Caval Ridge Mine: Horse Pit Extension

Stygofauna Survey Program

Prepared for: BHP Mitsubishi Alliance

Prepared by Ecological Service Professionals Pty Ltd

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Acknowledgement of Country: In the spirit of reconciliation Ecological Service Professionals acknowledges the Barada Barna, the Traditional Custodians of country where we have worked, and we recognise their connection to land, sea and community. We pay our respect to their Elders past and present and extend that respect to all Aboriginal and Torres Strait Islander peoples through our scientific work on country.

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1 Introduction

1.1 Project Background

Caval Ridge Mine (CVM) is an existing open-cut coal mine located approximately five kilometres (km) south-west of Moranbah in the Bowen basin region of central Queensland (Figure 1.1). It is owned and operated by BHP Mitsubishi Alliance (BMA), on behalf of the Central Queensland Coal Associates Joint Venture (CQCA JV) and has been in operation since 2014. Operations at CVM are carried out under the conditions of Environmental Authority (EA) EPML00562013 and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Approval (2008/4417).

The CVM includes two pits: Horse Pit (north of Peak Downs Highway) and Heyford Pit (north of Harrow Creek), both located within Mining Lease (ML) 1775. Existing infrastructure is located primarily within ML 70403 and ML 70462. The CVM Environmental Impact Statement (EIS) (2010) and approval was based on a 30-year mine plan across defined extents for Horse Pit and Heyford Pit. Due to changes in mine sequencing, improvement in mining efficiency and further resource definition, environmental approvals for an extension to the approved mining footprint of Horse Pit were developed and granted.

1.2 Aims and Objectives

In December 2024, the extension of Horse Pit (the Project) was approved under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) by the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW), subject to conditions (2021/9031). Condition 16(l) of the approval specifies that a suitably qualified water expert is required to prepare a Water Management Plan that must "*include a Stygofauna Survey Program designed in accordance with the Subterranean Aquatic Fauna Assessment Guidelines to detect the presence, diversity and abundance of stygofauna which may be impacted by the action*". This Stygofauna Survey Program has been prepared by Ecological Service Professionals Pty Ltd to address Condition 16(l) of the approval (2021/9031).

