



Works Approval

Works approval number	W6584/2021/1
Works approval holder	GMA Garnet Pty Ltd
ACN	009 344 227
Registered business address	Level 4/108 St Georges Terrace Perth WA 6000
DWER file number	DER2021/000422
Duration	22/12/2021 to 30/06/2025
Date of issue	22/12/2021
Date of amendment	16/12/2024
Premises details	Port Gregory Garnet Mine 1420 George Grey Drive Yallabatharra WA 6535 Legal description - Mining tenements M70/856, M70/204, M70/259, M70/926, M70/927, M70/968, G70/171, M70/1330 and M70/1331(excluding Lot 58 on Plan 65344)

Prescribed premises category description (Schedule 1, <i>Environmental Protection Regulations 1987</i>)	Assessed production capacity
Category 8: Mineral sands mining or processing: premises on which mineral sands ore is mined, screened, separated or otherwise processed.	3,000,000 tonnes per annual period.
Assessed activities directly related to the above categories	
Remediation of hydrocarbon contaminated soil generated on site at a bioremediation facility.	

This works approval was amended, subject to the attached conditions, on 16 December 2024, by:

**MANAGER, RESOURCE INDUSTRIES
INDUSTRY REGULATION (STATE-WIDE DELIVERY)**
*Officer delegated under section 20
of the Environmental Protection Act 1986*

Works approval history

Date	Reference number	Summary of changes
22/12/2021	W6584/2021/1	Works approval granted.
10/03/2023	W6584/2021/1	Works approval amended to change location of tailings transfer station and to change the layout and liner specification of the bioremediation facility.
16/12/2024	W6584/2021/1	Amendment to extend the duration of the works approval by 6 months

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 - general

1. The works approval holder must:
 - (a) construct and/or install the infrastructure;
 - (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
1.	Solar Drying Ponds	<ul style="list-style-type: none"> • to be constructed within mining tenement M70/856 as per Schedule 1, Figure 2 • 5 ponds to be constructed with total capacity not exceeding 39,530 tonnes • to be constructed with the internal batter slope at 1V:3H and to a maximum embankment height of 4.5m • to be constructed to provide a minimum 500mm total freeboard (including 300mm operational freeboard and an allowance for a 1% AEP 72-hour rain event) above the normal operating pond • earthen bunding and fencing to be constructed around the perimeter of the solar drying ponds 	<p>Proposed Solar Drying Ponds as depicted in Schedule 1, Figure 2</p> <p>Infrastructure layout depicted in Schedule 1, Figures 3 & 4</p>
2.	Tailings delivery pipelines and tailings transfer station	<ul style="list-style-type: none"> • Pipelines to be constructed using 110mm HDPE pipes • pipelines to be constructed within containment bunds adequately sized to contain any spill for a period equal to the time between routine inspections • tailings transfer station to be installed in the location depicted within Schedule 1, Figure 2 • tailings transfer tank to be covered to prevent rainfall infiltration • tailings transfer tank to have high level alarm (including automatic shut off pumps) installed to ensure freeboard level is not breached 	<p>Tailings pipeline and Transfer Station as depicted in Schedule 1, Figure 2</p>
3.	Bioremediation facility	<ul style="list-style-type: none"> • Bioremediation facility is to be constructed within mining tenement M70/856 in the location depicted within Schedule 1, Figure 1 	<p>Bioremediation Farm as depicted in Schedule 1, Figure</p>

	Infrastructure	Design and construction / installation requirements	Infrastructure location
		<ul style="list-style-type: none"> • Bioremediation pads and stormwater catchment sumps to be lined with a HDPE liner • HDPE liner shall be covered with a sacrificial marker layer such as blue metal with a minimum thickness of 0.3 m • HDPE liner material to have the following minimum requirements: <ul style="list-style-type: none"> - Shear strength – 525 N/25 mm; - Shear elongation at break – 50%; - Peel separation – 25%; - Peel strength at hot wedge seams – 398 N/25 mm; and - Peel strength at extrusion fillet seams – 340 N/25 mm. • A visual inspection of each roll shall occur prior to installation of the liner for tears, punctures, abrasions, cracks, indentations and thin spots or other faults in the liner material • Panels of the liner shall overlap by a minimum of 100mm prior to heat welding or mechanical joining • Membrane welding material shall be supplied by the liner manufacture and shall be identical to the liner membrane • The weld testing for the HDPE membrane shall be undertaken in accordance with Table 10 in Schedule 2 • Bioremediation pads to be constructed on 5% gradient to allow run-off from the pads to enter the HDPE lined stormwater catchment sumps • Internal earthen bunds shall be constructed to a minimum height of 1m around the bioremediation pads to prevent stormwater inflows • Stormwater catchment sumps to be designed with sufficient capacity to contain run-off from a 1 in 100-year over 72 hours rainfall event 	<p>2</p> <p>Infrastructure layout depicted in Schedule 1, Figure 6</p>

2. The works approval holder must design, construct, and install groundwater monitoring wells in accordance with the requirements specified in Table 2.

Table 2: Groundwater monitoring well construction requirements

Infrastructure	Design, construction, and installation requirements	Monitoring well location(s)	Timeframe
<p>Groundwater Monitoring wells MB01, MB02, MB03, MB05 and MB06</p>	<p><u>Well design and construction:</u> Designed and constructed in accordance with ASTM D5092/D5092M-16: Standard practice for design and installation of groundwater monitoring bores.</p> <p>Well screens must target the part, or parts, of the aquifer most likely to be affected by contamination¹. Where temporary/seasonal perched features are present, wells must be nested, and the perched features individually screened.</p> <p><u>Logging of borehole:</u></p> <p>Soil samples must be collected and logged during the installation of the monitoring wells. A record of the geology encountered during drilling must be described and classified in accordance with the Australian Standard Geotechnical Site Investigations AS1726. Any observations of staining / odours or other indications of contamination must be included in the bore log.</p> <p><u>Well construction log:</u></p> <p>Well construction details must be documented within a well construction log to demonstrate compliance with <i>ASTM D5092/D5092M-16</i>. The construction logs shall include elevations of the top of casing position to be used as the reference point for water-level measurements, and the elevations of the ground surface protective installations.</p> <p><u>Well development:</u></p> <p>All installed monitoring wells must be developed after drilling to remove fine sand, silt, clay and any drilling mud residues from around the well screen to ensure the hydraulic functioning of the well. A detailed record should be kept of well development activities and included in the well construction log.</p> <p><u>Installation survey:</u> the vertical (top of casing) and horizontal position of each monitoring well must be surveyed and</p>	<p>As depicted in Schedule 1, Figure 5: Monitoring Bores Locations.</p>	<p>Must be constructed, developed (purged), and determined to be operational prior to the commencement of time limited operation activities under condition 12</p>

Infrastructure	Design, construction, and installation requirements	Monitoring well location(s)	Timeframe
	<p>subsequently mapped by a suitably qualified surveyor.</p> <p><u>Well network map</u>: a well location map (using aerial image overlay) must be prepared and include the location of all monitoring wells in the monitoring network and their respective identification numbers.</p>		

Note 1: refer to Section 8 of Schedule B2 of the Assessment of Site Contamination NEPM for guidance on well screen depth and length.

