance value reported in ANZG (2023) has been adopted.

[4]Insufficient data to set a guideline value based on health considerations.

[5]No Limit – meaning there is no concentration that would pose a risk for these parameters based on the HSL C exposure scenario (NEPC, 2013).

4.2 Surface Water Quality

The same DGVs listed in Table 5 are applicable for SW results.

5 REPORTING

5.1 Data Review and Quality Assessment

Following each sampling event, water level and chemistry data (both field measurements parameters and laboratory data) should be reviewed, with consideration of QA/QC results and anomalous results. This review will facilitate timely corrective actions if erroneous results are identified.

5.2 Technical Reporting

An annual monitoring report should be prepared summarising:

- The methodology of the sampling undertaken and any variations from the monitoring programme.
- Results of the QA/QC procedures.
- Water level data and observed trends.
- Water chemistry data, exceedances of water quality criteria, comparison of background versus downgradient data, and observed temporal trends.

Reporting will be aligned with statutory reporting requirements (such as Works Approval or Environmental Plans).

5.3 Monitoring Plan Review

The TMG should be reviewed and revised every three years or as a result of:

- Any regulatory or statutory requirements, changes and updates.
- Any significant change to water management practices.
- Construction of additional surface water storages.
- Continual exceedances of any threshold values.
- Any incident that requires reporting.

A review of the monitoring plan should be undertaken by a suitably qualified person and aligned with site updates. As this document is viewed as a dynamic document which may require future updates as the project expands or simplifies into a smaller scope from the original intent. Table 6 indicates the timeline and record of change, including justification of change for each period. Future revisions of this document are anticipated to include the developed SSTVs.

Table 6: Record of monitoring plan variation

VERSION	DATE	JUSTIFICATION	REVIEWER AND APPROVER
RevA	23 March 2026	Draft report	MH
Rev0	08 April 2026	Final report	MH & WG
Rev1	09 April 2026	Updated Final Report[1]	MH & WG
Rev2	April 2029	First Tri-Annual Review	

[1]*Updated title to "Technical Monitoring Guideline: Groundwater and Surface Water"*

6 REFERENCES

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7 LIMITATIONS

Attention is drawn to the document "Limitations", which is included in Appendix C of this report. The statements presented in this document are intended to provide advice on what the realistic expectations of this report should be, and to present recommendations on how to minimise the risks associated with this project. The document is not intended to reduce the level of responsibility accepted by Hydro Geochem Group, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in doing so.

APPENDIX A ABBREVIATIONS

ABBREVIATION	DEFINITION
BGP	Belisama Gas Project
BOM	Bureau of Meteorology
COC	Chain of Custody
CPF	Central Processing Facility
DBNGP	Dampier to Bunbury Natural Gas Pipeline
DGV	Default Guideline Value
DO	Dissolved Oxygen
DWER	Department of Water and Environmental Regulation
EC	Electrical Conductivity
GW	Groundwater
HGG	Hydro Geochem Group
IWA	Inland Waters Assessment
ORP	Oxidation Reduction Potential
SSTV	Site Specific Trigger Value
SW	Surface Water
TARP	Trigger Action Response Plan
TDS	Total Dissolved Solids
TKN	Total Kjeldahl Nitrogen
TMG	Technical Monitoring Guideline
TP	Total Phosphorus

APPENDIX B DEFINITIONS

TERM	DEFINITION
Aquifer Boundaries	A physical barrier to ground water flow identified as the contact between geologic materials defined as an aquifer and materials defined as non-aquifer (or as an aquifer but with a significantly lower hydraulic conductivity).
Annular seal	A sealing material, typically bentonite or cement grout, installed in the annular space between the bore casing and the surrounding formation to prevent vertical migration of groundwater between aquifers.
Bore casing	A pipe installed within a drilled borehole to maintain structural stability and prevent collapse of the bore walls and to isolate groundwater zones.
Bore development	The process of removing drilling fluids, fine sediments and other materials from a newly constructed bore to improve hydraulic connection between the bore and the surrounding aquifer.
Default Guideline Value (DGV)	A guideline value derived from national water quality guidelines used as an initial benchmark for assessing water quality where site-specific trigger values have not yet been established.
Central Processing Facility	A CPF receives materials from the production wells, processes them by separating them into gas and condensate and treating them for subsequent export / sale.
Conventional Gas	Conventional gas is stored in porous and permeable sedimentary rocks such as in a geological structure known as a trap. Impermeable rocks directly above the structure trap the gas. A well drilled into the structure intersects the porous reservoir and hydrocarbons flow into the well.
Ephemeral	A stream or river that flows for a short period of time, typically after periods of high rainfall.
Groundwater	Groundwater is water that exists underground in saturated zones beneath the land surface. The upper surface of the saturated zone is called the water table.
Headworks	The surface components of a bore including protective casing, caps, seals and surface protection structures designed to prevent contamination and physical damage.
Hydrogeology	Hydrogeology is the study of groundwater – it is sometimes referred to as geohydrology or groundwater hydrology. Hydrogeology deals with how water gets into the ground (recharge), how it flows in the subsurface (through aquifers) and how groundwater interacts with the surrounding soil and rock (the geology).
Low-flow sampling	A groundwater sampling method that uses low pumping rates to minimise disturbance of the water column and obtain representative groundwater samples.
Site Specific Trigger Value (SSTV)	A threshold value derived from site-specific monitoring data used to identify potential environmental impacts and trigger management responses.
Surface water	Streams, rivers, lakes and reservoirs - collectively referred to as surface water – are important natural resources for irrigation, public supply, wetlands and wildlife.

APPENDIX C EXAMPLE OF SAMPLING FIELD FORMS

Groundwater Sampling Form

HYDRO GEOCHEM GROUP — GREENROAD GROUP

GREENROAD

Job Information		
Client:	Date:	Time:
Project Locations:	Project Number:	
Site Location:	Sampler:	
Bore ID:	Weather:	

Equipment	Bore Details
	TOC (m):
	WL (mbtoc) - BEFORE:
	WL (mbtoc) - AFTER:
	EOH (mbtoc):
	Observations:

Water Quality Parameters

Beginning purge time:	Ending purge time:	Pump Intake Depth (m TOC):

Time	Volume (L)	pH	Temp (°C)	EC (mS/cm)	DO (mg/L)	Redox (mV)	Drawdown ( )	Comments

Example Comments: clear / slightly cloudy / turbid / very turbid / no odour /slight odour / odour / strong odour

Total Bore Volume	Sample time:			Comments:			
Flow rate (mL/minute)	Did field parameters stabilise?	Y	N	NA	Was the bore dry purged?	Y	N

Sampling comments

APPENDIX D LIMITATIONS

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