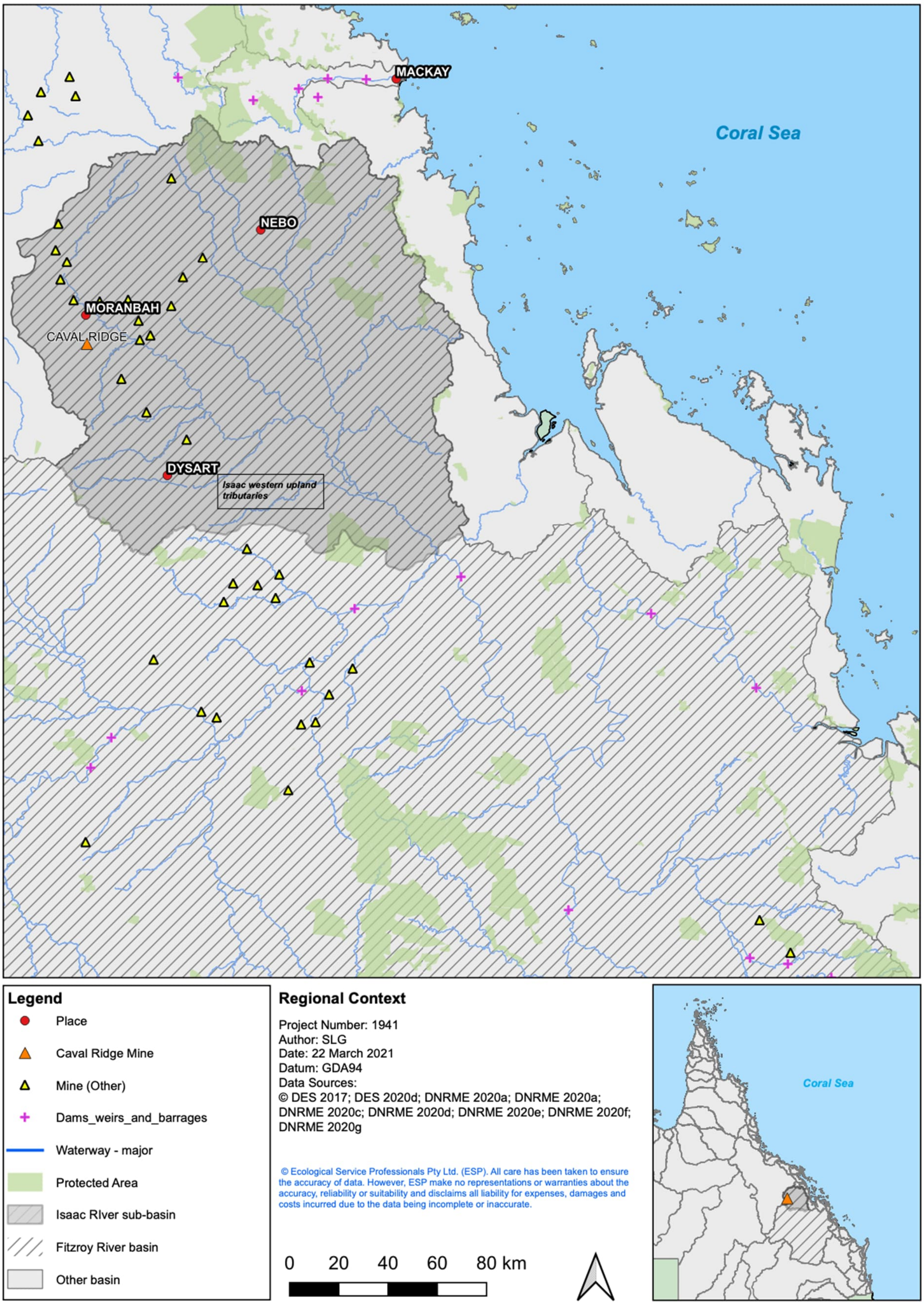

Figure 1.1 Location of Caval Ridge Mine in a regional context

2 Stygofauna Overview

Stygofauna are subterranean aquatic fauna that live part of or all of their lives in groundwater systems (DES 2018). Stygofauna are thought to play key roles in nutrient and organic matter cycling (Danielopol et al. 2003), water filtration (Asmyhr et al. 2014), and modification of water flow though changes to interstitial pore spaces and mineral formation (Murray et al. 2006). Stygofauna are key contributors to Australia's biodiversity (Humphreys 2006), and can act as indicators of groundwater ecosystem health (Tomlinson et al. 2007).

Habitats for stygofauna include underground aquifers and caves, where they occur in water filled pore spaces and voids. Depending on where they occur, stygofauna are also referred to as (Glanville et al. 2016, Tomlinson 2011):

- stygophilic fauna, which inhabit surface water and groundwater environments
- stygoxenic fauna, which inhabit mostly surface environments, and only inhabit groundwater inadvertently and are unable to establish subterranean populations, and
- stygobitic fauna, which live exclusively in groundwater throughout their entire lifecycle.

The lithologies where most stygofauna taxa are found include alluvium, basalt and coal, gravel and sands, and sandstones (Glanville et al. 2016, DES 2018). These habitats are typically restricted in their distribution (Eberhard et al. 2005, Glanville et al. 2016 and references within) and unchanged over long time periods (Humphreys 2006). These factors contribute to the high degree of endemism and narrow distribution of stygofauna (Humphreys 2006).

Stygofauna communities in Australia are dominated by crustaceans, however oligochaetes, insects, molluscs, rotifers and fish have also been recorded (4T 2012, DES 2018, frc environmental 2013, Glanville et al. 2016). The majority of stygofauna species identified in Australia are not found anywhere else in the world (Humphreys 2006). Common adaptations of stygofauna to the absence of light and restricted space are:

- small body size (<1 millimetres [mm] total body length)
- lack of pigmentation
- absence of eyes, and
- elongated appendages for tactile sensing.

In Australia, most studies on the composition of stygofauna communities and description of taxa to date have been in the Pilbara, Western Australia (where a highly diverse and regionally endemic community exists), New South Wales, and Tasmania. In Queensland, comparatively fewer studies have been undertaken, with most studies conducted in the Surat, Bowen, Fitzroy and Galilee basins in the context of Environmental Impact Statements for coal and gas projects (Hose et al. 2015, Glanville et al. 2016). Subsequently, knowledge of the biodiversity and value of stygofauna communities is relatively poor, but is increasing as more studies are conducted and taxonomic knowledge improves.

2.1 Habitat Preferences and Ecology

Stygofauna are tolerant of a relatively wide range of environmental conditions and can occur in a variety of aquifer types, however they require favourable conditions to survive, and not all aquifers are suitable (Doody et al. 2019). Important habitat characteristics known to influence the presence of stygofauna include:

- aquifer type
- hydraulic conductivity
- groundwater quality
- food supply
- water extraction and use, and
- depth to groundwater.