Baseline Groundwater Monitoring

- The works approval holder must undertake baseline ambient groundwater monitoring in accordance with Table 3 once the monitoring wells required by condition 2 have been constructed.
- All sample analysis must be undertaken by laboratories with current accreditation from the National Association of Testing Authorities (NATA) for the relevant parameters, unless otherwise specified, in Table 3.

Table 3: Groundwater monitoring of ambient concentrations

Monitoring well location	Parameter	Unit	Frequency	Method
Groundwater monitoring wells MB01, MB02, MB03, MB05, MB06 and HM08 as depicted in Schedule 1, Figure 5	Standing water level ¹	mbgl	One off Sample	Spot sample, in accordance with AS/NZS 5667.11.
	pH ¹	pH unit		
	Electrical conductivity ¹	µS/cm		
	Total dissolved solids	mg/L		
	Total Hardness (as CaCO ₃)			
	Total Alkalinity (as CaCO ₃)			
	Calcium, Magnesium, Sodium, Potassium, Ammonia, Phosphate, Carbonate, Sulphate, Nitrate, Silica, Aluminium, Arsenic, Cadmium, Copper, Lead, Iron, Manganese, Selenium and Nickel			

Note 1: In-field non-NATA accredited analysis permitted

Compliance reporting

- The works approval holder must, within 60 calendar days of the monitoring wells being constructed, submit to the CEO a well construction report evidencing compliance with

- the requirements of condition 2.
6. The well construction report required by condition 5, must also include baseline ambient groundwater monitoring results as required by condition 3.
 7. 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:
 - (a) undertake an audit of their compliance with the requirements of condition 1; and
 - (b) prepare and submit to the CEO an Environmental Compliance Report on that compliance.
 8. The Environmental Compliance Report required by condition 7, must include as a minimum the following:
 - (a) certification by a suitably qualified geotechnical or civil 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;
 - (b) as constructed plans and a detailed site plan for each item of infrastructure or component of infrastructure specified in condition 1; and
 - (c) be signed by a person authorised to represent the works approval holder and contains the printed name and position of that person.

Environmental commissioning phase

Environmental commissioning requirements

9. The works approval holder may only commence environmental commissioning of the tailings delivery pipelines once the Environmental Compliance Report has been submitted for that item of infrastructure in accordance with condition 7 of this works approval.
10. Any environmental commissioning activities undertaken for an item of infrastructure specified in Table 4 may only be carried out:
 - (a) In accordance with the corresponding commissioning requirements; and
 - (b) For the corresponding authorised commissioning duration

Table 4: Environmental commissioning requirements

Infrastructure	Commissioning requirements	Authorised commissioning duration
Tailings delivery pipelines and associated infrastructure	<ul style="list-style-type: none"> • flush to capacity with process water to check for leaks • corrective measures taken for early detection of leaks. 	For a period not exceeding 30 calendar days in aggregate.

11. The works approval holder must submit to the CEO an Environmental Commissioning Report within 30 calendar days of the completion date of environmental commissioning for each item of infrastructure specified in Table 4.

Time limited operations phase

Commencement and duration

- 12.** The works approval holder may only commence time limited operations for an item of infrastructure identified in condition 14:
- where the item of infrastructure is not authorised to undertake environmental commissioning, the Environmental Compliance Report as required by condition 7 has been submitted by the works approval holder for that item of infrastructure; and
 - where the item of infrastructure is authorised to undertake environmental commissioning under condition 10, the Environmental Commissioning Report for that item of infrastructure as required by condition 11 has been submitted by the works approval holder.
- 13.** The works approval holder may conduct time limited operations for an item of infrastructure specified in condition 14:
- for a period not exceeding 180 calendar days from the day the works approval holder meets the requirements of condition 12 for that item of infrastructure; or
 - until such time as a licence for that item of infrastructure is granted in accordance with Part V of the *Environmental Protection Act 1986*.

Time limited operations requirements

- 14.** During time limited operations, the works approval holder must ensure that the premises infrastructure and equipment listed in Table 5 and located at the corresponding infrastructure location is maintained and operated in accordance with the corresponding operational requirement set out in Table 5.

Table 5: Infrastructure and equipment requirements during time limited operation

	Infrastructure	Operational requirements	Infrastructure location
1.	Solar Drying Ponds	A 300mm operational freeboard to be maintained at all times.	Proposed Solar Drying Ponds as depicted in Schedule 1, Figure 2
2.	Tailings delivery pipelines and tailings transfer station	Sufficient secondary containment to be maintained to completely contain any spills from pipeline leakage or breach for a period equal to the time between routine inspections.	Tailings pipeline and Transfer Station as depicted in Schedule 1, Figure 2
3.	Bioremediation facility	<ul style="list-style-type: none"> Only hydrocarbon contaminated material generated from within the premises to be treated within the bioremediation facility. Bioremediation must only occur on the bioremediation pads within the bioremediation facility. Hydrocarbon contaminated material shall be placed at a maximum thickness of 0.5m Volume of waste deposited within the facility to be recorded. 	<p>Bioremediation Farm as depicted in Schedule 1, Figure 2</p> <p>Bioremediation facility layout depicted in Schedule 1, Figure 6</p>

	Infrastructure	Operational requirements	Infrastructure location
		<ul style="list-style-type: none"> Mechanical mixing and turning of material shall occur at a minimum of once per month Internal earthen bunds to be maintained to a minimum height of 1m around the bioremediation pads Water carts to be used to apply dust suppression water if required. To be managed so contaminated or potentially contaminated stormwater is captured to prevent release into the environment. Stormwater catchment sumps to be maintained to ensure sufficient capacity to contain a 1 in 100-year over 72 hours rainfall event. 	
4.	Wet Plant Processing	<ul style="list-style-type: none"> Include <i>Magnafloc 1425 Coagulant</i> into the wet plant process. 	N/A

15. During time limited operations, the works approval holder must ensure that the emission(s) specified in Table 6, are discharged only from the corresponding discharge point(s) and only at the corresponding discharge point location(s).

