



<b>Works approval number</b>	W6788/2023/1
<b>Works approval holder</b>	BHP Nickel West Pty Ltd
<b>ACN</b>	004 184 598
<b>Registered business address</b>	125 St Georges Terrace PERTH WA 6000
<b>DWER file number</b>	DER2023/000156
<b>Duration</b>	20/06/2023 to 19/06/2026
<b>Date of issue</b>	20/06/2023
<b>Premises details</b>	BHP Nickel West Kwinana Nickel Refinery Baldivis facility Lot 100 on Deposited Plan 423540 and Lot 820 on Deposited Plan 77252 KWINANA BEACH WA 6167 Certificate of Title Volume 2958 Folio 292 As defined by the premises maps in Schedule 1

Prescribed premises category description (Schedule 1, <i>Environmental Protection Regulations 1987</i> )	Assessed production capacity
Category 44: Metal smelting or refining: premises on which metal ore, metal ore concentrate or metal waste is smelted, fused, roasted, refined or processed.	90,000 tonnes per annum of Nickel Metal

This works approval is granted to the works approval holder, subject to the attached conditions, on 20 June 2023, by:

**MANAGER, PROCESS INDUSTRIES  
REGULATORY SERVICES**

an officer delegated under section 20 of the *Environmental Protection Act 1986* (WA)

## Interpretation

In this works approval:

- (a) the words 'including', 'includes' and 'include' in conditions mean "including but not limited to", and similar, as appropriate;
- (b) where any word or phrase is given a defined meaning, any other part of speech or other grammatical form of that word or phrase has a corresponding meaning;
- (c) where tables are used in a condition, each row in a table constitutes a separate condition;
- (d) any reference to an Australian or other standard, guideline, or code of practice in this works approval:
  - (i) if dated, refers to that particular version; and
  - (ii) if not dated, refers to the latest version and therefore may be subject to change over time;
- (e) unless specified otherwise, any reference to a section of an Act refers to that section of the EP Act; and
- (f) unless specified otherwise, all definitions are in accordance with the EP Act.

**NOTE:** This works approval requires specific conditions to be met but does not provide any implied authorisation for other emissions, discharges, or activities not specified in this works approval.

# Works approval conditions

The works approval holder must ensure that the following conditions are complied with:

## Construction phase

### Infrastructure and equipment

1. The works approval holder must:
  - (a) construct and/or install the infrastructure and/or equipment;
  - (b) in accordance with the corresponding design and construction / installation requirements; and
  - (c) at the corresponding infrastructure location;
 as set out in Table 1.

**Table 1: Design and construction / installation requirements**

Infrastructure	Design and construction / installation requirements	Infrastructure location
Chloride Brine Storage (CBS) Tanks (40ML and 70ML capacity respectively)	<ol style="list-style-type: none"> <li>a) Underlying surface must be cleared of vegetation, free of stones, sharp objects and any other unsuitable material that may cause damage to the liner;</li> <li>b) Tanks must be constructed on a compacted limestone pad;</li> <li>c) Tanks to be constructed using tilt up concrete panels, post tensioning cables and supported by a continuous concrete ring beam;</li> <li>d) Tanks must be fitted with multi-layer liner system and leak detection system (as depicted in Figures 4 and 5 in Schedule 1);</li> <li>e) The Floor lining system consists of:               <ol style="list-style-type: none"> <li>(i) A primary liner of 1mm fortified polyolefin alloy;</li> <li>(ii) Electrically conductive geotextile (to enable testing of fusion welded joints during installation);</li> <li>(iii) Geonet flow / drainage layer (for leak detection system);</li> <li>(iv) Secondary liner 1mm fortified polyolefin alloy;</li> <li>(v) Geosynthetic Clay Liner (GCL) underlying whole tank;</li> </ol> </li> <li>f) Wall lining system consists of:               <ol style="list-style-type: none"> <li>(i) A primary liner of 1mm fortified polyolefin alloy;</li> <li>(ii) Electrically conductive geotextile (to enable testing of fusion welded joints during installation);</li> <li>(iii) Secondary liner 1mm fortified polyolefin alloy; and</li> <li>(iv) Electrically conductive geotextile (to enable testing of fusion welded joints during installation &amp; to protect secondary liner from abrasion against concrete walls); and</li> </ol> </li> <li>f) Tank design freeboard of 655mm able to be monitored via the installation of level alarms.</li> </ol>	As per Figure 3, 6 and 7 in Schedule 1

Infrastructure	Design and construction / installation requirements	Infrastructure location
Leak detection system	a) Each tank must have a designated leak detection inspection pit connected to the liner system; b) Level switch and remote alarm system must be installed; and c) The detection pits must be equipped with a sump pump capable of automatic operation when liquid is detected.	As per Figures 3, 6 and 7 in Schedule 1
Access platform	An access platform must be constructed to allow inspection access of the tanks and the leak detection inspection pits.	
Baldivis One HDPE Pipeline	Installation of an approximately 900m long pipeline from evaporation ponds to existing break tank to allow for the required flows to drain the ponds.	
Refinery Two HDPE pipelines and 900mm wide culvert	a) Installation of pipelines, approximately 300m in length that connect the CBS tanks to the existing pipework from Baldivis evaporation cells; b) A 100m culvert must be installed from tie in point to existing Baldivis pipelines to CBS tanks; c) Headwalls must be installed at both ends of each culvert; and d) Pipeline route from the refinery to the CBS tanks must be within a culvert or surface run.	