Stygofauna are most commonly found in karstic and alluvial aquifers, which have high porosity. These large pores and fractures allow stygofauna to pass through them and facilitate water movement and connectivity, which is important in supplying dissolved oxygen and nutrients (Strayer 1994, Hahn & Fuchs 2009, Hose et al. 2015). Although stygofauna have also been recorded from fractured rock aquifers (such as sandstone, coal and basalt), these will often only contain stygofauna when there is sufficient hydrological connection to either limestone or alluvial aquifers (Doody et al. 2019).

Stygofauna can occur across a range of depths, however a higher diversity and abundance of stygofauna is typically found near the water table (when the water table is shallower than 20 to 30 metres [m]) (Datry et al. 2005). Stygofauna are also more likely to occur in aquifer recharge areas where the water table is close to the land surface (<10 m), and near deep rooted trees (Humphreys 2000, Hancock and Boulton 2008). This is because these areas generally have higher concentrations of organic matter and dissolved oxygen (Hyde et al. 2018). Diversity and abundance of stygofauna communities then decline with depth (Datry et al. 2005).

Water quality can be an important determinant in the presence and abundance of stygofauna. Stygofauna are typically most likely to occur where electrical conductivity is less than 5,000 microsiemens/cm (µS/cm). Although stygofauna have been collected from aquifers with electrical conductivity of up to 56,000 µS/cm, the diversity and abundance of stygofauna typically decreases with increasing electrical conductivity above 5,000 µS/cm (Hancock & Boulton 2008, Watts & Humphreys 2009, Schulz et al. 2013, Glanville et al. 2016). Stygofauna can also tolerate a pH range of 3.5 to 10.3, but a higher diversity is likely to occur in aquifers with a pH range of 6.5 to 7.5 (4T 2012).

The occurrence of stygofauna communities within the Bowen basin is poorly understood. A previous review of stygofauna studies in the Bowen basin concluded that stygofauna are rare or unlikely to occur within the bedrock (4T 2012). However, they are considered likely to occur in some of the unconsolidated sandy sediments associated with the Isaac River floodplain due to the high porosity, suitable hydraulic conductivity and interconnectivity. In alluvial sediments, stygofauna are typically found in shallow depths (<20 m), and at electrical conductivity levels of less than 2,000 µS/cm, though they still may occur outside of this range (4T 2012).

The Bowen basin in the vicinity of the Project is characterised by a relatively thin accumulation of consolidated sediments, gentle easterly dips and minor to moderate deformation (URS 2009). Three distinct units occur within the Project site, including Cainozoic sediments (alluvium and regolith), Cainozoic basalt and Permian coal measures. The Quaternary alluvial formations, Tertiary sediment and basalt formations, and the Permian coal measures, generally yield low sustainable volumes of poor-quality groundwater, and are not recognised aquifers of the area.

Alluvial deposits in the vicinity of the Project occur predominantly along creeks such as Horse Creek, Grosvenor Creek and Cherwell Creek (URS 2009). The Quaternary alluvial aquifers are not extensive in the vicinity of the Project; however, they become more significant along and adjacent to the Isaac River main channel. The minimum distance between the Project open cut pit and the Isaac River alluvium is approximately 9 km (SLR 2021). Tertiary to Quaternary aged alluvium deposits are distributed along the courses of Cherwell Creek and Harrow Creek, located 1.7 km to the south of Horse Pit, extending to the south and south east. Within the Project site, the Cherwell Creek alluvium extends from the creek approximately 1.7 km north towards Horse Pit. Adjacent to Cherwell Creek, the alluvium comprises between 6 to 9 m of clay and silt, which is underlain by up to 10 m of fine to coarse sand and gravel. The thickness of the alluvium decreases towards Horse Pit (SLR 2021). Alluvial deposits located adjacent to Harrow Creek extend approximately 3 km south and 1 km south east, and comprise 2 m of silt and clay, overlying 6 m of sands and gravels with bands of silt and clay (SLR 2021). While there is potential for groundwater to exist within the sand and gravel deposits of the alluvium close to the Project, the alluvium is not considered a significant aquifer due to the shallow depth (approximately 10 to 20 m below ground level, where saturated), limited extent and continuity. The aquifer is likely to only become temporarily saturated in the vicinity of the Project following significant creek flow events (URS 2009).

Regolith material in the vicinity of the Project comprises Cainozoic (Quaternary to Tertiary) aged sediments, including alluvium and colluvium. The regolith in the Project site comprises a heterogeneous distribution of fine to coarse grained sand, clay, sandstone and claystone, with regolith material generally 15 m to 45 m thick. The regolith is densely compacted and largely unsaturated, with the presence of water restricted to lower elevation areas along the Isaac River and the lower reaches of its tributaries (i.e. Cherwell Creek and Ripstone Creek). Flow within the regolith where it is saturated is a reflection of topography, flowing towards nearby drainage lines (SLR 2021).