Table 6: Authorised discharge points

	Emission	Discharge Point	Discharge point location
1.	Clay fines slurry	Solar drying ponds	Proposed Solar Drying Ponds in Schedule 1 Figure 2
2.	Bioremediated soil generated within the premises which meets Uncontaminated Fill Criteria ¹	Mining voids within the premises	N/A

Note 1: Uncontaminated Fill Criteria as outlined within Schedule 3 and has been taken from Table 6 of the Department's *Landfill Waste Classification and Waste Definitions 2019*.

16. The works approval holder must ensure that material treated by the bioremediation facility meets the Uncontaminated Fill Criteria of the *Landfill Waste Classification and Waste Definitions 2019* specified in Schedule 3 prior to disposal within mine voids within the premises.
17. The works approval holder must undertake testing of the material treated by the bioremediation facility in accordance with the minimum sampling and testing requirements for Uncontaminated Fill in the *Landfill Waste Classification and Waste Definitions 2019* specified in Schedule 4.
18. During time limited operations, the works approval holder must conduct visual inspections of the infrastructure specified in Table 7.

Table 7: Inspections of infrastructure

	Site infrastructure and equipment	Operational requirement	Infrastructure location
1.	Solar Drying Ponds	Daily inspections to be carried out to ensure freeboard capacity.	Proposed Solar Drying Ponds as

	Site infrastructure and equipment	Operational requirement	Infrastructure location
			depicted in Schedule 1, Figure 2
2.	Tailings delivery pipelines and tailings transfer station	<ul style="list-style-type: none"> Daily visual inspection to be carried out to ensure integrity of the pipelines. Daily visual inspection of tailings transfer tank to ensure high level alarms and automatic cut off is working correctly. 	Tailings pipeline and Transfer Station as depicted in Schedule 1, Figure 2
3.	Bioremediation facility	Facility to be inspected on a minimum monthly basis or after every large rainfall event (greater than 20mm) to ensure waste and stormwater is adequately contained.	Bioremediation Farm as depicted in Schedule 1, Figure 2

Monitoring during Time limited operation

19. The works approval holder must conduct a groundwater monitoring programme in accordance with the requirements specified in Table 9 and record the results of all monitoring activity conducted under that programme.
20. All sample analysis must be undertaken by laboratories with current accreditation from the National Association of Testing Authorities (NATA) for the relevant parameters, unless otherwise specified in Table 8.

Table 8: Ambient Groundwater monitoring

Monitoring well location	Parameter	Unit	Limit	Frequency	Method
Groundwater monitoring wells MB01, MB02, MB03, MB05, MB06 and HB08 as depicted in Schedule 1, Figure 5	Standing water level ¹	mbgl	4 mbgl	Monthly	Spot sample, in accordance with AS/NZS 5667.11.
	pH ¹	pH unit	-		
	Electrical conductivity ¹	µS/cm			
	Total dissolved solids	mg/L		Quarterly	
	Total Hardness (as CaCO ₃)				
	Total Alkalinity (as CaCO ₃)				
	Calcium, Magnesium, Sodium, Potassium, Ammonia, Phosphate, Carbonate, Sulphate, Nitrate, Silica, Aluminium, Arsenic, Cadmium, Copper, Lead, Iron, Manganese, Selenium and Nickel				

Note 1: In-field non-NATA accredited analysis permitted

Time-limited Operation Compliance reporting

21. 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.
22. The works approval holder must ensure the report required by condition 21 includes the following:
 - (a) summary of the time limited operations, including timeframes and amount of tailings discharged into the solar drying ponds;
 - (b) results of groundwater monitoring programme as required by condition 19;
 - (c) results of material testing undertaken in accordance with condition 17, including details on sample size, a statement of limit of detection of the analysis and a comparison of test results with the Uncontaminated Fill criteria outlined in Schedule 3;
 - (d) a summary of the environmental performance of all infrastructure as constructed or installed (as applicable);
 - (e) a review of performance and compliance against the conditions of the works approval and the Environmental Commissioning Report; and
 - (f) 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 (general)

23. 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.
24. 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 14;
 - (c) testing carried out in accordance with condition 17, including details on sample size and a statement of limit of detection of the analysis; and
 - (d) complaints received under condition 23.
25. The books specified under condition 24 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 9 have the meanings defined.

Table 9: Definitions

Term	Definition
AEP	means Annual Exceedance Probability
AS/NZS 5667.11	means the Australian Standard AS/NZS 5667.11 Water Quality – <i>Sampling – Guidance on sampling of groundwaters</i>
books	has the same meaning given to that term under the EP Act.
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 info@dwer.wa.gov.au
condition	a condition to which this works approval is subject under section 62 of the EP Act.
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 commissioning	means the sequence of activities to be undertaken to test equipment integrity and operation, or to determine the environmental performance, of equipment and infrastructure to establish or test a steady state operation and confirm design specifications.
Environmental Commissioning Report	means a report on any commissioning activities that have taken place and a demonstration that they have concluded, with focus on emissions and discharges, waste containment, and other environmental factors.
Environmental Compliance Report	means a report to satisfy the CEO that the conditioned infrastructure and/or equipment has been constructed and/or installed in accordance with the works approval.
EP Act	<i>Environmental Protection Act 1986 (WA)</i> .
EP Regulations	<i>Environmental Protection Regulations 1987 (WA)</i> .

Term	Definition
HDPE	High Density Polyethylene
mbgl	means metres below ground level
monthly period	means a one-month period commencing from day 1 of a month until final day of the same month.
NATA	National Association of Testing Authorities, Australia
NATA accredited	means in relation to the analysis of a sample that the laboratory is NATA accredited for the specified analysis at the time of the analysis
premises	the premises to which this licence applies, as specified at the front of this licence and as shown on the premises map (Figure 1) in Schedule 1 to this works approval
prescribed premises	has the same meaning given to that term under the EP Act.
quarterly	means a period of time where at least 45 days have occurred between the days on which samples are taken in successive quarters.
spot sample	means a discrete sample representative of the time and place at which the sample is taken
Suitably qualified geotechnical or civil engineer	means a person who; (a) holds a relevant tertiary academic qualification related to geotechnical or civil engineering; and (b) has a minimum of three years of experience working in the field of geotechnical and or civil engineering.
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.

