



Application for Works Approval Amendment

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

Works Approval Number	W5180/2012/1
Works Approval Holder	Poseidon Nickel Limited
ACN	060 525 206
File Number	2012/001172-1~1
Premises	Windara Gold Tailings Project M261SA, M38/1244 and M38/1245 LAVERTON, WA, 6440 As defined by the Premises maps attached to the Revised Works Approval
Date of Report	14 July 2022
Decision	Revised works approval granted

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1. Decision summary

Works Approval W5180/2012/1 is held by Poseidon Nickel Limited (Works Approval Holder) for the Windarra Nickel Project, now renamed Windarra Gold Tailings Project (the Premises), located at mining tenements ML261SA, M38/1244 and M38/1245 in Laverton WA.

This Amendment Report documents the assessment of potential risks to the environment and public health from proposed changes to the emissions and discharges during the construction and operation of the Premises. As a result of this assessment, Revised Works Approval W5180/2012/1 has been granted.

2. Scope of assessment

2.1 Regulatory framework

In completing the assessment documented in this Amendment Report, the department has considered and given due regard to its Regulatory Framework and relevant policy documents which are available at <https://www.der.wa.gov.au>.

2.2 Background

In March 2012, the department granted Poseidon Nickel Limited works approval W5118/2012/1 to construct a new nickel processing plant and associated infrastructure at Mount (Mt) Windarra, 20 km northwest of the town of Laverton in the northern goldfields of Western Australia (WA), at the former site of the WMC Resources Limited nickel and gold processing plants. In June 2012, the department granted Poseidon Nickel Limited an additional works approval W5180/2012/1 to also construct and commission:

- A new gold processing plant at Mt Windarra, for re-processing of tailings reclaimed from the old Mt Windarra gold tailing storage facilities (TSFs) via the hydromining method;
- Tailings and return water pipelines for disposal of combined nickel and gold tailings in the abandoned South Windarra open pit; and
- Dewatering infrastructure for the proposed Cerberus mine, connecting to the Mt Windarra mine water circuit via the South Windarra return water lines.

These proposed developments did not proceed due to a substantial downturn in nickel markets. The Premises (Mt Windarra) is covered by an existing licence L8173/2007/2 for mine dewatering, however this activity has ceased and the licence is being maintained while the premises is in care and maintenance.

Recent developments have resulted in Poseidon Nickel Limited reviewing the feasibility of the re-processing of the Mt Windarra gold tailings from the old Mt Windarra TSF (north and south cells) component of the project and have decided to go ahead with a standalone gold tailings project at the Premises.

This means the works approval holder only intends to construct and commission under W5180/2012/1 the following;

- New gold processing plant for re-processing of tailings reclaimed from the old Mt Windarra gold TSFs located within the premises. Tailings will be reclaimed by a process called hydraulic mining, whereby tailing solids are converted into slurry using high-pressure water; the slurry will then be pumped via pipeline to the processing plant; and
- Tailings and return water pipelines for disposal of gold tailings into the abandoned South Windarra open pit (tailings no longer combined with nickel tailings).

The works approval holder does not intent to construct:

- The Cerberus nickel mine and related dewatering infrastructure proposed under W5180/2012/1; and
- The nickel processing plant and related infrastructure at Mt Windarra proposed under W5118/2012/1.

2.3 Application summary

On 8 December 2020 the Works Approval Holder submitted an application to the department to amend Works Approval W5180/2012/1 under section 59 and 59B of the *Environmental Protection Act 1986* (EP Act).

The following amendments are being sought, in addition to the already approved gold processing plant and the reprocessing of tailings from the old Mt Windarra TSFs via a hydromining method:

- Allow for the construction of a tailings trench for the storage of tailings and the re-processing of tailings re-claimed from old tailings dams at Lancefield, approximately 17km southeast of the Premises. Expected rate of around 180 tonnes per hour or 1.5 million tonnes per annum (Mtpa).
- the inclusion of an alternative method to the (already assessed) hydromining method for the recovery of tailings from the old TSFs at mount Windarra. This option would involve a dredging method to reclaim tailings and would include the unloading of the Lancefield tailings directly into the old Windarra North TSF instead of into a tailings trench as outlined in the above point. The applicant would like both options to be covered by the works approval.
- Allow for the change in tailings composition into the proposed South Windarra in-pit TSF. Tailings no longer combined with nickel tailings and now includes gold tailings produced from the reprocessing of tailings from an additional source (Lancefield tailings).

Infrastructure already approved for construction under W5180/2012/1 includes the:

- stand-alone gold processing plant for the re-processing of tailings from the old Mt Windarra TSFs; including associated hydraulic mining infrastructure; and
- the infrastructure for the disposal of the tailings from the gold re-processing plant (tailings and return water pipelines, pumps etc) to the South Windarra in-pit TSF

This infrastructure will be constructed as set out in the original works approval application documents and no changes are proposed (other than minor changes where processing plant infrastructure was to connect to the nickel processing plant approved under W5118/2012/1). As a result, a risk assessment will not be carried out regarding the emissions and discharges associated with the *construction* of the gold processing plant and hydromining infrastructure at the old Mt Windarra TSFs as this has already been completed during the original works approval application assessment.

Time limited operation conditions will be added to the works approval as part of this amendment and therefore emissions and discharges associated with the *operation* of the processing plant, pipelines and hydromining infrastructure at the old Mt Windarra TSF have been re-assessed.

The works approval holder is not at this stage planning to construct the Cerberus nickel mine dewatering infrastructure already approved under W5180/2012/1 but would like this infrastructure to remain on the works approval in case plans change. A reassessment of the risks involved with the operation of the Category 6 infrastructure has not been carried out during this amendment and therefore time limited operation phase for the Category 6 infrastructure has not been approved under this amendment.

2.3.1 Re-processing of third-party tailings (Lancefield tailings).

The Works Approval holder is proposing to re-claim tailings from old tailings dams at Lancefield, about 17km southeast of Mt Windarra. It is expected that approximately 1.2 Million tonnes (Mt) of tailings will be reclaimed over nine to twelve months. The Lancefield tailings are a dry stacked tailings/stockpile and as such can be reclaimed by mechanical mining methods (digging machinery and front-end loaders). Once mined the tailings will be loaded and trucked to the premises approximately 17 km away via Eristoun Road. Prime movers with side-tipping trailers in a triple road train configuration are proposed to haul the tailings to the Premises.

The reprocessing of the Lancefield tailings once at Mt Windarra will occur via one of the following two methods:

1: Storage trench and hydromining of Lancefield tailings.

At Mt Windarra, the Lancefield tailings will be unloaded (side tipped) into a trench which has been constructed within a raised ROM pad, (see Figure 2). The trench will be sized to contain tailings unloaded from three, four trailer road trains (240 m³ total volume of material) to provide a buffer of several hours for any process faults or tailings haulage interruptions

The trench will have a volume of about 1,000 m³ and will be operated to maintain at least 0.25 m of freeboard, substantially more than the estimated 1:100 year 72-hour ARI rain event of about 0.17 m. The trench will be lined with High Density Polyethylene (HDPE) and the pad into which the trench will be cut will be constructed from clayey mine waste material reclaimed from the tailings dams and built up in compacted layers to form low, stable landform about 2 meters above ground level.

Once in the trench, the Lancefield tailings will be made into a slurry and washed along the trench by water cannons similar to those proposed for hydraulic tailings mining in the adjacent Mt Windarra TSFs. A barge pump will be installed in the sump at the deep end of the trench to recover tailings to the tailings screening and pumping station (approved under the original works approval for the hydraulic mining of the old Windarra TSFs) for transfer by pipeline to the processing plant.

A bypass pipe from the barge pump, or a separate submersible pump, will be used to reclaim surplus water from high rainfall events to the hydraulic mining pumping and screening plant area, to be pumped to the process plant Leach Feed Thickener along with the process slurry.

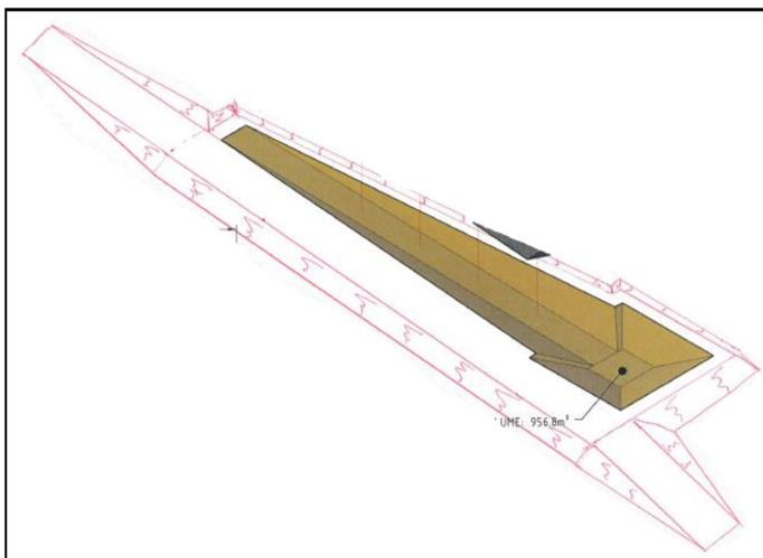


Figure 2: Design concept drawing of the proposed Lancefield tailings storage trench.

2: Tipping of Lancefield tailings into Windarra North TSF and dredging of tailings

The Lancefield tailings will be side-tipped into the Windarra North TSF and reprocessed via dredging method outline in section 2.3.2 (see Figures 3 and 4). To facilitate the tipping of tailings into the Windarra North TSF a tailings unloading area with ramps will need to be constructed at the Windarra North TSF. This will consist of:

- An access point for the road train side-tippers from the proposed material transport route to the nominated discharge point at the north-eastern corner of the Windarra North TSF.
- An incline and decline ramp constructed parallel to the perimeter wall of the Windarra North TSF.
- A suitable discharge platform between ramps to facilitate the side-tipping (by others) of third party tailings material into the Windarra North TSF dredge zone (Figure 4).
- The discharge platform will be graded toward the TSF to contain all dumped or spilled tailings and ensure any runoff is directed into the TSF dredge zone.
- It is proposed that the ramp infrastructure will be constructed from capping materials recovered and stockpiled from the Windarra North TSF.