Tertiary basalts mapped in the vicinity of the Project are not regionally extensive, occurring only along the western edge of the Project site. The occurrence is generally discontinuous and isolated. Recharge to the basalt aquifers is likely to be via surface infiltration and overland flow in areas where the basalt is exposed and/or no substantial clay barriers occur in the shallow subsurface. Recharge may also occur via vertical seepage from overlying alluvium aquifers. Exploration boreholes and monitoring wells across the Project site found the basalt ranged from fresh to highly weathered with variable clay, and to be up to 35 m thick (SLR 2021).

Permian sequences consist of coal seam aquifers confined above and below by very low permeability geological formations. Faulting and seam splitting is common throughout the region. Due to the clay characteristics of the regolith overlying the coal seams in the vicinity of the Project, it is considered that recharge is limited. Any leakage between aquifers through the faults is dictated by a variety of factors, including the hydraulic conductivity of the fault, the interburden thickness between the aquifers, and the piezometric level in the aquifers. Monitoring of groundwater levels in the Permian aquifers in the vicinity of CVM indicates drawdown in response to current mining activities in both Horse and Heyford Pits, as well as the adjacent Peak Downs Mine (URS 2009).

Overall, the Project site comprises the following key hydrogeological units (SLR 2021):

- Cainozoic sediments:
  - Quaternary alluvium – unconfined aquifer (water-bearing strata of permeable rock, sand, or gravel) localised along Cherwell Creek and the Isaac River.
  - Quaternary to Tertiary colluvium and weathered units (regolith) – unconfined and largely unsaturated unit bordering alluvium.
- Tertiary Basalt – unconfined, heterogenous and discontinuous and highly variable permeability, dependant on degree of weathering and nature of fracturing / vesicularity.
- Permian coal measures – low permeability interburden units with aquitard properties, and coal sequences that exhibit water bearing properties associated with secondary porosity through cracks and fissures.

2.2 Stygofauna Communities in the Vicinity of the Project

Overall, aquifers within the Project site are considered to have a low likelihood of supporting stygofauna communities. Although stygofauna have been recorded from fractured rock aquifers (e.g. basalt and coal), they are less likely to occur where there is insufficient hydrological connection to limestone or alluvial aquifers (Doody et al. 2019). The alluvium aquifer is unconfined and likely fed by surface water; as such, groundwater available for stygofauna communities is likely to be limited and spatially sporadic.

Stygofauna are known to be present in the Quaternary alluvial aquifers in the wider vicinity of the Project. The Isaac River and its tributaries are ephemeral, particularly in the upper reaches (which often experience prolonged dry periods) (4T 2012). Along with varied permeability, this indicates that the distribution of stygofauna in the upper reaches of the alluvium further from the main rivers, may only be highly localised (i.e. where there is sufficient groundwater storage to sustain populations) (4T 2012). In the lower reaches, and where there are confluences and extensive river alluvium deposits, the likelihood of saturation and therefore the likelihood of occurrence of stygofauna is greater.

Stygofauna sampling occurred at 23 bores (several of which were located in alluvium) as part of the baseline surveys for the Project (ESP 2021a). In addition, stygofauna sampling has recently occurred in the vicinity of the Project (i.e. within approximately 30 km) as part of stygofauna pilot studies for the following:

- two bores in the Isaac River alluvium were sampled for the Olive Downs Project EIS (located approximately 32 km south-east of the Project area; DPM Envirosciences 2018)

- 10 bores (including bores adjacent to the Isaac River) were sampled for the Isaac Downs Project (located approximately 10 km north-east of the Project area; frc environmental 2019)
- 10 bores (none of which were located in alluvium) were sampled for the Vulcan Complex Project (located approximately 30 km south-east of the Project; frc environmental 2020), and
- up to 15 bores (including bores adjacent to the Isaac River) were sampled across three surveys for the Winchester South Project (located approximately 20 km east / south-east of the Project; ESP 2021b & 2022).

No true stygofauna were recorded during most of these surveys, however they were considered likely to occur in the unconsolidated sediments of the Isaac River alluvium, in the lower reaches of the Isaac River and at the confluences of larger tributaries. Stygoxenic fauna (meaning they are aquatic fauna that will use groundwater ecosystems) were recorded during some of these surveys (and have been recorded historically from other studies in the wider region; Queensland Herbarium 2016), but they are not dependent on groundwater to complete their lifecycle; that is, they are not obligate inhabitants of groundwater ecosystems and are unable to establish populations in such environments.