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 prescribed premises

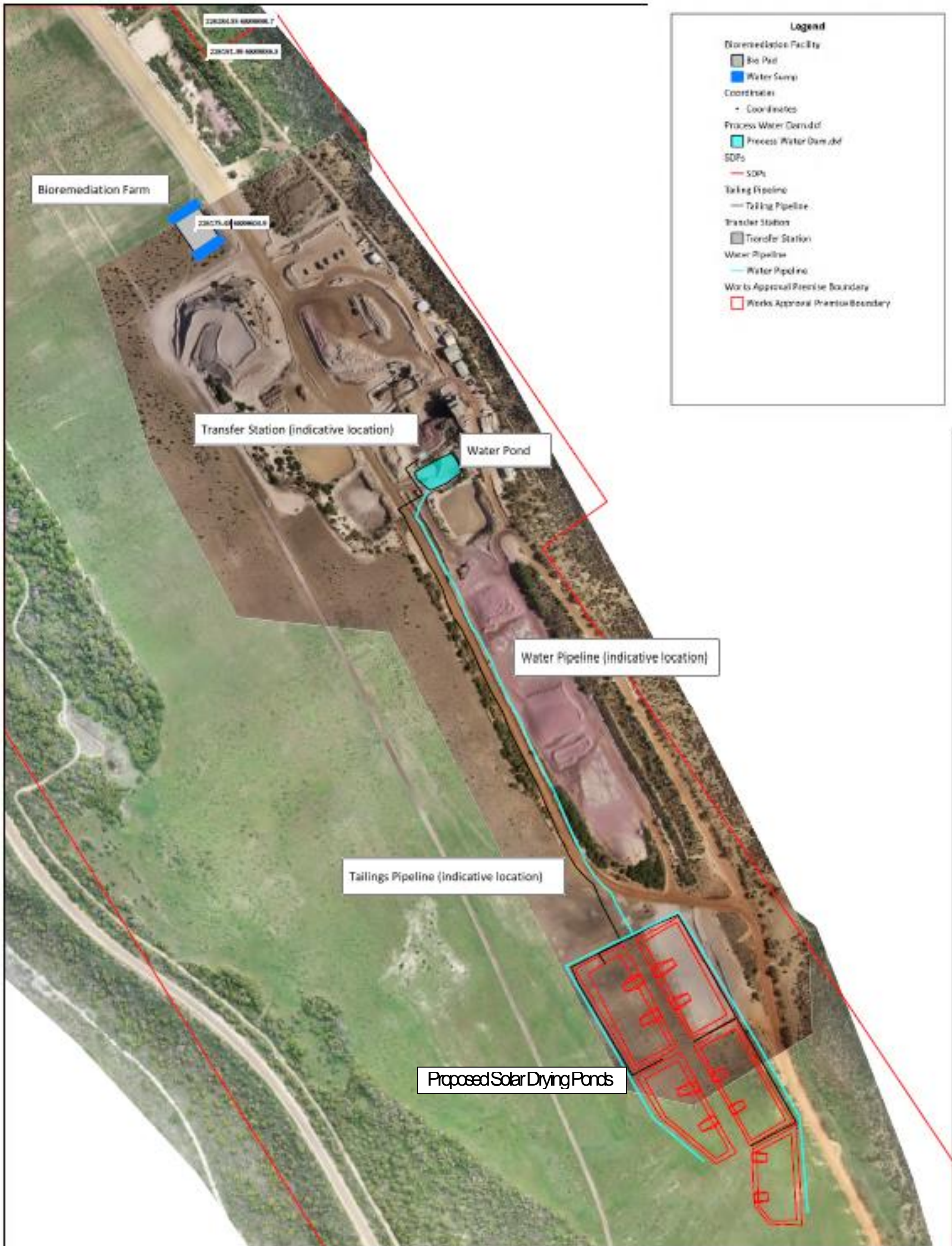


Figure 2: Location of the proposed Solar