



Application for Works Approval

Part V Division 3 of the *Environmental Protection Act 1986*

Works Approval Number W2960/2025/1

Applicant Cygnet Gold Pty Ltd

ACN 660 841 252

File number APP-0027357

Premises Golden Pig Gold Mine
Southern Cross
Legal description -
Within mining tenements M77/109 (under agreement with
Barto Gold), M77/90, M77/1016, M77/525, M77/552

Date of report 24 October 2025

Proposed Decision Works approval granted

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1. Decision summary

This decision report documents the assessment of potential risks to the environment and public health from emissions and discharges during the construction and operation of Golden Pig Mine (the premises). As a result of this assessment, works approval W2960/2025/1 has been granted.

2. Scope of assessment

2.1 Regulatory framework

In completing the assessment documented in this decision report, the Department of Water and Environmental Regulation (the department; DWER) has considered and given due regard to its regulatory framework and relevant policy documents which are available at <https://dwer.wa.gov.au/regulatory-documents>.

2.2 Application summary and overview of premises

On 31 January 2025, the applicant applied for a works approval to the department under section 54 of the *Environmental Protection Act 1986* (EP Act). The application is to construct and operate dewatering infrastructure at the premises, which is located approximately 300 m west of Southern Cross.

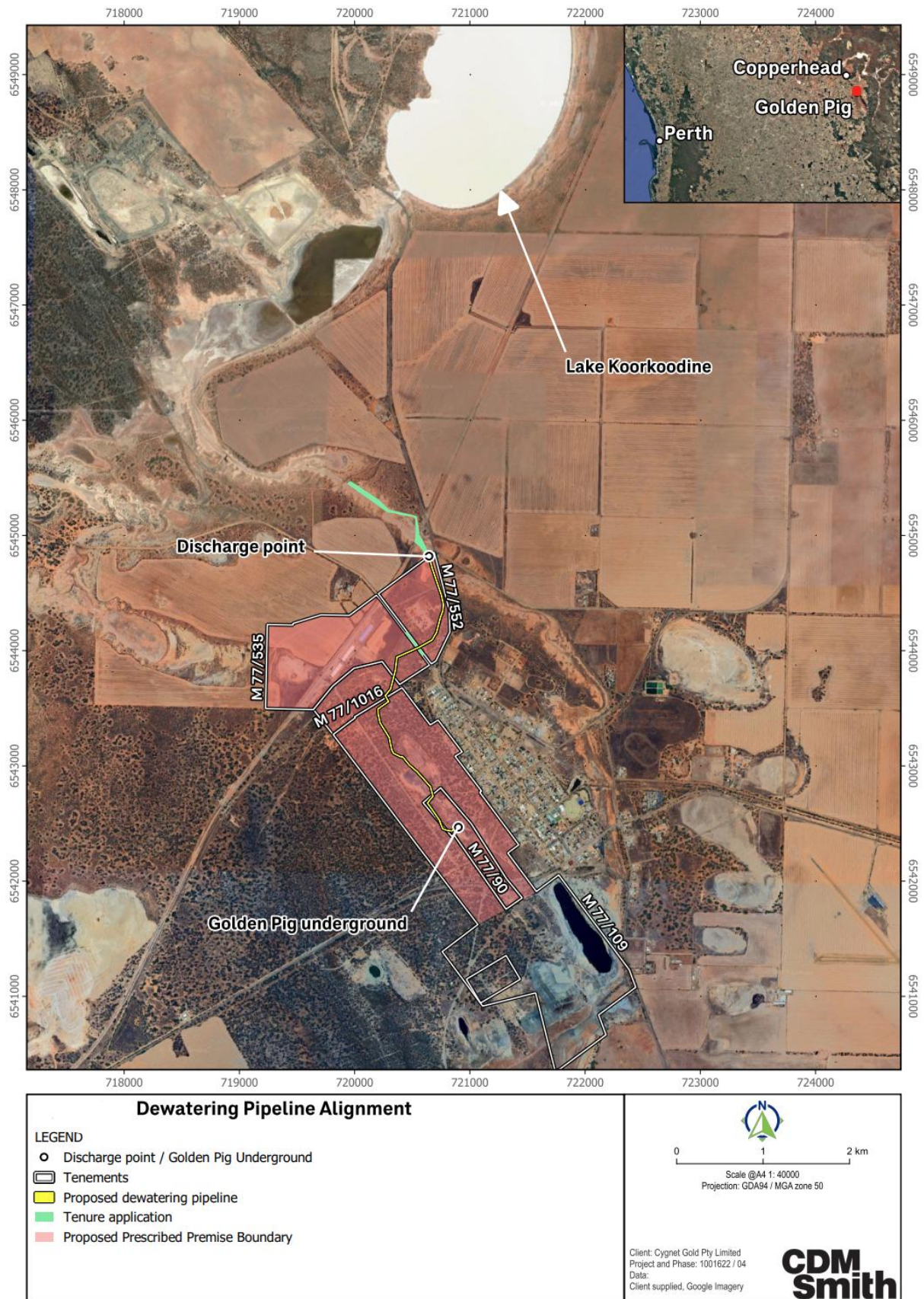
The applicant proposes to construct a 2.5 km groundwater discharge pipeline and associated infrastructure. The pipeline will remove mine water from the Golden Pig mine and will then be pumped to a nearby creek which will act as the discharge point. The creek is a surface water body that flows directly into Lake Koorkoordine further to the north (Figure 1: Premises boundary, pipeline alignment and discharge point).

Golden Pig Mine was previously dewatered but this ceased when the Golden Pig underground mine was placed into care and maintenance in 2006. The dewatering activities included discharge to Lake Polaris. Environmental studies completed at the time found the potential environmental impacts to be not significant due to the salinity of Lake Polaris and existing impacts from surrounding mining and rural development (CDM Smith 2025). Since then, the vacated underground voids have become submerged by the inflow of groundwater, resulting in the need for dewatering operations prior to commencement of underground mining activities.

The applicant plans to recommence underground mining operations at the Golden Pig Project, and approximately 2 years of dewatering is expected to be required to support the recommencement of underground mining operations. As such, the applicant is seeking to obtain a works approval for dewatering of up to 1,400,000 tonnes of water per annual period.