Two true (i.e. stygobitic) stygofauna taxa (ostracods from the family Candonidae, and syncarid shrimp) were recorded from bores targeting the Isaac River alluvium in January and February 2022 sampled as part of the Winchester South Project (ESP 2022), and the Moorvale South Coal Project (located approximately 32 km north-east of the Project; pers. comm. Peabody Pty Ltd 2022). Further afield, two true stygofauna taxa (copepods from the family Cyclopidae and oligochaetes from the family Naididae) were also recorded from shallow bores targeting alluvial aquifers adjacent to Hughes Creek sampled as part of the Lake Vermont Meadowbrook Project (approximately 54 km southeast of the Project; Stygoecologia 2022). These findings are consistent with conclusions from all other studies listed above, which concluded that stygofauna are likely to occur in alluvial areas associated with the Isaac River and its larger tributaries (DPM Envirosciences 2018, frc environmental 2019, ESP 2021b).

2.3 Potential Impacts to Stygofauna Associated with the Project

Although no true stygofauna were recorded during pilot studies for the Project, and they are considered unlikely to occur within the Project site, the EPBC referral studies concluded that stygofauna communities may occur in the broader region, particularly in the unconsolidated sediments of the Isaac River alluvium. Therefore, potential impacts associated with the Project were considered in the EPBC referral studies to the extent the Project may impact these alluvial aquifers, as discussed below (ESP 2021a). Direct impacts to stygofauna from physical disruption of aquifers were not considered, as they are not relevant to the Project.

Groundwater modelling completed for the EPBC referral studies demonstrated that changes to groundwater quantity due to drawdown associated with the Project are likely to be localised, with no predicted direct or indirect interference with alluvial groundwater as a result of the Project (SLR 2021). Changes to groundwater quantity are not expected in the unconsolidated sediments of the Isaac River alluvium, in the lower reaches of the Isaac River and at the confluences of larger tributaries (i.e. where stygofauna communities are likely to occur). Therefore, the Project is not expected to impact stygofauna communities as a result of changes in groundwater quantity.

Impacts to groundwater quality may result from saline or acid drainage, seepage, tailings disposal, hazardous and dangerous goods storage, and hydrocarbon and chemical spills (e.g. from fuels, lubricants and oils required for the operation of vehicles and machinery). Where these are managed in accordance with existing Management Plans and the EA, any impacts are expected to be low risk.

Areas potentially impacted by vegetation clearing, surface sealing / compaction, backfilling and rehabilitation works are within the Project site where stygofauna are unlikely to occur. Further, changes in catchment area and surface flow are likely to be localised and not expected to impact areas where stygofauna are likely to occur (i.e. unconsolidated sediments of the Isaac River alluvium, lower reaches of the Isaac River and at the confluences of larger tributaries). As such, any potential impacts are expected to be low risk.

3 Survey Program Design

This stygofauna survey program has been designed in accordance with relevant guidelines, including the *Guideline for the Environmental Assessment of Subterranean Aquatic Fauna* (DSITI 2015), and the *Biological assessment – Background information on sampling bores for stygofauna* (DES 2018). The sampling design and effort have been informed by the baseline sampling and impact assessment completed for the EPBC referral studies (as described in 2 above) and finalised based on the aims of the survey, i.e. to detect the presence, diversity and abundance of stygofauna which may be impacted by the Project (noting that any potential impacts are expected to be low risk, as discussed in Section 2.3 above).

3.1 Survey Timing and Monitoring Schedule

During each annual monitoring period, two surveys will be completed at least three months apart, during the early-wet / pre-wet season (i.e. notionally October to December, pending rainfall) and late-wet / post-wet season (i.e. notionally May to July, pending rainfall). Exact timing of the surveys will be contingent on rainfall conditions leading up to the surveys.

In accordance with the requirements for a comprehensive survey under the *Guideline for the Environmental Assessment of Subterranean Aquatic Fauna* (DSITI 2015), monitoring is proposed for a minimum of two years (i.e. four surveys), with the survey program to be reviewed annually (see Section 4).

3.2 Sampling Bore Details

In accordance with the requirements for a comprehensive survey under the *Guideline for the Environmental Assessment of Subterranean Aquatic Fauna* (DSITI 2015), the monitoring program has been designed to collect a total of 40 samples from a minimum of ten representative bores.