Tailings will be side tipped into the TSF to be recovered directly by a dredge with a loader available to assist with pushing tailings into the dredge zone and recovering any spillage.

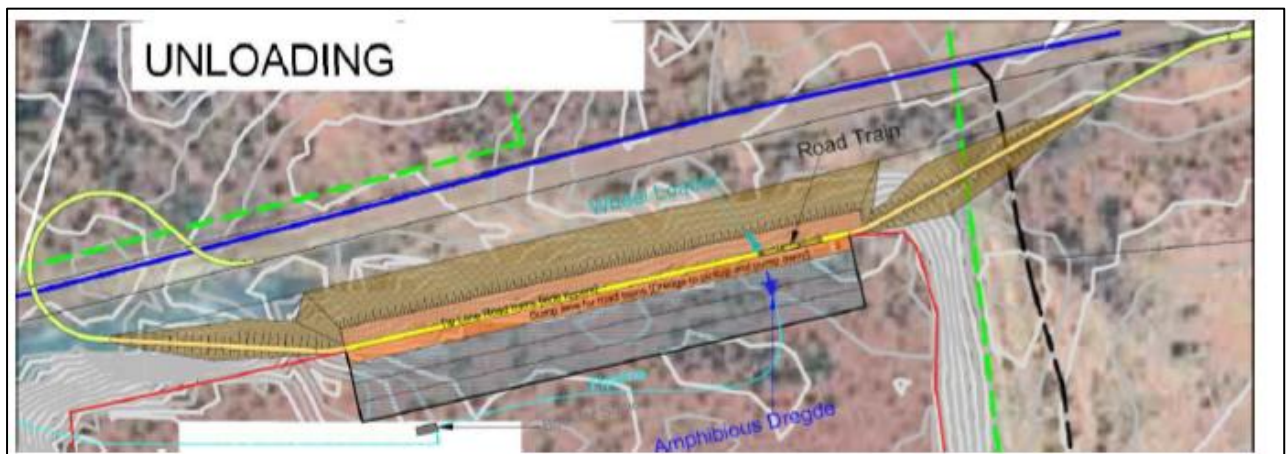


Figure 3: Tailings unloading facility for dredging option

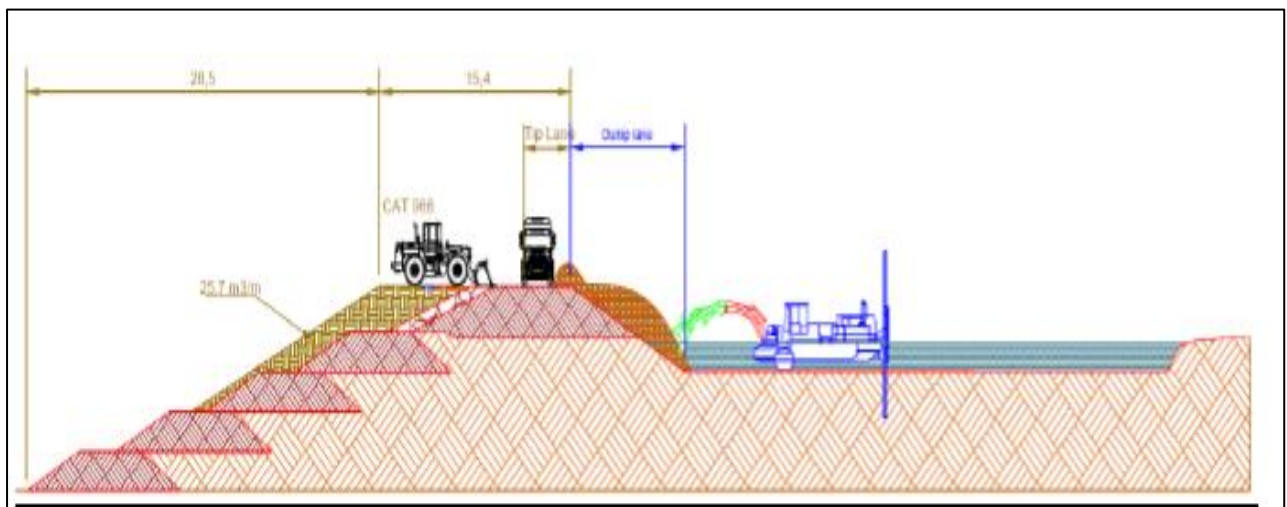


Figure 4: Depiction of third-party tailings discharge into the North Windarra TSF and dredging option.

2.3.2 Tailings recovery via dredging method (alternative option to hydromining)

Dredging is proposed as an alternative method of tailings recovery from the old onsite TSFs to hydraulic mining. One of the two methods will be selected prior to commencement of tailings recovery and therefore the applicant has requested that both options are covered by this works approval. The hydromining method has already been approved as per the existing works approval.

The dredging option will involve the installation of a dredge pipeline (HDPE) from the Mt Windarra North TSF to the processing plant and a relocatable diesel booster pump within the TSF. The location of the booster pump will move to three different positions, when necessary, within the TSFs over the duration of the dredging program. All positions will be located within the existing TSF structure such that any spillage of tailings / hydrocarbons will be contained within the TSFs.

Once the pipeline and booster pump has been installed, dredging will commence with a starter pond being excavated in the north-east corner of the Windarra North TSF. This will allow a cut (trench) to be established so an amphibious dredge can be launched and will provide capacity to receive the Lancefield tailings as outlined in section 2.3.1.

The starter pond would form a 'pocket' within the TSF where the dredge could operate, allowing the vessel to progressively remove nearby tailings materials until the surrounding 'cut' is complete. This 'pocket' would progress to a 4 metre cut depth, at all stages requiring 500mm of water above the tailings level for the dredge to operate within. Upon completion of the dredge pocket, the vessel would focus on the recovery of materials at the 'dredge face' where the cutter head would target the material zone below the 500mm water depth (Figure 4). Dredging would progress across the TSF in the same sequence as proposed for hydraulic mining until the cut is completed. The same sequence would then be followed for the next 4m 'cut'. Progressive lowering of the water level will be achieved as the tailings level drops.

The TSF wall will be progressively decommissioned in parallel with the dredging works while maintaining freeboard above the remaining tailings surface to contain tailings and the dredge pond.

When capping removal, dredging and decommissioning of the Windarra North TSF is complete, the amphibious dredge will be removed from the North TSF and repositioned in the south-west corner of South TSF. Along with the relocation of the booster pump and reconnection of the dredging pipeline this will allow the amphibious dredge to undertake the proposed mining direction sequence previously set out for the hydraulic mining option. A similar approach to dredging to Windarra North TSF would be undertaken.

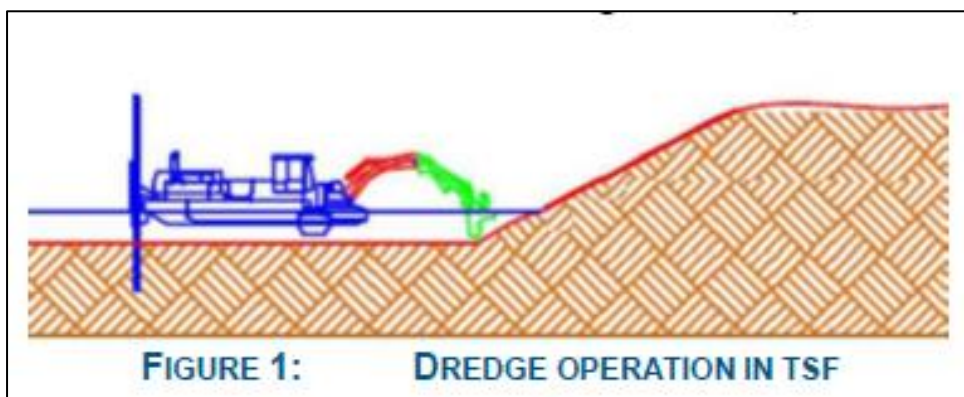


Figure 4: Diagram depicting a dredge operating within a TSF.

Water required for dredging will be sourced as for the hydraulic mining option. The quantity of water used will be higher than hydraulic mining due to the requirement to maintain a 0.5m

depth of water over the dredge pond. The pond will vary in size, reaching a maximum size towards the end of each of the two 4 m cuts required for the 8 m depth northern cell, at which time the pond will cover approximately 10,000 m².

The dredge is proposed to operate 24 hours per day, 7 days per week. Recovery of Lancefield tailings would take approximately 9-12 months. Windarra North tailings would then be recovered over a further 30 months and then another 7 months would be required to recover the Windarra South tailings.

2.3.2 Deposition of gold only tailings into proposed South Windarra in-pit TSF

The abandoned South Windarra pit will be used as an in-pit TSF for disposal of the process tailings from the gold processing plant. Mining at the South Windarra pit ceased in 1994, with the pit cut to 120 meters deep and having a surface area at the pit rim of 27 hectares (ha). Since the cessation of mining, groundwater inflows have flooded the pit with the current water surface being 15 meters below the pit rim.

The original works approval approved the disposal of a combined gold and nickel tailings into the South Windarra Pit. This amendment application will assess any changes in the risk to the environment due to no longer disposing of the nickel tailings into the pit as well as the addition of the Lancefield tailings as plant feed and how this impacts tailings composition and the water balance within the pit.

Tailings and return water pipelines will run for approximately 17 km between Mt Windarra processing plant and the South Windarra in-pit TSF (see Figure 2). The topography of the pipeline corridor is relatively flat, though will cross an ephemeral local drainage system that comprises a few minor drainage lines, and more substantial drainage line crossings at Beasley Creek and one of its tributaries.

The Works Approval Holder will;

- Raise the pipelines above ground level at minor drainage line crossings to provide corridor drainage points.
- At the more substantial Beasley Creek and tributary crossings, the Works Approval Holder proposes to bury the pipeline for protection.
- Install flow sensors at both ends of the tailings pipeline for leak detection; any difference in flow detected for more than five minutes will set off an alarm. Isolation valves will be installed at appropriate intervals along the pipelines. The tailings and return water circuit will be monitored by telemetry, incorporated into a "Citect" process control system.
- Construct earthen bunds and catch pits (sumps) at appropriate intervals and at low points along pipeline corridor. The pits will be sized to provide containment of about 140 m³, to allow for at least 30 minutes of typical tailings flow at 280 m³/hr.

This infrastructure has already been assessed as part of the original works approval application and no change has been proposed.