2. The works approval holder must ensure all fortified polyolefin alloy liners comply with the properties listed in Table 2 and are constructed in accordance with the requirements specified in that table.

**Table 2: fortified polyolefin alloy liner requirements**

Item	Property/construction requirement
Liner Properties	Fortified polyolefin alloy liners must have the following properties: <ul style="list-style-type: none"> <li>- Minimum Strength <math>\geq 1.0\text{mm}</math> (Test ASTM D 5199 – 1 test per roll);</li> <li>- Strength at break <math>\geq 31\text{N/mm}</math> (Test ASTM D 638 – 1 test per roll);</li> <li>- Elongation at break <math>\geq 1000\%</math> (Test ASTM D 638 – 1 test per roll);</li> <li>- Trapezoidal Tear Resistance <math>\geq 400\text{N}</math> (Test ASTM D 751 – 1 test per roll);</li> <li>- Puncture Resistance <math>\geq 298\text{N}</math> (Test ASTM D 4833 – 1 test per roll);</li> <li>- Axi-Symmetric Break Strain <math>\geq 50\%</math> (Test ASTM D 4833 – 1 test per roll);</li> <li>- Standard Oxidative Induction Time (S-OIT) <math>\geq 200</math> Min (Test ASTM D 3895 – 3 tests per batch);</li> <li>- High Pressure OIT <math>\geq 2000</math> Min (Test ASTM D 5885 – 1 test per batch);</li> <li>- Oven Aging at <math>85^{\circ}\text{C}</math> Standard OIT <math>\geq 35\%</math> retained after 90 days (Test ASTM D 5721 – 1 test per roll); and</li> <li>- UV Resistance Standard OIT <math>\geq 90\%</math> retained after 40,000 hours (Test ASTM D 4329).</li> </ul>

3. The works approval holder must ensure that all GCL liners comply with the properties listed in Table 3 and are constructed in accordance with the requirements specified in that table.

**Table 3: GCL liner requirements**

Item	Property/construction requirement
GCL material	<p>GCL liners must have the following properties:</p> <ul style="list-style-type: none"> <li>- Hydraulic conductivity <math>\leq 2.8 \times 10^{-11}</math> m/s (Test ASTM D 5887 – 1 test per 1000m<sup>2</sup>);</li> <li>- Bentonite Particle Size <math>\geq 75\%</math> passing 75<math>\mu</math>m (Test dry screen – 1 test per 1000m<sup>2</sup>);</li> <li>- Swell Index <math>\geq 24</math> mL/2 g (Test ASTM D 5890 – 1 test per 1000m<sup>2</sup>);</li> <li>- Fluid Loss <math>\leq 15</math> mL (Test ASTM D 5891 – 1 test every 2 rolls);</li> <li>- Mass per unit area of non-woven cover geotextile <math>\geq 240</math> g/m<sup>2</sup> (Test AS 3706.1);</li> <li>- Bentonite Mass measure at 0% moisture content <math>\geq 4000</math> g/m<sup>2</sup> (Test ASTM D 5993 - 1 test every 2 rolls);</li> <li>- Mass per unit of woven carrier geotextile <math>\geq 110</math> g/m<sup>2</sup> (Test AS 3706.1);</li> <li>- Mass per unit area of GCL <math>\geq 4350</math> g/m<sup>2</sup> (Test ASTM D 5993 - 1 test per 1000m<sup>2</sup>);</li> <li>- CBR Strength of GCL <math>\geq 1600</math>N (Test AS3706.4 – 1 test per 1000m<sup>2</sup>);</li> <li>- CBR Elongation of GCL <math>\geq 15\%</math> (Test AS3706.4 – 1 test per 1000m<sup>2</sup>);</li> <li>- Strip Tensile Strength <math>\geq 8</math> kN/m (Test ASTM D 6768 – 1 test per 1000m<sup>2</sup>);</li> <li>- Peel Strength (min avg.) <math>\geq 360</math> N/m (Test ASTM D 6496 – 1 test per 1000m<sup>2</sup>);</li> <li>- Cation exchange capacity of Bentonite <math>\geq 70</math> Meq/100g (or cmol/kg) (Test Methylene Blue Method – 1 test per 1000m<sup>2</sup>); and</li> <li>- Montmorillonite Content <math>&gt; 70\%</math> by weight (Test X-Ray diffraction or ASTM D 4373 – 1 test per 1000m<sup>2</sup>).</li> </ul>

4. The works approval holder must ensure that all geotextile materials comply with the properties listed in Table 4 and are constructed in accordance with the requirements specified in that table.