During each monitoring survey, sampling will occur at a total of ten bores distributed throughout the Project area and comparable nearby bores outside of the Project area. Bores have been selected for inclusion in the monitoring program in accordance with the *Guideline for the Environmental Assessment of Subterranean Aquatic Fauna* (DSITI 2015). The proposed sampling bores have been determined based on the location of existing bores with suitable conditions for sampling, distributing bores throughout a representative range of aquifer formations within and outside of the Project area (with greater sampling occurring in more prospective stygofauna habitats), and accessibility of the sites throughout the year. Each bore has been established for more than six months, and is likely to contain groundwater.

The locations of the bores proposed for sampling are summarised in Table 3.1 and shown in Figure 3.1. While it is proposed that 10 bores are sampled during each survey event, 14 bores have been included in the program in anticipation that some bores may be unable to be sampled during a survey event (e.g. if bores become dry due to low rainfall and groundwater recharge rates, or are unable to be accessed).

In some instances, collecting 10 samples in a survey event may not be possible. Where bores are unable to be sampled for more than one survey (e.g. they become non-functional due to sediment infill, blockages, collapse, or decommissioning), or additional bores that are more suitable for stygofauna are developed (noting that any new bores must be established for at least six months prior to sampling), sampling bore locations may change.

Sampling bores included in the program will be reviewed as part of the survey program review, to be completed annually, as described in Section 4.

Table 3.1 Proposed sampling bores, including location, total depth and aquifer formation

Location Bore ID	**Latitude**	**Longitude**	**Total Depth (mbGL)**	**Aquifer Formation**
Within Footprint				
PZ01	-22.0584	148.0656	85	Coal seam
PZ04	-22.1016	148.0746	93	Coal seam
PZ12D	-22.0853	148.0743	57	Non-coal Permian - siltstone
PZ12S	-22.0848	148.0743	31	Regolith - sandstone / siltstone
MB20CVM01A	-22.0571	148.0663	8	Alluvium
Outside of Footprint				
MB19CVM01A	-22.16894	148.0701	13	Alluvium
MB19CVM05T	-22.1387	148.0771	35	Basalt / basal sands
MB19CVMP07T	-22.1287	148.0819	12	Basalt
MB19CVMP09A	-22.1436	148.0915	15	Alluvium
PZ08S	-22.15419	148.08047	15	Alluvium
PZ11S	-22.172895	148.132792	9	Alluvium
162145	-22.1416	148.117	21	Coal / sandstone
162144	-22.0319	148.1162	12	Alluvium
182164	-22.0375	148.064	2	Basalt