The works approval holder plans to sub-aerially deposit tailings into the flooded South Windarra Pit where the tailings are expected to settle beneath the water level. Tailings will be deposited by a single open pipe discharge at the deepest (central-west) part of the pit.

Water will be reclaimed from the eastern end of the pit lake, about 1 km from the discharge point and sent back via return water pipeline to the processing plant. The works approval holder intends that the water return will reclaim over 100% of the water in tailings inflow, to make up for evaporative and other process losses.

Tailings deposition will be managed in accordance with a TSF operations manual which will

include management controls including water return, maintenance of a freeboard and groundwater monitoring. These controls are outlined within Table 1. A map showing the location of groundwater monitoring bores is show in Figure 3.

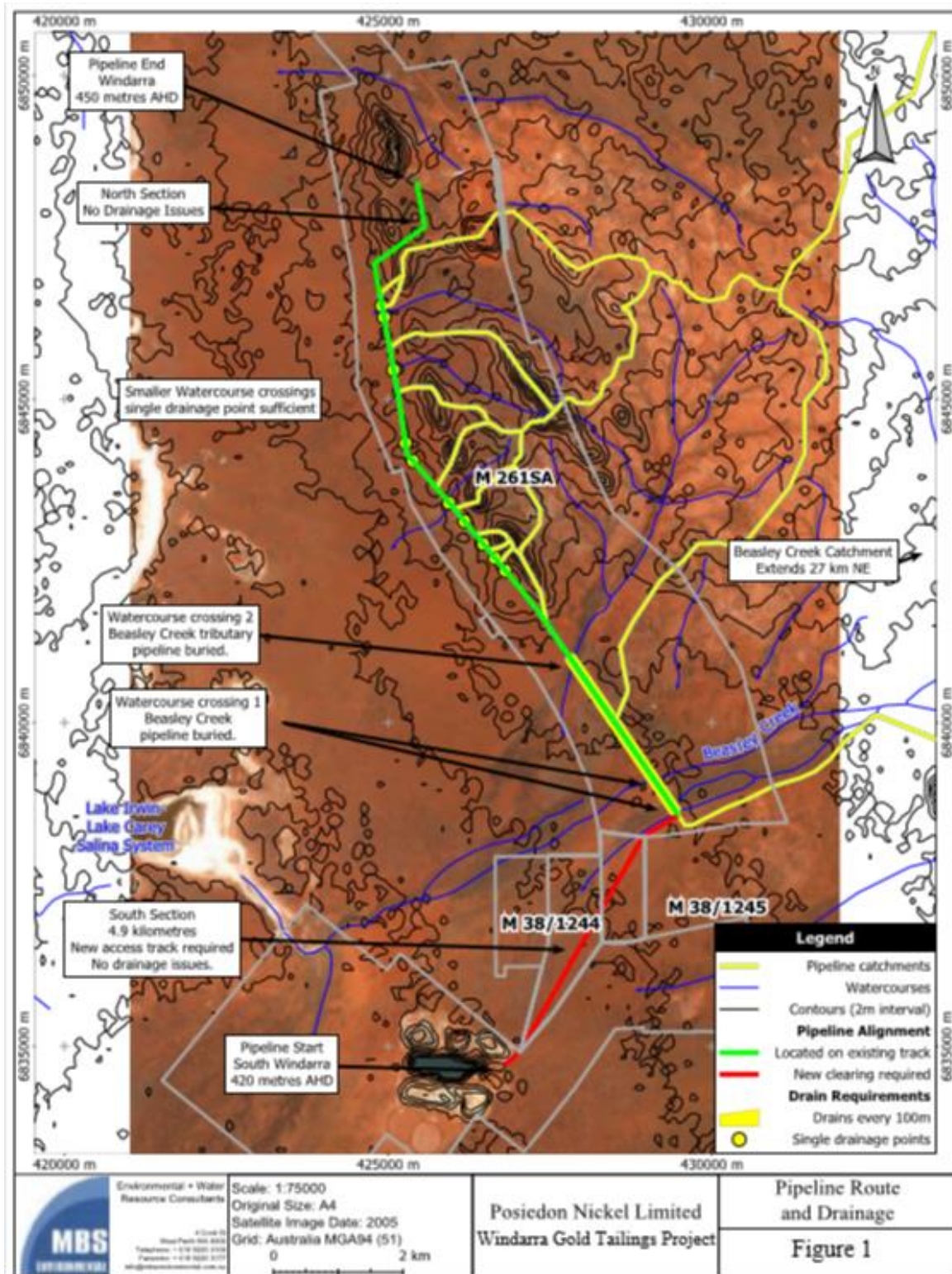


Figure 2: Location of tailings and return water pipelines from the Windarra Gold processing plant to the South Windarra in-pit TSF.

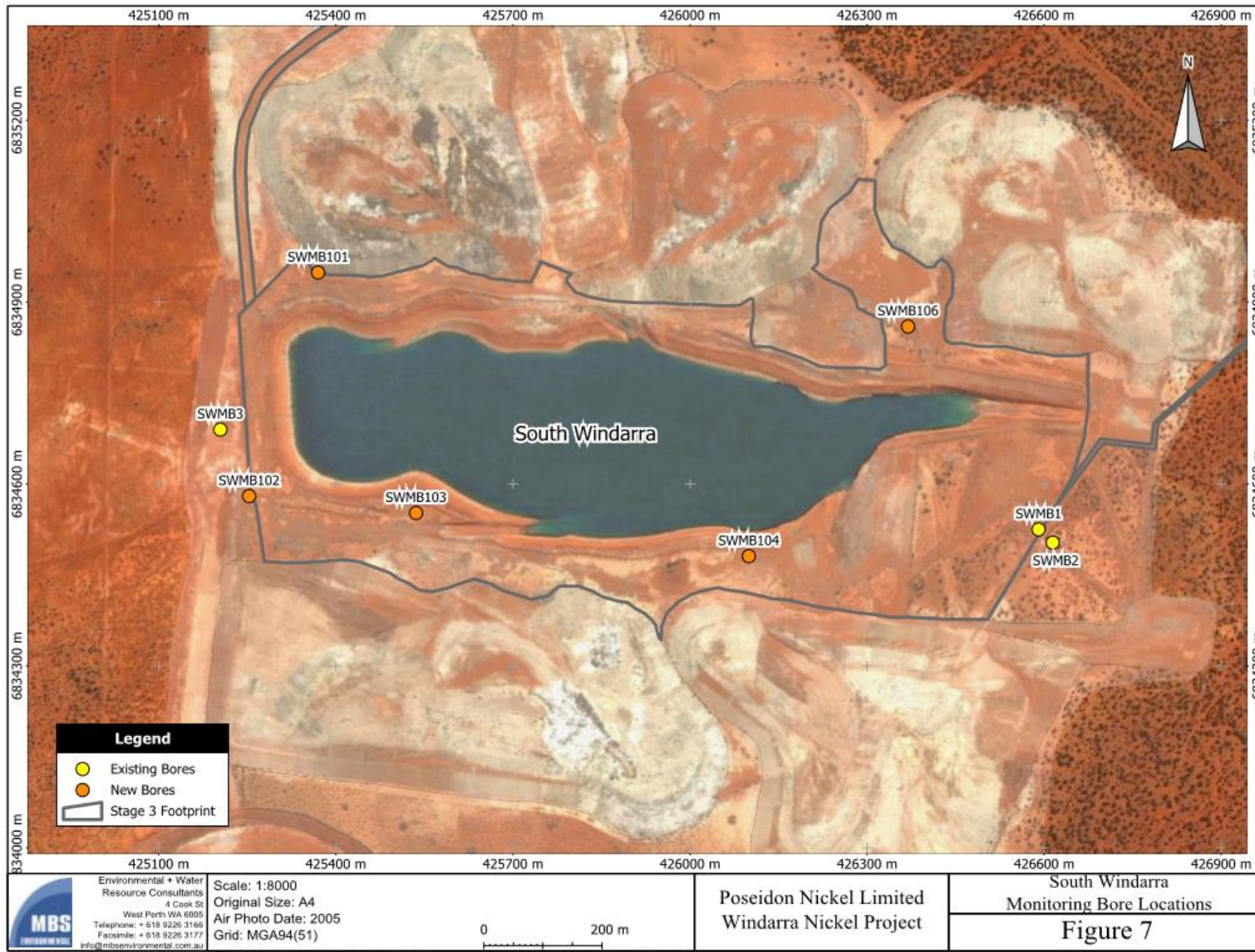


Figure 3: Location of groundwater monitoring bores surrounding the South Windarra in-pit TSF.

3. 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 *Guidance Statement: Risk Assessments* (DER 2017).

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.

3.1 Source-pathways and receptors

3.1.1 Emissions and controls

The key emissions and associated actual or likely pathway during premises construction and operation which have been considered in this Amendment Report are detailed in

Table below.

Table also details the proposed control measures the Works Approval Holder has proposed to assist in controlling these emissions, where necessary.

Table 1: Works Approval Holder controls

Emission	Sources	Potential pathways	Proposed controls
Construction of Lancefield tailings storage trench and associated infrastructure			
Dust	Vehicle movements, and earthworks	Air/windborne pathway	Dust suppression water sprays will be applied during construction.
Noise	Vehicle movements, and earthworks	Air/windborne pathway	Motors, engines, and generators will be fitted with sound attenuating measures, and operated in accordance with manufactures specifications
Construction of Dredging infrastructure, including tailings unloading area at Mt Windarra North TSF			
Dust	Vehicle movements, and earthworks	Air/windborne pathway	Dust suppression water sprays will be applied during construction.
Noise	Vehicle movements, and earthworks	Air/windborne pathway	Motors, engines, and generators will be fitted with sound attenuating measures, and operated in accordance with manufacturer's specifications
Operation (Lancefield tailings storage)			
Leachate	Lancefield tailings storage trench and hydraulic mining process.	Seepage to soils and groundwater	<ul style="list-style-type: none"> Trench will be constructed above ground within a ROM pad constructed from clayey material. Trench will be lined with HDPE. Lancefield tailings will only be stored within the trench for a short period of time (10 – 12 months).