**Table 4: Geotextile material requirements**

Item	Property/construction requirement
Geotextile material	<p>Geotextile materials must have the following properties:</p> <ul style="list-style-type: none"> <li>- Wide Strip Tensile Strength <math>\geq 13.0</math> kN/m (MD), <math>\geq 15.2</math> kN/m (CMD) (Test AS 3706.2 – 1 test for 1000m<sup>2</sup>);</li> <li>- Wide Strip Toughness <math>\geq 3.79</math> kJ/m<sup>2</sup> (MD), <math>\geq 4.16</math> kJ/m<sup>2</sup> (CMD) (Test AS 3706.2 – 1 test for 1000m<sup>2</sup>);</li> <li>- Grab Tensile Strength <math>\geq 888</math> N (MD), <math>\geq 1105</math> N (CMD) (Test AS 3706.2 – 1 test for 1000m<sup>2</sup>);</li> <li>- Trapezoidal Tear Strength <math>\geq 411</math> N (MD), <math>\geq 407</math> N (CMD) (Test AS 3706.3 – 1 test for 1000m<sup>2</sup>);</li> <li>- CBR Burst Strength <math>\geq 2500</math> N (Test AS 3706.4 – 1 test for 1000m<sup>2</sup>);</li> <li>- Pore Size <math>\leq 75\mu</math>m (Test AS 3706.7 – 1 test for 1000m<sup>2</sup>); and</li> <li>- Water permeability <math>\geq 175</math> l/(m<sup>2</sup>/s) (Test AS 3706.9 – 1 test for 1000m<sup>2</sup>).</li> </ul>

5. The works approval holder must ensure that all geonet drainage materials comply with the properties listed in Table 5, and are constructed in accordance with the requirements specified in that table.

**Table 5: Geonet drainage material requirements**

Item	Property/construction requirement
Geonet drainage material	<p>Geonet drainage materials must have the following properties:</p> <ul style="list-style-type: none"> <li>- Thickness (at 80kpa) <math>\geq 4.8</math> mm (Test AS 3706.1);</li> <li>- Density <math>\geq 0.94 \text{g.cm}^3</math> (Test ASTM D1505);</li> <li>- Compressive Strength <math>\geq 500 \text{kPa}</math> (Test ASTM D1621); and</li> <li>- Flow rate per unit width at hydraulic gradient of 0.005, 80kPa confining pressure and inclusion of the proposed conductive geotextile in manufactures independent testing <math>\geq 0.007 \text{L/s/m}</math> (Test ASTM D4716).</li> </ul>

## Compliance reporting

6. The works approval holder must within 60 calendar days of an item of infrastructure or equipment required by condition 1 being constructed and/or installed:
- undertake an audit of their compliance with the requirements of condition 1; and
  - prepare and submit to the CEO an Environmental Compliance Report on that compliance.
7. The Environmental Compliance Report required by condition 6, must include as a minimum the following:
- certification by a suitably qualified engineer that the items of infrastructure or component(s) thereof, as specified in condition 1, have been constructed in accordance with the relevant requirements specified in condition 1;
  - as constructed plans and a detailed site plan for each item of infrastructure or component of infrastructure specified in condition 1;
  - a Quality Control / Quality Assurance Certificate from an independent geotechnical engineer or specialist which demonstrates that each item of infrastructure or component thereof, as specified in conditions 2, 3 4, and 5 been built and installed in accordance with the requirements specified in those conditions;
  - records of any quality assurance/control testing undertaken to demonstrate the requirements of conditions 2, 3, 4 and 5 have been met, including the basis of any method specification adopted;
  - A summary of performance of the infrastructure compared to expected performance in accordance with the manufacturer's specifications, including outcomes of liner system testing; and
  - be signed by a person authorised to represent the works approval holder and contains the printed name and position of that person.

## Time limited operations phase

### Commencement and duration

8. The works approval holder may only commence time limited operations for an item

of infrastructure identified in condition 1 where the Environmental Compliance Report as required by condition 6 has been submitted by the works approval holder for that item of infrastructure.

9. The works approval holder may conduct time limited operations for an item of infrastructure specified in condition 1 (as applicable):
  - (a) for a period not exceeding 180 calendar days from the day the works approval holder meets the requirements of condition 6 for that item of infrastructure; or
  - (b) until such time as a licence for that item of infrastructure is granted in accordance with Part V of the *Environmental Protection Act 1986*, if one is granted before the end of the period specified in condition 9(a).

