



## Application for a licence amendment

### Division 3, Part V *Environmental Protection Act 1986*

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<b>Licence number</b>	L8437/2010/3
<b>Licence holder</b>	BHP Nickel West Pty Ltd
<b>ACN</b>	004 184 598
<b>File number</b>	2012/000069-1~2
<b>Premises</b>	<ol style="list-style-type: none"><li>1. Kwinana Nickel Refinery Lot 89 on Deposited Plan 411084 Patterson Road KWINANA BEACH WA 6167 Certificate of Title Volume 2958 Folio 292</li><li>2. Baldivis Facility Lot 820 on Plan 77252 Miller Road BALDIVIS WA 6171 Certificate of Title Volume 2841 Folio 582</li></ol>
<b>Date of report</b>	26/10/2022
<b>Proposed decision</b>	Amended Licence

## 1. Amendment description

This amendment is made pursuant to section 59 of the *Environmental Protection Act 1986* (EP Act) to amend the existing licence issued under the EP Act for a prescribed premises as set out below. This notice of amendment is hereby given under section 59B(9) of the EP Act.

This amendment is limited to changes to Category 44: metal smelting or refining.

In completing the assessment documented in this report, the department has considered and given due regard to its regulatory framework and relevant policy documents which are available at <https://dwer.wa.gov.au/regulatory-documents>.

### 1.1 Purpose and scope of assessment

The Licence Holder BHP Nickel West Pty Ltd (Nickel West) has applied for an amendment to Licence L8437/2010/3 at the Baldivis Facility to increase the rate of evaporation of processes wastewater from three evaporation ponds (referred to as evaporation cells by the Applicant) at the facility. The Licence Holder has advised that wastewater levels contained within the evaporation cells has been higher than anticipated over recent years on account of periods of high rainfall coinciding with process upsets that cause excess wastewater levels to be disposed of within the wastewater pond system.

High levels of wastewater contained within the ponds reduces the capacity of the facility to accommodate stormwater from future extreme rainfall events or any additional unexpected increases to wastewater generated through unexpected upsets to processing operations.

The changes requested by the Licence Holder were applied for over two separate applications received by the department on 18 February 2022 and 10 May 2022 and are assessed jointly under this Amendment Report. The requested changes are:

- To extend the existing evaporation sprinkler system for evaporation ponds 1 and 2 to include pond 3 (application date: 18 February 2022 DWER Document reference number DWERDT573071); and
- To install and operate a Pitt Boss Evaporation Systems across the premises, 18 units in total are proposed to be installed across the three evaporation ponds at the Baldivis Facility; and 1 unit is proposed to be installed within the 12.5 ML effluent storage tank at the Kwinana Nickel Refinery (application date: 10 May 2022 DWER Document reference number DWERDT601725).
- To remove condition 33 (which requires the Licence Holder to operate the sprinkler system in accordance with the BHB Billiton Nickle West Site – Baldivis Evaporation Management Plan).to allow flexibility and outcome based controls for the management spray-drift from the evaporation sprinklers.

The Delegated Officer also undertakes to make alterations to the Licence commensurate with the reduced regulation of the ongoing operations under Part IV of the *Environmental Protection Act 1986* (EP Act) as detailed in Section 2.1.1, and to the exclusion of management of part of the Baldivis Facility under *Contaminated Sites Act 2003* (CS Act) as detailed in Section 2.1.2. The alterations sought by the Delegated Officer are an attempt to address the underlying basis of the need for increased wastewater evaporation at the site, now that the possibility of duplicitous regulation with Part IV of the EP Act, is removed.

### 1.2 Background

The Kwinana Nickel Refinery premises is separated into two main operational areas the Kwinana Nickel Refinery which is the primary prescribed category activities area, and the Baldivis Facility, a parcel of land which is 5.5km south-east and contains a closed ammonia sulphate residue tailings storage facility (TSF), and three wastewater Evaporation Cells (EC) and a staging pond. These two areas are joined by a utilities corridor where wastewater is conveyed between the refinery to the evaporation ponds; and contains necessary associated

infrastructure such as pumps and electrical line that support the conveyance of wastewater.

Wastewater is generated at the Kwinana Nickel Refinery as a byproduct of the nickel refining processes including leaching of nickel matte, copper boiling, nickel reduction, cobalt recovery, ammonium sulphate recovery and from the wastewater treatment plant that recycles water back into process operations at the refinery. Surplus effluents are volumetrically reduced through evaporation at the Baldivis Facility.

These wastewaters are held in evaporation ponds 2 and 3 (EC 2 and EC 3 respectively). Evaporation pond 1 (EC 1) is managed as an isolated cell and contains excess concentrate from the reverse osmosis plant and process effluent. The evaporation ponds rely on both passive solar and wind evaporation, and through this amendment increasing active means of evaporation to accelerate passive evaporation, through the use of evaporation sprinklers and Pitt Boss evaporation units, which blows air into and across the evaporation pond surface.

Evaporation is a relatively slow method of increasing capacity of wastewater capable of being stored within the effluent holding tank and evaporation ponds at the premises, and it is not a reliable method of water loss as it relies on climatic conditions, and effective losses to the system can be quickly reversed with process upsets or incidents of high rainfall, which usually occur when ambient humidity is high, further reducing loss through active evaporation methods (evaporation sprinklers and Pitt Boss evaporation units).

The process effluent has extremely high total dissolved solids, which includes very high levels of ammonium sulphate, a range of metals including high levels of nickel, heavy metals such as copper and cobalt; and metalloids such as boron and silica. Ammonium sulphate is widely used as an agricultural fertiliser and at high concentrations is known to burn vegetation when applied as a foliage spray. At very high concentrations ammonia sulphate can kill vegetation, acidify soils and mobilise soluble aluminium, reducing the availability of cations in the soil which can impact on the chemical and physical structure and function of soil. The metals and metalloid compounds in the effluent such as nickel, cobalt and copper and known to be toxic to aquatic freshwater and marine biota.

### **2.1.1 Ministerial Statement 377**

The Baldivis Facility is subject to Ministerial Statement 377 (MS 377) administered under Part IV of the Environmental Protection Act by the Environmental Protection Authority (EPA). MS 377 was approved on 18 January 1995 and superseded MS 144 (published date 14 May 1991) and was intended to manage the Baldivis Facility and the dense plume of ammonium sulphate that had seeped/ and was seeping into the aquifer below from the leaking TSF. It required proponent to comply with a number of commitments in relation to the TSF, the wastewater treatment plant, the EC's and required ongoing monitoring of groundwater and surface water feeding into the nearby Lake Coo loongup.