Emission	Sources	Potential pathways	Proposed controls
			<ul style="list-style-type: none"> Stormwater runoff will be prevented from entering the trench as it will be constructed 2 meters above ground level). Surplus water within the trench will be pumped out and returned to the processing plant.
Dust	Dumping of dry Lancefield tailings into storage trench	Air/windborne pathway	<ul style="list-style-type: none"> Dust suppression water sprays will be applied while unloading of tailings is taking place Suspension of unloading operations when dust cannot be adequately controlled.
Discharges to land	Pipeline leaks or spills from tailings pipeline to processing plant	Direct discharge to land	<ul style="list-style-type: none"> Tailings slurry screening and pumping station installed within an impermeable bunded compound to contain spills from hose or other equipment failures. The tailings slurry transfer line to the processing plant will be over a few hundred meters and will have flow meters at inlet and outlet for leak detection.
	Overtopping of trench.	Direct discharge to land	<ul style="list-style-type: none"> The trench is sized to contain, with margin, tailings unloaded from up to three, four-trailer road trains to provide a buffer of several hours for any process faults or tailings haulage interruptions. The trench will be operated to maintain at least 0.25 m of freeboard, substantially more than the estimated 1:100 year 72-hour ARI rain event of about 0.17 m. Tipping of tailings into trench will be controlled to prevent tailings slurry and water from overtopping the far side of the trench. A loader will be available on site to assist with recovery of any tailings that spill out of the trench.
Operation of the Lancefield tailings unloading area at Mt Windarra North TSF			
Dust	Dumping of dry Lancefield tailings into Mt Windarra North TSF.	Air/windborne pathway	<ul style="list-style-type: none"> Dust suppression water sprays will be applied while unloading of tailings is taking place Suspension of unloading operations when dust cannot be adequately controlled.

Emission	Sources	Potential pathways	Proposed controls
Discharges to land	Spills to land during unloading of tailings	Direct discharge to land	<ul style="list-style-type: none"> Tipping of tailings into the North TSF will be controlled to prevent tailings spills. A loader will be available on site to assist with recovery of any tailing spills. Discharge platform will be graded towards the TSF to contain all dumped or spilled tailings and ensure any runoff is directed into the TSF.
		Seepage to groundwater	
Operation (Dredging of Mt Windarra TSFs to recover tailings, including Lancefield tailings).			
Dust	Dredging activities within the old TSFs.	Air/windborne pathway	Water sprays will be applied to the tailings surface as it dries out to mitigate potential dust emissions
Discharges to land	Pipeline leaks or spills from tailings pipeline to processing plant	Direct discharge to land	<ul style="list-style-type: none"> Dredger and water reclaim HDPE pipelines to the processing plant (including boosting pumps) will mostly be located within the TSF embankments where spills and leaks will be captured. The tailings slurry and water reclaim pipelines to the processing plant will be over a few hundred meters and will have flow meters at inlet and outlet for leak detection Regular inspections of the infrastructure will occur for leak detection.
	Overtopping or escape of tailings from old TSFs	Direct discharge to land	A freeboard will be maintained to prevent overtopping of the TSF.
Leachate	Seepage from base and walls of old Mt Windarra TSFs.	Seepage to groundwater	<ul style="list-style-type: none"> Dredging and water reclaim will be managed to minimise the amount of water within the TSF cells to limit potential for seepage. Note: a 0.5m cover of water is required over the tailings for the dredge to operate. Dredging activities will be progressive over 2 – 3 years and will empty the old TSF of tailings preventing ongoing seepage. Works approval holder is proposing to monitor groundwater levels monthly and groundwater quality quarterly in the existing monitoring bores adjacent to the old TSFs to monitor for seepage.
Operation (Hydromining Mt Windarra TSFs to recover tailings)			

Emission	Sources	Potential pathways	Proposed controls
Dust	Hydromining activities within the old TSF	Air/windborne pathway	Water sprays will be applied to the tailings surface as it dries out to mitigate potential dust emissions
Discharges to land	Pipeline leaks or spills from tailings pipeline to processing plant	Direct discharge to land	<ul style="list-style-type: none"> • Tailings slurry screening and pumping station installed within an impermeable bunded compound to contain spills from hose or other equipment failures. • The tailings slurry transfer line to the processing plant will be over a few hundred meters and will have flow meters at inlet and outlet for leak detection. • Regular inspections of infrastructure
	Overtopping or escape of tailings from old TSFs	Direct discharge to land	<ul style="list-style-type: none"> • Hydromining will be carried out within the embankments of the old Mt Windarra TSFs • Hydromining activities will be set back from the embankments.
Leachate	Base and walls of old Mt Windarra TSFs	Seepage to groundwater	<ul style="list-style-type: none"> • Water ponding will be managed to minimise the amount of water within the TSF cells to limit potential for seepage. • Works approval holder is proposing to monitor groundwater levels monthly and groundwater quality quarterly in the existing monitoring bores adjacent to the old TSFs to monitor for seepage.
Operation (gold tailings processing plant)			
Noise	Processing plant	Air/windborne pathway	Motors, engines, and generators will be fitted with sound attenuating measures, and operated in accordance with manufactures specifications
Discharges to land	Spills and leaks of hydrocarbons and processing reagents	Direct discharge to land	<ul style="list-style-type: none"> • Containment and recovery of reagent spills for return to process or tailings. • Spill response kits and procedures in place • all liquid reagents and fuels will be stored in bunded areas with the capacity to hold 110 % of the largest vessel according to Australian Standards AS1940-2004 <i>Storage and handling of flammable and combustible liquids</i> and AS1692-2006 <i>Steel tanks for flammable and combustible liquids</i>. • Fuel and reagent tanks will have high

Emission	Sources	Potential pathways	Proposed controls
			<ul style="list-style-type: none"> level alarms to prevent overflow. Regular inspections of infrastructure
	Contaminated stormwater runoff	Direct discharge to land	<ul style="list-style-type: none"> Diversion drains will be constructed around the processing plant reporting to sediment traps sized for a 1 in 10-year 24-hour rain event. Sediments traps will be inspected after heavy rains and cleaned out to maintain capacity, as necessary.
Operation (deposition of tailings into South Windarra in-pit TSF)			
Discharges to land	Overtopping of in-pit TSF	Direct discharge to land	<ul style="list-style-type: none"> A 5-meter freeboard will be maintained. Regular inspections of the freeboard will take place. Modelling indicates there is sufficient capacity within the pit to prevent overtopping. Drainage diversions and bund will be repaired or constructed around the pit to prevent stormwater inflow.
	Pipeline spills or leaks	Direct discharge to land	<ul style="list-style-type: none"> Pipelines elevated above ground level at minor drainage line crossings; buried at major drainage line crossings to protect pipeline. Pipelines installed within bunded corridor with catch pits at appropriate intervals and locations. The pits will be sized to provide containment of about 140 m³, to allow for at least 30 minutes of typical tailings flow at 280 m³/hr; the corridor bunds will provide further containment. Isolation valves installed on pipeline at appropriate intervals Pipelines will be inspected on a regular basis. Flow metering and leak detection will be installed on both tailings and return water pipelines. High level detection on return water tank.
Leachate	In-pit TSF – mounding and contaminates in groundwater	Seepage to groundwater	<ul style="list-style-type: none"> Modelling indicates that the in-pit TSF is likely to act as a groundwater sink. Groundwater monitoring bores have been installed around in-pit TSF to

Emission	Sources	Potential pathways	Proposed controls
			<p>monitor sanding water levels and water quality.</p> <ul style="list-style-type: none"> • Baseline groundwater quality monitoring will take place prior to deposition of tailings. • Standing water level trigger value of 5mbgl will be applied to monitoring bores surrounding in-pit TSF. Actions will be taken to reduce groundwater mounding in the event of trigger level being reached. • Trigger values for a number of parameters have been developed to compare groundwater quality results. • In the event that monitoring indicates an exceedance of trigger values or a trend towards trigger values, Poseidon will engage a hydrogeologist and/or environmental geochemist to review the data, assess the possible causes, and propose corrective actions, which may include: <ul style="list-style-type: none"> - disposal of excess water via the existing licensed mine water discharge infrastructure at Mt Windarra, the existing evaporation ponds at South Windarra, or some other means, subject to water quality criteria and approval by DWER. - In the event that free cyanide concentrations exceed trigger values, review of operations and pit lake solute balance modelling will be undertaken in consultation with a hydrogeologist. If required, consideration may be given to change processing or tailings treatment in consultation with DWER • Management will be guided by the South Windarra Pit Tailings Storage Facility Operations Manual, and other applicable Department of Mines, Industry Regulation and Safety (DMIRS) guidelines

3.1.2 Receptors

In accordance with the *Guidance Statement: Risk Assessment* (DER 2017), the Delegated Officer has excluded employees, visitors and contractors of the Works Approval Holder's from

its assessment. Protection of these parties often involves different exposure risks and prevention strategies and is provided for under other state legislation.

Table 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 (*Guidance Statement: Environmental Siting* (DER 2016)).

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

Sensitive receptor	Distance from prescribed activity
Human receptors	
Town of Laverton	Situated approximately 10 km southeast of the Premises. Given the significant distance, the Delegated Officer does not consider that emissions and discharges from the premises would impact this receptor. Therefore, this receptor is not considered in this risk assessment.
Members of the public visiting the Mt Windarra heritage trail (Reserve 45177).	Within the prescribed premises boundary. Directly adjacent to the gold processing plant area.
Environmental receptors	
Public Drinking Water Area: Laverton Water Reserve and Catchment Area (P1)	Directly east of premises boundary up hydraulic gradient. Approximately 5.5km east of gold processing plant area and approximately 6.5km northeast of proposed South Windarra in-pit TSF.
Designated area – <i>RIWI Act 1914</i>	Premises located within the Goldfields Groundwater Area.
Priority ecological communities	Laverton Downs calcrete groundwater assemblage type on Carey palaeodrainage on Laverton Downs Station (stygofauna). Laverton downs calcrete: overlaps with the premises boundary to the north. Edge of buffer zone is approximately 6.5km from North West of South Windarra in-pit TSF. Given the significant distance, the Delegated Officer does not consider that emissions and discharges from the premises would impact this receptor. Therefore, this receptor is not considered in this risk assessment.
	Mount Morgan calcrete groundwater assemblage type on Carey palaeodrainage on Mt Weld Station. 11km south-west of the South Windarra in-pit TSF. Given the significant distance, the Delegated Officer does not consider that emissions and discharges from the premises would impact this receptor. Therefore, this receptor is not considered in this risk assessment.
	Mount Jumbo Range vegetation complex (banded ironstone formation). 12km south-east of the South Windarra in-pit TSF.

