Decision Report

Application for Works Approval

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

Works Approval Number	W6624/2021/1
Applicant	BHP Nickel West Pty Ltd
ACN	004 184 598
File number	DWER2021/000635
Premises	Kambalda Nickel Concentrator Durkin Road, KAMBALDA WA 6442 Legal description ML15/149, ML15/150 Lot 13 DP49832-K173678L Easement over Part lot 13 on DP 48932-K173679E Lease agreement over portion M26/317 As defined by the premises maps attached to the issued works approval
Date of report	31/03/2022
Proposed Decision	Intent to grant works approval

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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 the optimisation works at the Kambalda Nickel Concentrator (Premises). As a result of this assessment, Works Approval W6624/2021/1 has been granted.

2. Scope of assessment

2.1 Regulatory framework

In completing the assessment documented in this decision report, the Delegated Officer has considered and given due regard to the Department of Water and Environmental Regulation's (department) 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

BHP Nickel West Pty Ltd (applicant) applied on 8 November 2021, for a works approval under section 54 of the *Environmental Protection Act 1986* (EP Act). The applicant holds licence L5533/1976/11 for the Premises.

The application is to undertake optimisation works and recommence production at the Premises following 3 years of minimal operation.

2.2.1 Process description

The production of nickel concentrate from ore at the Premises can be described in five main processing streams (see Process Flowchart in Figure 1):

1. Weighing and Crushing – Ore is received on site, crushed and stockpiled on the ROM Pad.
2. Semi Autogenous Grinding – crushed ore is transferred via conveyor to a ball mill to further reduce ore size. Ground ore is then passed through a screen and onto cyclones to classify particle sizes.
3. Floatation – Classified material in a slurry is then passed onto floatation tanks that uses xanthates, guar, copper sulphate and air to separate the nickel sulphide from the slurry.
4. Thickening – The separated streams are then directed to either tails or product streams. Tailings produced in the floatation circuit reports to the tails thickener to separate solids and process water components. The concentrated tailings are pumped as a slurry to the Tailings Storage Facility (TSF) via pipeline. A concentrate thickener accepts the product concentrate in solution from the floatation circuit as well as third party repulped concentrate. The concentrate thickener then reduces the water from the fluidised product to direct thickened product to stock tanks to introduce into the drying process.
5. Concentrate Drying – Wet concentrate is fed to one of three spray dryers to reduce moisture content to less than 0.25%. Dry concentrate is stored in concentrate silos prior to transporting to the Kalgoorlie Nickel Smelter.

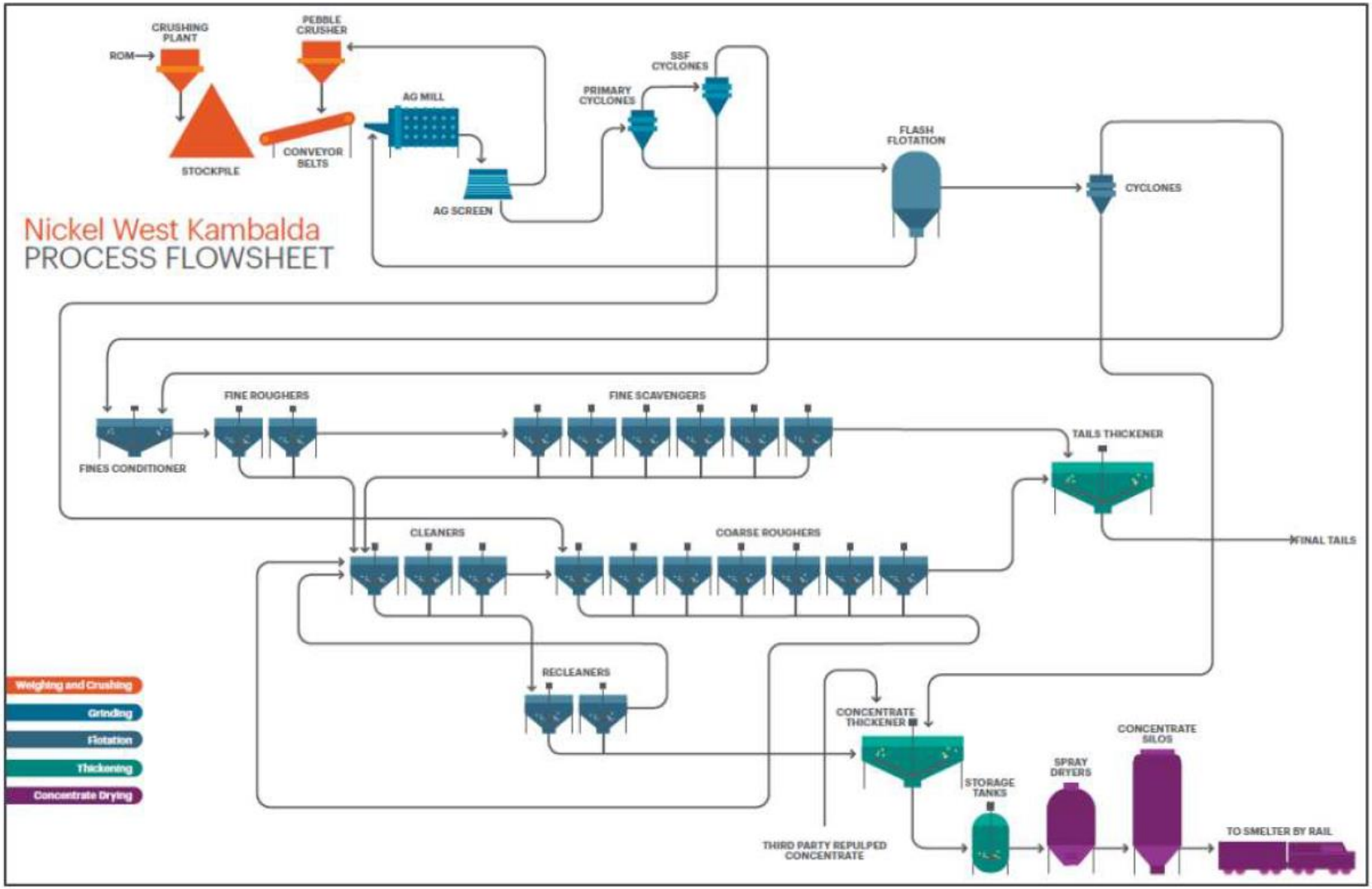

Figure 1: Process flowchart

2.2.2 Proposed works

The applicant proposes to conduct the following works at the Premises:

1. An embankment raise of Tailings Storage Facility (TSF) 3B from RL 302.5m to RL 305m;
2. Installation of an additional thickener and associated containment infrastructure;
3. Installation of a filtration building containing condensate filter presses and processing tanks; and
4. Construction of wet condensate storage areas

TSF 3B raise

Within the Premises there are 4 TSFs with TSF 1 and 2 already completed and decommissioned for active use and TSF 3A and 3B as the remaining active ones. The Premises has not been operating the last 2 years but with the restart of the operations there is only sufficient storage capacity in the TSFs for about 3 months. The proposed raise of TSF 3B will provide an additional 30 months of storage.