On the 4 June 2019, the EPA advised the Licence Holder that no further actions were required under Part IV of the Environmental Protection Act 1986, and that the occupier may cease reporting compliance with MS 377 as the ammonium sulphate levels within the groundwater beneath and downstream of the Baldivis Facility had reached a level where abstraction from recovery wells was having a limited effect on controlling further migration of the plume which was relatively dilute (DWER, 2019). The ongoing management of the TSF is now undertaken in accordance with the *CS Act* and reporting guidelines.

### **2.1.2 Management of the Baldivis Facility as a Contaminated site**

Nickle West undertook Detailed Site Investigation (DSI) (Golder and Associates, 2017) under the *CS Act* 2003 at the Baldivis Facility and in accordance with Regulation 31(1)(b) of the Contaminated Sites Regulation 2006, a Mandatory Auditors Report was also undertaken as the site identified as a contamination source site (GHD, 2017b). The site is currently classified as *Contaminated - Remediation Required*.

The DSI found the ammonium sulphate plume below the premises extended radially from the premises along the base of the aquifer and was present under the Leda Nature Reserve to the north and Kerosene Lane to the south. Regional groundwater was also noted to migrate to the west towards more generally, towards the coast and towards Lake Cooloongup which was found to act as a more localised groundwater sink. On the basis of the management of the site has included an Ecological Investigation undertaken in accordance with the CS Act 2003.

The DSI estimates that 35% of the ammonium sulphate is still present in the aquifer, but that it does not pose an unacceptable risk to human health while use as a potable water source is restricted. Groundwater continues to be monitored for potential environmental receptors, including Lake Cooloongup. The ongoing management objective is to investigate, remediate and optimise monitoring of the site so that it at some point in the future the site be reclassified as "Remediated-- - Restricted use".

### **2.1.3 Recent alterations to the premises wastewater generation**

In 2018 Kwinana Nickel Refinery applied to construct a new Powder Leach Nickel Sulphate Plant (PLNSP) to produce an additional 22,000 tonnes per annum of nickel sulphate (Works Approval W6117/2018/1 issued on 17/7/2018). In 2019, the Kwinana Nickel Refinery increased the wastewater holding capacity at the site by 18.65ML as two effluent holding tanks were constructed at the Kwinana Nickel Refinery of 1 x 14.65 ML and 3 ML that hold an operational volume of 12.5 ML and 2.5 ML respectively to accommodate a shut down at the facility (Amendment dated 11 July 2019). Since then, the site has increased production throughput rates by 20% at the premises from 75ktpa to 90 ktpa (Works Approval W6275/2019/1 granted 25/09/2020).

These increases in throughput capacity are likely to have significantly increased the volumes of wastewater generated at the site that require treatment and result in increased volumes being disposed into the evaporation cells for treatment. An assessment of the capacity of the wastewater treatment system to process or contain these additional volumes was not assessed by DWER at the time as these ponds were managed under MS 377. No formal assessment was undertaken under Part IV of the EP Act at this time to determine if the wastewater treatment system as a whole is able to manage the additional volumes of effluent requiring treatment at the Baldivis Facility or reprocessing through the wastewater treatment plant for reuse.

In addition to the increase in wastewater generated through increased processing at the Kwinana Nickel Refinery, the volume of stormwater being conveyed to the wastewater treatment system is significantly greater through the 2018 amendment with the construction of additional hardstand areas at the facility as part of the new PLNSP.

Notwithstanding this, high pond levels mean that the site has diminished capacity to contain water inflow from additional extreme rainfall events or additional wastewater from unanticipated processing upsets that could occur in the future. During periods of high rainfall, evapotranspiration rates are typically lower, further compounding the issue by reducing water loss to the pond system.

An estimation was provided to DWER in 2022 that between 50-80ML is sent to Baldivis Facility for evaporation from the Kwinana Nickel Refinery each year (BHP, 2022c). It is not clear if this is pre or post water treatment and recycling into the process operations, or if it includes rainfall.

### **2.1.4 Relevant incident and complaints history**

The following incidents and complaints are recorded on the Department's Incident and Complaint Management System (ICMS) and are included as they are considered relevant to the current assessment.

ICMS 13429 & 12662: on 23 May 2008 and 30 July 2008 respectively, the Department received complaints in relation to a strong ammonia odour coming from the Baldivis Facility. The odour was confirmed as coming from the Baldivis Facility on both occasions, but the odour detection area was limited to within industrial/rural zoned areas including Kerosene Lane to the south (incident date 23 May 2008). Kerosene Lane now forms the boundary of a new residential development area in Baldivis.

ICMS: 35555: on the 20 November 2014, a process effluent pipeline leak was reported to the Department from a below ground pipeline that conveyed process effluent between the Kwinana Nickel Refinery. The leak was estimated at 77kL by the Licence Holder.

ICMS 32944: on 6 May 2014 departmental officer attended the site and observed overspray from the evaporation ponds had caused rusting on the northern premises perimeter fence and vegetation decline and deaths along the same perimeter fence area.

ICMS 50483: On 10 July 2018 rainfall caused an overflow of process water within effluent thickener tank to overflow and resulted in a 250kL discharge to ground.

### 3. Proposed amendment

The proponent intends to construct the following infrastructure under this amendment, and this includes an extension of the sprinkler system from evaporation ponds 1 and 2 into pond 3. Nineteen Pitt Boss evaporation units will also be installed.

**Table 1: Licence Holder Controls**

Infrastructure	Operational requirements	Location
Evaporation pond 3 sprinkler system <sup>1</sup>	<ul style="list-style-type: none"> <li>Reduced sprinkler runs on cells (EC3 North, EC1 South) near south and north premises boundary</li> <li>Sprinkler heads are designed with a throw pattern of 20° or less</li> <li>Daily pre-start checks of weather forecast via BoM website</li> <li>Sprinklers runs operate based on prevailing wind speed and direction</li> <li>Pre-start-up inspection of sprinklers for leaks and blocked sprinkler heads</li> <li>Regular cleaning and replacement of sprinkler heads.</li> <li>Regular visual inspection of wind conditions and sprinkler performance</li> <li>At least three checks per shift for spray-drift</li> <li>Immediate shut-down of sprinkler system if spray-drift is detected</li> <li>Periodic photo inspections of vegetation condition.</li> </ul>	Schedule 2 Figure 5 of Licence
18 x Pitt Boss evaporator units in Evaporation ponds 1, 2 and 3 <sup>2</sup>  1 Pitt Boss Evaporator Unit In 12.5ML Effluent	<ul style="list-style-type: none"> <li>6 Pitt Boss Evaporator Units, within each evaporation cell (18 units in total).</li> <li>Centralised weather station, controlling units start up and shut down on set parameters.</li> <li>Daily pre-start checks of weather forecast via Bureau of Meteorology (BoM) website.</li> <li>Evaporator units operate based on prevailing wind speed and direction.</li> <li>Pre-start-up inspection of units.</li> <li>Regular visual inspection of wind conditions and</li> </ul>	Schedule 2 Figures 6 and 7 of Licence