### Time limited operations requirements and emission limits

10. During time limited operations, the works approval holder must ensure that the premises infrastructure and equipment listed in Table 6 and located at the corresponding infrastructure location is maintained and operated in accordance with the corresponding operational requirement set out in Table 6.

**Table 6: Infrastructure and equipment requirements during time limited operations**

Site infrastructure and equipment	Operational requirement	Infrastructure location
Chloride brine storage tanks including leak detection system and associated pipeline infrastructure.	<ol style="list-style-type: none"> <li>a) Freeboard must be maintained at, at least 655mm at all times via level indicators and weekly field operator inspections;</li> <li>b) Continuous level monitoring and control via the site Distributed Control System;</li> <li>c) Weekly inspections of pipelines, listed under Condition 1, to ensure there are no integrity issues;</li> <li>d) If seepage occurs into the leak detection pits, tanks contents must be returned by pumping back to the main CBS tank from which it originated; and</li> <li>e) The existing buried pipeline between the Baldivis Facility and the Kwinana Nickel Refinery to be monitored via continuous leak detection system.</li> </ol>	As per Figure 3 in Schedule 1

### Compliance reporting

11. The works approval holder must submit to the CEO a report on the time limited operations within 60 calendar days of the completion date of time limited operations or 30 calendar days before the expiration date of the works approval, whichever is the sooner.
12. The works approval holder must ensure the report required by condition 11 includes the following:
  - (a) a summary of the time limited operations, including timeframes and amount of chloride brine transferred to the tanks;
  - (b) a summary of the environmental performance of all infrastructure as constructed or installed (as applicable);

- (c) a review of performance and compliance against the conditions of the works approval; and
- (d) where the manufacturer's design specifications and the conditions of this works approval have not been met, what measures will the works approval holder take to meet them, and what timeframes will be required to implement those measures.

## Records and reporting

13. The works approval holder must record the following information in relation to complaints received by the works approval holder (whether received directly from a complainant or forwarded to them by the Department or another party) about any alleged emissions from the premises:
  - (a) the name and contact details of the complainant, (if provided);
  - (b) the time and date of the complaint;
  - (c) the complete details of the complaint and any other concerns or other issues raised; and
  - (d) the complete details and dates of any action taken by the works approval holder to investigate or respond to any complaint.
14. The works approval holder must maintain accurate and auditable books including the following records, information, reports, and data required by this works approval:
  - (a) the works conducted in accordance with condition 1;
  - (b) any maintenance of infrastructure that is performed in the course of complying with condition 10;
  - (c) complaints received under condition 13.
15. The books specified under condition 14 must:
  - (a) be legible;
  - (b) if amended, be amended in such a way that the original version(s) and any subsequent amendments remain legible and are capable of retrieval;
  - (c) be retained by the works approval holder for the duration of the works approval; and
  - (d) be available to be produced to an inspector or the CEO as required.



## Definitions

In this works approval, the terms in Table 7 have the meanings defined.

**Table 7: Definitions**

Term	Definition
AS 3706.1	means the Standard <i>Geotextiles — Methods of test, Method 1: General requirements, sampling, conditioning, basic physical properties and statistical analysis</i>
AS 3706.2	means the Standard <i>Geotextiles - Methods of test: Determination of tensile properties - Wide-strip method</i>
AS 3706.3	means the Standard <i>Geotextiles - Methods of test: Determination of tearing strength - Trapezoidal method</i>
AS3706.4	means the Standard <i>Geotextiles - Methods of test: Determination of burst strength - California bearing ratio (CBR) - Plunger method</i>
AS 3706.7	means the Standard <i>Geotextiles - Methods of test: Determination of pore-size distribution - Dry-sieving method</i>
AS 3706.9	means the Standard <i>Geotextiles - Methods of test: Determination of permittivity, permeability and flow rate</i>
ASTM D 638	means the <i>Standard Test Method for Tensile Properties of Plastics</i>
ASTM D 751	means the <i>Standard Test Methods for Coated Fabrics</i>
ASTM D1505	means the <i>Standard Test Method for Density of Plastics by the Density-Gradient Technique</i>
ASTM D1621	means the <i>Standard Test Method for Compressive Properties of Rigid Cellular Plastics</i>
ASTM D 3895	means the <i>Standard Test Method for Oxidative-Induction Time of Polyolefins by Differential Scanning Calorimetry</i>
ASTM D 4329	means the <i>Standard Practice for Fluorescent Ultraviolet (UV) Lamp Apparatus Exposure of Plastics</i>
ASTM D 4373	means the <i>Standard Test Method for Rapid Determination of Carbonate Content of Soils</i>
ASTM D 4716	means the <i>Standard Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head</i>
ASTM D 4833	means the <i>Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products</i>
ASTM D 5199	means the <i>Standard Test Method for Measuring the Nominal Thickness of Geosynthetics</i>