Perimeter embankment

The current TSF3B embankment crest elevation is at the Stage 2 raise level at RL 302.5m. This application relates to the Stage 3 embankment raise of 2.5m from the current elevation RL 302.5m to RL 305m and includes decant causeway, decant tower and access ramps.

Stage 3 embankment design of TSF3B is an upstream construction on the existing TSF3B. The location for the upstream toe of Stage 3 wall lift was determined as below:

- Downstream toe of the perimeter embankments will coincide with downstream crest edge of the existing embankment;
- The existing embankment will be raised by 2.5m with upstream side slope 1(V):1.5(H) and downstream side slope 1(V):2.75(H); and
- The new embankment will have 8 m wide crest.

The work involves raising the following structures:

- Existing TSF3B perimeter embankments (north, north-east and eastern embankments only);
- Existing decant causeway and decant structure; and
- Existing access ramps.

Due to the upstream construction method adopted, part of Stage 3 perimeter embankment footprint will be located on the existing crest of TSF3B and a remaining width of the embankment footprint will be located on the tailings beach area.

Foundation preparation will be undertaken and soft tailings will be removed and replaced with suitable material to form a stable foundation for the upstream raise.

All construction materials required to carry out the works for the TSF3B Stage 3 embankment raise will be borrowed from TSF3B and other material sources, moisture conditioned, placed and compacted in layers of 300mm. The crest will be covered with 100mm thick gravel and will have 2% slope towards the upstream side of TSF3B.

The upstream construction method is shown in Figure 2.

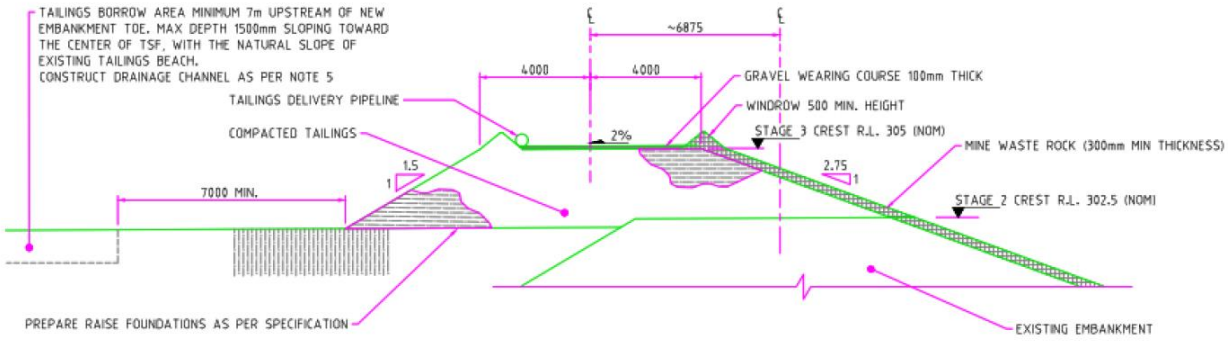

Figure 2: Typical Section of Perimeter Embankment

Decant causeway

The causeway will be raised using the centreline raise method. The causeway is designed to slope parallel with the tailings beach, maintaining a minimum 2.5m height in accordance with the embankment raise.

The characteristics of the decant causeway are as follows:

- Crest width: 8.00m
- Raise height: 2.5m
- Batter slopes: 1(V):1.5(H)
- Total length: 165m

Decant structure

The decant structure raise will consist of extending the DN1800 slotted pre-cast concrete pipe sections and slotted decant riser pipe upward.

Filter rock fill material will be placed around the DN1800 slotted pre-cast concrete pipe sections to a diameter of 10 m and then slope down toward the tailings at a batter slope of 1(V):1.5(H).

Windrows, 0.5m high with slopes of 1.0 (V):1.3(H) will be constructed from mine rock waste material and will be located around the crest edges of the filter zone. Windrow heights are to be increased at times of construction to half wheel height of the associated construction vehicle. A typical section of the proposed 2.5 m raise of the decant structure is shown in Figure 3.

The storage capacity of the Stage 3 embankment raise at RL 305 m is 1,213,136 m^3.

When accounting for a 1% deposited tailings beach profile the tailings volume at RL 304.7m, to allow for free board, was estimated to be approx. 843,250m^3 which corresponds to 1,264,875 tonnes of tailings at a deposited density of 1.5 t/m^3.

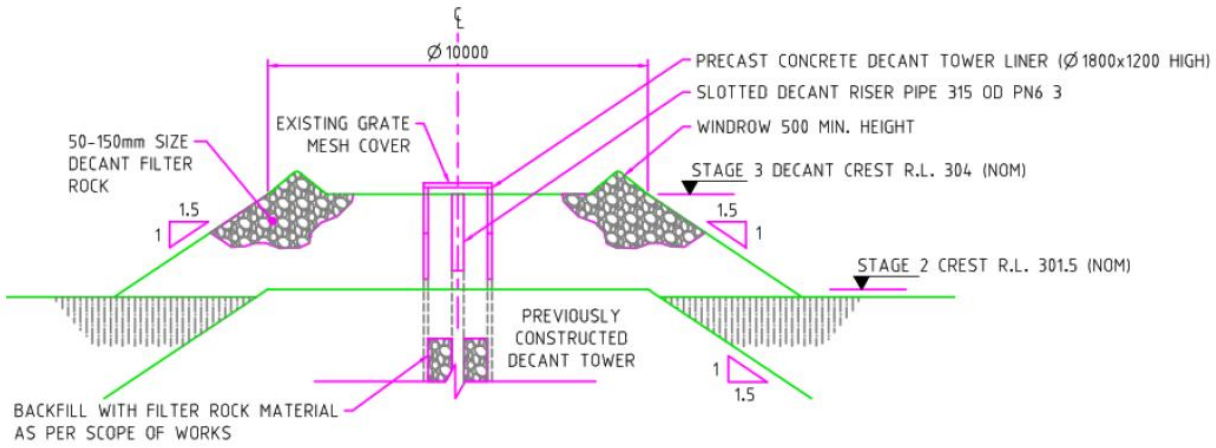

Figure 3: Typical Section of Decant Structure

Seepage collection toe drain (TSF3B)

To address seepage risks from TSF 3B following restart of the concentrator circuit and subsequent wall raise to RL305m. Seepage analysis undertaken by both Golder (Golder, 2021) and Advisian (Advisian, 2021) suggest the risk of seepage is low. However, if it were to occur, seepage would likely be expressed from the northern flank of TSF3B. This area is closest to the central decant pond which would likely be the primary driver for any seepage. Due to the increased distance from the decant pond, it is less likely for seepage to occur on the eastern flank of TSF3B. Based on the variable risk profile presented across the perimeter of TSF3B, BHP do not consider a toe drain along the entire facility is warranted. Rather a toe drain along a portion of the northern flank of TSF3B is proposed, targeting the area presenting the highest seepage risk.