	Given the significant distance, the Delegated Officer does not consider that emissions and discharges from the premises would impact this receptor. Therefore, this receptor is not considered in this risk assessment.
Lake Irwin Salina	Directly adjacent to southern premises boundary. Approximately 3km North-west of the South Windarra in-pit TSF.
Ephemeral creeks	Several unnamed, minor, ephemeral drainage lines run from the north-western flank of a quartz ridge (Mt Windarra itself) and cross the proposed project site from southeast to northwest, before dissipating into the plains. A minor ephemeral drainage line is located approximately 5.4km west of the processing plant area.
Groundwater	Groundwater Resource Management (GRM) carried out a survey of baseline conditions within and around the South Windarra pit in 2011 as part of hydrogeological investigations for the combined nickel and gold projects proposed in the original submissions for works approval W5180. GRM recorded the pit lake level at the time as 403 mAHD, 11 to 15 m below the surrounding ground level (mBGL) of 414 to 418 mAHD, and water levels of 403 to 406 mAHD in surrounding monitoring bores, indicating gradients consistent with groundwater flows from northeast to southwest through the pit lake. GRM identified no groundwater dependent ecosystems or listed ecological communities near South Windarra; while listed ecological communities associated with calcrete habitats have been identified in the wider region, no such habitat has been identified near South Windarra. There are 11 stock watering bores within 5km of the South Windarra in-pit TSF. Not all are operational. The closest operational bore is Escott Well which is located approximately 2km south-west of the proposed in-pit TSF (down hydraulic gradient). Groundwater salinity within the shallow aquifer in the immediate vicinity of the mine ranges from 3,600 mg/L to the east to 66,000 mg/L to the southwest (saline to hypersaline).
Underlying soils	The Windarra area is generally characterized by red, brown calcareous earths on slopes, with thick development of textured sandy and sub-saline clay soils near the lower parts of drainage systems. Soils in the project footprint are clay rich (indicating low permeability) and moderately acidic to near-neutral (pH 4.8 – 6.9), with typically low salinity other than in some more saline deep subsoil and regolith material.

3.1 Risk ratings

Risk ratings have been assessed in accordance with the *Guidance Statement: Risk Assessments* (DER 2017) for those emission sources which are proposed to change and takes

into account potential source-pathway and receptor linkages as identified in Section 3.1. Where linkages are in-complete they have not been considered further in the risk assessment.

Where the Works Approval Holder has proposed mitigation measures/controls (as detailed in Section 3.1), these have been considered when determining the final risk rating. Where the Delegated Officer considers the Works Approval Holder'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 Works Approval Holder's controls are not deemed sufficient. Where this is the case the need for additional controls will be documented and justified in Table 3.

The Revised Works Approval W5180/2012/1 that accompanies this Amendment Report authorises construction and time-limited operations. The conditions in the Revised Works Approval 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. A risk assessment for the operational phase has been included in this Amendment 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 operations

Risk Event					Risk rating ¹ C = consequence L = likelihood	Works Approval Holder's controls sufficient?	Conditions ² of works approval	Justification for additional regulatory controls
Source/Activities	Potential emission	Potential pathways and impact	Receptors	Works Approval Holder's controls				
Construction								
<i>Activity:</i> Construction of the gold processing plant infrastructure / hydraulic mining infrastructure and tailings /return water pipelines to the south Windarra in-pit TSF	Emissions and discharges associated with the construction of the gold processing plant /hydraulic mining infrastructure and tailings/return water pipeline to the in-pit TSF have already been assessed under the original works approval and therefore will not be re-assessed as part of this amendment. No changes to this infrastructure have been proposed as part of this amendment.							
<i>Activity:</i> Construction of Lancefield tailings storage trench including earthmoving equipment and movement of vehicles	Dust	Air/windborne pathway causing impacts to health and amenity	Public visiting Mt Windarra heritage trail located adjacent to processing plant area.	Refer to Section 3.1	C = Slight L = Unlikely Low Risk	Y	N/A	N/A
	Noise			Refer to Section 3.1	C = Slight L = Unlikely Low Risk	Y	N/A	N/A <i>Environmental Protection (Noise) Regulations 1997 apply.</i>
<i>Activity:</i> Construction of Lancefield tailings tipping / unloading area at the Windarra North TSF and installation of dredging infrastructure. Including earthmoving equipment and movement of vehicles.	Dust	Air/windborne pathway causing impacts to health and amenity	Public visiting Mt Windarra heritage trail located adjacent to processing plant area.	Refer to Section 3.1	C = Slight L = Unlikely Low Risk	Y	N/A	N/A
	Noise			Refer to Section 3.1	C = Slight L = Unlikely Low Risk	Y	N/A	N/A <i>Environmental Protection (Noise) Regulations 1997 apply.</i>

Risk Event					Risk rating ¹ C = consequence L = likelihood	Works Approval Holder's controls sufficient?	Conditions ² of works approval	Justification for additional regulatory controls
Source/Activities	Potential emission	Potential pathways and impact	Receptors	Works Approval Holder's controls				
Operations (including time limited operations)								
<p><i>Activity:</i> Tipping of Lancefield tailings into storage trench</p> <p>Or tipping of Lancefield tailings into Windarra TSF North via tipping area.</p>	Dust	<p><i>Pathway:</i> Air/windborne dispersion</p> <p><i>Impact:</i> Reduced health and amenity</p>	Public visiting Mt Windarra heritage trail located adjacent to processing plant area.	Refer to Section 3.1	C = Minor L = Unlikely Medium Risk	Y	<p><u>Storage trench controls</u></p> <p>Condition 7, table 3, row 5 – operations requirements</p> <p><u>Tipping area at TSF north controls</u></p> <p>Condition 7, table 3 row 6 – operational requirements.</p>	The works approval holders' controls will be conditioned within the works approval.
<p><i>Activity:</i> Tipping of Lancefield tailings into storage trench/ TSF north, slurryification (hydromining or dredging) operations and operation of processing plant</p>	Noise	<p><i>Pathway:</i> Air/windborne dispersion</p> <p><i>Impact:</i> Reduced health and amenity</p>	Public visiting Mt Windarra heritage trail located adjacent to processing plant area.	Refer to Section 3.1	C = slight L = Unlikely Low Risk	Y	N/A	N/A <i>Environmental Protection (Noise) Regulations 1997</i> apply.
<p><i>Activities:</i> Storage of Lancefield tailings slurry in trench. Adding of water to Lancefield tailings to make a slurry (hydromining)</p>	Tailings (spills or overtopping)	<p><i>Pathway:</i> Direct discharge to land – overtopping of trench, pipeline leaks</p> <p><i>Impact:</i> soil contamination inhibiting vegetation growth and</p>	<p>Native vegetation</p> <p>Surface water – ephemeral drainage lines</p>	Refer to Section 3.1	C = Moderate L = Unlikely Medium Risk	Y	<p>Condition 1 – infrastructure design requirements</p> <p>Condition 7, table 3, row 5 – operations</p>	The works approval holders' controls will be conditioned within the works approval.

Risk Event					Risk rating ¹ C = consequence L = likelihood	Works Approval Holder's controls sufficient?	Conditions ² of works approval	Justification for additional regulatory controls
Source/Activities	Potential emission	Potential pathways and impact	Receptors	Works Approval Holder's controls				
		survival. Degradation of surface water quality.					requirements	
	Leachate from storage trench containing cyanide and elevated metals and metalloids	<i>Pathway:</i> Seepage of leachate through base and sides of trench <i>Impact:</i> Reduced quality or contamination of groundwater/soils	Surrounding soil and groundwater	Refer to Section 3.1	C = Moderate L = Unlikely Medium Risk	Y	Condition 1 – infrastructure design requirements. Condition 6 – tailings to be processed.	The works approval holders' controls have been conditioned within the works approval.
<i>Activity:</i> Hydromining tailings within old Mt Windarra TSFs.	Tailings	<i>Pathway:</i> Direct discharge to land – spills or overtopping of TSF embankments, pipeline leaks <i>Impact:</i> soil contamination inhibiting vegetation growth and survival. Degradation of surface water quality.	Native vegetation Surface water – ephemeral drainage lines	Refer to Section 3.1	C = Minor L = Unlikely Medium Risk	Y	Condition 7, table 3, row 2 – operations requirements	The works approval holders' controls have been conditioned within the works approval.
	Leachate containing cyanide and elevated metals and metalloids	<i>Pathway:</i> Seepage of leachate through base and sides of old Mt Windarra TSFs <i>Impact:</i> Reduced quality or contamination of groundwater/soils	Surrounding soil and groundwater	Refer to Section 3.1	C = Minor L = Unlikely Medium Risk	Y	Condition 8 – groundwater monitoring requirements	The works approval holders' controls have been conditioned within the works approval

Risk Event					Risk rating ¹ C = consequence L = likelihood	Works Approval Holder's controls sufficient?	Conditions ² of works approval	Justification for additional regulatory controls
Source/Activities	Potential emission	Potential pathways and impact	Receptors	Works Approval Holder's controls				
Activity: Dredging of tailings within old Mt Windarra TSFs	Tailings (spills and leaks)	<p><i>Pathway:</i> Direct discharge to land – spills or overtopping of TSF embankments, pipeline leaks</p> <p><i>Impact:</i> soil contamination inhibiting vegetation growth and survival.</p> <p>Degradation of surface water quality.</p>	<p>Native vegetation</p> <p>Surface water – ephemeral drainage lines</p>	Refer to Section 3.1	<p>C = Minor</p> <p>L = Unlikely</p> <p>Medium Risk</p>	Y	<p>Condition 1, table 1, row 5 – construction requirements</p> <p>Condition 7, table 3, row 6 and 7 – operations requirements</p>	The works approval holders' controls have been conditioned within the works approval
	Leachate containing cyanide and elevated metals and metalloids	<p><i>Pathway:</i> Seepage of leachate through base and sides of old Mt Windarra TSFs</p> <p><i>Impact:</i> Reduced quality or contamination of groundwater/soils</p>	Surrounding soil and groundwater	Refer to Section 3.1	<p>C = Minor</p> <p>L = Possible</p> <p>Medium Risk</p>	Y	Condition 8 – groundwater monitoring requirements	<p>The works approval holder's controls (groundwater monitoring around TSF) have been conditioned within the works approval.</p> <p>Groundwater monitoring around the old Windarra TSF has been deemed necessary due to the large volume of water required to be added to the TSF surface for dredging activities.</p> <p>It is recommended that these monitoring requirements are also transferred to</p>