drying ponds and Bioremediation pads

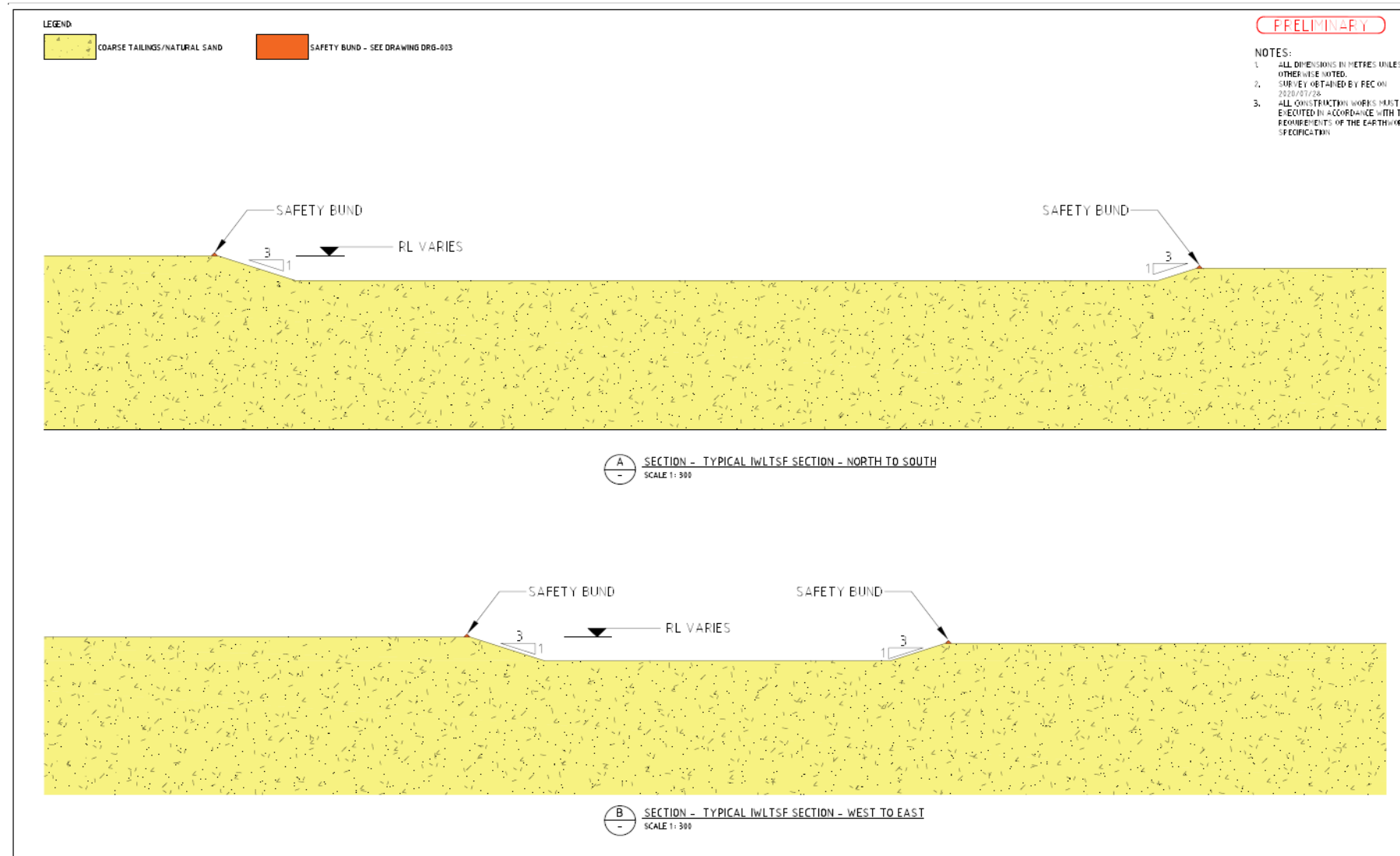
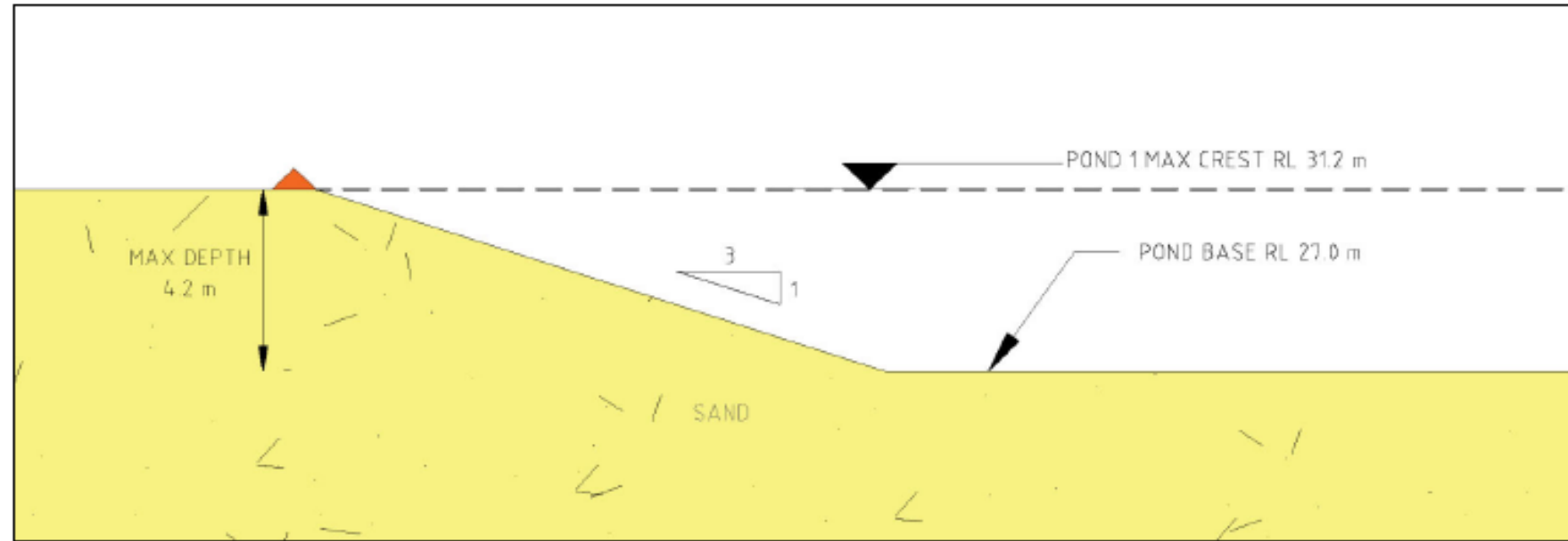
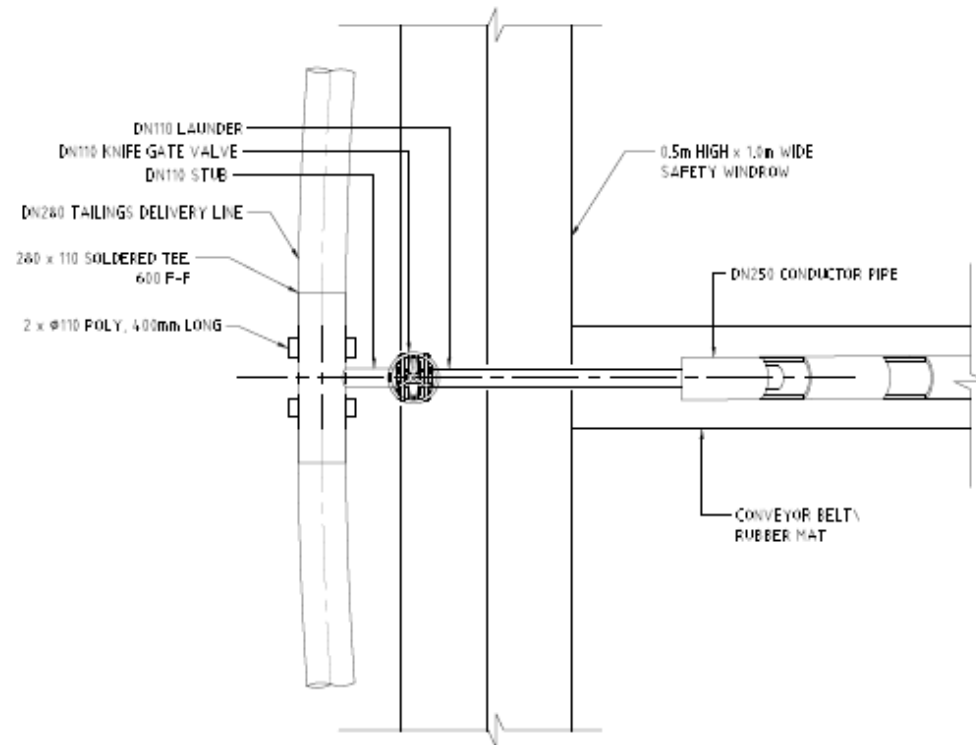