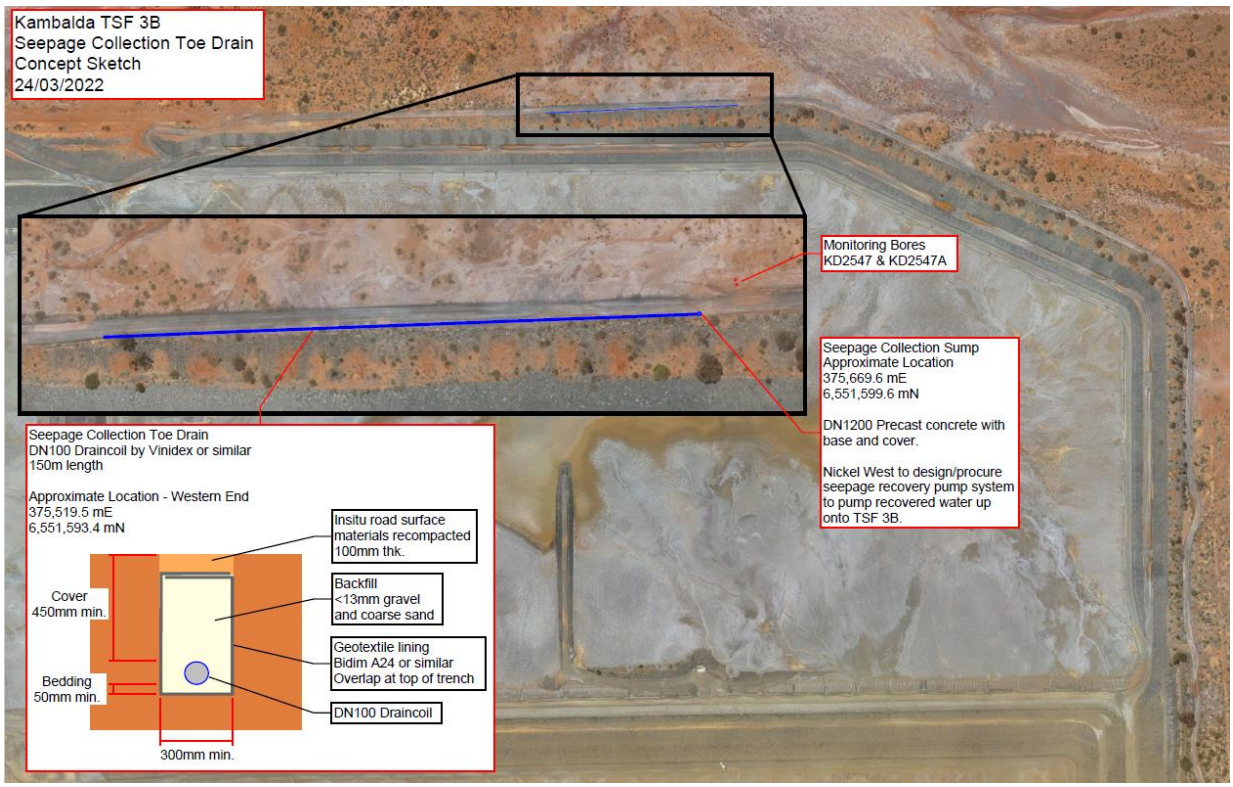

Figure 4: Concept drawing of proposed toe drain (from applicant)

Optimisation works

The remaining optimisation works includes the installation of a thickener, the addition of wet concentrate measurement and filtering capabilities and the installation of an additional electrical substation. The measurement and filtering capabilities are to satisfy contractual requirements for the restart operation of the concentrator. The existing concentrate thickener receives both fresh concentrate and repulped third party pulp (TPP) concentrate for drying. A new thickener is required on fresh concentrate duty only to separate the fresh concentrate from the repulped TPP concentrate. Filtration of thickener underflows is required when off specification product is produced. Additional areas for concentrate stockpiling are required to store off specification material prior to removal from site or reprocessing.

An additional electrical substation is required to enable the separation of high and low voltage switchboards, reducing the risks associated with operation of the existing low voltage switchboard which uses older technologies.

2.3 Other approvals

2.3.1 Department of Mines, Industry Regulation and Safety (DMIRS) – geotechnical review

The mining proposal related to the optimisation works to optimise quality of concentrate production (ID 101630) has been assessed and approved under the *Mining Act 1978* on the 14 January 2022.

The mining proposal related to the TSF 3B lift to 322 m RL (MP20175) was approved in 2008.

3. Risk assessment

The Delegated Officer 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.

3.1 Source-pathways and receptors

3.1.1 Emissions and controls

The key emissions and associated actual or likely pathway during premises construction / 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	Ground disturbance activities and	Air / windborne	Use of predictive and actual monitoring of weather conditions to ensure that the use of

Emission	Sources	Potential pathways	Proposed controls
	movement of TSF material	pathway	dust suppression such as a water cart works. If excessive windy conditions are predicted, then work to cease till dust control can be implemented effectively again.
Noise	Construction equipment, including mobile machinery and cranes	Air / windborne pathway	Construction activities to occur during daylight hours.
Discharges to land	Accidental discharges due to ineffective waste management and storage breaches	Seepage to soil and groundwater	Ensuring all staff adheres to the proper site waste disposal procedures. Spill kits are available for accidental spills.
Operation			
Seepage	Tailings.	Seepage to groundwater	- Thin layer spigot deposition, rotated around the perimeter to allow drying and consolidation of the tailings. - Control of the supernatant pond around the decant structure and limiting pond size to 10% of the surface area. - Monitoring of the phreatic surface within and around the TSF through the use of vibrating wire piezometers (VWPs) and groundwater monitoring. Review of VWP readings and groundwater monitoring results are to be undertaken as part of routine monthly inspections. Changes in VWPs of greater than 0.5m from the previous month will initiate a response in accordance with the Trigger Action Response Plan detailed in the OSM. Responses include notification, inspections and implementation of measures to draw down the facility and reduce phreatic surface. - Regular visual inspections of TSF 3B for signs of seepage. These inspections form part of regular TSF surveillance checks completed 6 hourly when depositing tailings, otherwise every 24 hours. - A toe drain along a portion of the northern flank of TSF3B is proposed, targeting the area presenting the highest seepage risk. - The toe drain includes the following specifications: (a) Buried slotted drainage pipes to collect any near surface seepage. This approach is preferred to suit the limited space

Emission	Sources	Potential pathways	Proposed controls
			available for the installation of a toe drain; (b) Slotted drainage pipes are to discharge to a collection sump; and (c) The collection sump will include a metered sump pump to transfer any seepage water back into the TSF or return water pond. - Groundwater monitoring bores already in place along the northern and eastern flanks of TSF3B are well located to pick up water level and quality changes that would be expected should seepage occur.
Run-off from TSF 3B embankment	Erosion of embankments		- Embankment crests designed with a cross-fall of 2% sloping into the TSF, resulting in surface water draining to the inside of the TSF and preventing concentrated flow down the downstream slopes. - Embankment crests designed with a gravel wearing course to prevent erosion of the crest surface. - Downstream slopes designed with a waste rock layer to prevent erosion of the downstream slopes. - Installation of a layer of waste rock at each spigot location to prevent erosion of the upstream slopes. - Slotted conductor pipes are used at the spigot locations to allow tailings to direct discharge away from the upstream slopes, reducing the potential for scour at the spigot points. - The mitigation measure against beach erosion is the opening of multiple spigots in accordance with the method outlined in the OSM. This will result in low-velocity deposition that minimizes the risk of beach erosion at the spigot discharge points. - Daily inspections include observations of tailings flow characteristics at the point of discharge to check for excessive erosion, i.e. greater than 300mm - Future embankment raise designs are to include 0.5m thick waste rock capping layer along the downstream slope.
Loss of containment from tailings pipeline	Tailings / decant water	Direct discharge to soil and vegetation	- Pipeline management and easement maintenance as per conditions of L5533/1976/11 and the Operations, surveillance and maintenance manual (OSM – Golder, 2021)