Risk Event					Risk rating ¹	Works Approval Holder's controls sufficient?	Conditions ² of works approval	Justification for additional regulatory controls
Source/Activities	Potential emission	Potential pathways and impact	Receptors	Works Approval Holder's controls	C = consequence L = likelihood			
								the licence for ongoing operation.
Activity: Operation of processing plant	Hydrocarbons / reagents	<i>Pathway:</i> Direct discharge to land – hydrocarbon/reagent spills or leaks <i>Impact:</i> soil contamination Degradation of surface water quality.	Native vegetation Surface water – ephemeral drainage lines	Refer to Section 4.1	C = Minor L = Unlikely Medium Risk	Y	Condition 7, table 3, row 1 – operations requirements	The works approval holders' controls have been conditioned within the works approval.
	Contaminated stormwater	<i>Pathway:</i> Overland flow, runoff <i>Impact:</i> soil contamination inhibiting vegetation growth and survival. Degradation of surface water quality	Native vegetation Surface water – ephemeral drainage lines	Refer to Section 4.1	C = Moderate L = Unlikely Medium Risk	Y	Condition 7, table 3, row 1 – operations requirements	The works approval holders' controls have been conditioned within the works approval.
Activity: Discharge of gold tailings into the South Windarra in-pit TSF.	Tailings / return decant water	<i>Pathway:</i> Direct discharge to land – overtopping of in-pit TSF <i>Impact:</i> Degradation of soil structure and soil contamination inhibiting vegetation growth and survival. Smothering of vegetation.	Surrounding soil and native vegetation Surface water – ephemeral drainage lines	Refer to Section 4.1	C = Moderate L = Rare Medium Risk	Y	Condition 7, table 3, row 4– operations requirements	The works approval holders' controls have been conditioned within the works approval.
		<i>Pathway:</i> Direct discharge to land –	Surrounding soil and native	Refer to Section	C = Minor	Y	Condition 7, table 3, row 3–	The works approval holders' controls

Risk Event					Risk rating ¹	Works Approval Holder's controls sufficient?	Conditions ² of works approval	Justification for additional regulatory controls
Source/Activities	Potential emission	Potential pathways and impact	Receptors	Works Approval Holder's controls	C = consequence L = likelihood			
		<p>pipeline leaks</p> <p><i>Impact:</i> soil contamination inhibiting vegetation growth and survival.</p> <p>Degradation of surface water quality.</p>	<p>vegetation</p> <p>Surface water – ephemeral drainage lines</p>	4.1	L = Unlikely Medium Risk		operations requirements	have been conditioned within the works approval.
	Leachate containing cyanide and elevated metals and metalloids	<p><i>Pathway:</i> Seepage of leachate through base and walls of South Windarra Pit.</p> <p><i>Impacts:</i></p> <ol style="list-style-type: none"> Mounding of groundwater table causing vegetation decline or death. Reduced quality or contamination of groundwater/soils 	Groundwater (including stock watering bores) and native vegetation surrounding pit	Refer to Section 4.1	C = Moderate L = Unlikely Medium Risk	N	<p>Condition 8-groundwater monitoring</p> <p><u>Condition 11 – pit lake level monitoring</u></p>	<p>Refer to section 4.3 for the detailing risk assessment for seepage of leachate from South Windarra in-pit TSF.</p> <p>The works approval holders' controls (groundwater monitoring) have been conditioned within the works approval.</p>

Note 1: Consequence ratings, likelihood ratings and risk descriptions are detailed in the *Guidance Statement: Risk Assessments* (DER 2017).

Note 2: Proposed Works Approval Holder's controls are depicted by standard text. **Bold and underline text** depicts additional regulatory controls imposed by department.

3.2 Detailed risk assessment – seepage from South Windarra in-pit TSF

3.2.1 Overview of risk event

Tailings from the gold processing plant will be disposed of in the flooded South Windarra pit. The pit has an estimated volume of approximately 25,600,000 kL (GRM, 2020). It is proposed that approximately 1.2 million tonnes of existing historical Lancefield gold tailings, 3.6 million tonnes of Windarra North gold tailings and 0.8 million tonnes of Windarra South gold tailings (5.5 million total) will be reprocessed over 3.75 years.

Final tailings of about 48% solids (1.4 t/m³) will comprise a water inflow of about 1.6 gigalitres (GL) a year into the pit; the Works Approval holder intends to reclaim an equal amount of water from the pit lake for use in processing and hydraulic mining.

Tailings from nickel processing will no longer be deposited within the in-pit TSF as only tailings from the gold processing plant will be deposited. The source of gold tailings that will be reprocessed by the proposed gold processing plant will come from the old tailings dams at the Mt Windarra mine site (north and south cells) and will now also include tailings sourced from the Lancefield tailings dams located 17km away from the premises. This change will alter the composition of the tailings that is deposited into the in-pit TSF and will impact on the chemical composition of leachate that could potentially be emitted from the base and walls of the in-pit TSF.

For the original works approval application submission in 2012, the Works Approval Holder engaged a number of consultants to carry out investigations into the impact of tailings deposition into the South Windarra pit. These investigations included a hydrogeological assessment of the South Windarra pit for use as a TSF by Groundwater Resource Management (GRM, 2012). This assessment found that the alluvial aquifer surrounding the pit flowed from northeast to southwest through the hypersaline pit lake and that there was operating stock bores 2-3 km down-gradient of the pit. This assessment also involved the installation of 5 new groundwater monitoring bores around the pit. These were sampled along with an additional three bores that were already existing. Figure 3 shows the location of these bores. Monitoring results from the bores surrounding the pit indicated that groundwater levels were between 10 to 14 meters below ground level (mbgl).

Seepage of leachate through the walls and base of the in-pit TSF could result in the following impacts:

- groundwater mounding around the South Windarra in-pit TSF; and
- Elevated metal and metalloids in the groundwater surrounding the South Windarra in-pit TSF.

The above impacts have the potential to adversely impact groundwater users (stock watering bores down gradient) and native vegetation surrounding the pit due to the mounding of the groundwater table.

3.2.2 Geochemical characterisation of tailings

The geochemistry of the tailings being reprocessed by the proposed gold processing plant can be generally described as follows:

- 'Lancefield tailings are highly weathered with significant acid neutralising capacity (ANC) and are non-acid forming (NAF) but contain elevated levels of arsenic (range as total concentration 2,325 to 3,614 mg/kg) which is fairly soluble and reports to the tailings liquor. Levels of other metals and metalloids in extracts were not notable, extracts were saturated with respect to gypsum and calcite' (MBS, 2021).

- 'Windarra tailings are also NAF although some sulfides (0.36% w/w as sulfur) were present with detectable (1%) chalcopyrite (CuFeS₂). Arsenic (1,780 mg/kg) is primarily insoluble, presumably present as insoluble arsenopyrite' (MBS, 2021).

3.2.3 Groundwater impact analysis

In 2012 for the original works approval application, the works approval holder contracted a consultant (GRM) to carry out a GoldSim water and solute balance model to simulate changes in the South Windarra pit void lake during deposition of tailings (GRM, 2012). The model incorporated tailings streams from both the reprocessing of onsite gold tailings and nickel processing. The model indicated that the in pit TSF would act as a groundwater sink.

A groundwater sink is a condition whereby the pit lake level is at a lower elevation than the surrounding groundwater system due to high evaporation rates, with no discharge of lake water to the surrounding groundwater environment.

For this works approval amendment application, the Works Approval holder has undertaken additional hydrogeological (GoldSim groundwater flow and solute mass balance model) and geochemical modelling for the South Windarra in-pit TSF incorporating the Lancefield tailings (MBS, 2021). The model simulation was also extended to 100 years to assess the long-term impacts of the project post closure.

The modelling found that:

- During the 3.75-year period of the operational phase, the simulated pit lake water level rises 2.5m (from 400mRL to 402.5mRL). Post closure the pit lake water level falls to 400.5 mRL. The groundwater depth in monitoring bores surrounding the South Windarra pit is between 403 mRL – 406 mRL. The minimum depth (403 mRL) is 0.5 meters above the maximum predicted pit lake water level, indicating that the pit lake is expected to remain as a groundwater sink throughout the operational phase of the project and post closure. Consequently, the risk of the lake forming a flow-through system or aquifer recharge source is low (MBS, 2021).
- A minimum available freeboard from the pit crest is predicted to be approximately 10.2 meters, including margin for a 1 in 100-year 72-hour rainfall event. Therefore, the risk of overtopping of the pit is low (MBS, 2021).
- The already saline pit lake was predicted to become hypersaline by 2125 with salinity increasing from seawater composition (38,000 mg/L TDS) to over 124,000 mg/L between 2022 and 2125 (MBS, 2021).
- Concentrations of iron, chromium, barium, boron, antimony, silver, manganese, nickel, cobalt, lithium and zinc are predicted to remain below livestock drinking water guidelines within the pit lake (MBS, 2021).
- Selenium, molybdenum and cadmium (over the 100- year period), arsenic (between 2023-2055) and cyanides (between 2022-2040) were predicted to exceed livestock drinking water guidelines within the pit lake (MBS, 2021).
- Groundwater use for livestock purposes is unlikely given salinity levels (MBS, 2021).

A technical review of the modeling report indicates that the use of the GoldSim model to model water level changes in the South Windarra pit-lake is suitable for this purpose. However, there are concerns about the approach used to determine values of evaporation that was used in the model.

In semi-arid regions, the rate of evaporation from the water surface of a mine pit-lake has a large influence on the final resting water level in the lake. Usually, evaporation rates are not measured at mines sites within Western Australia but are estimated by using pan evaporation rates that are measured at the nearest meteorological station. These values are then multiplied by a pan-factor to determine evaporation rates at a mine site. This is how the evaporation rate

at South Windarra was determined for this modelling report.