The premises relates to the category and assessed design capacity under Schedule 1 of the *Environmental Protection Regulations 1987* (EP Regulations) which are defined in works approval W2960/2025/1. The infrastructure and equipment relating to the premises category and any associated activities, which the department has considered in line with *Guideline: Risk Assessments* (DWER 2020), are outlined in works approval W2960/2025/1.

Figure 1: Premises boundary, pipeline alignment and discharge point



2.2.1 Dewatering pipeline construction and operation

Dewatering infrastructure will consist of a relocatable and removable dewatering pump, approximately 2.5 km of high-density polyethylene (HDPE) pipeline and associated bunding. The pump will be placed at the entrance to the Golden Pig underground mine, and construction of the pipeline and bunding will utilise existing cleared areas such as exploration tracks which will reduce the need for vegetation clearing. The entirety of the pipeline will be located above surface with the only exception being the suction line entering the underground areas.

Approximately 2,106,000 kL of groundwater is expected to be extracted from within the Golden Pig underground mine (including estimated recharge over two years) to be transferred via the pipeline to a discharge point at the lease boundary to enable drainage to the hyper-saline Lake Koorkoordine for evaporation. It flows north into the southern portion of Lake Koorkoordine before entering the northern section of Lake Koorkoordine via a culvert. (Figure 1: Premises boundary, pipeline alignment and discharge point).

2.2.2 Hydrology and water quality of existing environments

The Golden Pig Mine is located within the Yilgarn River surface water catchment which covers the western extent of the Avon River catchment and is situated near the watershed boundary of the Polaris palaeodrainage and Lake Julia catchment to the west. The Polaris system is an ephemeral surface water drainage network which directs surface water eastward towards the Southern Cross area and ultimately into Lake Koorkoordine.

Water from Lake Koorkoordine is hypersaline and typically neutral with metal concentrations below the limit of detection (except for total manganese recorded between 0.043 mg/L and 0.520 mg/L). Monitoring undertaken during the care and maintenance phase indicates that the receiving environment for the Golden Pig Mine discharge at Lake Koorkoordine has a greater Electrical Conductivity (salinity), Total Dissolved Solids (TDS) but similar pH to the water stored in the Golden Pig underground. The Golden Pig Mine extraction point also recorded lower concentrations of metals (Arsenic, Cadmium, and Lead) compared to the Lake Koorkoordine samples (CDM Smith 2025).

With regards to groundwater within and surrounding the premises, the DWER water register identifies that the Cygnet operational areas encompass palaeochannel aquifers and fractured rock aquifers. The groundwater quality in the palaeochannel aquifers generally ranges from saline to hypersaline (10,000 - >35,000 mg/L TDS) however, sampling events undertaken in 2024 indicate a TDS of as low as 5,280 mg/L (CDM Smith 2025). The detailed risk assessment included in Section 4.3 provides further detail on the groundwater quality.

In high rainfall events the discharged water is expected to be diluted by fresh rainfall prior to continued flow downstream. The design maximum discharge rate for the dewatering infrastructure is 40 L/s, which will be reduced in high rainfall events to avoid potential impacts to the receiving surface water environments. After an initial estimated volume of 2 GL of existing groundwater has been removed from the mine, ongoing dewatering rates of approximately 1 L/s are expected. If the ongoing dewatering rates fall to 1 L/s then the annual dewatering discharge is expected to be below 50,000 kL/year. The applicant expects this will be sufficient for operational uses. The impact to the lake from the dewatering is therefore expected to be of a limited duration as the minor flows after the initial dewatering of the underground will not be significant.

2.2.3 Lake Koorkoordine and associated nature reserve

Flora and Vegetation surveys completed around Golden Pig by AECOM in 2023 note that the vegetation condition within the Golden Pig area varies from Completely Degraded to Very Good condition, with most of the native vegetation being in Very Good condition (CDM Smith 2025). Further, the Eucalyptus Woodlands of the Western Australian Wheatbelt (Eucalypt Woodland Threatened Ecological Community(TEC)) is known to occur in the area, it is not located within

the proposed works approval area, and no TEC's were found to be within the survey area (Figure 2).

It should be noted that the survey area (Figure 2) covers only the Golden Pig pit, creek bed and southern section of Lake Koorkoordine. Mine dewater that is discharged via the designated discharge location has the potential to reach the northern section of Lake Koorkoordine which lies outside of the survey area. The northern section of Lake Koorkoordine is located within, and surrounded by, an unnamed nature reserve (R 25801) which has been reserved for the purpose of conservation of flora and fauna (Figure 2).

The reserve consists of vegetation that is representative of the Great Western Woodlands, which has the potential to support such conservation significant flora as *Daviesia microcarpa* (ranked Critically Endangered) and *Eucalyptus crucis* (ranked Endangered). It is possible that the reserve may also support conservation significant fauna and associated habitat, including malleefowl (*Leipoa ocellata*, ranked Vulnerable) and chuditch (*Dasyurus geoffroii*, ranked Endangered).

Considering the significant volume of the water to be discharged from the Golden Pig pit as well as the flow path, the proposed discharge into Lake Koorkoordine has the potential to cause adverse impacts to the health of the reserve through changes to surface and groundwater hydrological regimes and water quality.

To better understand the overall health of the reserve and to manage the potential impacts derived from the proposed operations, vegetation health monitoring has been proposed, and is further outlined in section 3.1.2.