Emission	Sources	Potential pathways	Proposed controls
			- Secondary and tertiary containment installed and maintained along pipeline easement
Fugitive dust	TSF dust lift off	Air / windborne pathway	- Continuous rotation of spigot deposition points around the perimeter of the TSF to keep the beach moist. - Installation of erosion resistant materials (rock capping and gravel wearing course) on the downstream slope and embankment crests to prevent the generation of fugitive dust.
Discharge to land	Loss of containment and/or spills near concentrate thickener, filter building or new condensate storage area	Direct discharge	- Design includes concrete hardstand and stormwater containment sumps. - Thickener bunding designed to AS4681. - Filter building on concrete hardstand with filter presses located inside the building.

3.1.2 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 and Figure 4 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 the Premises

Human receptors	Distance from prescribed activity
Residents in Kambalda East	100m from the Premises boundary, 600m from the actual industrial premises
Commercial, light industrial premises	50m from the Premises boundary
Industrial premises	Directly adjacent
Environmental receptors	**Distance from prescribed activity**
Lake Lefroy	Adjacent to TSF
Groundwater	0.5 mbgl around TSF 3B
Remnant vegetation	Adjacent to TSF

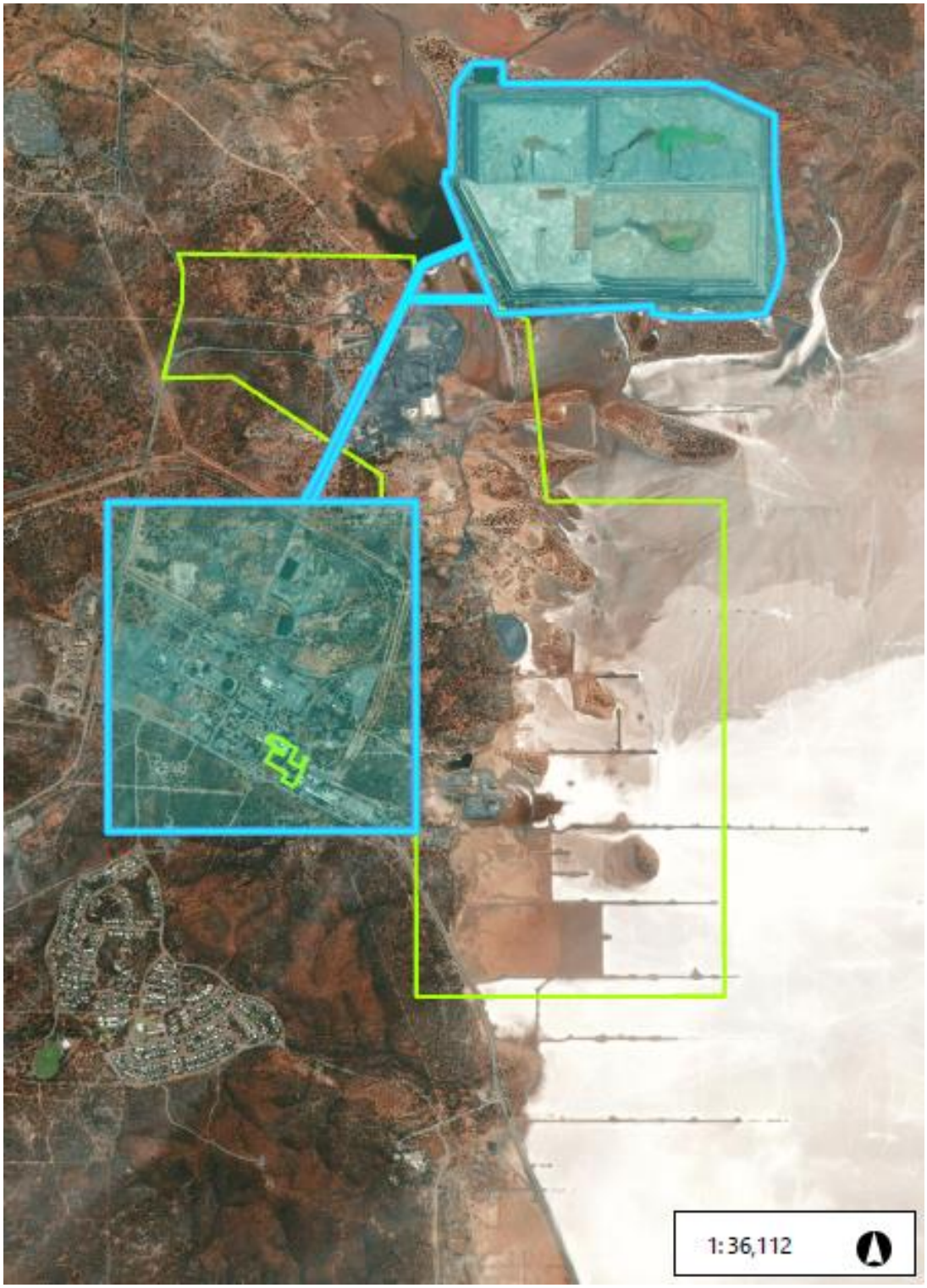

Figure 4: Distance to sensitive receptors

Notes: Premises shown in shaded blue area. Green marked areas are two other licenced premises, Long Victor Nickel Complex (L8575/2011/11, area outside the Premises) and Kambalda Power Station (L8566/2011/2, green area inside the Premises).

3.2 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 3.1. 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 3.1), 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 W6624/2021/1 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 amendment is required following the time-limited operational phase authorised under the works approval to authorise emissions associated with the ongoing operation of the Premises.