It has been shown that actual measurements of evaporation from pit-lakes show very little correlation with estimates made using pan-factors and pan evaporation data, particularly when the data is collected from a remote site (McJannet *et al.*, 2017; McJannet *et al.*, 2019). Consequently, estimates of water level changes in pit-lakes that are made using this approach are unreliable. A detailed assessment of evaporation rates in a mine-void in the Pilbara region suggests that discrepancies between measured and predicted evaporation rates are approximately 20% (McJannet *et al.*, 2017).

Although measurements of evaporation in mine voids indicate that actual evaporation rates often exceed those predicted using pan evaporation data estimates with a pan-factor of 0.7 (McJannet *et al.*, 2017; McJannet *et al.*, 2019), this is not always the case, and cannot be relied upon for the pit-lake in the South Windarra mine void.

Most of the existing mine voids in semi-arid regions of Western Australia are thought to be terminal groundwater sinks (Johnson and Wright, 2003). This is partly due to the high rate of evaporation that occurs throughout much of Western Australia, and is also because most of the mine voids in Western Australia are surrounded by hard rocks where groundwater flow is very limited, and is largely restricted to fracture zones in these rocks.

The situation for the South Windarra mine void is different though, as although this site likely has a high rate of annual evaporation, the aquifer the pit is excavated into has a high permeability. Therefore, there is a risk that groundwater outflow will take place from this mine void. This possibility cannot be excluded by the water balance modelling that has been undertaken at the site, due to the uncertainties in evaporation estimates.

3.2.4 Justification for additional regulatory requirements

Modelling results indicate that the south Windarra in-pit TSF is expected to remain as a groundwater sink over the life of operations and post closure, with no outflow to the surrounding groundwater systems. A technical review of the updated model indicates that the correct water balance model (GoldSim) to predict how tailings discharge to the mine void would affect water levels in the pit lake in the void. However, the model results are considered to be somewhat unreliable due to the use of inappropriate evaporation data for the pit lake in the model.

As a result, conditions for the monitoring of groundwater (condition 8 -10) around the in-pit TSF will be placed on the works approval during time limited operations and is recommended to be transferred to the operational licence for ongoing operation. Groundwater monitoring will determine whether any outflow from the pit lake is taking place, as would changes in the chemical composition of groundwater that are caused by seepage from the pit lake. Limits or targets for water quality and standing water levels should be considered for ongoing operations during the risk assessment for the licence.

Conditions (Condition 11 and 13) will be placed on the works approval requiring the elevation of the water surface in the pit lake to be measured on an ongoing basis during time limited operations and compared with water level changes that are predicted by the GoldSim model. This will further support the model's findings that the pit will act as a groundwater sink. It is recommended when a licence is issued that a limit be placed on the water level within the in-pit TSF.

4. Consultation

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

Table 4: Consultation

Consultation method	Comments received	Department response
<p>Local Government Authority advised of proposal on 5 March 2021</p>	<p>The shire provided the following comments from the manager of the local tourism centre:</p> <ul style="list-style-type: none"> ▪ If approved, this will 100% restrict access to Windarra area as it will be an active mine. ▪ In Poseidon's proposal, it states that they have had heavy consultation with the Shire during 2007-2013 regarding the proposed works. The tourism center manager is unsure what agreement was made. It was of the understanding that the signage, information bay and access tracks were to be updated and upgraded (but this has not happened to date) as access to the walking site was no longer available. As far as the shire is aware, there were not going to be any restrictions to accessing the Drill Mast, Information Bay, Discovery Hole or Lookout. ▪ The site was officially registered as a heritage site due to its colonial cultural significance. As it is a part of the Golden Quest Discovery Trail, and a popular tourist area close to Laverton, it will have a major impact on tourism in Laverton. ▪ The tourism center has concerns regarding accessibility and request a plan to be put in place before the amendment to works is granted, the tourism center manager suggested it may require more up to date consultation with the Shire. (if this is possible). 	<p>The shire's comments have been noted. In response the department has requested that the works approval holder address these comments. The following comments were made by the works approval holder –</p> <p><i>'As noted in the original amendment application, Poseidon engaged extensively with the shire on the previously-proposed nickel and gold project, including potential impacts on public access to the heritage trail and how they could be managed over the life of operations; the shire was supportive of the project.</i></p> <p><i>Poseidon and the shire agreed in principle to changes to the trail to provide an adequate separation between public visitors and areas of operation, and an agreement between the parties was drafted but not completed before the project was shelved due to adverse markets. Poseidon acknowledges that the shire CEO and other shire officers have since changed.</i></p> <p><i>Our Commercial Manager spoke to the present shire CEO (Peter Naylor) on 22 March 2021 to discuss the current proposal and the history of the previous proposal; this discussion was followed up with a detailed description of the project by email.</i></p> <p><i>The CEO advised that the local tourism centre had raised the question of plans for the trail as a matter of local interest when engaged by DWER. The CEO has expressed no concerns with the current proposal in principle.</i></p> <p><i>Poseidon intends to send the previously drafted agreement to the CEO and looks forward to finalising an agreement with the shire that retains most of the tourism value of the trail, while protecting both public safety and the security of the operations over the life of the project'</i></p> <p>The department is satisfied that consultation with the Shire regarding this issue is adequately being addressed.</p>
<p>DMIRS advised of proposal on 5 March 2021.</p>	<p>DMIRS replied on 24 March 2021.</p> <ul style="list-style-type: none"> ▪ A mining proposal has been submitted for the activities propose in this works approval amendment application 	<p>The department notes that a mining proposal has yet to be approved and that an updated mining proposal incorporating the change in Lancefield tailings handling/processing has yet to be submitted to DMIRS as of 4/05/2021.</p>

	<ul style="list-style-type: none"> ▪ A request to amend the mining proposal was received last week to include hydraulic mining of third-party tailings in a trench adjacent to the Windarra TSF. Assessing officer is waiting on a new mining proposal to support this change before refereeing to geotechnical experts. ▪ the proposed activities are not able to be approved under the Mining Act until the Windarra State Agreement is terminated and Poseidon are currently in the process of moving a draft termination bill through Parliament. DMIRS cannot approve this Mining Proposal until the State Agreement is terminated, and appropriate Mining Act tenure granted. The Mining Proposal will still be assessed and approved 'in principle' to support the termination process. 	<p>As a decision- making authority, the Department does not have to make any decision to approve an application for a works approval where other government approvals preclude implementation. Where it is practical to do so, the department will begin the process of assessing any application it receives concurrently with assessments by other authorities but may defer a decision on the application until the other authority has made a final decision. Therefore, as the mining proposal has yet to be approved the department will finalise this works approval amendment as an 'intent to grant' until the mining proposal has been approved.</p>
	<p>Correspondence from DMIRS was received on 08/7/2022 confirming that the mining proposal (ID 93831) has now been approved with no outstanding environmental issues noted. Mining Proposal was considered to meet DMIRS environmental objectives</p>	<p>Noted.</p>
<p>Works Approval Holder was provided with draft amendment on 28/05/2021 and responded on 21/06/2021.</p>	<p>Comments were received regarding</p> <ul style="list-style-type: none"> ▪ change in registered business address ▪ new figures provided for figures 2 and 3 ▪ request to include an additional option to use a dredging method for recovery of tailings from the old mount windarra TSF (besides the hydromining method). This includes the construction of an unloading area for Lancefield tailings to be dumped straight into North TSF cell. 	<p>First two requested changes were made.</p> <p>Additional information was requested from the applicant regarding the dredging option, and this was assessed under this works approval.</p>
<p>Works Approval Holder was provided with second updated draft amendment on 9 August 2021 and responded on 30 August 2021.</p>	<p>Following requests were made:</p> <p>The Tailings and return water pipelines between the plant and dredging, recovery trench and hydraulic mining will be fitted with the same specification of alarm systems proposed for the tailings transfer pipeline from South Windarra pit. Flow sensors will be installed at both ends of the tailings pipeline for leak detection; any difference in flow detected for more than five minutes will set off an alarm. Isolation valves will be installed at appropriate intervals along the pipelines. The circuit will be monitored by telemetry, incorporated into a "Citect" process control system, which will trigger within 5 minutes of a spill occurring based on flow meters.</p>	<p>Requested changes are accepted. Wording of conditions have been updated.</p>

	<p>On this basis Poseidon request that the secondary containment requirement for these pipelines (Table 1, Items 4 and 5) pipeline be amended to require containment sufficient for 30 minute of pumping at the average pumping rate. This would match the South Windarra Tailings pipeline specification for containment (W51180 Amendment Report S2.3.2).</p> <p>The requirement for inspection intervals of 12 hours Table 1 Item 2,3,5,7 would require inspections to be carried out in darkness during winter months. Given the leak monitoring systems in place Poseidon believe daily inspections will adequately address the risks of infrastructure failure, while allowing all inspections to be carried out in daylight hours, improving personnel safety, and therefore request the inspection intervals in Table 1 be increased from 12 to 24 hours.</p>	
	<p>Correspondence from Works approval holder received on 02/03/2022 and 07/07/2022 respectively outlined that:</p> <p>The Poseidon Nickel Agreement Amendment (Termination) Bill 2021 was passed on 1 March 2022.</p> <p>Mining proposal was approved by DMIRS on 7 July 2022.</p>	Noted.
	<p>Correspondence from Works approval holder received on 12/07/2022 outlined that:</p> <p>The draft works approval that we received back in July 2021 had an expiry date of 1 July 2023. Therefore, a 2-year period was advised in the original notification of the approval (July 2021) to the expiry (July 2023). We would like to maintain that 2-year expiry period.</p> <p>Given the 12-month delay that we have encountered since July 2021, to facilitate the change from the State Agreement to a Mining Lease, we would like to extend the expiry date to 1 July 2024 (to maintain the same 2-year expiry period that we had in the July 2021 notification of approval).</p> <p>In relation to the premises description, the correct description is M261SA (not ML261SA), otherwise the remaining details that you have in place are correct.</p>	Noted and changes requested have been updated.

5. Conclusion

Based on the assessment in this Amendment Report, the Delegated Officer has determined that a Revised Works Approval will be granted, subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

5.1 Summary of amendments

Table provides a summary of the proposed amendments and will act as record of implemented changes. All proposed changes have been incorporated into the Revised Works Approval as part of the amendment process.