Figure 3: Cross section of the Proposed solar drying ponds

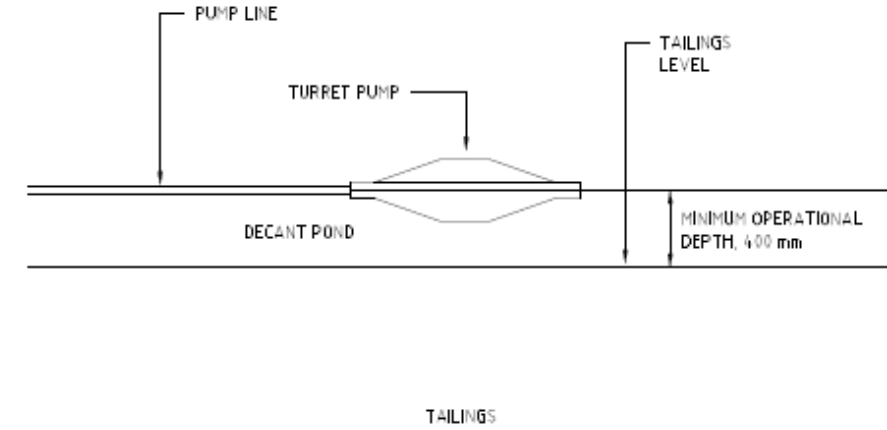
PRELIMINARY

NOTES:

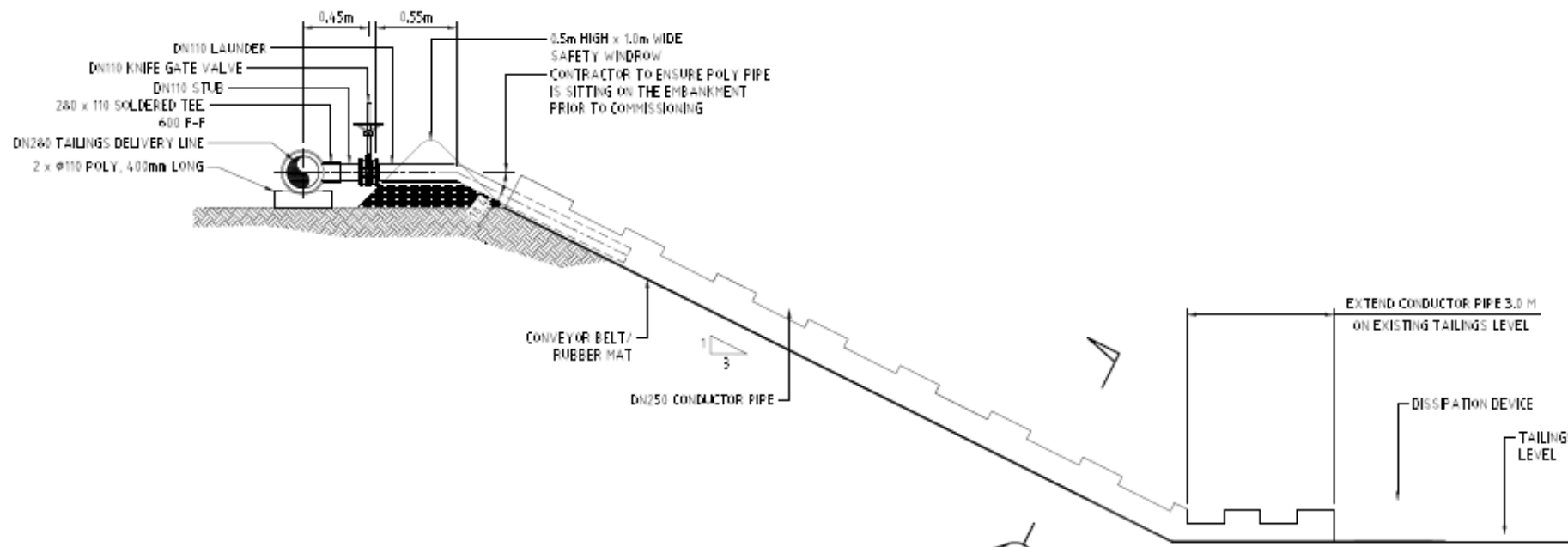
1. ALL DIMENSIONS IN METRES UNLESS OTHERWISE NOTED.
2. SURVEY OBTAINED BY REC ON 2020/07/28
3. ALL CONSTRUCTION WORKS MUST BE EXECUTED IN ACCORDANCE WITH THE REQUIREMENTS OF THE EARTHWORKS SPECIFICATION



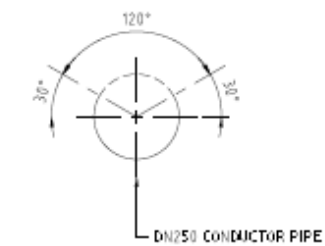
TYPICAL SPIGOT ARRANGEMENT PLAN
NOT TO SCALE