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

Risk events					Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions [2] of works approval	Justification for additional regulatory controls
Sources / activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
Construction								
Embankment raise of TSF 3B	Dust	Air / windborne pathway causing impacts to health and amenity	No receptors	Refer to Section 3.1	N/A			
	Noise							
Construction of an additional thickener and associated containment infrastructure; Installation of a filtration building containing condensate filter presses and processing tanks; Construction of wet condensate storage areas; Installation of an additional electrical substation	Dust	Air / windborne pathway causing impacts to health and amenity	Residences about 700 m from the proposed location of the works	Refer to Section 3.1	C = Moderate L = Unlikely **Medium Risk**	*Y*	-	Applicant controls are conditioned in the works approval.
	Noise							
	Spills of chemicals/ hydrocarbons to ground	Direct discharge causing soil contamination	Soil underneath the Premises which potentially can impact ground water to Lake Lefroy					
Operation ***(including time-limited-operations operations)***								
Operation of the Nickel Concentrator and auxiliary facilities	Dust	Air / windborne pathway causing impacts to health and amenity	Residents about 600 m from where the actual	Refer to Section 3.1	C = Minor L = Unlikely **Medium Risk**	Y	Condition 1, 2 and 3	N/A

Risk events					Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions [2] of works approval	Justification for additional regulatory controls
Sources / activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
	Noise		activities are occurring.	Refer to Section 3.1	C = Minor L = Unlikely **Medium Risk**	Y		N/A
	Spills of chemicals/ hydrocarbons to ground	Direct discharge causing soil contamination	Soil underneath the Premises which potentially can impact ground water to Lake Lefroy	Refer to Section 3.1	C = Minor L = Possible **Medium Risk**	Y		Applicant controls are conditioned in the works approval.
Deposition of tailings into TSF3 B	Tailings containing metals, metalloids seeping into groundwater/ surface water	Seepage and infiltration through subsurface impacting the quality of groundwater and Lake Lefroy; Mounding impacting remaining vegetation	Refer to Section 3.1	Refer to Section 3.1	C = Moderate L = Possible **Medium Risk**	N	Conditions 1, 4, 5, 6, 9 and 10	Refer to Section 3.3
	Runoff from TSF3B embankment	Transport of surface water contaminated with metals and metalloids impacting	remaining vegetation and Lake Lefroy	Refer to Section 3.1	C = Minor L = Possible **Medium Risk**	Y		Applicant controls are conditioned in the works approval.
	Tailings overtopping	Discharge of waste fines outside of the containment infrastructure	Localised soils and vegetation	Refer to Section 3.1	C = Slight L= Possible **Low risk**	Y		Applicant controls are conditioned in the works approval.
TSF 3B return pipeline	Tailings containing metals, metalloids direct discharge	Direct discharge of tailings/decant water	Localised soils and vegetation	Refer to Section 3.1	C = Minor L = Possible **Medium Risk**	N	**Condition 1 Table 1**	The 2019 Annual TSF Operation Review (Golder, 2020) identified faults along the TSF

Risk events					Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions [2] of works approval	Justification for additional regulatory controls
Sources / activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
								pipeline route and recommended: - Reinstate damaged catch pits and containment bunds along the pipeline route - Reinstate windrows along the pipeline route The above recommendations and applicant controls are conditioned in the works approval.

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.

3.2.1 Groundwater and process water quality

Historical groundwater monitoring results were provided by the applicant as part of this assessment. The data shows that groundwater quality has been impacted by contaminates present in the tailings.

Chromium levels at KD5247A are above ANZG 2018 for slightly to moderately disturbed ecosystems. This monitoring bore is a superficial bore, 6.3 m below ground level, and it is located adjacent to the north side of TSF3B.

Zinc concentration in groundwater for all bores is above ANZG 2018 for slightly to moderately disturbed ecosystems (0.008 mg/L) – Figure 5.

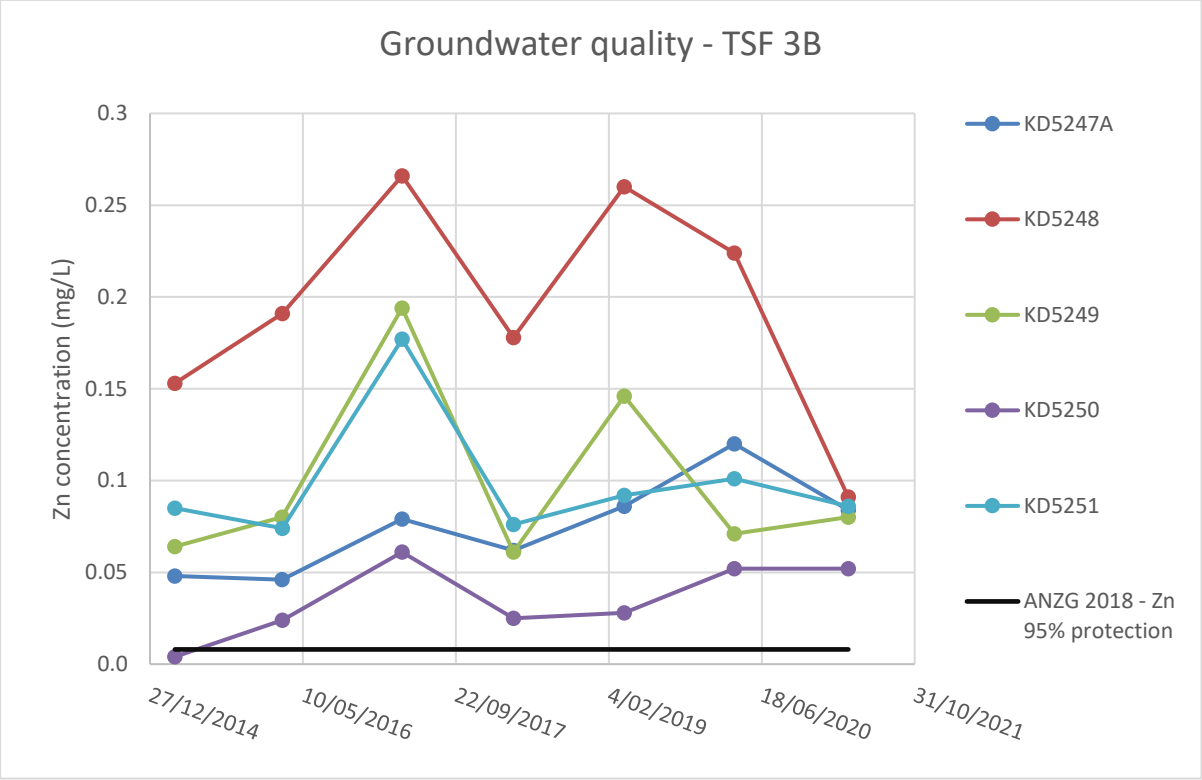

Figure 5: Zinc concentration in groundwater around TSF 3B.

Nitrate in groundwater around TSF 3B shows concentration above 10.6 mg/L as per ANZG 2018 - for slightly to moderately disturbed systems (95% protection). The data is limited to the period between 1993 to 1997.

A summary of the groundwater quality historical data is shown in Appendix 2.

The process water will make up the tailings composition to be disposed into TSF 3B. Process water chemical composition between October 2020 and November 2021 is presented below:

- cobalt (average 3.4 mg/L)
- copper (average 0.67 mg/L)
- nickel (average 54 mg/L)
- zinc (average 0.57 mg/L) and
- sulphate (average 8203 mg/L)

3.2.2 Cobalt (Co) and sulphate (SO_4^{-2}) are contaminants that will be present in the seepage water and should be part of the groundwater monitoring programme. Tailings kinetic test results

In 2017, a twelve months kinetic test was conducted by the applicant on tailings samples from Kambalda and another two BHP Nickel West sites. The samples were also analysed for static acid-base accounting (ABA) properties and for mineralogical composition.