	sprinkler performance. <ul style="list-style-type: none"> <li>• At least three checks per shift for spray-drift.</li> <li>• Immediate shut-down of Pitt Boss Evaporator System if spray-drift is detected.</li> <li>• Periodic photo inspections of vegetation condition.</li> </ul>	
Windsock	Maintained to provide a visible indication of wind speed and direction.	N/A

Note 1: Adapted from Table 2 Adapted from BHP Nickel West Kwinana Licence L8437/2010/3 Licence Amendment Application Supplementary Information Baldivis Evaporation Cells – Sprinkler Operation (BHP, 2022a)

Note 2: BHP Nickel West Kwinana Licence L8437/2010/3 Licence Amendment Application Supplementary Information Effluent Storage Facilities – Pitt Boss Evaporator System (BHP, 2022b)

### 3.1 Consultation

The application that forms this assessment was not subject to third party consultation, constituting a minor amendment to the premises.

### 3.2 Licence holder comments on draft decision

The Licence Holder was provided with a draft Amendment Report and draft Licence on 5 August 2022. The Licence Holder requested an extension to the 21-day comment period, and on 29 September 2022 provided detailed comments which are summarised in Appendix 1. The proposed Licence and risk assessment have been revised as a result of the consultation process with the Licence Holder.

## 4. Risk assessment

The table below describes the risk events associated with the amendments consistent with the *Guidance Statement: Risk Assessments* (DER 2017). The table identifies whether the risk events are acceptable and tolerated, or unacceptable and not tolerated, and the appropriate treatment and degree of regulatory control, where required.

Risk Event				Consequence rating <sup>1</sup>	Likelihood rating <sup>1</sup>	Risk <sup>1</sup>	Reasoning	Regulatory controls
Source/ Activities	Potential emissions	Potential receptors, pathway and impact	Licence holder controls					
<b>PROPOSED AMENDMENT</b>								
Additional spray sprinklers being added to EC3	Overspray of effluent containing high levels of ammoniums sulphate, metals and metalloid compounds	Air and wind dispersion to nearby native vegetation causing decline in vegetation health and/or vegetation death	<ul style="list-style-type: none"> <li>•Reduced sprinkler runs on cells (EC3 North, EC1 South) near south and north premises boundary</li> <li>•Sprinkler heads are designed with a throw pattern of 20° or less</li> <li>•Daily pre-start checks of weather forecast via BoM website</li> <li>•Sprinklers runs operate based on prevailing wind speed and direction</li> <li>•Pre-start-up inspection of sprinklers for leaks and blocked sprinkler heads</li> <li>•Regular cleaning and replacement of sprinkler heads.</li> <li>•Regular visual inspection of wind conditions and sprinkler performance</li> <li>•At least three checks per shift for spray-driftImmediate shut-down of sprinkler system if spray-drift is detected</li> <li>•Periodic photo inspections of vegetation condition;</li> <li>•Escalation procedure contained within SEMP for management of overspray and overtopping of ponds cause by sprinklers</li> </ul>	High level on-site impacts Mid-level off-site impacts <b>Major</b>	The risk event could occur at some time <b>Possible</b>	<b>High</b> Acceptable, subject to multiple regulatory controls	<p>Licence condition 33 requires the Licence Holder to operate the sprinkler system in accordance with the BHB Billiton Nickle West Site – Baldivis Evaporation Management Plan, Document Number NKW-PRO-PRO-0053 Version 1.0 23 October 2014.</p> <p>The Licence Holder has requested that Licence condition 33 be removed Licence to allow the updated to the Sprinkler Evaporation Management Plan (SEMP) to occur without requiring a Licence Amendment. The Licence Holder also requests this condition is removed to allow flexibility in how they achieve the outcome of no impacts across the premises boundary (as specified by condition 34).</p> <p>Previous overspray events have cause vegetation decline and deaths offsite as evidence by the site visit to the premises by departmental staff on 6 May 2014. The Delegated Officer considers the management of spraying activities is suitable for direct regulatory control as the volume and surface areas of effluent subject to evaporative spraying is increased through this amendment.</p> <p>A low-risk method of increasing evaporation would be to increase the evaporation surface area through the construction of additional effluent holding ponds, and thereby increasing evaporation through passive solar/wind means, or to reduce the volumes of effluent generated at the premises.</p> <p>The Delegated Officer has determined that condition 33 shall be amended to remove reference the SEMP. Due to the increase in volumes of effluent capable of being sprayed at any one time, the Delegated Officer considers any spray drift to have a greater impact both on site and off site should it contact vegetation. The current condition 34 only prevents off site impacts from spray drift, the proposed new condition prevent on site impacts to vegetation to the south and west of the evaporation ponds.</p> <p>Condition 34 will be retained as it covers other impacts and is not limited to spray drift. Condition 34 is amended to include reference to the Pitt Boss evaporation units as discussed below.</p> <p>Condition 33 now provides construction requirements for the installation and operation of additional sprinklers and Pitt Boss Units under this amendment.</p>	<p>Existing condition 33 will be removed. New condition 33 will be added specifying the installation and operation requirements of the new evaporation sprinklers to be installed on EC3.</p> <p>Existing condition 34 requires the evaporation ponds to be operated in a manner that does not result in impacts beyond the boundary of the Baldivis Facility. This condition is amended to prevent spray drift from causing impacts to vegetation within the premises boundary.</p>
Commissioning and Operation of 19 Pitt Boss evaporation units. 6 x EC1, 6 x EC2, 6 x EC3; 1 x 15.5 ML effluent storage tank	Overspray of effluent containing high levels of ammoniums sulphate, metals and metalloid compounds	Air and wind dispersion to nearby native vegetation causing decline in vegetation health and/or vegetation death	<ul style="list-style-type: none"> <li>•6 Pitt Boss Evaporator Units, within each evaporation cell (18 units in total).</li> <li>•Centralised weather station, controlling units start up and shut down on set parameters.</li> <li>•Daily pre-start checks of weather forecast via Bureau of Meteorology (BoM) website.</li> <li>•Evaporator units operate based on prevailing wind speed and direction.</li> </ul>	High level on-site impacts Mid-level off-site impacts <b>Major</b>	The risk event could occur at some time <b>Possible</b>	<b>High</b> Acceptable, subject to multiple regulatory controls	<p>The Licence Holder will commission the Pitt Boss evaporators in accordance with the Kwinana and Baldivis Pitt Boss Evaporation System Commissioning Management Plan; the Work Instruction: How to start up and Shut-down the Pitt Boss Evaporation Fans and the Baldivis Evaporation Cell tile Monitoring form. The commissioning plan allows for:</p> <ul style="list-style-type: none"> <li>• Pre-start checks including visual inspection of mooring lines, fans and generators</li> <li>• sequential starting up and monitoring of the Pitt Boss units in suitable wind conditions to ensure overspray and over topping does not occur;</li> <li>• if the wind speed is above 4m/s the Pitt Boss Commissioning Trigger Response Action Plan will be enacted;</li> <li>• the sprinkler system will not be used during commissioning of the Pitt Boss system;</li> </ul>	<p>Previous Condition 33 is removed.</p> <p>New condition 33 will be added specifying the installation and operation requirements of the new Pitt Boss Evaporation Units</p> <p>Existing condition 34 requires the evaporation ponds to be operated in a manner that does not result in impacts beyond the boundary of the Baldivis Facility. This condition is amended to prevent spray drift from the Pitt Boss Evaporation Units causing impacts to vegetation within</p>