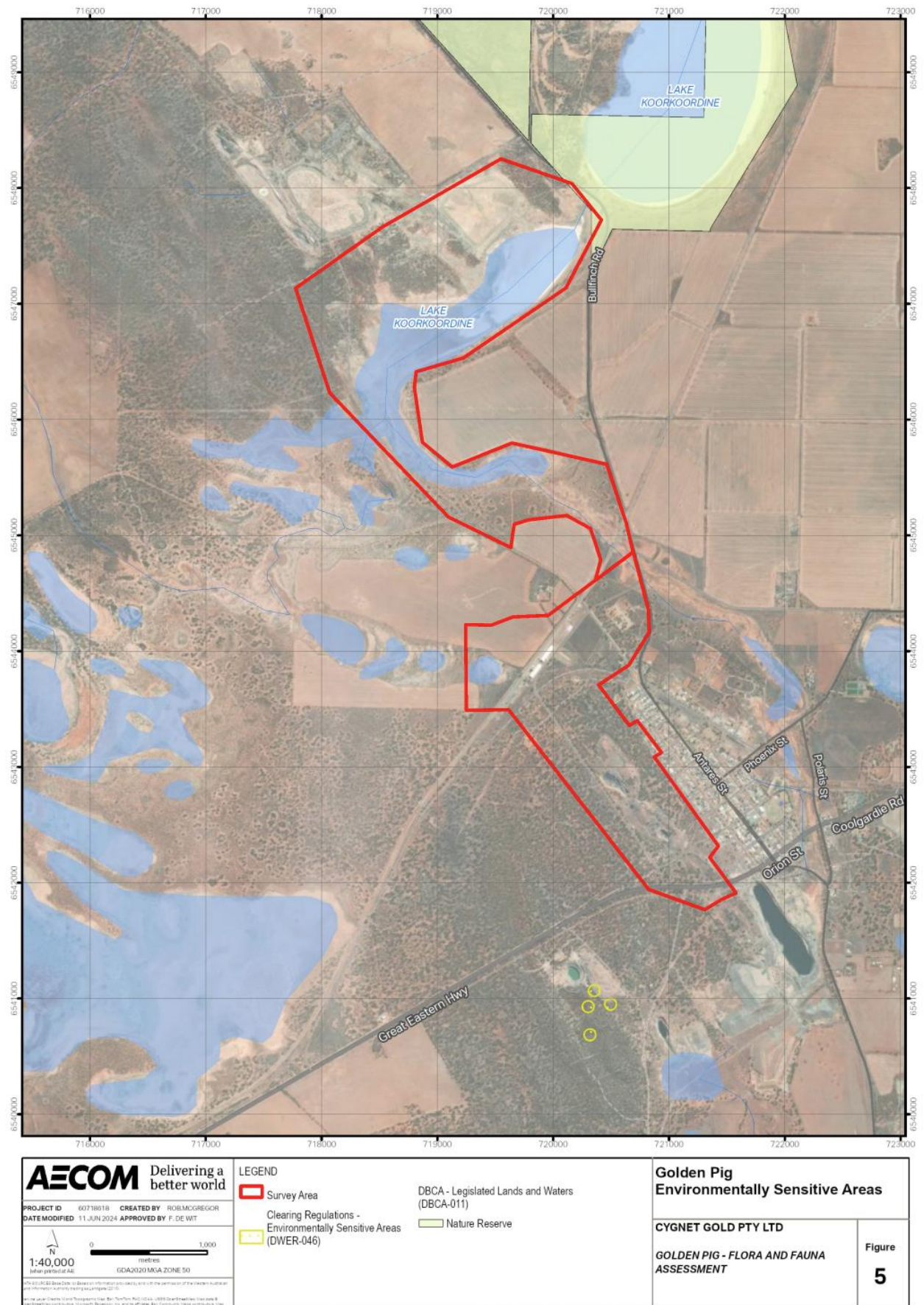


Figure 2: Vegetation survey extent showing location of nature reserve

3. Monitoring

3.1.1 Water quality monitoring

Water quality monitoring is expected to be in line with the Groundwater Operating Strategy, which monitors water extracted from the Golden Pig Mine (CDM Smith 2025a). This water is then proposed to be discharged to the creek bed via the authorized discharge location. Monitoring includes a complete chemical analysis involving the collection and submission of quarterly groundwater samples via the National Association of Testing Authorities (NATA). The following parameters are monitored under the complete chemical analysis:

- Metals (Al, As, Cd, Co, Cr, Cu, F, Fe, Hg, Mn, Ni, Pb, Se, Zn).
- Major ions (Ca, Cl, K, Mg, Na, CaCO₃ (bicarbonate alkalinity, carbonate, hydroxide alkalinity), SO₄, SiO₂).
- pH, Electrical Conductivity (EC), Total Dissolved Solids (TDS), and Total Suspended Solids (TSS); and
- Nutrients (Nitrate and Nitrite).

In addition to the complete chemical analysis, monthly basic water quality monitoring is proposed to continue and includes analysis of pH, EC, TDS and TSS as well as monthly flow meter readings from both draw and discharge locations.

As the quality of the mine dewater discharge and its impacts on the nature reserve and surrounding vegetation are relatively unknown, additional monitoring requirements have been proposed by the Delegated Officer. These are discussed in the Detailed Risk Assessment (Section 4.3).

3.1.2 Vegetation health monitoring

AECOM (CDM Smith 2025) did not identify any declared rare or priority flora within the fringing vegetation of Lake Koorkoordine (Figure 2). The fringing vegetation community is described as Tecticornia Samphire Shrublands, with all species within the community known to inhabit saline environments surrounding salt lakes and inland waters.

The applicant has proposed vegetation health monitoring following the construction and commissioning of the Golden Pig discharge pipeline to Lake Koorkoordine. Monitoring will focus on the fringing vegetation from the discharge location to north-eastern extents of the lake and will commence one month prior to the commencement of groundwater discharge (CDM Smith 2025a).

DWER GIS (Geocortex 2025) shows that there are threatened and priority fauna species surrounding the prescribed premises and within the vicinity of Lake Koorkoordine (Table 2). This fauna may rely on native vegetation, and as such will benefit from vegetation health monitoring.

Monitoring prior to commencement of discharge will establish an environmental baseline and determine the location of monitoring locations to be used throughout operations. Annual monitoring will commence thereafter, concluding twelve months post cessation of groundwater discharge to the lake. Monitoring will include the establishment of multiple monitoring points on Lake Koorkoordine, with results reported annually.

Vegetation health monitoring in this way will aim to ensure the ongoing protection of threatened flora and significant fauna through the establishment of baseline health parameters so that any changes to these parameters in response to the proposed operations can be tracked, monitored and appropriate action taken where adverse impacts are observed.

4. Risk assessment

The department assesses the risks of emissions from prescribed premises and identifies the potential source, pathway and impact to receptors in accordance with the *Guideline: Risk Assessments* (DWER 2020).

To establish a risk event there must be an emission, a receptor which may be exposed to that emission through an identified actual or likely pathway, and a potential adverse effect to the receptor from exposure to that emission.

4.1 Source-pathways and receptors

4.1.1 Emissions and controls

The key emissions and associated actual or likely pathway during premises construction and operation which have been considered in this decision report are detailed in Table 1 below. Table 1 also details the control measures the applicant has proposed to assist in controlling these emissions, where necessary.