TYPICAL TURRET PUMP ARRANGEMENT



TYPICAL SPIGOT SECTION
NOT TO SCALE



SECTION - CONDUCTOR PIPE SLOT CUTS
NOT TO SCALE

Figure 4: Spigot details

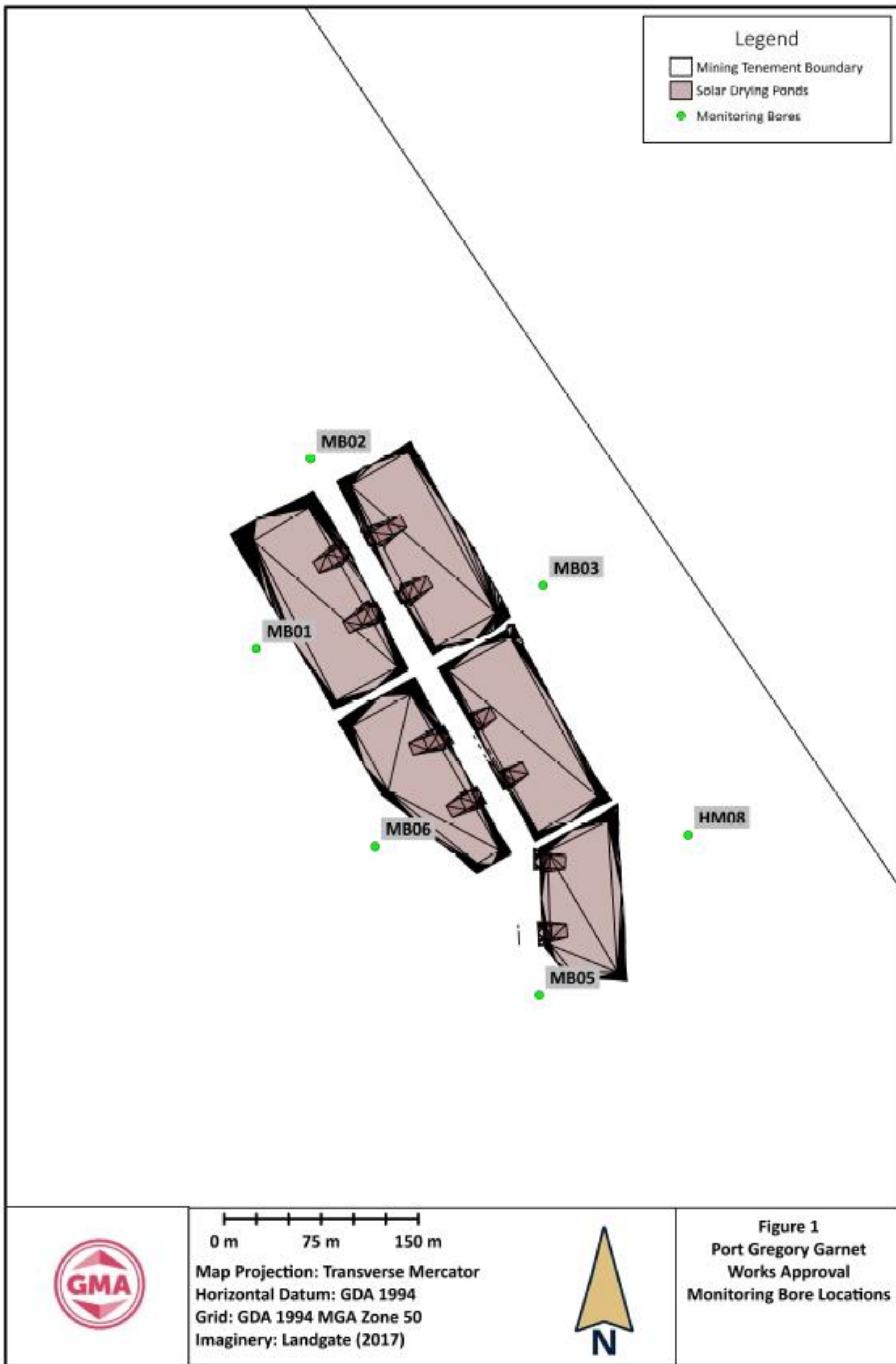


Figure 5: Monitoring bores locations

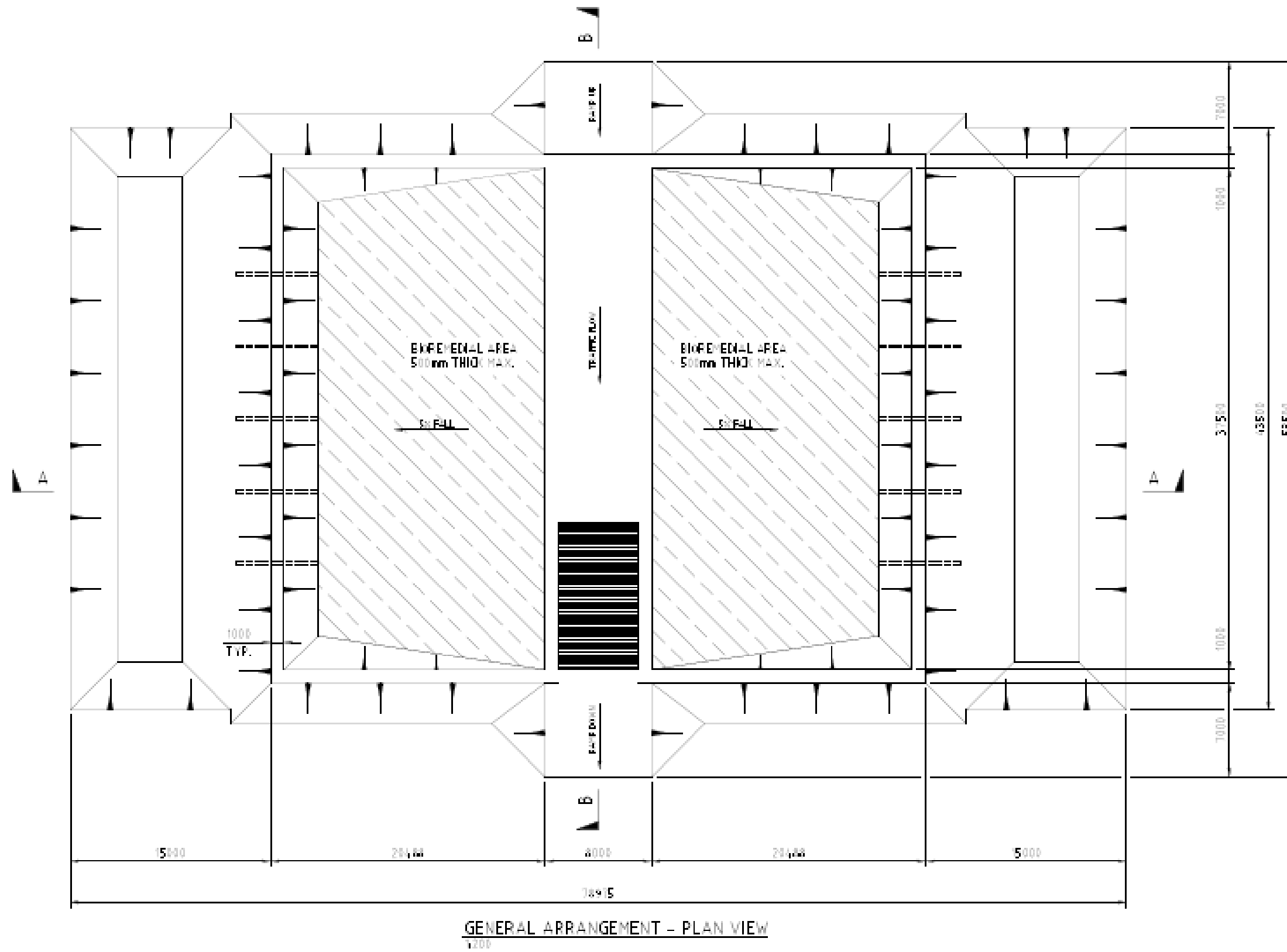


Figure 6: Bioremediation Facility Layout

Schedule 2: Construction quality assurance testing

Table 10: HDPE liner quality assurance testing

Item	Property	Standards/methods	Frequency	Minimum value
Start-up test weld	Welding equipment	N/A	Start of works daily and whenever the welding equipment is shut-off for more than one hour. Also after significant changes in weather conditions.	N/A
	Weld conditions		Test weld strips will be required whenever personnel or equipment are changed and/or wide temperature fluctuations are experienced. Minimum 1.5 m continuous seam.	
Destructive weld testing	On-site, hand tensiometer in peel and shear	ASTM D6392	Every 150 m (if fusion weld), Every 120 m (if extrusion weld)	Peel: 450 N/25mm Shear: 690 N/25mm
Non – destructive weld testing	Air pressure test	ASTM D5820	All seams over full length	Observed, validated and recorded by the consultant
	Vaccum box test	ASTM D5641		Presence/absence of bubbles