			<ul style="list-style-type: none"> <li>•Pre-start-up inspection of units.</li> <li>•Regular visual inspection of wind conditions and sprinkler performance.</li> <li>•At least three checks per shift for spray-drift.</li> <li>•Immediate shut-down of Pitt Boss Evaporator System if spray-drift is detected.</li> <li>•Periodic photo inspections of vegetation condition.</li> <li>•Escalation procedure contained within SEMP for management of overspray and overtopping of ponds cause by Pitt Boss Units</li> </ul>				<ul style="list-style-type: none"> <li>• 29 monitoring tiles will be placed along the boundary fence of the Baldivis Facility to determine if overspray can be detected;</li> <li>• Visual inspection of evaporation cell tile monitoring will occur every 4 hours during commissioning when Pitt Boss units are in use;</li> <li>• Visual inspection for overtopping of ponds will occur during routine inspections</li> <li>• If there is any observable overspray the Pitt Boss units will be shut down;</li> <li>• Vegetation monitoring will occur</li> <li>• Environmental notification in case any spray drift/overtopping occurs; and</li> <li>• Escalation procedure for any issues identified.</li> </ul> <p>The Delegated Officer notes there is no proposal contained within the application for the management of the sprinkler systems while the Pitt Boss units are operational. On this basis, and for the potential for these two evaporation systems to compound the potential for spray drift, the Delegated Officer considers it appropriate to include a condition that restricts the operation of the Pitt Boss units and the sprinkler systems such that no impact to onsite or off site vegetation occurs.</p> <p>It is also noted the Work Instruction <i>How to start up and Shut down the Pitt Boss Evaporation Fans</i> Table 2.6.2 Item 1 advised that operation of the Pitt Boss Evaporation Units may continue if spray drift is observed so long as wetted vegetation is not observed. The Delegated Officer does not consider this acceptable to prevent impacts on nearby vegetation and overspray should be prevented prior to impacting on vegetation. On this basis, the Pitt Boss evaporation units should be shut down if any visible or non-visible overspray is detected (such as salt deposition on vegetation leaves). This measure is considered protective of native vegetation located within the premises boundary to the south and east of the evaporation ponds as well as off-site vegetation.</p> <p>The Pitt Boss evaporation units have the potential to cause wave action within the evaporation ponds, on this basis the Delegated Officer considers that an operating freeboard of 500mm should be maintained at all times in EC1-EC3. Should the operating freeboard be reduced, the Licence Holder has advised their own calculations allow for an operating freeboard of 468mm can be carefully managed without overtopping occurring. If this target value is reduced the site is required to implement the Trigeer Action Response Plan to reduce water within the affected cells.</p> <p>There is also the potential for the liners of EC1-EC3 to be damaged during installation of the Pitt Boss evaporation units. The Licence Holder will be required to report on the installation works and include a summary of any damage to the pond liners.</p> <p>The Licence Holder has advised they have already undertaken an assessment of the pond liners and these are due for replacement within 2-5 years. An application form is expected to be submitted December 2022 to allow for extra water storage on site to allow for replacement storage capacity prior to pond liners being replaces. Any replacement of pond liners will be subject to a separate application.</p>	the premises boundary.
	Overtopping of effluent containing high levels of ammoniums sulphate, metals and metalloid compounds	Direct discharge to soil, overland flow a impacting on vegetation health and infiltration to ground impacting on groundwater quality.		High level on-site impacts Mid-level off-site impacts <b>Major</b>	The risk event will probably not occur in most circumstances <b>Unlikely</b>	<b>Medium</b> Acceptable, generally subject to regulatory controls		New condition 35 is included requiring the Licence Holder to maintain an operating freeboard of 467mm on EC1, EC2 and EC3 at any time. If this value is reduced then the site is required to implement the Trigeer Action Response Plan to reduce water within the affected cells
	Tear EC1, EC2 or EC3 pond liner causing effluent discharge containing high levels of ammoniums sulphate, metals and metalloid compounds	Direct discharge to soil, overland flow impacting on vegetation health and infiltration to ground impacting on groundwater quality. Groundwater is both a receptor and a pathway to Lake Cooloongup	<ul style="list-style-type: none"> <li>•Units to be carefully installed;</li> <li>•Anchored by at least three guide lines to secure the position in the pond relative to the pond liner;</li> <li>•Units to include floatation devices;</li> <li>•Daily inspection of anchor lines and unit floats; and</li> <li>•Escalation procedure contained within SEMP for management of visual damage of pond liners</li> </ul>	High level on-site impacts Mid-level off-site impacts <b>Major</b>	The risk event will probably not occur in most circumstances <b>Unlikely</b>	<b>Medium</b> Acceptable, generally subject to regulatory controls		New condition 33 requires the Licence Holder to report on installation of the Pitt Boss units and any damage to the pond liners.  New specified action condition 40 and 41 also require the Licence Holder to undertake an assessment of the water volumes lost from the system and to submit a report on this assessment including a proposal to change or repair the liners.
Increased volatilisation of ammonia from the operation of additional sprinkler units and the Pitt Boss units at the Baldivis Facility	Ammonia type offensive odour	Air and wind dispersion to nearby human receptors	No additional control proposed by Licence Holder	Low level impacts offsite <b>Moderate</b>	The risk event will probably not occur in most circumstance <b>Unlikely</b>	<b>Medium</b> Acceptable, generally subject to regulatory controls	<p>In 2008 two complaints were received by nearby industrial sites in relation to the occurrence of an ammonia type odour coming from the ponds while the sprinklers were operational. No complaints have been received for approximately 12 years, however it is possible impacts to local residential receptors could occur in the future. The Delegated Officer does not consider nearby Industrial premises as sensitive receptors for the purpose of this assessment.</p> <p>The encroachment of residential areas to the Baldivis Facility and with the increased of active evaporation through the increase in sprinkler us and the installation of Pitt Boss units that there may be an increase in odour emitted for the premises and therefore an increase in complaints from the premises. The Delegated Officer considers existing condition 34 suitable for managing this risk.</p>	Existing Condition 34 is considered sufficient to manage any impacts of odour on residential sensitive receptors to the north or south of the premises.
Wastewater delivery lines	Leaks, spoils and ruptures	Direct discharge to	No additional control proposed by Licence Holder (previously managed	High level on-site impacts	The risk event could occur at	<b>High</b> Acceptable,	Leaks spills and ruptures of pipelines between the Kwinana Nickle Refinery and the Baldivis Facility was previously regulated by MS 377 commitments 32 and	New specified action condition 39 include to require installation of