Table 1: Proposed applicant controls

Emission	Sources	Potential pathways	Proposed controls
Construction			
Dust	Construction of pipeline, pump and bunding.	Air / windborne pathway	Vehicle management & dust suppression are mentioned by the applicant, however no specific controls have been proposed .
Noise	Vehicle movements		No specific controls have been proposed by the applicant.
Operation			
Mine dewater (saline - 6,090 mg/L TDS)	Spills and leaks of mine dewater transported in pipelines	Direct discharge to land	Construction to manufactures recommendations. Adequate secondary containment. Leak detection will be installed on all pipelines and pumping infrastructure. Scheduled inspections of infrastructure will also occur on regular basis during active pumping. Monthly discharge monitoring of parameters as per the Groundwater Operating Strategy
Mine dewater (saline - 6,090 mg/L TDS)	Mine dewatering discharge from Golden Pig Underground into the creek which flows into Lake Koorkoordinate	Direct discharge and infiltration	Initial discharge rates (for water currently within the pit) will be low to prevent mobilisation of salts across the receiving environment. Rock rip rap to be installed at discharge location to slow surface water flows and prevent erosive forces. Vegetation will be monitored to identify impacts to vegetation. If vegetation impacts

Emission	Sources	Potential pathways	Proposed controls
			are detected, discharge rates will be reduced. Reduce discharge rates during rainfall events.

4.1.2 Receptors

In accordance with the *Guideline: Risk Assessment* (DWER 2020), the Delegated Officer has excluded the applicant's employees, visitors, and contractors from its assessment. Protection of these parties often involves different exposure risks and prevention strategies and is provided for under other state legislation.

Table 2 below provides a summary of potential human and environmental receptors that may be impacted as a result of activities upon or emission and discharges from the prescribed premises (*Guideline: Environmental Siting* (DWER 2020)).

Table 2: Sensitive human and environmental receptors and distance from prescribed activity

Human receptors	Distance from prescribed activity
Southern cross residences.	300 metres east of operations.
Environmental receptors	Distance from prescribed activity
Native vegetation.	Surrounding and adjacent to pipeline corridor and Lake Koorkoordine.
Threatened and priority fauna: - <i>Aspidites ramsayii</i> (woma) - <i>Dasyurus geoffroii</i> (chuditch, western quoll) - <i>Falco peregrinus</i> (Falco peregrinus) - <i>Nyctophilus major</i> (central long-eared bat) - <i>Tringa nebularia</i> (common greenshank)	All sighted in the area immediately surrounding the premises and the town of Southern Cross and Lake Koorkoordine.
Underlying groundwater (non-potable purposes).	Underlying premises and within palaeochannel aquifers and fractured rock aquifers. Prior to the development of the Golden Pig Underground in the 1972 the groundwater levels were recorded at approximately 47m below ground level. Exploration undertaken in April/May 2025 shows the groundwater to start between 60 m and 120 m below the surface.
Surface water: - Creek located for discharge (flows into Lake Koorkoordine) - Lake Koorkoordine	- Creek located within the premises and is the discharge point for mine dewater from Golden Pig (2.3 km north of Golden Pig Underground). - Lake Koorkoordine is located 1km north west of the discharge point.

4.2 Risk ratings

Risk ratings have been assessed in accordance with the *Guideline: Risk Assessments* (DWER 2020) for each identified emission source and takes into account potential source-pathway and receptor linkages as identified in Section 4.1. Where linkages are in-complete they have not been considered further in the risk assessment.

Where the applicant has proposed mitigation measures/controls (as detailed in Section 4.1), these have been considered when determining the final risk rating. Where the delegated officer considers the applicant's proposed controls to be critical to maintaining an acceptable level of risk, these will be incorporated into the works approval as regulatory controls.

Additional regulatory controls may be imposed where the applicant's controls are not deemed sufficient. Where this is the case the need for additional controls will be documented and justified in Table 3.

Works approval W2960/2025/1 that accompanies this decision report authorises construction and time-limited operations. The conditions in the issued works approval, as outlined in Table 3 have been determined in accordance with *Guidance Statement: Setting Conditions* (DER 2015).

A licence is required following the time-limited operational phase authorised under the works approval to authorise emissions associated with the ongoing operation of the premises i.e. category 6 activities. A risk assessment for the operational phase has been included in this decision report, however licence conditions will not be finalised until the department assesses the licence application.

Table 3: Risk assessment of potential emissions and discharges from the premises during construction and operation

Risk Event					Risk rating C = consequence L = likelihood	Applicant controls sufficient?	Conditions of works approval	Justification for additional regulatory controls
Source/Activities	Potential emissions	Potential pathways and impact	Receptors	Applicant controls				
Construction								
Construction of pipeline, pump and bunding. Vehicle movements	Dust	Pathway: Air/windborne pathway Impact: Health and amenity	Residences of Southern cross Native vegetation	Section 3.1.1	C = Slight L = Possible Low Risk	N	Condition 1, Table 1: Design and construction requirements.	Dust should be managed during construction works to minimise impact on nearby residences and native vegetation.
	Noise		Residences of Southern cross Threatened fauna	Section 3.1.1	C = Slight L = Possible Low Risk	N	<u>Condition 1, Table 1: Design and construction requirements.</u>	Noise of vehicles and construction activities need to be managed during construction to avoid and minimise impacts to residents and fauna.

Risk Event					Risk rating C = consequence L = likelihood	Applicant controls sufficient?	Conditions of works approval	Justification for additional regulatory controls
Source/Activities	Potential emissions	Potential pathways and impact	Receptors	Applicant controls				
Operation (including time-limited operation)								
Spills and leaks of mine dewater transported in pipelines	Mine dewater (saline - 6,090 mg/L TDS)	Pathway: direct discharge to land Impact: contamination, erosion, death/loss of vegetation health	Residences of Southern Cross Surface water Native vegetation Threatened flora Threatened fauna	Section 3.1.1	C = Slight L = Unlikely Low Risk	N	Condition 9, Table 2: Infrastructure and equipment requirements during time limited operations.	N/A
Mine dewatering discharge from Golden Pig Underground into the creek which flows into Lake Koorkoordine	Mine dewater (saline - 6,090 mg/L TDS)	Pathway: direct discharge and infiltration Impact: loss of vegetation health/death, erosion, contamination	Lake Koorkoordine Groundwater Native vegetation	Section 3.1.1	C = Minor L = Unlikely Medium Risk	N	Conditions 2, 3 and 4 Condition 9, Table 2: Infrastructure and equipment requirements during time limited operations. Conditions 11, 12, 13 and 14	Refer to section 4.3.