The result of the kinetic tests of the tailings (Golder, 2018) indicated that:

- the tailing sample from the Premises can be classified as potentially non-acid forming but may acidify in the long term;
- cadmium (Cd) and molybdenum (Mo) were present in tailings leachate; and
- leachate from the Premises tailings have the potential to generate a leachate that is metalliferous.

3.2.3 Seepage assessment

A seepage assessment was conducted in 2021 (Golder, 2021b) to review and update previous seepage assessments. The assessment focused on seepage from the downstream toe of TSF 3B. The modelling results indicate that the maximum seepage of 4 m^3/day from the toe and the maximum seepage of 8 m^3/day through the base. The hydraulic parameters used for the seepage modelling indicates that the permeability of the base of the TSF 3 in 10^{-7} m/s – semi permeable (Pazdro, Kozerski, 1990).

There are limited details for the construction of TSF number three (TSF 3) at the Premises in the Notice of Intent (NoI), TSF 3A and TSF 3B were combined as a single facility. TSF 3 was built on top of gravelly loams/ferricrete as shown in Figure 6 (Golder, 2021a).

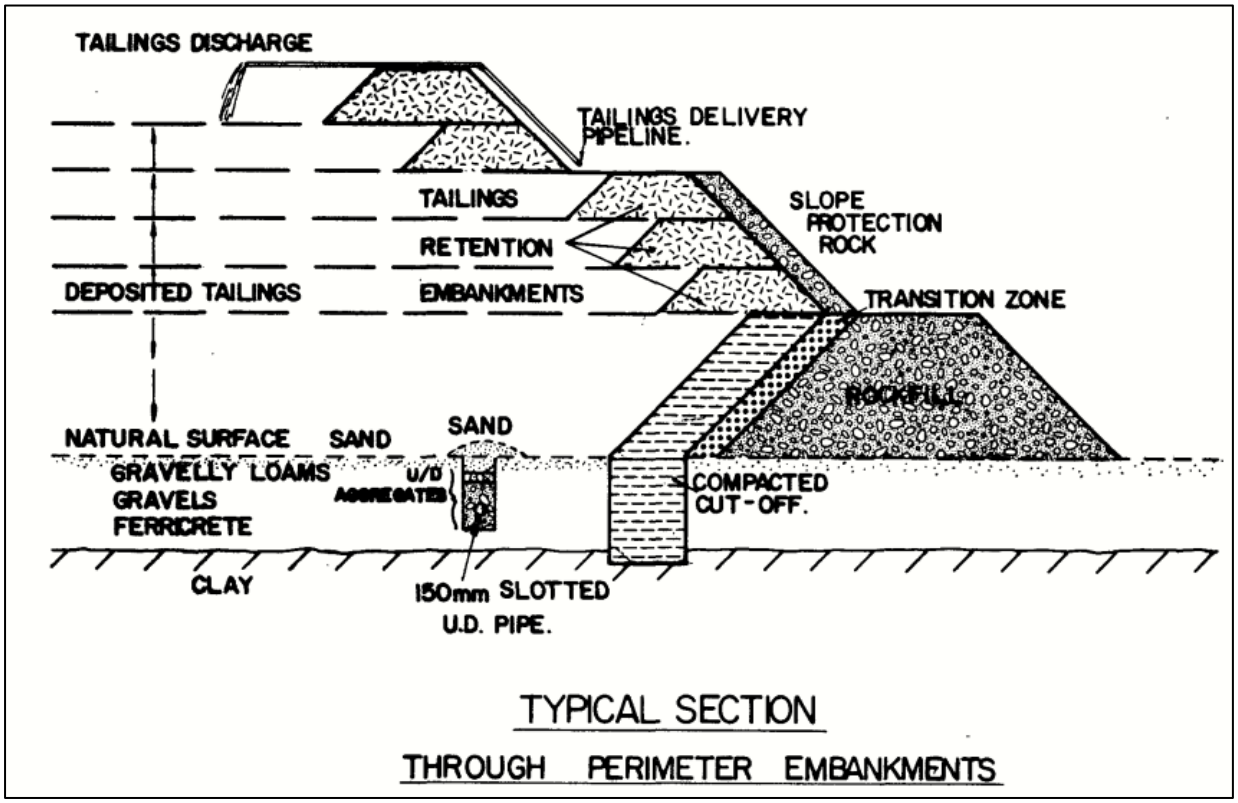

Figure 6: TSF 3 (NoI 373) depicting the type of soil where TSF 3 was built.

The groundwater monitoring programme required under L5533/1976/11, condition 23, requires analysis of pH, TDS, EC, Cr, Fe, Cu, Ni, Zn and As. The process water composition and the kinectic test results shows that there are other contaminants present in the tailings that are not part of the parameters measured on site.

Based on the predicted seepage and the current monitoring network around the TSF 3B, further monitoring bores will be required to target seepage to the superficial aquifer, which is connected to Lake Lefroy.

Therefore, additional monitoring requirements will be included in this works approval.

The requirements are:

- inclusion of sulphate (SO_4^{-2}), cadmium (Cd), cobalt (Co) and molybdenum (Mo) in the groundwater analysis suite;
- inclusion of nitrate (NO_3^-) and nitrite (NO_2^-) in tailings decant and groundwater to determine if nutrients are impacting Lake Lefroy;
- inclusion of two additional shallow bores; and
- record monthly the volume of water recovered from toe drainage and decant system.

4. Consultation

Table 4 provides a summary of the consultation undertaken by the department.

Table 4: Consultation

Consultation method	Comments received	Department response
Application advertised on the department's website on 10 December 2021	None received	N/A
City of Kalgoorlie Boulder advised of proposal on14 December 2021	None received	N/A
Shire of Coolgardie advised of proposal on14 December 2021	None received	N/A
Applicant was provided with draft documents on 21/02/2022 and 30 March 2022	BHP Nickel West provided comments on 16 March, 29 March and 31 March 2022.	Refer to Appendix 1

5. Decision

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. Department of Environment Regulation (DER) 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
2. Department of Water and Environmental Regulation (DWER) 2020, *Guideline: Environmental Siting*, Perth, Western Australia.
3. DWER 2020, *Guideline: Risk Assessments*, Perth, Western Australia.
4. Golder Associates 2018, *Results from kinetic testing of tailings samples – Month 12 final factual report*, 1662051-039-L-Rev0, , Perth, WA.
5. Golder Associates 2020, *2019 Annual TSF Operational Review Kambalda Nickel Concentrator*, 1788205-090-R-Rev0, Perth, WA.
6. Golder Associates 2021a, *Kambalda Nickel Concentrator Tailings Storage Facilities Operations, Surveillance, and Maintenance Manual*, 1788205-049-R-Rev4, Perth, WA.
7. Golder Associates 2021b, *Technical memorandum – Seepage assessment – Kambalda nickel concentrator TSF 3B embankment raise to RL 305 m*, 20145775-004-M-Rev0, Perth, WA.
8. Pazdro Z., Kozerski B. 1990. Hydrogeologia ogólna. Wydawnictwa Geologiczne, Warszawa.
9. Notice of Intent 373, Western Mining Corporation Limited, Kambalda Nickel Operations, Notoce of Intent for the construction of nº 3 Tailings Dam, 30 March 1989 - GeoDocs (dmirs.wa.gov.au)
10. ANZG 2018, Australian and New Zealand guidelines for fresh and marine water quality https://www.waterquality.gov.au/guidelines/anz-fresh-marine.
11. Email from Lauren Kupsch dated 29/03/202, *Draft decision W6624 – clarification required,* including attachment NKC TSF 3B – Toe Drain – Concept Sketch 24032022