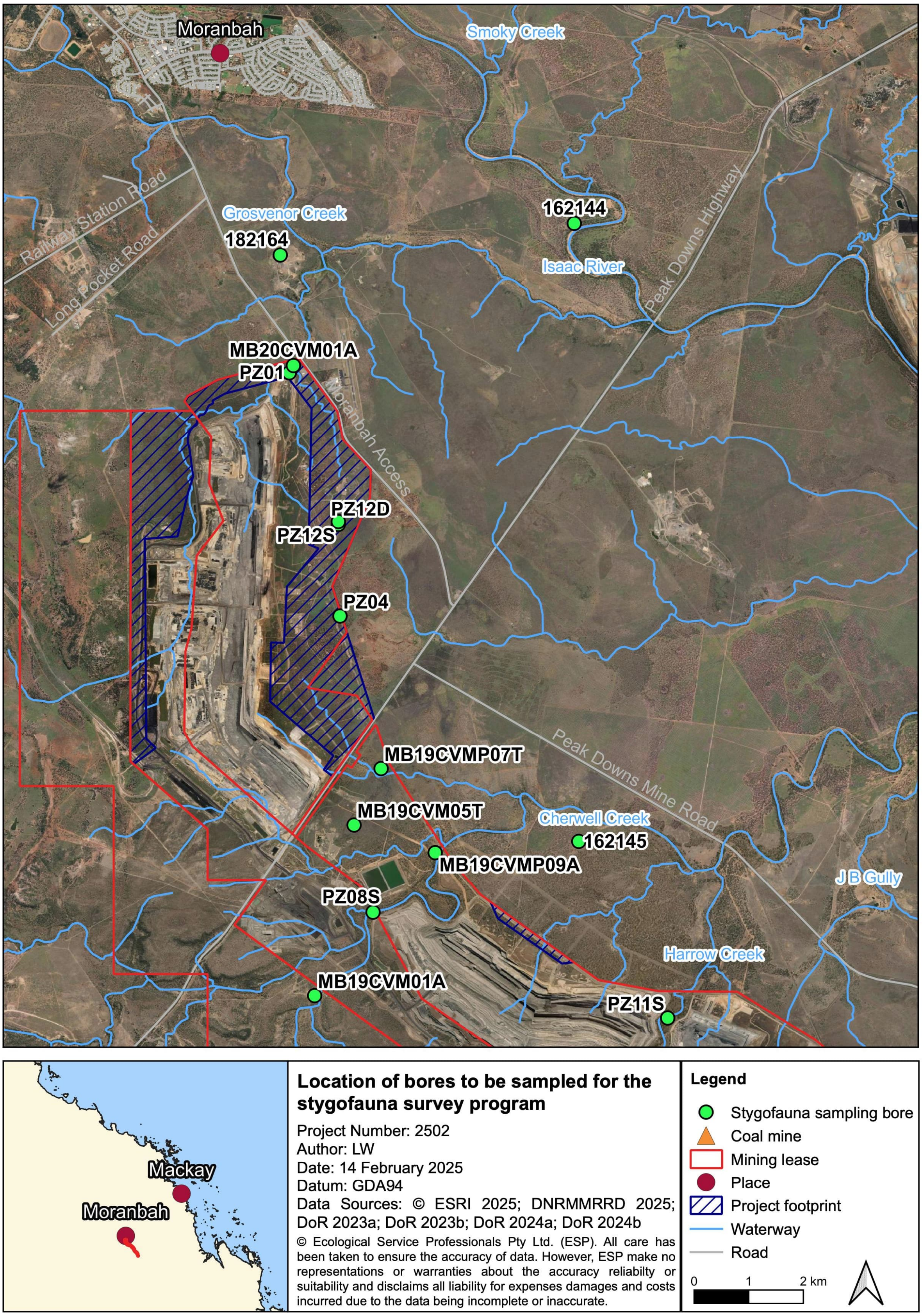

Figure 3.1 Location of proposed sampling bores

3.3 In Situ Water Quality

Water quality will be recorded on site at all sampled bores to provide information on habitat suitability for stygofauna. Temperature, electrical conductivity and pH will be measured in situ at each bore using a hand-held YSI ProDSS multi-parameter water quality sonde. The water quality meter will be calibrated prior to field sampling.

Where the haul netting method is used to sample for stygofauna (see Section 3.4.1 below), a bailer will be used to collect a water sample from approximately 1-2 m below the water level of the bore. The sample will be retrieved slowly and poured into the measuring cup of the water quality probe. The water sample is to be collected before the stygofauna samples are collected.

Where the pumping method is used to sample for stygofauna (see Section 3.4.2 below), in situ water quality measurements will be taken from the first bucket and then every 50 litres (L) (i.e. every five buckets).

3.4 Stygofauna Sampling

During each survey, one stygofauna sample will be collected from each of 10 bores (with two surveys proposed each year, equating to a total of 40 samples over two years).

Samples may be collected using either the haul netting or pumping methods, as outlined below. The equipment used to sample stygofauna will comply with standards outlined in the *Biological assessment – Background information on sampling bores for stygofauna* (DES 2018).

Photographs will be taken of the bore and surrounding environment. The diameter of the bore, casing type, whether the bore is screened and whether a pump is installed, the height of the collar and the depth of the bore and depth to water level will also be recorded, where possible.

3.4.1 Haul Netting

The full water column within each bore will be sampled by hauling a weighted phraetobiological net. Three hauls will be completed with a coarse mesh net (150 µm) and three hauls will be completed with a fine mesh net (50 µm). Nets will be lowered to the bottom of the bore, bounced five times to dislodge resting animals and then carefully retrieved to avoid a bow wave (which could result in the loss of specimens). After each haul, the net and collection vial will be emptied onto a 50 µm sieve and rinsed with deionised water. The three fine mesh hauls and three coarse net hauls will be combined into one sample per bore and preserved in 100 per cent ethanol.

To prevent cross-contamination, all sampling equipment will be washed thoroughly with Decon90 solution or similar, and rinsed with potable water after sampling is completed at each bore.

3.4.2 Pumping

If conditions are unsuitable for haul netting, samples may be collected using the pumping method (noting that impeller driven pumps such as electric submersible pumps are more likely to damage fauna during collection and should therefore be avoided if possible).

The sampling hose will be fed into the bore until it reaches the bottom of the bore casing, then lifted so that it sits approximately 2 m above the bottom of the bore. Three rows of ten x 10 L buckets (i.e. equivalent to a 100 L sample) will be filled to collect three 100 L samples. After recording in situ water quality (see Section 3.3), contents of each bucket will be gently swirled to suspend any organic matter and fauna, and then sieved using a 50 µm mesh sieve. Sieved water will be captured in another bucket, then transferred back into the original bucket, elutriated, and sieved twice more. After sieving the first 10 buckets (i.e. 100 L), contents of the sieve will be transferred into a sample jar and preserved with 100% ethanol. This method will be repeated for the second and third 100 L of water, so that there are three x 100 L samples per bore site. Each of the three sub-samples will be labelled separately.