Note 1: Consequence ratings, likelihood ratings and risk descriptions are detailed in the *Guideline: Risk Assessments* (DWER 2020).

Note 2: Proposed applicant controls are depicted by standard text. **Bold and underline text** depicts additional regulatory controls imposed by department.

4.3 Detailed risk assessment

4.3.1 Overview of risk assessment

This detailed risk assessment considers the potential for environmental harm associated with the proposed discharge of approximately 1,400,000 tonnes mine dewater per annual period from the Golden Pig pit into Lake Koorkoordine via a nearby creek bed.

The discharge of mine dewater into the creek bed leading to Lake Koorkoordine at an estimated rate of 40 L/s has the potential to cause the following:

- Alterations in surface water chemistry for Lake Koorkoordine - Over the duration of the dewatering, nutrients, salts and metals will be added to the ecosystem. Which could have a negative impact on fauna and flora.
- Adverse impacts to downstream receptors.
- Discharged waters may cause erosion of the creek banks at the discharge location.
- Loss of endemic vegetation communities or protected species - Fringing vegetation community present on the shoreline of lake Koorkoordine contains species known to persist in highly saline environments.
- Loss of habitat of endangered species - One Endangered species with the potential to use the area, Common Greenshank, is migratory and likely to use the habitat on occasion.

4.3.2 Characterisation of emission

Water quality of receiving environment

Surface water samples were collected from Lake Koorkoordine in November 2023 and again in September 2024. Consolidated NATA accredited laboratory results for Lake Koorkoordine are shown in Table 4.

Table 4: Lake Koorkoordine water quality

Sample ID	Sample Type	pH Units	EC (µS/cm)	TDS (mg/L)
Lake Koorkoordine 2023 November	Water (grab sample)	7.26	215,000	337,000
Lake Koorkoordine 2024 September	Water (grab sample)	7.04	239,000	315,000

Dewater discharge water quality

Groundwater samples were collected from the Golden Pig portal in April and September 2024, with the consolidated groundwater monitoring results (as reported by a NATA accredited laboratory) for Golden Pig being shown in Table 5.

Table 5: Golden Pig water quality

Sample ID	Sample Type	pH Units	EC (µS/cm)	TDS (mg/L)
Golden Pig Portal 2024 April	Water (grab sample)	7.42	9,220	5,280
Golden Pig Portal 2024 September	Water (grab sample)	7.34	10,300	6,090

The results of the spot sampling and analysis indicate that the receiving environment for the Golden Pig discharge at Lake Koorkoordine has a greater Electrical Conductivity (salinity), Total Dissolved Solids (TDS) but similar pH to the water stored in the Golden Pig underground.

Water from Lake Koorkkordine is hypersaline and typically neutral with metal concentrations below the limit of detection (exception being total manganese 0.043 and 0.520 mg/L). Golden Pig dissolved metal concentrations are slightly elevated when compared to water from Lake Koorkkordine, however, the Golden Pig Portal metals are generally slightly above the limit of detection or below detection limit. High salinity is consistent with hypersaline groundwater across the area (CDM Smith 2025).

Discharge volumes

Currently there is an estimated total water volume of 2,060,256 kL within the Golden Pig pit which is proposed to be discharged into Lake Koorkkordine. Table 6 provides an estimated total discharge volume over a two-year dewatering campaign to remove the currently stored water from within the pit as well as the potential groundwater recharge during this time.

Table 6: Estimated total discharge volume of mine water from Golden Pig pit

Area	Volume
Underground	2,060,256 kL
Potential recharge during dewatering activities	~86.4 kL/ per day*
Total Estimated Discharge Over Two Years	~2,106,539.80 kL

*Note: calculation estimate as 1L/s, 60 seconds in a minute, 3,600 seconds in an hour, 24 hours in a day, 365 days a year for a two-year dewatering campaign.

The discharge over the 2003/2004 period was 1.2 L/s (103.68 kL per day), a significant reduction from previous years where discharge was around 12 - 15 L/s (CDM Smith 2025). Environmental studies completed at the time found the potential environmental impacts to be not significant due to the salinity of Lake Polaris and existing impacts from surrounding mining and rural development (CDM Smith 2025).

Proposed dewatering rates are estimated to be around 1 L/s, while annual discharge is expected to be less than previous mining campaigns, particularly if groundwater inflows are partially used for mining operations (CDM Smith 2025). The initial volume of water required to be removed from the mine is estimated to be just over 2 GL, and it is expected that a significant portion of this water will flow into Lake Koorkkordine.

4.3.3 Characterisation of potential impact

The discharge of mine dewater from Golden Pig pit has the potential to alter the chemistry and water quality of the receiving environment, which includes the creek bed, Lake Koorkkordine and surrounding vegetation.

Investigations that have been carried out on saline water discharges to salt lakes in the Wheatbelt region (Degens et al., 2018) have suggested that the net acidity of saline discharges is likely the most important parameter that can affect the health of aquatic invertebrates in salt lakes in the region. This Wheatbelt research has indicated that saline water discharges to salt lakes could become toxic to aquatic fauna in these systems if the net acidity of the discharge exceeded approximately -8 mg/L as CaCO₃.

Additionally, native bismuth is a common accessory mineral in the gold mines near Southern Cross (Bloem et al., 1994), and chemical compounds of this element are known to have a high toxicity to aquatic organisms.

A baseline flora and vegetation survey (extent shown in Figure 2) was conducted in 2023 by AECOM (CDM Smith 2025) which did not identify any declared rare or priority flora within the fringing vegetation of Lake Koorkkordine. The fringing vegetation community is described as Tecticornia Samphire Shrublands, with all species within the community known to inhabit saline environments surrounding salt lakes and inland waters.

However, DWER records show that there are several threatened and priority fauna species within and surrounding the prescribed premises (Table 2). Fauna may rely on native vegetation, and as such will benefit from vegetation health monitoring.

Due to the volume of proposed dewater to be discharged into the creek bed that leads directly into Lake Koorkoordine, it is expected that some adverse impacts to surrounding vegetation health and water quality may occur. In addition, there is a significant difference in the EC of the water proposed to be discharged from the Golden Pig pit (Table 5) and the receiving lake (Table 6), and the impacts of this remain largely unknown and will require ongoing monitoring, with management responses in place where impacts to vegetation health and/ or water quality have occurred.