between the Kwinana Nickel Refinery and the Baldivis Facility	discharging effluent to the environment containing high levels of ammoniums sulphate, metals and metalloid compounds	soil Soil infiltration to groundwater  Localised soil and groundwater contamination	in accordance with MS 377)	Mid-level off-site impacts <b>Major</b>	some time <b>Possible</b>	subject to multiple regulatory controls	33. On the 20 November 2014 an estimated 77kL discharge occurred and went relatively unnoticed as it occurred over a section of the pipeline buried 1.5m below the ground surface. On this basis and due to the extended length of the pipelines, the Delegated Officer will include a condition requiring flow meters to be fitted at either end of the pipeline between the Kwinana Nickel Refinery and the Baldivis Facility and to fit the pipelines with automatic leak detection and shut off systems to minimize discharge and allow maintenance and recovery of effluent.  The Delegated Officer has included a new standard condition requiring the Licence Holder to undertake monitoring the pipelines for leaks, ruptures and spills.	automatic leak detection monitoring equipment to supplement routine inspections where not already present.
Capacity of the premises to process effluent generated at the premises	Wastewater discharging to land containing high levels of ammonia sulphate, metals and metalloid compounds	Air and wind dispersion to nearby native vegetation causing decline in vegetation health and/or vegetation death  Direct discharge to soil, overland flow a impacting on vegetation health and infiltration to ground impacting on groundwater quality.  Groundwater is both a receptor and a pathway to Lake Cooloongup  Impacts to water quality in nearby Lake Cooloongup impacting on ecosystem health.	No additional control proposed by Licence Holder (previously managed in accordance with MS 377)	High level on-site impacts Mid-level off-site impacts <b>Major</b>	The risk event could occur at some time <b>Possible</b>	<b>High</b> Acceptable, subject to multiple regulatory controls	The Delegated Officer considers it appropriate for the Licence Holder to provide an assessment of the site's wastewater treatment plant and the evaporation ponds capacity to contain and process the increase in effluent generated on the site during: <ol style="list-style-type: none"><li>1. normal operations,</li><li>2. during extreme rainfall events;</li><li>3. when process upsets occur; and</li><li>4. when process upsets occur during periods of extreme rainfall.</li></ol> A water balance should be provided annually for each of the four scenarios listed above based on effluent production rates, with a summary of increases of wastewater generated since 2018 if the data is available. The water balance model should consider; <ul style="list-style-type: none"><li>• volumetric holding capacity of the infrastructure,</li><li>• Pan evaporation rates,</li><li>• water recycling capacity through the wastewater treatment plant,</li><li>• extreme rainfall events,</li><li>• seepage rates through the initial pond liner</li><li>• operating freeboard for each of the ponds/evaporation cells;</li><li>• an account of desludging/sediment buildup removal or management.</li><li>• predictive evaporative losses due to Pitt Boss and sprinkler system; and</li><li>• contingency planning should include a worst-case scenario process upsets and include freeboard capacities and contingency measures for the disposal of waste water off site should a trigger value be reached.</li></ul>	New specified action condition 40 included to require the Licence Holder to assess if the wastewater treatment system at the site, including EC1, EC2, EC3, the staging pond, the wastewater treatment plant which recycles water back into process operations is of sufficient capacity to cope with a range of operating configurations.
Integrity of the Evaporation Pond Liners	Seepage of effluent to the environment containing high levels of ammoniums sulphate, metals and metalloid compounds	Direct discharge to soil, infiltration to ground groundwater impacting on groundwater quality.  Groundwater is both a receptor and	<ul style="list-style-type: none"><li>• Escalation procedure contained within SEMP for management of visual damage of pond liners</li></ul> No additional control proposed by Licence Holder (previously managed in accordance with MS 377)	High level on-site impacts Mid-level off-site impacts <b>Major</b>	The risk event could occur at some time <b>Possible</b>	<b>High</b> Acceptable, subject to multiple regulatory controls	The evaporation ponds were constructed approximately over 25 years ago and since the removal of reporting under the MS which included a (commitment 22) requirement to monitor the seepage rates from the ponds, the Delegated Officer considers it appropriate for the Licence Holder to submit an assessment of the integrity of the pond liners, so that any seepage from these ponds can be realised and actioned accordingly..  The Delegated Officer Considers electrical Liner testing be undertaken as groundwater monitoring will only detect seepage after it has occurred and as there is a closed tailings dam on the site which is a known contamination source site so it will be unable to detect if contamination is coming from the ponds or the closed ammonia sulphate tailings dam (currently managed under the CS Act 2003) The electrical testing method is also considered a suitable method for testing pond liner integrity as active evaporation rates through the use of	New specified action condition 42 is included to require the site to submit a report of the most recent integrity test results of the pond liners for EC1, EC2, EC3 and the staging pond.