Table 5: Summary of works approval amendments

Condition no.	Proposed amendments
Front page	Name of premises changed to 'Windarra Gold tailings project'
Expiry date	Expiry date has been extended for a further 12 months to allow works to be completed within a 2 year period.
Numbering and headings	Construction phase heading added with the deletion of the heading 'general conditions' Numbering of conditions changed due to addition of new conditions
Condition 1	Wording of condition updated to match current condition library wording. Table 1 updated to include reference to design drawings / maps of infrastructure. Lancefield tailings trench infrastructure requirements added to the table. Table separated into two sections (Category 5 and Category 6 infrastructure).
Condition 2 and 3	Old condition 4 and 5 has been replaced by condition 2 and 3. Compliance reporting conditions. Wording has been updated to new wording in condition library. Intent of conditions remain the same as original conditions
Condition 4 and 5	New conditions regarding a time limited operations phase. These conditions are in regards to commencement and duration of the time limited operations phase. Old condition 6 (Notification) has been deleted as no longer necessary.
Condition 6	New condition added restricting the tailings source for the processing plant to tailings from the onsite Mt Windarra TSF cells and the Lancefield tailings.
Condition 7	New condition added stipulating the operating requirements of new infrastructure during time limited operations.
Condition 8 - 10	New conditions added to require groundwater monitoring around in pit TSF and the old Mount Windarra TSFs during time limited operations
Condition 11	New condition requiring the pit lake water level within the in-pit TSF to be monitored during time limited operations.
Conditions 12 - 13	New conditions added for compliance reporting for the time limited operations phase.
Conditions 14-16	New conditions added regarding records and reporting. These conditions are standard for new works approvals.
Definitions	Definitions added for AS/NZS 5667.1, Assessment of site contamination NEPM, mbgl, mg/L, µS/cm, Schedule 2, suitably qualified and experienced engineer, TSF, Time limited operations. Definitions deleted: Stage 2, Stage 3 and commissioning
Schedule 1 Maps/Drawings	New figures added: Figure 2 to 9.
Schedule 2	New Schedule 2 added for monitoring quality assurance requirements

References

1. Department of Environment Regulation (DER) 2016, *Guidance Statement: Environmental Siting*, Perth, Western Australia.
2. DER 2017, *Guidance Statement: Risk Assessments*, Perth, Western Australia.
3. DER 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
4. Groundwater Resource Management (GRM) technical memorandum, 8 June 2020, Kathy McDoougall, *South Windarra water & Solute balance modelling*. Unpublished report for Poseidon Nickel Limited.
5. Groundwater Resource Management (GRM) 2012 *South Windarra in-pit tailings hydrogeological investigation*, Unpublished report (J110023R02) prepared for Poseidon Nickel Limited.
6. MBS Environmental (MBS), 2012, *Windarra nickel project tailings characterization*, Unpublished report prepared for Poseidon Nickel Limited.
7. MBS Environmental (MBS), 2021, *Windarra Gold Tailings Project South Windarra Pit Lake Geochemical Modelling*. Unpublished report prepared for Poseidon Nickel Limited.
8. McJannet, D., Hawdon, A., van Niel, T., Boadle, D., Baker, B., Trefry, M. and Rea, I., 2017. Measurements of evaporation from a mine void lake and testing of modelling approaches. *Journal of Hydrology*, **555**, 631-647.
9. McJannet, D., Hawdon, A., Baker, B., Ahwang, K., Gallant, J., Henderson, S. and Hocking, A., 2019. Evaporation from coal mine pit lakes: measurements and modelling. *Proceedings of Mine Closure 2019*, Perth, Western Australia.

Appendix 2: Application validation summary

SECTION 1: APPLICATION SUMMARY				
Application type				
Works approval	<input type="checkbox"/>			
Licence	<input type="checkbox"/>	Relevant works approval number:		None <input type="checkbox"/>
		Has the works approval been complied with?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
		Has time limited operations under the works approval demonstrated acceptable operations?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>	
		Environmental Compliance Report / Critical Containment Infrastructure Report submitted?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
		Date Report received:		
Renewal	<input type="checkbox"/>	Current licence number:		
Amendment to works approval	<input checked="" type="checkbox"/>	Current works approval number:	W5180/2012/1	
Amendment to licence	<input type="checkbox"/>	Current licence number:		
		Relevant works approval number:	N/A	<input type="checkbox"/>
Registration	<input type="checkbox"/>	Current works approval number:	None	<input type="checkbox"/>
Date application received	8/12/20			
Applicant and Premises details				
Applicant name/s (full legal name/s)	Poseidon Nickel Limited			
Premises name	Windarra Nickel Project			
Premises location	ML261SA, M38/1244 and M38/1245			
Local Government Authority	Shire of Laverton			
Application documents				
HPCM file reference number:	2012/001172-1			
Key application documents (additional to application form):	Att 3b Proposed activities summary document Att 3a Commissioning plan Att 5: Consultation document Attachment 6 a: emissions and discharges <ul style="list-style-type: none"> - Tailings Characterisation (MBS 2012) - South Windarra In-Pit Tailings Hydrogeological Investigation (GRM 2012) - Environmental Risk Assessment for South Windarra In-pit TSF (MBS 2012) - Water and solute balance modelling for South Windarra In-Pit TSF (GRM, 2020) - In-pit tailings storage design and operations manual (Coffey, 2011) 			

		Att 7: location and siting
Scope of application/assessment		
Summary of proposed activities or changes to existing operations.	<p>Works approval amendment</p> <p><u>Poseidon no longer proposes to construct:</u></p> <ul style="list-style-type: none"> - Infrastructure to discharge water from the formerly proposed Cerberus underground mine (previously approved under W5180). - A plant to process nickel ore from the formerly proposed reopening of the Mt Windarra underground mine and development of the Cerberus underground mine (previously approved under W5118 with tailings and return water lines to be shared with the gold processing plant) <p><u>Consequently:</u></p> <ul style="list-style-type: none"> - Final gold tailings will not be combined and disposed of with the nickel tailings; - Mine water from Cerberus will not be incorporated into the process water circuit; and <p><u>Poseidon also wishes to amend works to include:</u></p> <ul style="list-style-type: none"> - Use of new 1.2Mt of tailings from nearby Lancefield site 	
Category number/s (activities that cause the premises to become prescribed premises)		
Table 1: Prescribed premises categories		
Prescribed premises category and description	Assessed production or design capacity	Proposed changes to the production or design capacity (amendments only)
Category 5 – Processing or beneficiation of metallic or non-metallic ore	1,500,000 tonnes per annual period	None
Category 6 – Mine dewatering: premises on which water is extracted and discharged into the environment to allow mining of ore.	400,000 tonnes per annual period	None
Legislative context and other approvals		
Has the applicant referred, or do they intend to refer, their proposal to the EPA under Part IV of the EP Act as a significant proposal?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	<p>Referral decision No: #DEC6569</p> <p>The original project for which the licence was granted was referred to the EPA in Nov 2011 but the outcome as that the project could be adequately managed under Part V of the EP Act.</p> <p>Managed under Part V <input type="checkbox"/></p>

		Assessed under Part IV <input type="checkbox"/>
Does the applicant hold any existing Part IV Ministerial Statements relevant to the application?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Ministerial statement No: EPA Report No:
Has the proposal been referred and/or assessed under the EPBC Act?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Reference No:
Has the applicant demonstrated occupancy (proof of occupier status)?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Certificate of title <input type="checkbox"/> General lease <input type="checkbox"/> Expiry: Mining lease / tenement <input checked="" type="checkbox"/> Expiry: Other evidence <input type="checkbox"/> Expiry:
Has the applicant obtained all relevant planning approvals?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input checked="" type="checkbox"/>	Approvals for Poseidon's mining tenements are under the <i>State Agreement Act</i> , in place of the requirement for planning approvals. Expiry date: If N/A explain why?
Has the applicant applied for, or have an existing EP Act clearing permit in relation to this proposal?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	CPS No: Former permit CPS5110/3 lapsed in 2017. Poseidon has indicated they will apply for a new clearing permit with DMIRS.
Has the applicant applied for, or have an existing CAWS Act clearing licence in relation to this proposal?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Application reference No: N/A Licence/permit No: N/A
Has the applicant applied for, or have an existing RIWI Act licence or permit in relation to this proposal?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Application reference No: Licence/permit No: GWL160159 Entitlement: 4000,000KL Expires 29 May 2021
Does the proposal involve a discharge of waste into a designated area (as defined in section 57 of the EP Act)?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	PDWSA Laverton Water Reserve and Catchment Area RIWI Goldfields Groundwater Area Has Regulatory Services (Water) been consulted? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A <input type="checkbox"/> Regional office: Goldfields

<p>Is the Premises situated in a Public Drinking Water Source Area (PDWSA)?</p>	<p>Yes <input checked="" type="checkbox"/> No <input type="checkbox"/></p>	<p>Name: Public Drinking Water Source Area: Laverton Water Reserve and Catchment Area</p> <p>Priority: P1</p> <p>Are the proposed activities/ landuse compatible with the PDWSA (refer to WQPN 25)?</p> <p>Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A <input type="checkbox"/></p> <p>A small segment of the prescribed premises overlaps with the PDWSA directly adjacent to the east.</p>
<p>Is the Premises subject to any other Acts or subsidiary regulations (e.g. <i>Dangerous Goods Safety Act 2004, Environmental Protection (Controlled Waste) Regulations 2004, State Agreement Act xxxx</i>)</p>	<p>Yes <input checked="" type="checkbox"/> No <input type="checkbox"/></p>	<p><i>State Agreement Act: "Poseidon Nickel Agreement Act 1971"</i></p> <p>Termination of the act and transition to minerals tenure and administration under the <i>Mining Act 1978</i> is in process.</p>
<p>Is the Premises within an Environmental Protection Policy (EPP) Area?</p>	<p>Yes <input type="checkbox"/> No <input checked="" type="checkbox"/></p>	
<p>Is the Premises subject to any EPP requirements?</p>	<p>Yes <input type="checkbox"/> No <input checked="" type="checkbox"/></p>	
<p>Is the Premises a known or suspected contaminated site under the <i>Contaminated Sites Act 2003</i>?</p>	<p>Yes <input type="checkbox"/> No <input checked="" type="checkbox"/></p>	<p>Overlaps with the Murrin Murrin Nickel Project site which is currently awaiting classification from the contaminated sites branch.</p> <p>CSS site ID 2024</p> <p>Classification:</p> <p>Date of classification: N/A</p>