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

Condition	Summary of applicant's comment	Department's response
Cover page	BHP NiW maintains access for the pipeline easement on Lot 13 K173679E. Tailings storage occurs on M26/317 under a sublease arrangement and on Lot 13 K173678L. Update premises details to also include Lot 13 K173678L	No change required
Construction of groundwater monitoring wells Condition 4, Table 2	BHP NiW would like to propose alternative target locations for installation of two new monitoring wells within the M26/317 lease. The need and justification to install additional groundwater monitoring wells is understood and alternative locations would meet the desired outcomes, as detailed in the decision report. The DWER proposed additional monitoring bore locations are challenging based on flood zone interaction – meaning keeping the bore itself safe, as well as maintaining regular monitoring access will likely be problematic at these locations. Extending the installation area to cover the M26/317 lease will provide flexibility based on ground-truthing outcomes and avoid the main flood zone areas. Consideration of specific locations within this lease will seek to maintain the monitoring intent of the original locations, being 100-150m outboard of the TSF, towards the main drainage that feeds Lake Lefroy. The two areas to be explored for installation of new monitoring wells include a: • Western location which is aligned closely with the original DWER indicated bore; and • Northern location which is west of the original DWER indicated bore to avoid the main flood zone. Assuming all relevant approvals and access considerations are resolved, the following timeframe considerations are flagged: 1. the drilling and bore construction and development works themselves should only take approximately 1 week 2. the securing of a suitable drill rig and crew to undertake the works may take 3-6 months to secure (in the current market) Until the bore locations are drilled, the geology (and therefore the associated bore construction details) are unable to be confirmed.	Agree and changes made

Condition	Summary of applicant's comment	Department's response
	Skilled technical supervision of the field execution will be utilised to navigate this key uncertainty. ACCESS & APPROVALS: The areas identified in Schedule 1, Figure 4 are located on M26/317 held by Mincor Long Pty Ltd, however extend beyond the BHP NiW sublease area. Please refer to 'BHP NiW Sublease Map: M26/317'. As such BHP NiW presently has no ability to enter the proposed area and additional tenure arrangements would need to be sought to obtain the required access to this area. Furthermore installation and construction of monitoring bores on this tenure would be subject to the Mining Act and will likely require an approved Mining Proposal. BHP NiW has not sought an additional mining proposal for the TSF3B lift as it was previously authorised by MP 20175. An additional mining proposal would likely be required to undertake this activity. Currently the Wider Kambalda area does not sit under an agreed native title claim. There may be a requirement to undertake additional assessments prior to installing groundwater monitoring bores beyond the currently disturbed areas. Additional time is requested so BHP NiW to work through these requirements and any associated approvals. The proposed approach is to nominate the M26/317 lease in its entirety (or at least the western portion) and identify specific locations as part of the Groundwater Monitoring Improvement Plan (proposed condition 4). This plan will detail the due diligence process in identifying these locations and be designed to meet DWERs objective to measure potential impacts of TSF operation. Whilst every effort will be made to have two bores installed and operational before depositing tailings into TSF3B, due to time constraints and identified uncertainties, this cannot be guaranteed. TIMEFRAME: The first stage of construction associated with the NKC Optimisation Works is currently scheduled for completion in June 2022. These works satisfy the definition of 'Time Limited Operation' in the Works Approval, however relate to the installation of a new thickener, not the TSF3B lift. To satisfy the requirement of 30 calendar days prior to commencement of time limited operations, the new monitoring bores would need to be installed by May 2022. BHP NiW would like to confirm that the concentrator will restart ahead of completing the lift of TSF3B as there is some remaining capacity for tailings deposition at the proposed rates. The Concentrator is planned to restart in early May 2022 which will recommence deposition of tailings into TSF 3B. Deposition of	

Condition	Summary of applicant's comment	Department's response
	tailings will be into TSF3A whilst the raise on 3B is completed. Text should read "…. planned to restart in early May 2022 which will recommence deposition of tailings into TSF 3A." BHP NiW acknowledge the intent to install groundwater monitoring bores and obtain baseline data ahead of executing the TSF 3B lift. However, due to the above restrictions it is unlikely installation of the additional shallow monitoring bores can occur in the timeframe specified.	
Condition 8	180 days for time limited operations (TLO) is sufficient to submit the required documentation however it is understood DWER would like to undertake a licence review for L5533/1976/11. BHP NiW requests confirmation if this is to occur ahead of amending the licence to include Optimisation works or whether both processes will occur concurrently? BHP NiW anticipates the information required to support a licence review will be available in approximately 18 months. This information includes a number of assessments, including modelling and in field monitoring, to enable assessment of the relevant environmental factors. DWER to confirm approach to subsequent licence amendments and licence review. If both process are to be consolidated BHP NiW requests the timeframe to time limited operations is extended to 2 years.	The monitoring conducted as part of W6624 during TLO will be assessed when a licence amendment to include theses operations is submitted to the department. Monitoring records must be kept as per W6624 Condition 14. According to Guide to Licensing , Section 4.3 states that Time limited operations under works approval is set between 90 to 180 calendar days to allow for the assessment of the licence application. Therefore, a two-year TLO will not be granted at this time. The applicant should consider applying for a licence amendment as soon as the works are completed.
Time limited operations requirements Condition 9, Table 3	Decant for TSF 3B is gravity and doesn't use a pump off system. It is difficult to instrument and record volumes from a gravity fed system. However flows from the return water pond can be recorded. Daily log sheets currently reference 'Return water pumps'. As mentioned, the TSF 3B decant comprises a gravity fed system discharging directly into Return Water Pond #3. This type of flow is difficult to meter. The return water volumes from Return Water Pond #3, closely align with the decant water volumes discharged from the active tailings storage facility and this is already monitored as outlined in the Operations, Surveillance and Maintenance (OSM) Manual. As we will only be depositing tailings into one cell at a time, i.e. either 3A or 3B, the return water volumes from Return Water Pond #3 are representative of decant volumes of the respective cell. No underdrainage is installed within TSF 3B (internal toe drain) and no drains are installed along the outer toe of TSF 3B (external toe drain). Hence no volume could	a) condition amended b) and c) GOLDER 2021 report recommended installation of a perimeter toe drain around the TSF. The applicant has propsed a toe drain along a portion of the northern flank of TSF3B, which the delegated officer considers as reasonable and will ad this requirement to the works approval. Time Limited Operation reporting conditions included in the Works Approval.