4.3.4 Applicant controls

General controls

The applicant has proposed a number of general controls for minimizing the impacts related to the operation of the mine dewater pipeline. These include:

- Reduce discharge during rainfall events to limit changes to surface water chemistry from large quantities of water entering Lake Koorkoordine.
- All pipelines containing mine dewater are to be provided with secondary containment (bundling) sufficient to contain any spill for a period equal to the time between routine inspections.
- Rock rip rap adequate to slow surface water flows and prevent erosion to the creek bed and banks.
- Pipeline operation will be monitored by telemetry (where installed) and inspected regularly and as required.
- Flow meters to be used on dewatering pipelines.
- Scheduled inspections of infrastructure are to occur on a regular basis during active pumping.
- Initial discharge rates are to be kept low to prevent mobilisation of salts across the receiving environment. Commissioning and ramp up of discharge will include monitoring for downstream impacts such as erosion. The pattern of discharge will be
 - 20Ls for commissioning, likely 1-2 weeks followed by,
 - 1 week at 30Ls followed by,
 - operational discharge of 40Ls.

Water quality and vegetation health monitoring

The applicant has proposed a water quality monitoring program which is based on the existing Groundwater Operating Strategy (CDM Smith 2025a). The monitoring and laboratory analysis includes sample collection from the Golden Pig Portal and Lake Koorkoordine, with sample analysis completed by a NATA accredited laboratory. Current Groundwater Operating Strategy parameters include:

- Metals (Al, As, Cd, Co, Cr, Cu, F, Fe, Hg, Mn, Ni, Pb, Se, Zn)
- Major ions and cations (Ca, Cl, K, Mg, Na, CaCO₃ (bicarbonate alkalinity, carbonate, hydroxide alkalinity), SO₄, SiO₂)
- Silica
- pH, EC, TDS, TSS; and
- Nutrients (Nitrate and Nitrite).

Vegetation health monitoring has also been proposed due to the proximity of native vegetation to the discharge point and the receiving creek and lake, with the majority of vegetation having been identified as being in very good condition (CDM Smith 2025). In addition, Lake Koorkoordine is surrounded by vegetation that is located within a reserve (R 25801) for the purpose of conservation.

Where vegetation monitoring identifies impacts to vegetation, the applicant has proposed for discharge rates to be reduced.

4.3.5 Consequence

Based on the water quality of mine water discharge and the sensitivity of receptors (Lake Koorkoordine and surrounding vegetation) the delegated officer has determined that the impact of discharging mine dewater to the creek bed leading to Lake Koorkoordine (resulting in reduced water quality and impacts to vegetation health) is low-level, off-site impacts. Therefore, the delegated officer considers the consequence to be **'moderate'**.

4.3.6 Likelihood

Based on the water quality of mine water discharge and the proposed controls, the delegated officer has determined that the likelihood of mid-level, on-site impacts or low level off-site impacts from discharging mine dewater to the creek leading to Lake Koorkoordine is **'possible'**.

4.3.7 Overall rating of discharge of mine dewater to Lake Koorkoordine

The delegated officer has applied the consequence and likelihood ratings described above to the Risk Criteria table in the *Guidance Statement: Risk Assessments* (DWER 2020a) and determined that the overall rating for the risk of emissions to Lake Koorkoordine (from high volumes of mine dewater discharge) on sensitive receptors is **'Medium'**.

A risk rating of medium is acceptable but generally subject to regulatory controls. Controls determined to be necessary to mitigate the risk to an acceptable level are detailed in Section 4.3.9.

4.3.8 Regulatory controls

The delegated officer does not consider that the proposed suite of chemical analytes and the sampling frequency in the proposed water quality monitoring program will be adequate for assessing and responding to adverse environmental impacts that could potentially be caused by discharges of dewatering effluent to Lake Koorkoordine.

The delegated officer recommends additional parameters to be added to the water quality monitoring program, as well as additional management measures to ensure an effective response to any perceived impacts to vegetation health and water quality. The additional requirements are set out in detail below.

Water quality monitoring

- The applicant is required to measure the net acidity of the dewatering discharge from the Golden Pig mine site on at least a weekly basis during the dewatering program. The measurements should be carried out using field measurements of total acidity and total alkalinity (Net acidity = total acidity (in units of mg/L as CaCO₃) – total alkalinity (in units of mg/L as CaCO₃). Where the net acidity of discharge water exceeds -8 mg/L as CaCO₃, the discharge water should be lime-treated to reduce net acidity to below the prescribed trigger value.
- The proposed analytical suite for the monitoring program is generally considered to be acceptable, however, native bismuth is a common accessory mineral in the gold mines near Southern Cross (Bloem et al., 1994). Because chemical compounds of this element have a high toxicity to aquatic organisms, bismuth is to be added to the suite of chemical analytes that are measured in the water quality monitoring program.

- There are currently no water quality criteria available to assess the potential impacts of mine dewatering discharges to aquatic organisms in salt lakes in the Goldfields region. Consequently, the Delegated Officer recommends that the ANZ criteria to protect marine organisms are used as triggers for initiating a management response if exceeded in discharges from the Golden Pig mine site. The trigger values are shown in Table 7.

Table 7: Trigger levels for water quality monitoring parameters

Contaminant	Recommended trigger value (µg/L)
Arsenic	4.5
Bismuth	0.7
Cadmium	0.7
Cobalt	1.0
Chromium (VI)	4.4
Copper	8.0
Mercury	0.1
Manganese	80
Nickel	23 (80 th percentile criterion)
Lead	4.4
Selenium	3.0
Zinc	8.0

- Exceedance of the trigger values should trigger a management response. As such, the preparation of a plan for the management and reduction of parameters to below trigger values is required.
- The Delegated Officer has identified three potential and indicative locations for water quality monitoring to regularly occur (Figure 3). Monitoring should ideally occur at the discharge location, within the creek, and within Lake Koorkoordine proper.