Term	Definition
ASTM D 5721	means the <i>Standard Practice for Air-Oven Aging of Polyolefin Geomembranes</i>
ASTM D 5885	means the <i>Standard Test Method for Oxidative Induction Time of Polyolefin Geosynthetics by High-Pressure Differential Scanning Calorimetry</i>
ASTM D 5887	means the <i>Standard Test Method for Measurement of Index Flux Through Saturated Geosynthetic Clay Liner Specimens Using a Flexible Wall Permeameter</i>
ASTM D 5891	means the <i>Standard Test Method for Fluid Loss of Clay Component of Geosynthetic Clay Liners</i>
ASTM D 5890	means the <i>Standard Test Method for Swell Index of Clay Mineral Component of Geosynthetic Clay Liners</i>
ASTM D 5993	means the <i>Standard Test Method for Measuring Mass per Unit Area of Geosynthetic Clay Liners</i>
ASTM D 6496	means the <i>Standard Test Method for Determining Average Bonding Peel Strength Between Top and Bottom Layers of Needle-Punched Geosynthetic Clay Liners</i>
ASTM D 6768	means the <i>Standard Test Method for Tensile Strength of Geosynthetic Clay Liners</i>
books	has the same meaning given to that term under the EP Act.
CBS	means chloride brine storage.
CEO	means Chief Executive Officer. CEO for the purposes of notification means: Director General Department administering the <i>Environmental Protection Act 1986</i> Locked Bag 10 Joondalup DC WA 6919 <a href="mailto:info@dwer.wa.gov.au">info@dwer.wa.gov.au</a>
CMD	means Cross Machine Direction
Department	means the department established under section 35 of the <i>Public Sector Management Act 1994</i> and designated as responsible for the administration of Part V Division 3 of the EP Act.
discharge	has the same meaning given to that term under the EP Act.
emission	has the same meaning given to that term under the EP Act.
Environmental Compliance Report	means a report to satisfy the CEO that the conditioned infrastructure and/or equipment has been constructed and/or installed in

Term	Definition
	accordance with the works approval.
EP Act	<i>Environmental Protection Act 1986 (WA).</i>
EP Regulations	<i>Environmental Protection Regulations 1987 (WA).</i>
geotechnical engineer	means a person who: <ul style="list-style-type: none"> <li>a) holds a Bachelor of Engineering recognised by the Institute of Engineers; and</li> <li>b) has a minimum of five years of experience working in a supervisory area of geotechnical engineering or construction quality assurance; and</li> <li>c) is employed by an independent third party external to the Works Approval Holder's business;</li> </ul>
HDPE	means high-density polyethylene.
MD	means Machine Direction
premises	the premises to which this licence applies, as specified at the front of this licence and as shown on the premises maps (Figure 1 and 2) in Schedule 1 to this works approval.
prescribed premises	has the same meaning given to that term under the EP Act.
suitable qualified engineer	means a person who: <ul style="list-style-type: none"> <li>a) holds a tertiary academic qualification in civil engineering;</li> <li>b) has a minimum of five years' experience working in the area / field of design engineering; and</li> <li>c) is employed by an independent third party external to the works approval holder's business.</li> </ul>
time limited operations	refers to the operation of the infrastructure and equipment identified under this works approval that is authorised for that purpose, subject to the relevant conditions.
works approval	refers to this document, which evidences the grant of the works approval by the CEO under section 54 of the EP Act, subject to the conditions.
works approval holder	refers to the occupier of the premises being the person to whom this works approval has been granted, as specified at the front of this works approval.

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## END OF CONDITIONS



## Schedule 1: Maps

### Premises map

The boundary of the prescribed premises is shown in the map below (Figure 1).



**Figure 1: Map of the boundary of the Kwinana Nickel Refinery (prescribed premises)**





**Figure 2: Map of the boundary of the Baldvis Facility**

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IR-T05 Works approval template (v6.0) (September 2022)