3.5 Sample Processing

The composite stygofauna samples will be sorted in the laboratory under a stereomicroscope. Each sample container will be drained of ethanol and washed into a shallow elongated counting tray to create a thin layer of sediment spread across the bottom of the tray. Any aquatic animals will be transferred into 2 millilitre (mL) vials with 100 per cent ethanol and identified to the lowest practical taxonomic level. For the following major taxonomic groups, a representative subset of specimens collected must at a minimum be identified to the genus level: Amphipoda, Copepoda, Isopoda, Ostracoda, Remipedia, Spelaeogriphacea, Syncarida and Thermosbaenacea. For the following major taxonomic groups, a representative subset of specimens collected must at a minimum be identified to the order or family level: Acarina, Coleoptera, Decapoda, Mollusca, Nematoda, Oligochaeta, Rotifer, Polychaeta, and Turbellaria.

All laboratory processing of specimens is to be undertaken by suitably qualified and experienced ecologists, with finer-level identification by appropriate, specialist stygofauna taxonomists where required. Where required, genetic analysis will be completed on specimens to confirm identification.

3.6 Reporting

An annual report will be completed following completion of two seasonal field surveys. The report will include:

- A detailed description of all methodologies, including timing duration and survey effort, and any deviations from this survey program.
- A summary and discussion of the results, including the presence, diversity and abundance of any stygofauna recorded in the vicinity of the Project during the two surveys completed within the monitoring period.
- Any recommendations regarding changes to the survey program.

CVM Site Environment Team will maintain copies of the annual reports along with supporting data collected.

In accordance with Condition 17 of the EPBC approval, a final report will be developed within 5 years of commencing the action, presenting the findings of the survey program in terms of distribution, diversity and abundance of stygofauna within the project area and in groundwater within the groundwater area of investigation, as well as what stygofauna may be impacted and to what extent stygofauna will be impacted. The final report will be provided to the Minister within 1 month of its completion.

Note: Condition 18 of the EPBC approval identifies requirements if the Minister is satisfied that stygofauna may be significantly impacted by the action. Should this scenario be realised a revised plan will be developed for submission to the Minister in accordance with the Condition.

4 Roles and Responsibilities

The EA and EPBC Approval holder is responsible for the implementation of this survey program.

Table 4.1 Roles and Responsibilities

Department	Responsibilities
General Manager and Site Leadership Team	• Support implementation of stygofauna survey and process outlined within this program. • Ensure activities identified within this program included in budget cycles.
CVM Site Environment Team	• Understand the conditions of the EPBC approval and requirements in regard to stygofauna. • Arrange for a Suitably Qualified Stygofauna Survey Team to undertake the survey actions outlined in this program. • Ensure accurate reporting of relevant data to both internal and external stakeholders. • Undertake external reporting commitments in accordance with EPBC approval. • Submit final report to the Minister in accordance with Condition 17 of the EPBC approval, within 5 years of commencing the action.
Suitably experienced Stygofauna Survey Team	• Undertake the survey (sampling, processing and reporting) in accordance with this program, reporting to the CVM Site Environment Team. • Review this program annually (using outcomes of annual reports) as per Section 5 (noting that any proposed changes to the program other than formatting or spelling will be confirmed with the department). • Compile annual reports each year and provide to CVM Site Environment Team. • Compile final report within 5 years as outlined in this program.

5 Survey Program Review

This survey program design will be reviewed annually, as part of the reporting process, to ensure that it is fulfilling the aims and objectives outlined in Section 1.2. The review will be informed by the survey results and will consider the suitability of sampling bores (including the number of bores, their location, and aquifer formations), frequency of monitoring, and appropriateness of sampling methodologies. Any recommendations for the program will be summarised in the annual reports.

The program will also be reviewed on an as-needed basis if any significant changes to the groundwater operating strategy are proposed as part of the Project.

6 Revision History

Review No.	Review Date	Review Description	Author	Endorsed by:	Approved By:
0	28/02/2025	Document prepared and issued by ESP on behalf of BMA	K. Keating (ESP)	L. Thorburn (ESP)	K. Taske (BMA)
1	9/4/2025	Addition of roles and responsibilities detail	K.Taske (BMA)		

7 References

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