		<p>a pathway to Lake Coo롱gup</p> <p>Impacts to water quality in nearby Lake Coo롱gup impacting on ecosystem health.</p>					<p>sprinklers and Pitt Boss units could be masking seepage through the liners.</p> <p>During consultation the Licence Holder advised that Integrity testing of the evaporation ponds EC1, EC2, and EC3 and the staging pond have already occurred. The Delegated Officer has included a condition requiring the report detailing the most recent test results be submitted.</p> <p>This information may be used to inform a review of the Part V Licence review of the Baldivis Facility in the future.</p>	
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Note 1: Consequence ratings, likelihood ratings and risk descriptions are detailed in the Guidance Statement: Risk Assessments (DER 2017).

## 5. Decision

The Delegated Officer has determined the application to increase the wastewater evaporation rates via the installation of a total of 19 Pitt Boss units within the 12.5ML Holding tank at the Kwinana Nickel Refinery and the evaporation ponds EC1, EC2 and EC3 at the Baldivis Facility; and the request to add evaporation sprinklers to EC3. The delegated officer's determination is to authorise the increase in the extent of sprinklers on EC3 and to approve the use of Pitt Boss units to increase the loss of wastewater requiring storage at the Baldivis Facility.

With appropriate regulatory controls applied, these changes are unlikely to result in a material change to the overall risk profile of the site. The increase in active evaporation infrastructure at the premises, is noted and suggests that the ponds and wastewater treatment and recycling infrastructure at the premises may not be sufficient to manage the amount of wastewater generated at the premises. Specifically with regards to the recent increases in processing throughput at the Kwinana Nickel Refinery and the increase in diversion of stormwater from the Kwinana Nickel Refinery to the Baldivis Facility. Added to this uncertainty, climatic conditions and process upsets can be variable and make evaporation of water loss unreliable.

As there are no longer any regulatory controls applied to the ongoing operation of these ponds under Part IV of the EP Act 1986, the Delegated Officer will require the inclusion of conditions requiring aspects of the Baldivis Facility that are not subject to management under CS Act 2003, to be regulated under this operational Licence.

The evaporation ponds and effluent pipelines represent a long-term risk to the environment as they contain significant volumes of biologically hazardous effluent and are within close proximity to sensitive environmental receptors, especially Lake Cooloongup which is directly downstream of the premises. The ponds occupy the premises without a significant buffer to the premises boundary to the north and east, which means that offsite impacts to vegetation and encroaching residential receptors may be difficult to control without specific operation control and monitoring procedures in place.

To address the potential for impacts to vegetation, soil, groundwater the Delegated Officer has determined the following controls are suitable to manage the risks of impacts from operations under the existing licence:

- The evaporation sprinklers and the Pitt Boss evaporation units shall not be operated at the same time, to minimise the likelihood of overspray and odours from occurring;
- The Licence Holder shall shut down the evaporation sprinklers and the Pitt Boss units if any spray drift is evident, to protect vegetation;
- The Licence holder is required to maintain an embankment freeboard of at least 500mm; to accommodate process upsets and extreme rainfall events;
- The Licence Holder is required to undertake twice daily routine inspections of above ground effluent conveyance pipelines for the early detection of spills, rupture and discharges;
- The Licence Holder is required to demonstrate that effluent conveyance infrastructure is fitted with telemetry systems, pressure sensors, flow meters, automatic leak detection and shut infrastructure and secondary containment infrastructure by 31 January 2023;
- The Licence Holder is required to test the integrity of the pond liners for EC1, EC2, EC3 and the staging pond by the 31 January 2023 to ensure water loss through base of the pond liners is not occurring. A report of the results of the integrity test of the ponds is required to be submitted to the CEO within 1 month of the completion of the tests,

- The Licence Holder is required to undertake an annual water balance for the site which assesses the water holding capacity, the anticipated wastewater generation volumes, losses to the system via recycling, evaporation (active and passive) plus an assessment of the ponds to contain a future 1 in 100 year 72 hour rainfall event, an include effluent generated by process upsets.
- Contingency water management options are required to be provided to the CEO by 31 January 2023 in the event the ponds are not able to contain or process the amount wastewater requiring treatment on site, there is another disposal option being consider to prevent discharge to the environment.

## 5.1 Licence holder comments on draft decision

The Licence Holder was provided with a draft Amendment Report and draft Licence on 5 August 2022. The Licence Holder requested an extension to the 21-day comment period, and on 29 September 2022 provided detailed comments which are summarised in Appendix 1.

## 6. Conclusion

Based on this assessment, it has been determined to amend the existing licence, subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

### 6.1 Summary of amendments

The below table provides a summary of the proposed amendments and will act as a record of implemented changes. All proposed changes have been incorporated into the revised works approval as part of the amendment process.

Condition no.	Proposed amendments
19	Amended to include the requirement for the :Licence Holder to submit an annual water balance within the Annual Environmental Report due by 31 December each year.
Previous condition 33	Deleted as requested by the Licence Holder too allow greater operational flexibility and outcomes based regulation for management of the evaporation sprinklers.
New Condition 33	Inserted to cover installation and operational requirements of new infrastructure
34	Amended to require the Licence Holder to prevent impacts from spray drift inside the premises boundary as well outside the premises boundary.
35	New Condition requiring an operating freeboard of 467mm to be maintained on EC1, EC2, EC3 and the Staging Pond- or to implement a Trigger Action Response Plan to reduce water levels in the affected pond.
36	New condition requiring twice daily monitoring of effluent conveyance infrastructure
37	New condition requiring a report of compliance to be submitted for the construction and installation of evaporation sprinklers on EC3 and for the installation of 19 Pitt Boss evaporation units at the Kwinana Nickel Refinery (1 unit) and at the Baldivis Facility (18 units)
38	New condition requiring a summary of commissioning monitoring and performance of the evaporation sprinklers on EC3 and for the installation of 19 Pitt Boss evaporation units at the Kwinana Nickel

	Refinery (1 unit) and at the Baldivis Facility (18 units)
39	New condition requiring the Licence Holder to demonstrate that effluent conveyance infrastructure is fitted with telemetry systems, pressure sensors, flow meters, automatic leak detection and shut infrastructure by 31 January 2023
40	New condition requiring the Licence Holder to undertake an annual water balance for the site which assesses the water holding capacity, the anticipated wastewater generation volumes, losses to the system via recycling, evaporation (active and passive) plus an assessment of the ponds to contain a future 1 in 100 year 72 hour rainfall event, an include effluent generated by process upsets
41	New condition requiring the Licence Holder to undertake an annual seepage assessment within the AER
42	New Condition requiring the Licence Holder to submit a report of the results of the integrity test of the ponds is required to be submitted to the CEO by 31 January 2022
Definitions	Included definitions for EC1, EC2 and EC3
Schedule 1: Maps	Figure 2: Updated to show the a more recent map of the part of the premises boundary for the Baldivis Facility New Map Figure 3 included to show the entire premises boundary between the Kwinana Nickel Refinery, the Baldivis facility and the pipelines and infrastructure corridor that joins the two operational areas.
Schedule 2: Emission Points	New Figure 5: an updated location of evaporation sprinklers on EC1, EC2 and EC3. New Figure 6: Shows the location of the Pitt Boss evaporation unit within the 12.5ML effluent holding tank at the Kwinana Nickel Refinery New Figure 7 Shows the location of the 18 Pitt Boss evaporation units at the Baldivis Facility (EC1, EC2 and EC3).