**Figure 3: Map of the location of the chloride brine storage tanks (yellow circles)**

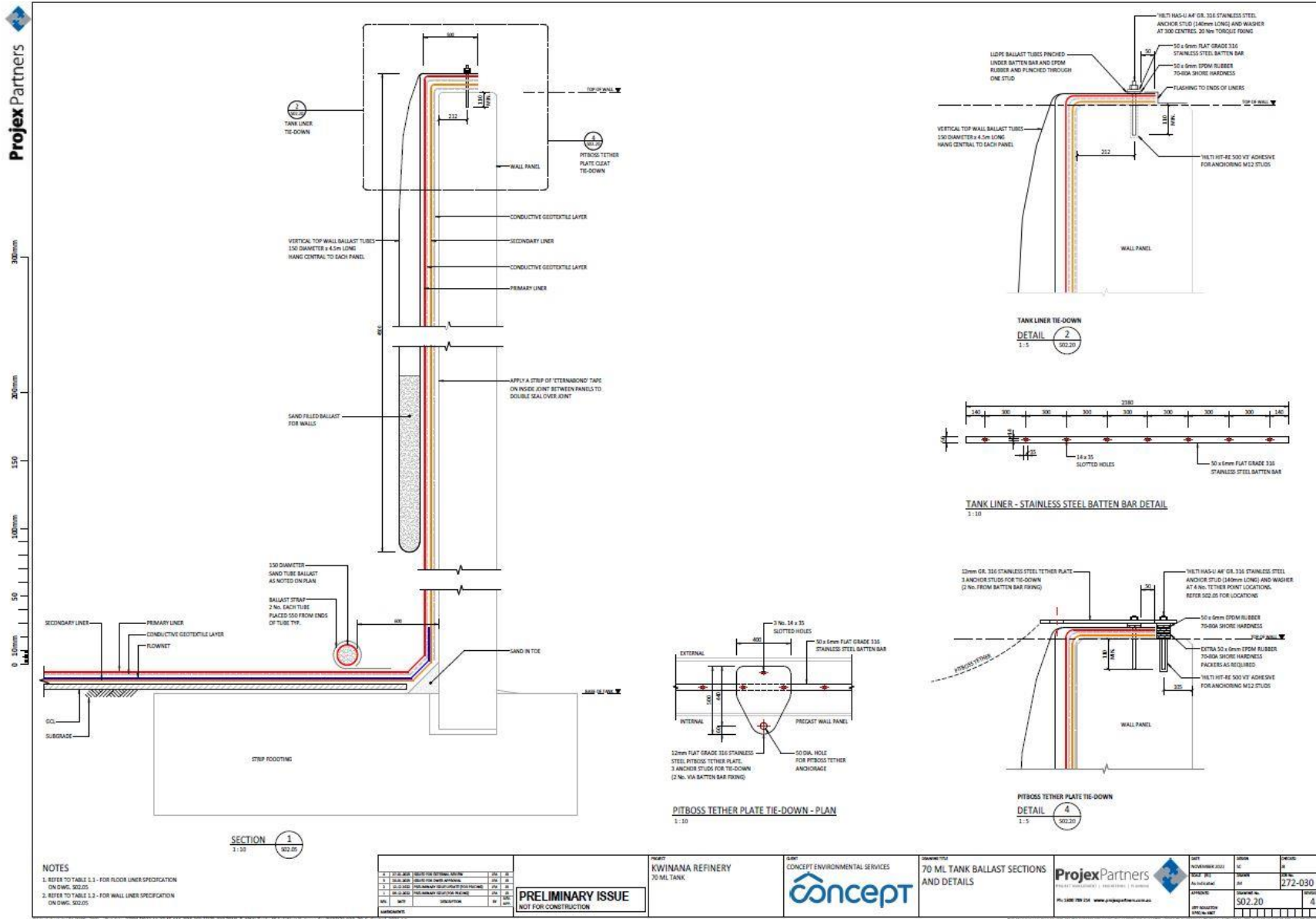
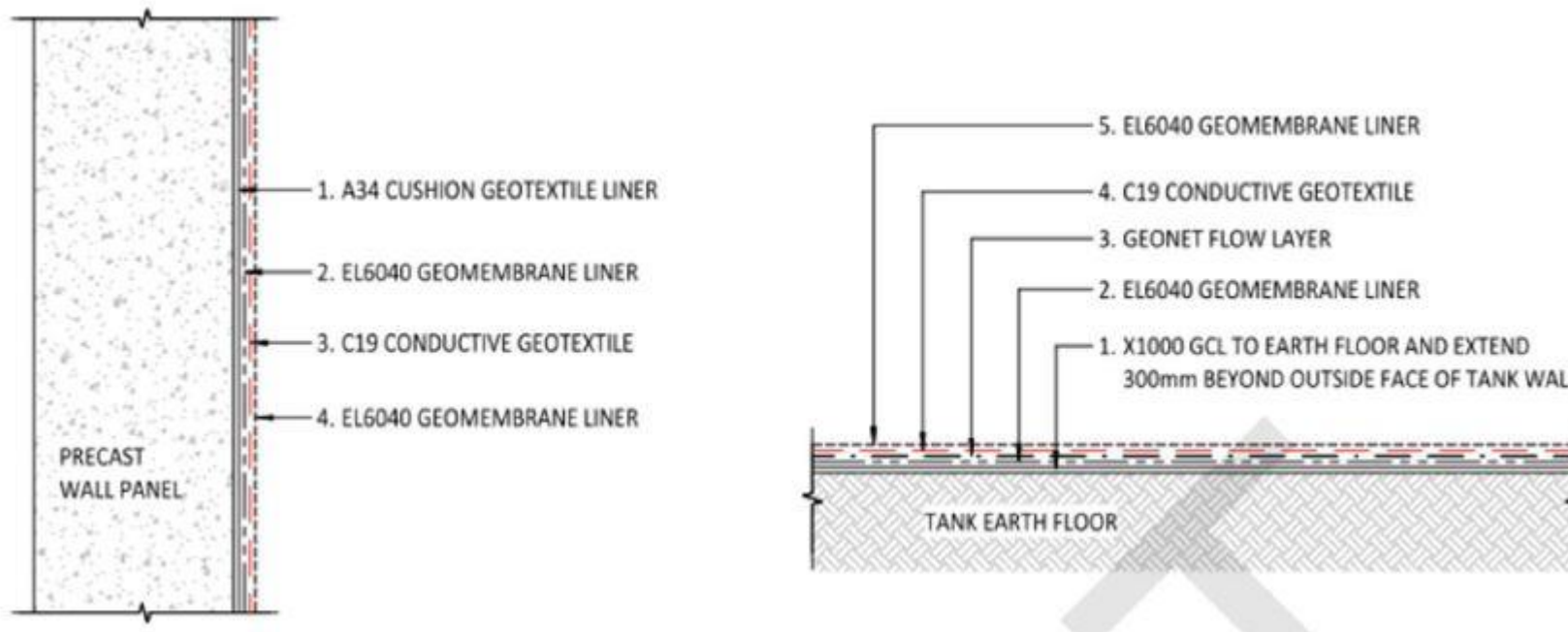