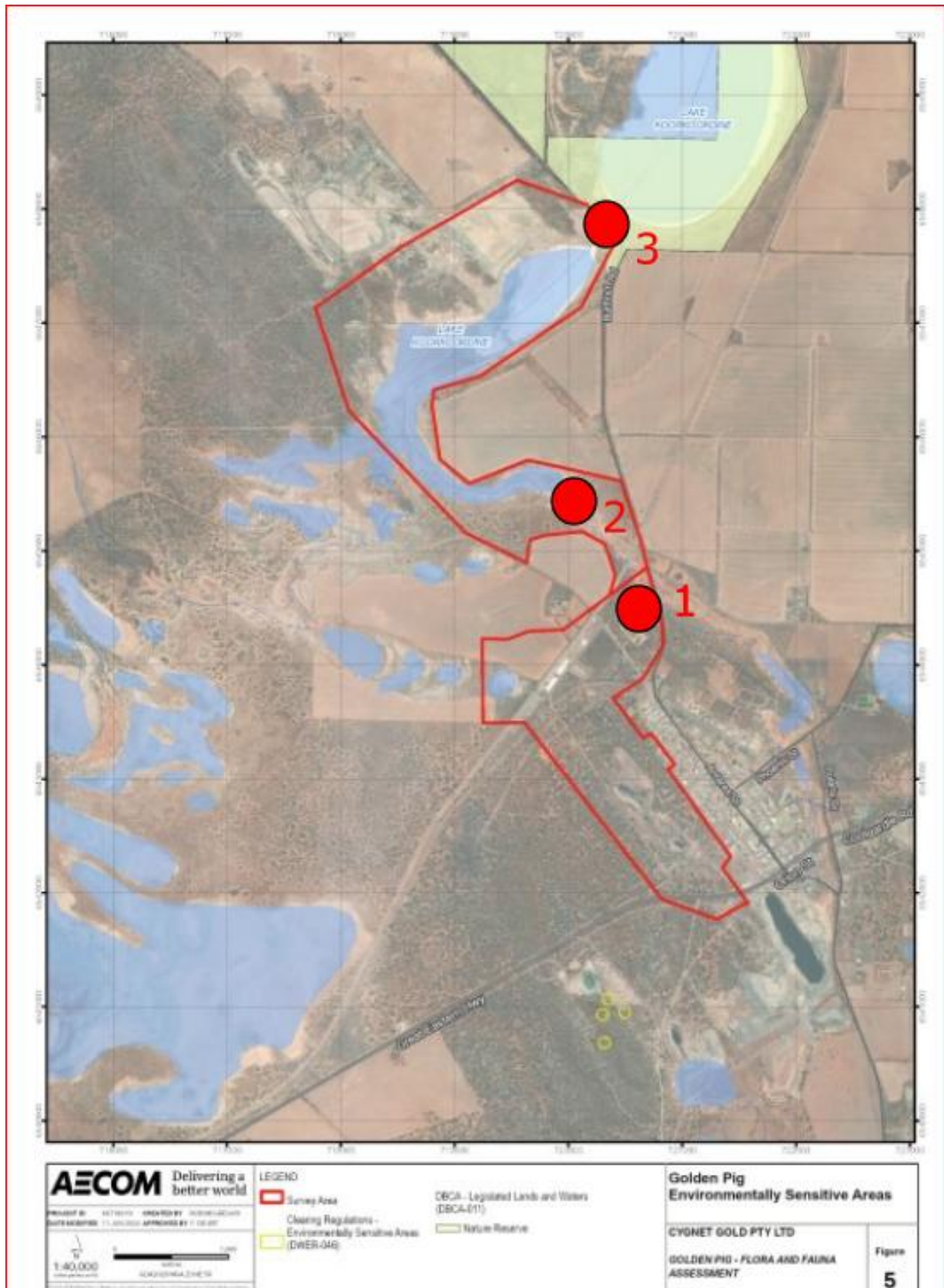


Figure 3: Indicative mine dewater discharge monitoring locations

Vegetation health monitoring

The applicant has proposed vegetation health monitoring; however, the following additional criteria are required to adequately reduce the risk of mine dewater discharge on native vegetation:

- Mine water must be discharged from the mine void to Lake Koorkoordine via the discharge point in a manner that avoids inundating the shoreline at Lake Koorkoordine, with the pipeline extending 20 m from the shoreline and avoids scouring of the surface sediments of Lake Koorkoordine.
- The applicant is to prepare and conduct a vegetation monitoring program which must be carried out at sufficient level of detection to allow comparison with the marine and waters and sediment default values in the current ANZECC/ARMCANZ Guidelines for Fresh and Marine Water Quality.
- Monitoring of aquatic biota (algae, invertebrates (including resting stages)) is to be undertaken by a qualified scientist experienced in biological sampling from salt lakes and that monitoring occurs at the Lake Koorkoordine discharge site and at least two further locations.

5. Consultation

Table 8 provides a summary of the consultation undertaken by the department.

Table 8: Consultation

Consultation method	Comments received	Department response
Application advertised on the department's website on 30 May 2025	N/A	N/A
Shire of Yilgarn advised of proposal on 30 May 2025	N/A	N/A
Department of Biodiversity, Conservation and Attractions (DBCA) advised of proposal on 23 July 2025.	The DBCA responded on 18 August 2025 with the below comments: The applicant is proposing to discharge saline-hypersaline groundwater from Golden Pig underground mine into a nearby drainage channel that flows into Lake Koorkoordine, intersecting Un-named Nature Reserve (R 25801) (the Reserve). The Reserve is vested in the Conservation and Parks Commission and managed by DBCA under the CALM Act for the purpose of conservation of flora and fauna.	Noted. The report has been updated with the relevant information.
	The Reserve contains vegetation considered likely to be representative of the Great Western Woodlands and has the potential to support conservation significant flora including threatened <i>Daviesia</i>	Noted. The report has been updated with the relevant information.