Condition	Summary of applicant's comment	Department's response
	be recorded. TSF 3B was commissioned in 2009 and was active until being placed into care and maintenance in 2018. Seepage observed at the toe of TSF 3B in 2015 was assessed to have been a result of operational practices adopted at the time. Operational controls implemented in response to the seepage issue were successful in addressing the problem and no further seepage was observed. These operational controls are included in the Operations, Surveillance and Maintenance (OSM) Manual for the TSF and are expected to minimize the risk of seepage for the TSF 3B raise to RL 305m. With the current controls in place, seepage water at the toe is not anticipated and collection/recovery measures are not expected to be necessary. In the event that new areas of seepage are identified, the trigger action response plan for seepage (as outlined in the OSM manual) outlines that the causes of seepage are to be assessed and measures to mitigate and prevent seepage impacts are to be reviewed and implemented as required. Location and size of decant pond is recorded on daily inspection logs. VWP data is continuously recorded via the telemetry system and the full history of the devices is accessible on the online VWP system. BHP Nickel West requests: a) reference to Decant Pumps be amended to 'Return water pumps' b) requirement to record volume of decant recovered be changed to 'volume of return water'. c) 'Volume of toe drainage recovered' be removed and a) removal of quarterly record requirements for 'Location and size of decant pond' as this is already adequately monitored and recorded on the daily log sheets.	
Decision report		
2.2.2 Proposed work, Perimeter Embankment, page 1	Construction materials will also be sourced from other areas as outlined in the design report. The applicant requests an update of this section to include reference to other material sources.	Amended

Condition	Summary of applicant's comment	Department's response
2.2.2 Proposed work, Perimeter Embankment, page 1	To clarify, the mining proposal covering TSF 3B raise is MP 20175, which was approved 1 September 2008. The mining proposal covering the Optimisation Works, approved on 14 January 2022, is for the infrastructure component only as the TSF raise was previously approved. The applicant requests an update to this section to confirm the TSF3B raise was previously approved and the recent MP was for infrastructure components in the processing area only.	Mining proposal number for the optimisation works was amended. Mining proposal number for TSF 3B lift amended.
2.3.1 DMIRS Geotechnical review	The figure included is for TSF3A, not TSF3B. Figure 6 in the OMS shows the relevant cross section for TSF3B. Design and construction details for TSF3B are outlined in the OMS in the paragraph above and below Figure 6.	Figure description amended. The purpose of Figure 5 is to show the soils where the foundations of TSF 3 were built, which are relevant to assess seepage. As stated in the text, the mining proposal for TSF 3 was for one cell that covered the area of TSF 3A and 3B. The legend in for the figure in the NOI 373 is: typical section through perimeter embankments Figure 2.

Appendix 2: Kambalda Nickel Concentrate - historical groundwater quality (applicant supplied)

Sample Point	Sample Date	Cr (mg/L)	Cu (mg/L)	Ni (mg/L)	Zn (mg/L)	Fe (mg/L)
KD5247A	18/03/2015	0.02	0.02	0.05	<0.05	<0.5
	3/03/2016	0.03	<0.02	0.05	<0.1	<1
	30/03/2017	0.062	0.02	0.079	<0.100	1.11
	29/03/2018	0.03	0.05	0.06	0.05	0.12
	26/03/2019	0.518	<0.021	0.09	<0.105	10.1
	20/03/2020	0.201	0.036	0.12	<0.105	4.96
	28/03/2021	0.245	<0.021	0.084	<0.105	5.80
KD5248	18/03/2015	<0.02	0.03	0.15	<0.1	<1
	3/03/2016	<0.02	<0.02	0.19	<0.1	<1
	30/03/2017	0.051	0.026	0.266	<0.100	<1.00
	29/03/2018	<0.01	0.06	0.18	0.07	<0.1
	26/03/2019	0.05	0.023	0.26	0.15	4.66
	20/03/2020	0.023	0.046	0.224	0.17	2.12
	28/03/2021	<0.052	<0.052	0.091	<0.262	<2.62
KD5249	18/03/2015	<0.02	0.056	0.064	0.208	<1
	3/03/2016	<0.02	<0.02	0.08	0.227	<1
	30/03/2017	<0.050	0.056	0.194	<0.250	<2.50
	29/03/2018	<0.025	0.057	0.061	0.212	<0.25
	26/03/2019	0.029	0.045	0.146	0.358	2.92
	20/03/2020	<0.052	<0.052	0.071	0.298	<2.50
	28/03/2021	<0.052	<0.052	0.08	0.277	<2.62
KD5250	18/03/2015	<0.001	0.0	0.0	<0.005	<0.05
	3/03/2016	<0.02	<0.02	0.02	<0.1	<1
	30/03/2017	<0.050	<0.050	0.061	<0.250	<2.50
	29/03/2018	<0.025	0.05	<0.025	<0.125	<0.25
	26/03/2019	<0.021	0.025	0.028	<0.105	1.68
	20/03/2020	<0.052	<0.052	<0.052	<0.262	<2.50
	28/03/2021	<0.052	<0.052	<0.052	<0.262	<2.62
KD5251	18/03/2015	<0.02	0.07	0.09	0.64	<1
	3/03/2016	<0.02	<0.02	0.07	0.65	<1
	30/03/2017	<0.050	0.055	0.177	0.606	<2.50
	29/03/2018	<0.025	0.08	0.08	0.52	<0.25
	26/03/2019	0.079	0.054	0.09	0.59	21.4
	20/03/2020	<0.052	<0.052	0.1	0.68	<2.50
	28/03/2021	<0.052	<0.052	0.09	0.639	<2.62

Sample Point	Sample Date	Nitrate (mg/L)	Sulphate (mg/L)
KD5247	27/10/1993	9.7	12435
	29/07/1994	7	16450
	14/08/1995	6.5	14700
	14/02/1996	8.1	16250
	26/09/1996	4.8	15000
	30/01/1997	7	15000
	8/02/1997	6.9	15000
	23/12/1997	20	14000
KD5247A	14/08/1995	11	7050
	12/02/1996	13	9600
	30/01/1997	11	7800
KD5248	27/10/1993	17.2	22015
	29/07/1994	8.4	19550
	14/08/1995	8.3	21200
	19/02/1996	12	24450
	26/09/1996	8	22000
	30/01/1997	7.6	22000
	30/01/1997	9.6	21000
	6/02/1997	7.1	23000
	8/02/1997	8.5	23000
	23/12/1997	31	22000
KD5249	27/10/1993	7	24055
	29/07/1994	5.3	22400
	14/08/1995	0.5	24150
	19/02/1996	0.7	23500
	26/09/1996	1.3	26000
	30/01/1997	2.7	26000
	8/02/1997	3.5	26000
	23/12/1997	12	25000
KD5250	27/10/1993	14.1	21150
	29/07/1994	9.2	21050
	14/08/1995	5.6	21650
	12/02/1996	6.7	19700
	26/09/1996	4.9	21000
	30/01/1997	5.6	19000
	8/02/1997	6.3	20000
	23/12/1997	19	20000
KD5251	27/10/1993	18.9	24115
	29/07/1994	6.2	26250
	14/08/1995	1	23650
	12/02/1996	1.7	30700
	26/09/1996	1	29000
	30/01/1997	11	29000
	8/02/1997	4.8	30000
	23/12/1997	22	29000

Yellow highlight: nitrate concentration above ANZG 2018 for slightly to moderately disturbed systems (95% protection)