Figure 4: Chloride brine storage tank liner details

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**Figure 5: Indicative section of Chloride brine storage tank liner arrangement**



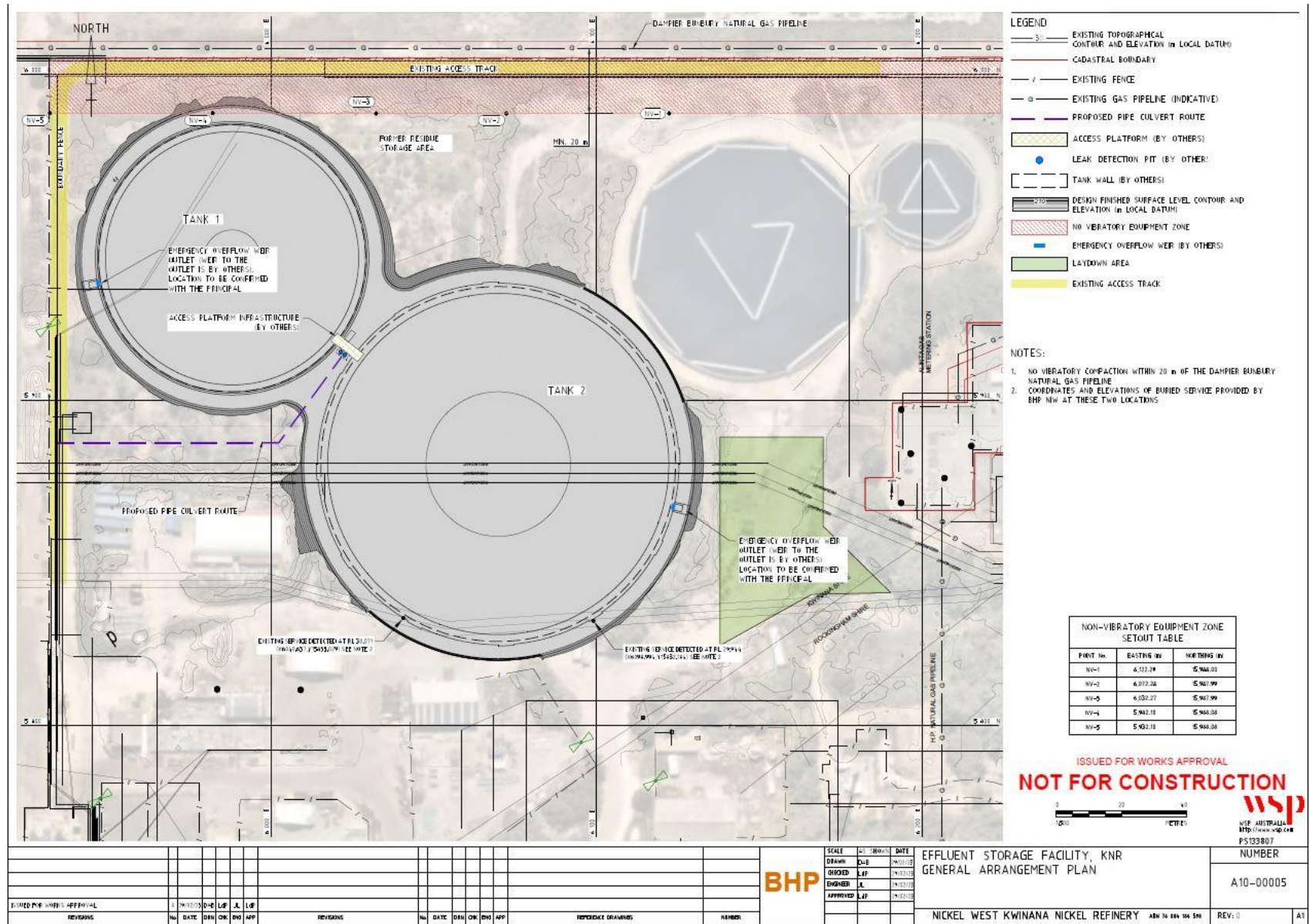