	<i>microcarpa</i> (ranked Critically Endangered) and threatened <i>Eucalyptus crucis</i> subsp. <i>crucis</i> (ranked Endangered). The Reserve may also support conservation significant fauna and associated habitat including threatened malleefowl (<i>Leipoa ocellata</i> , ranked Vulnerable) and chuditch (<i>Dasyurus geoffroii</i> , ranked Endangered).	
	The proposed discharge of mine dewater has the potential to impact the values of the Reserve through changes to surface and groundwater hydrological regimes, and water quality. For example, it is understood that the initial volume of water required to be removed from the mine (2 gigalitres) is four times higher than the previous annual licence limit and that it is expected that a significant portion of this water will flow into Lake Koorkoordine. It is important that the application, if approved, has no direct and/or indirect impact on the Reserve and its associated values.	Noted. The report has been updated with the relevant information.
Department of Mines, Petroleum and Exploration (DMPE) advised of proposal on 30 May 2025	DMPE confirms that the proponent submitted a Mining Proposal (MP) under Registration (Reg) ID 500215, received 24 January 2025 for the Golden Pig underground operations, which is currently under assessment with DMPE.	Noted.
	The proposal details a requirement to dewater to a volume of approximately 2,106,000 kL over two years, to be discharged via a pipeline to an evaporation area nominated as Lake Koorkoordine. This appears consistent with the application for works approval submitted to DWER.	Noted.
	The proposed pipeline configuration differs from that provided for the works approval application, although the discharge point is consistent.	Noted. The Delegated Officer has requested that the applicant confirm the pipeline alignment.
	It is noted that tenure is being applied for at the discharge area (Miscellaneous Licence 77/386). This has not been included under MP Reg ID 500215.	Noted. This has not formed part of this application.
	Regarding the environmental impact, the operational control will influence the final rehabilitation and closure of	The tenement holder / applicant is to be reminded of their obligations to fulfill mine closure tasks as they

	the area. The final disturbance envelope under Reg ID 500215 is likely to only encompass the discharge point and any other supporting infrastructure that is implemented through mechanised means (such as the riprap proposed at the discharge point) and is therefore not likely to encompass the entire disturbed lake area. There will be closure implications once the works approval expires and/or active dewatering ceases; the tenement holder would be responsible for rehabilitation and closure of areas within the disturbance envelope. It is considered that potential impacts to the lake outside the disturbance envelope would be mainly managed under other legislation, not regulated by DMPE.	were submitted to DEMIRS in January 2025 (CDM Smith 2025). As stated, rehabilitation of areas outside of the disturbance envelope remain the responsibility of the applicant and are administered under separate legislation.
	It is recommended that the proponent considers ensuring that the operational discharge is compatible with the proposed Post Mining Land Use (PMLU), in order to meet rehabilitation of the land and closure outcomes under the <i>Mining Act 1978</i> (Mining Act).	Noted, however this should form part of the Mine Closure Plan which falls outside the scope of this application.
	It is recommended that ongoing monitoring includes analysis via statistical significance tests, to allow detection of potential impacts and enable remedial action.	Vegetation health monitoring is proposed by the applicant both as part of the Mine Closure Plan and this application. The Works Approval is proposing to include conditions for the monitoring of vegetation health.
	It is the tenement holder's responsibility to ensure mining operations are conducted in accordance with Mining Act approvals and tenement conditions and to seek further approval or amendments under the Mining Act.	Noted.
	It is additionally noted that the main lake body of Lake Koorkoordine is classed as a Class C nature reserve (R 25801) managed by the Department of Biodiversity, Conservation and Attractions and part of the lake is also managed as a recreational area. The lake is also surrounded by farmland, which may be impacted by the influx of saline water and rise of salinity through groundwater mounding. Potential	Noted. Further advice from DBCA has been sought.

	downstream impacts to users should be appropriately considered.	
Marlinyu Ghoorlie Aboriginal Corporation was advised of proposal on 30 May 2025	N/A	N/A
Applicant was provided with draft documents on 7 October 2025.	Applicant provided response to draft documents on 9 October 2025. Refer to Appendix 1	Refer to Appendix 1

6. Conclusion

Based on the assessment in this decision report, the delegated officer has determined that a works approval will be granted, subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

References

1. Bloem, E.J.M., Dalstra, H.J., Groves D.I. and Ridley, J.R., 1994. *Metamorphic and structural setting of Archaean amphibolite-hosted gold deposits near Southern Cross, Southern Cross Province, Yilgarn Block, Western Australia*. Ore Geology Reviews, 9, 183-208.
2. CDM Smith 2025a, *Groundwater Operating Strategy Cygnet Gold Pty Ltd*, Perth, Western Australia.
3. CDM Smith 2025, *Works Approval Application Supporting Document*, Perth, Western Australia.
4. Degens, B.P., Krassoi, R., Galvin, L., Reynolds, B. and Micevska, T., 2018. *Net acidity indicates the whole effluent toxicity of pH and dissolved metals in metalliferous saline waters*. Chemosphere, 198, 492-500.
5. Department of Environment Regulation (DER) 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
6. Department of Water and Environmental Regulation (DWER) 2020, *Guideline: Environmental Siting*, Perth, Western Australia.
7. DWER 2020, *Guideline: Risk Assessments*, Perth, Western Australia.

Appendix 1: Summary of applicant's comments on risk assessment and draft conditions

DWER information request	Summary of applicant's comment	Department's response
Applicant to confirm pipeline route as it is inconsistent with the route provided for the mining proposal	The discharge pipeline route within the Mining Proposal RegID 500215 has been updated to reflect the works approval application.	Noted. Figure 1 showing the pipeline route to remain unchanged.
Applicant to confirm if the discharge of dewatering will continue after the initial dewatering of the underground	Following dewatering anticipated groundwater recharge into the underground is 1Ls which will be sufficient for operational uses.	Noted. Section 2.2.2 remains unchanged with the inclusion of 1 L/s discharge rates once the initial dewatering has concluded.
Applicant to confirm current depth to groundwater surrounding Golden Pig and the discharge point	Exploration undertaken in April/May 2025 shows the groundwater to start between -60m and -120m from surface.	Table 2 has been updated with this information.
Applicant to provide initial discharge rates	20Ls for commissioning, likely 1-2 weeks, followed by 1 week at 30Ls, followed by operational discharge of 40Ls. Commissioning and ramp up of discharge will include monitoring for downstream impacts such as erosion.	Section 4.3.4 has been updated to include the minimum discharge rates.
Applicant to confirm additional monitoring location and provide updated figures	Cygnat Gold to provide updated monitoring location map following baseline monitoring assessment as per the monitoring in the draft works approval W2960/2025/1. Note: baseline monitoring will commence following approval of the mining proposal (RegID500215) to allow inclusion of any monitoring requirements within that approval.	Noted. Figure 3 will remain an 'indicative' approximation of monitoring points, which will be confirmed by the applicant through baseline monitoring to be undertaken as a requirement of works approval W2960/2025/1.