## References

1. BHP, 2022a Nickel West Kwinana Licence L8437/2010/3 Licence Amendment Application Supplementary Information Effluent Storage Facilities – Pitt Boss Evaporator System (2022)
2. BHP, 2022b. Baldivis Facility evaporation sprinkler system BHP Nickel West Kwinana Licence L8437/2010/3 Licence Amendment Application Supplementary Information Baldivis Evaporation Cells – Sprinkler Operation (2022)
3. BHP, 2022c. Correspondence: BHP Nickel West Ltd L8437 Controlled Waste Acceptance approval (DWER reference document: A2099023)
4. DWER 2019. Correspondence: Notice of DWER Compliance Audit – Statement 377 (DWER reference document DWERDT164510)
5. GHD, 2017b BHP Billiton Nickel West Baldivis Tailings Storage Facility Mandatory Auditor's Report ((DWER reference document: A1786911)
6. Golder 2017 BHP BILLITON NICKEL WEST PTY LTD Baldivis Tailings Storage Facility, Baldivis, WA – Detailed Site Investigation Report (DWER reference document: A1786914)

## Appendix 1: Summary of licence holder's comments on risk assessment and draft conditions

Document reference	Licence holder comment	DWER response
Condition 33	<p><u>Evaporation Sprinklers</u></p> <p>BHP Nickel West request that the specification for table point referencing 'Sprinkler heads are designed with a throw patterns of 20 degrees or less be removed. The Licence Holder requested that a new table point referencing 'Sprinkler heads are to be designed and operated to ensure no spray drift beyond the prescribed premises boundary' be included.</p> <p><u>Pitt Boss Evaporation Units</u></p> <p>The Licence Holder advised that the exact pit boss locations will be finalised during commissioning</p>	<p><u>Evaporation Sprinklers</u></p> <p>The Delegated Officer has agreed to remove the requirement for sprinkler heads to be set at a particular angle, to allow greater flexibility in how operations are managed and as this is not an outcomes based control.</p> <p>The Delegated Officer does not accept the addition of the reference point specifying that no spray drift be permitted to cross the premises boundary as this implies that spray drift is permitted within the premises boundary. Discharge of spray drift within the premises boundary may cause harm to vegetation and contamination of soil and contribute to offsite impact over the long term. Spray drift fall out should be limited to the footprint of the containment infrastructure where possible.</p> <p><u>Pitt Boss Evaporation Units</u></p> <p>It is noted that the exact location of Pitt Boss units may change and any changes can be included within the compliance audit report that is required as part of Condition 38.</p>
Condition 34	<p>The Licence Holder requested the proposed amendment to condition be amended from <i>'The sprinkler system and the Pitt Boss evaporation Units installed on the evaporation ponds shall be operated in manner which does not result in spray drift'</i> to <i>"the sprinkler system and the Pitt Boss evaporation Units installed on the evaporation ponds shall be operated in manner which does not result in spray drift beyond the premises boundary"</i>.</p> <p>The reason cited for this change is to allow practical operation of the sprinkler system and Pitt Boss units</p>	<p>As stated above the Delegated Officer does not accept that spray drift be permitted within the premises boundary as this may still cause harm to onsite vegetation and soil contamination over the short term and over longer periods lead to offsite contamination through seepage to groundwater. Spray drift should be limited, and spray drift fall out limited to the footprint of containment infrastructure where possible.</p> <p>The Delegated Officer concedes that there may be occasions when it may be operationally very difficult to control spray drift under variable localised wind conditions. On this basis the following amendment to the condition is made to provide protection for on-site vegetation from spray drift, and does not restrict practical operation of the Pitt Boss Units and sprinkler system:</p> <p><i>'The sprinkler system and the Pitt Boss evaporation Units installed on the evaporation ponds shall be operated in a manner which does not result in impacts from spray drift to vegetation outside or within the premises boundary.'</i></p>
Condition 35 (condition deleted)	<p>BHP Nickel West request that this condition be amended to allow for the operation of the Pit Boss and Sprinklers at the same time in evaporation cells E1, E2 or E3</p>	<p>The Delegated Officer agrees to remove this condition as the revised condition 34 provides for adequate protection for impacts from on-site spray drift.</p>
Condition 36 (now condition 35)	<p>BHP Nickel West advised they are currently undertaking multiple studies and upgrade projects to further define and manage process water flow at the Kwinana Nickel Refinery. The aim of this is to create sufficient inventory to deal with operational upsets and extreme weather events. Currently BHP Nickel West is operating the Baldivis evaporation cells with a minimum target freeboard of 467mm, based on ANCOLD guidelines, comprising of a 1:100 AEP 72-hour storm event (167mm) plus an allowance of 300mm for wave action. BHP Nickel West sought advice from consultant storage dam engineers to determine if under extreme events and/or process upset, the total freeboard in the cells could be safely reduced below 467mm for a period of time. Under the direction of consultants, wave attenuating systems were trialled within the cells to reduce wave action with additional sand bagging around the perimeter of the cells to eliminate any wave splash exiting the cells. The consultants documented a trigger action response plan (TARP) to allow for the freeboard to safely be reduced, with implementation of these controls, to a minimum total freeboard of 317mm, which consisted of 1:100 AEP 72-hour storm event (167mm) plus an allowance of 150 mm for wave action. BHP Nickel West wish to operate the cells with a target minimum total freeboard of 467mm but with an allowance to operate for a period of time with a reduced minimum total freeboard of 317mm, subject to the implementation of additional controls and management plans. It is believed for both the target and reduced minimum total freeboard, the water levels can be managed effectively with no impacts or release of waters to the surrounding environment.</p> <p>As such, BHP Nickel West requests that the proposed licence condition be amended to state: <i>'The licence holder shall implement a target freeboard level of at least 467mm from the top of embankment for evaporation cells E1, E2, E3 and the Staging pond, as defined in Attachment 2 Schedule 1 Figure 2.'</i></p>	<p>The Delegated officer partially accepts the proposed changes. Should the freeboard be reduced the Licence Holder is required to implement the TARP and reduce water levels in the pods. The occupier is not limited by this condition and may undertake other actions to prevent discharge to the environment as specified by the plan.</p>