Figure 6: Chloride brine storage tank general arrangement

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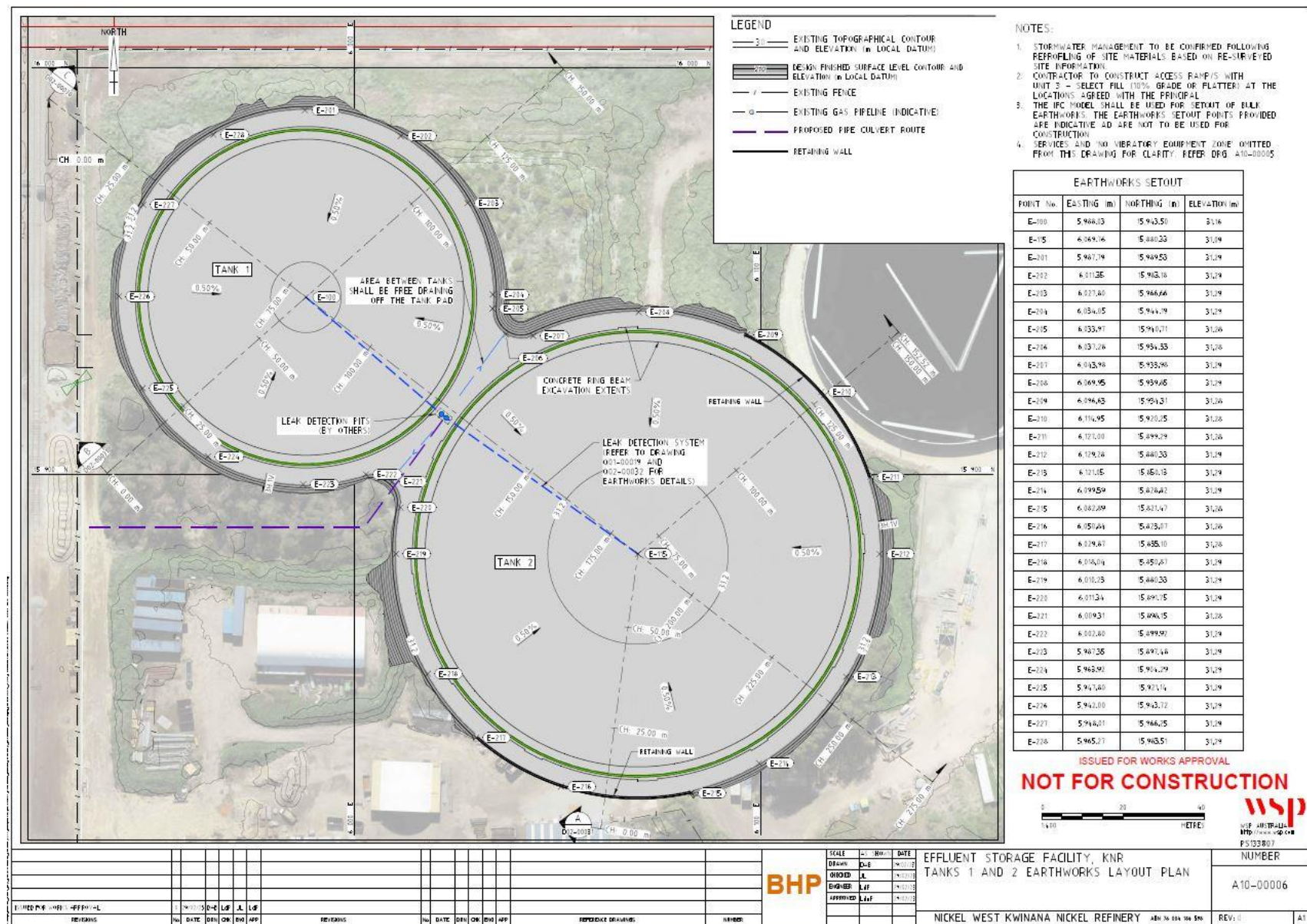


Figure 7: Chloride brine storage tank and leak detection system general arrangement

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