Schedule 3: Uncontaminated Fill thresholds

Table 11: Maximum concentrations (thresholds) of relevant chemical substances and limits of relevant physical attributes for uncontaminated fill

Parameter	Maximum Concentration ¹ mg/kg, dry weight	Leaching test ¹ ASLP, µg/L
Metals and metalloids		
Antimony	20	3
Arsenic	100	10
Barium	500	-
Beryllium	4	-
Cadmium	1	0.2
Chromium III	160	3
Chromium VI	1	1
Cobalt	50	1
Copper	50	2
Lead	300	3
Manganese	500	500
Mercury (inorganic)	0.5	0.05
Molybdenum	10	50
Nickel	10	10
Selenium	1	5
Silver	20	0.05
Thallium	1	0.03
Tin (inorganic)	50	-
Uranium	25	05
Vanadium	130	-
Zinc	120	10
Other inorganics		
Asbestos ²	10 ²	-
Sulfate	2500	-
Cyanides	5 complexed (weak acid dissociable) 1 free	5 as CN
Ammonia as N	-	350
Fluoride	400	120
Total nitrogen	-	2000
Total phosphorus	-	200
Organic compounds		
Benzene	0.5	1
Toluene	85	25
Ethyl benzene	55	5
Xylene (total)	40	20 sum
Total recoverable hydrocarbons (C6-C10) ^{3, 4}	45	-
Total recoverable hydrocarbons (>C10-	110	-

C16) ³		
Total recoverable hydrocarbons (>C16-C34) ³	300	-
Total recoverable hydrocarbons (>C34-C40) ³	2800	-
Naphthalene	3	15
Benzo[a]pyrene	1	0.01
Carcinogenic polycyclic aromatic hydrocarbons (PAHs) as B(a)P TEQ (8 species)	3	-
Total PAHs ⁵ (16 species)	300	-
Phenol	1	50
Cresols	-	2 (sum)
PCBs	1	-
Pesticides		
Aldrin	-	0.001
Dieldrin	-	0.01
DDT+DDD+DDE	3	0.006 DDT 0.0005 DDE
Other pesticides	-	< ADWG ⁶ and < WQG ⁷
Physical attributes		
pH (pH units) ⁸	5.5-8.5	-

Notes:

General – all thresholds consider ecological and human toxicity

1. Refer AS 4439 using reagent water. Both total concentration and leaching analyses are required to assess the quality of the fill material unless no value is included in Table 6 (indicated by '-').
2. Restrictions apply to the sale and supply of any asbestos and asbestos cement material other than for disposal. The maximum concentration is based on the product specification for recycled products in the *Guidelines for managing asbestos at construction and demolition waste recycling facilities* (DEC 2012 and as updated from time to time). The concentration indicated is equivalent to 0.001% asbestos weight for weight as specified in the guideline. The inspection, sampling and testing of fill material must be completed by a person who is competent in assessing the fill in the manner indicated by the guideline.
3. Thresholds for total recoverable hydrocarbons are applicable to petrogenic hydrocarbons (such as from petrol, diesel, crude oil, etc.). Additional analytical Landfill waste classification and waste definitions (December 2019) Department of Water and Environmental Regulation 21 methods, such as silica gel clean-up and chromatographic interpretation, may be applied to differentiate between petrogenic and biogenic hydrocarbon sources. Refer to Schedule B3 of National Environment Protection (Assessment of Site Contamination) Measure (ASC NEPM).
4. Threshold applies to 'F1' fraction, comprising total recoverable hydrocarbons (C6-C10) not including the sum of BTEX (benzene, toluene, ethylbenzene, xylenes). Refer to Schedule B1 of the ASC NEPM.
5. Carcinogenic PAHs (as B(a)P TEQ): is based on the eight carcinogenic polycyclic aromatic hydrocarbons (PAHs) listed below and their potency relative to benzo(a)pyrene. The B(a)P toxicity equivalence quotient (TEQ) is calculated by multiplying the concentration of each carcinogenic PAH in the sample by its B(a)P Total Equivalent Factor (TEF), given below, and summing these products.

PAH species	TEF	PAH species	TEF
Benzo(a)anthracene	0.1	Benzo(g,h,i)perylene	0.1
Benzo(a)pyrene	1	Chrysene	0.1
Benzo(b+j)fluoranthene	0.1	Dibenz(a,h)anthracene	1
Benzo(k)fluoranthene	0.1	Indeno(1,2,3-c,d)pyrene	0.1

6. Australian Drinking Water Guidelines (2011 as updated). The relevant compounds to be tested should be guided by the source of the fill material (site history).
7. Default guideline values for toxicants as specified in Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2018 and as updated).
8. Waste acid sulfate soils can be treated/neutralised before comparison against the thresholds.

Schedule 4 – Sampling and testing standards

Table 12: Minimum sampling and testing standards for uncontaminated fill

Activity	Minimum Requirement
Sampling	<p>Method 3.1 or Method 3.2 in the Australian Standard 1141 Methods for sampling and testing aggregates.</p> <p>Sampling of soil stockpiles should be consistent with the methodology described in Section 7.5 of Schedule B2 (Guideline on Site Characterisation) of the National Environment Protection (Assessment of Site Contamination) Measure (ASC NEPM). Depending on the source of the material being characterised, it may be possible to use relevant site characterisation data for in situ soils (such as in a detailed site investigation report) provided that this was carried out in accordance with the ASC NEPM and that, since sampling, the characterised material has not been subject to any potentially contaminating land uses including industrial, commercial, mining or intensive agricultural activities.</p> <p>Further information on characterisation of soils based on the 95% Upper Confidence Limit (average) [95%UCLavg] for the soil (including worked examples) is provided in “Industrial Waste Resource Guidelines (7), Sampling and Analysis; Soil Sampling”, EPA Victoria, 2010.</p>
Testing	<p>The laboratory should hold National Association of Testing Authorities, Australia (NATA) accreditation for the testing undertaken. Analytical methods adopted should be consistent with those specified in Schedule B3 of the ASC NEPM.</p> <p>Substances to be tested should be determined based on land use history of the site of origin. Refer to Appendix B (Potentially contaminating industries, activities and land uses) in the <i>Assessment and management of contaminated sites (DER 2014, and as updated from time to time)</i>. If no value for a potential contaminant is included in Table 6, and the substance is indicated for testing on consideration of the site history, then it is not appropriate to consider material from the site for classification as uncontaminated fill.</p>