	<p>The licence holder is required to maintain a minimum top of embankment freeboard of 317mm for evaporation cells E1, E2, E3 and the Staging pond, as defined in Attachment 2 Schedule 1 Figure 2.</p> <p>The Licence holder upon becoming aware that the target freeboard level of 467mm has been exceeded, will implement the following:</p> <p>(i) Wave attenuation devices to reduce wave action</p> <p>(ii) HDPE liner wrapped double sand bag long the perimeter walls</p> <p>(iii) Develop and implement a response plan to reduce water levels in the affected cells'</p>	
Condition 37 (now condition 36)	<p>Nickel West currently inspects all above ground sections of effluent pipelines, pumps and valves, where accessible, for leaks, spills and ruptures every 12 hours. However, where sections of the pipeline cross the Public Transport Authorities railway corridor tenure, inspections are not possible as these areas are inaccessible to Nickel West personnel. Nickel West requests that this condition be amended to state:</p> <p>'The Licence Holder shall undertake twice daily visual inspection of above ground effluent pipelines, pumps and valves, where access is available, for leaks, spills and ruptures'.</p>	The Delegated officer accepts the proposed changes
Condition 38 (now condition 37)	No change requested	NA
Condition 39 (now condition 38)	No change requested	NA
Condition 40 (now condition 39)	<p>No change proposed to items (i), (ii) and (iii). Item (iv) is not achievable for all above ground sections of the pipeline as it crosses multiple land use areas including Public Transport Authority tenure.</p> <p>The effluent pipelines are currently fitted with differential automatic shut offs valves. The automatic shut offs are engaged when a differential in the pipeline flow rate is detected. Pressure gauges located at intervals along the pipeline length ensure that section with the differential, or potential leak, is detected immediately. The engagement of the shut off triggers an alarm which ensures that the pipeline is inspected and any spills contained as soon as practicable, in accordance with the Baldivis Inspection Procedure (31093836). The combination of automatic shut offs, alarms and inspections is deemed to be sufficient for the management of a potential pipeline leaks. BHP NiW requests that item (iv) regarding the required for secondary containment be removed from the proposed condition</p>	Delegated Officer accepts requested change
Condition 41 (now condition 40)	No change requested	NA
Condition 42 (condition deleted)	<p>The evaporation cells comprise of a dual liner system with a leak detection layer, primary liner is a HDPE geomembrane, underlain by a geonet, underlain by a secondary LDPE geomembrane. BHP Nickel West undertook liner integrity testing of the primary liner of the evaporation cells located at Baldivis in September 2021. Geomembrane samples of the primary HDPE liners at locations within EC1, EC2, EC3 and the staging pond were taken and tested for the following properties</p> <ul style="list-style-type: none"> <li>• Notched Constant Tensile Load (NCTL) (ASTM D6693)</li> <li>• Tensile Properties (ASTM D6693)</li> <li>• Density and Thickness (ASTM D5199 and D792)</li> <li>• Melt Flow Index (MFI) (ASTM D1238 – 2020)</li> <li>• 180 Degree Bend</li> <li>• Carbonyl Index (CI) (ASTM F2102)</li> <li>• Standard Oxidative Induction Time (S-OIT) (ASTM D3895)</li> <li>• High Pressure Oxidative Induction Time (HP-OIT) (ASTM D5885)</li> </ul> <p>The results of the testing concluded that the primary liner had up to 2 years residual lifespan until it would become prone to failure. The integrity of the secondary liner was also tested and found to have 5-7years residual lifespan. As such, BHP Nickel West expedited consideration of options for the replacement of the liner systems across all of the Baldivis evaporation ponds. Currently, there is no surplus storage facility inventory within the Baldivis or Kwinana refinery facilities that would allow for an evaporation pond to be emptied of its contents in order for the liner system to be replaced. BHP Nickel West is presently in the design phase of a project that would allow for the installation of two tanks at the Refinery site. These tanks would hold sufficient capacity to allow for the evaporation ponds to be emptied in sequence and the HDPE liner systems replaced. BHP Nickel West, anticipates the submission of an application for approval of the tanks to DWER before the end of December 2022. The primary purpose for the installation of the tanks is to facilitate the relining of the Baldivis evaporation cells. In the interim BHP Nickel West has increased the frequency of seepage monitoring to ensure that any seepage through the primary liner is detected and managed. Groundwater monitoring is also undertaken to ensure that any seepage through the secondary liner is detected. Due to the integrity of the primary and secondary liners of the evaporation and staging ponds at Baldivis being known, BHP Nickel West requests the removal of this condition from the Amended licence</p>	Delegated Officer accepts the requested change and this condition is deleted



Condition 43 (now condition 41)	<p>The Baldvis ponds are lined with double HDPE liner system, with seepage interception between the primary and secondary liners. Any seepage that comes through the primary liner reports to the seepage collection sumps which is then pumped directly back into the pond. As detailed above, BHP Nickel West has undertaken liner integrity testing of EC1, 2 and 3, however not under the methodology proposed in Table 3. Testing of hydraulic conductivity of a HDPE liner, in the absence of the proposed electrical conductivity testing is in an inefficient method of determining liner seepage. Without electrical conductivity testing, the hydraulic conductivity calculations are based on a large number of assumptions that do not give an accurate assessment of potential seepage through the liner. BHP NiW proposes the following alternative condition wording:</p> <p><i>The Licence Holder will undertake a seepage assessment of EC1, EC2 and EC3 which is to be submitted with the Annual Environmental Report. As a minimum, the seepage assessment will consider the following:</i></p> <ul style="list-style-type: none"> <li><i>(i) details of the total volume of seepage collected from that pond, via the seepage interception system per year</i></li> <li><i>(ii) details of groundwater monitoring results, including testing of ammonium sulphate, metals and metalloid compounds concentrations, to determine any impacts to groundwater from potential seepage.</i></li> <li><i>(iii) an upgrade plan for the replacement or repair of the liner systems where required.</i></li> </ul>	The Delegated Officer accepts the change