



Application for Works Approval

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

Works Approval Number	W6780/2023/1
Applicant	Atlas Iron Pty Ltd
ACN	110 396 168
File number	DER2022/000704
Premises	McPhee Creek Project Mining tenements M45/1243-I, L46/158, L45/598 As defined by the premises maps attached to the issued works approval
Date of report	17/09/2024
Decision	Works Approval Granted

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1. Decision summary

This decision report documents the assessment of potential risks to the environment and public health from emissions and discharges during the construction and operation of the premises. As a result of this assessment, works approval W6780/2023/1 has been granted.

2. Scope of assessment

2.1 Regulatory framework

In completing the assessment documented in this decision report, the Department of Water and Environmental Regulation (the department; DWER) 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>.

2.2 Application summary and overview of premises

On 16 December 2022, Atlas Iron Pty Ltd (Atlas Iron, the applicant) submitted an application for a works approval to the department under section 54 of the *Environmental Protection Act 1986* (EP Act). The project is a greenfield's development, and as such, there are no pre-existing Part V instruments held for the premises. The proposed project area is approximately 30 km to the north of Nullagine in the Pilbara.

The application is for construction and time limited operations for infrastructure and activities summarised in Table 1 below. Indicative locations for prescribed activities are shown in Figure 1. Environmental commissioning has been requested for the sewage facility (category 54) and bulk storage of chemicals (category 73).

Table 1 Summary of proposed activities

Category ¹	Summary of proposed activity
<u>Category 5</u> Processing and beneficiation of metallic or non-metallic ore	<ul style="list-style-type: none"> • Mining above and below the water table from five open cut pits, with a production rate of 14 million tonnes per annum (Mtpa); • Construction of a dry ore processing facility; and • Stockpiling of ore
<u>Category 6</u> Mine dewatering	<ul style="list-style-type: none"> • Up to 7.5 gigalitres (GL) will be dewatered and up to 6 GL to be discharged per annum
<u>Category 12</u> Crushing and screening of material	<ul style="list-style-type: none"> • A single mobile crushing and screening plant is proposed and will operate at up to five locations across the prescribed premises where raw material for road base will be extracted. Once operational, the mobile plant will have the capacity to process up to 1,000,000 tonnes per annum
<u>Category 54</u> Sewage facility	<ul style="list-style-type: none"> • Three wastewater treatment plants, two septic tanks and associated leach drains. For all five wastewater treatment facilities, approximately 140m³/day will be treated
<u>Category 57</u> Used tyre storage	<ul style="list-style-type: none"> • A used tyre storage facility will be located within the prescribed premises for temporary storage of up to approximately 1,000 tyres, consisting of a mixture of light vehicle, road train and haul truck tyres
<u>Category 73</u>	<ul style="list-style-type: none"> • A total of 2,820 m³ of chemical aggregate will be stored within the Prescribed Premises. The aggregate will consist of hydrocarbons in

Bulk storage of chemicals	the form of liquid petroleum, explosives and other chemicals, such as ammonium nitrate (AN), AdBlue and chlorine.
<u>Category 89</u> Putrescible landfill site	<ul style="list-style-type: none"> Two class II landfills: one main landfill for all domestic and some industrial waste from the mine. The other for disposal of used tyres. The combined total waste to be buried per annum across the two landfill sites within the Prescribed Premises is approximately 2,030 tonnes.
<u>Ancillary to prescribed activities</u>	<ul style="list-style-type: none"> Construction and operation of a bioremediation facility intended for treatment of soils contaminated with hydrocarbons from spills on the mine site. Less than 1,000 tonnes per year. Desalination plant 0.01GL/annum (30kL/day) discharged via WWTP discharge Several turkeys nests containing mine dewater, with capacities ranging between 2 megalitres (ML) and 6 ML
<u>Other non-prescribed activities</u>	<ul style="list-style-type: none"> Power station 20MW (does not trigger threshold for category 52) Vehicle maintenance and washdown facilities

Note 1: Prescribed premises category Schedule 1 of the *Environmental Protection Regulations 1987*

The categories and assessed production / design capacity under Schedule 1 of the *Environmental Protection Regulations 1987* (EP Regulations) are also defined in works approval W6780/2023/1. The infrastructure and equipment relating to the premises category and any associated activities which the department has considered in line with *Guideline: Risk Assessments* (DWER 2020) are also outlined in works approval W6780/2023/1.



Figure 1 Indicative location of proposed prescribed activities

2.2.1 Category 5 activities

The project comprises both above and below water table mining of iron ore from five open cut pits, with the production rate of up to 14 million tonnes per annum (Mtpa) of ore on a 24-hour, seven days per week basis, over an expected mine life of 15 years. Once mined the ore will be transported via the haul road network to the Run of Mine (ROM) pad, where it will be processed within a dry processing facility (a crushing plant) known as the “Ore Handling Plant” (OHP) (Figure 5, Appendix 1). Due to the dry nature of the processing no tailings or wet waste products will be produced.

The OHP will crush material until it is a suitable size before the ore is fed out onto the product stockpile via a radial stacker (Figure 2). Any ore which is considered oversized (too large for the crusher feeder) will be separated into an oversized ore stockpile which will be periodically processed using a rock breaker before being fed into the OHP. Once crushed to a suitable size, the ore will be transported offsite for further processing.

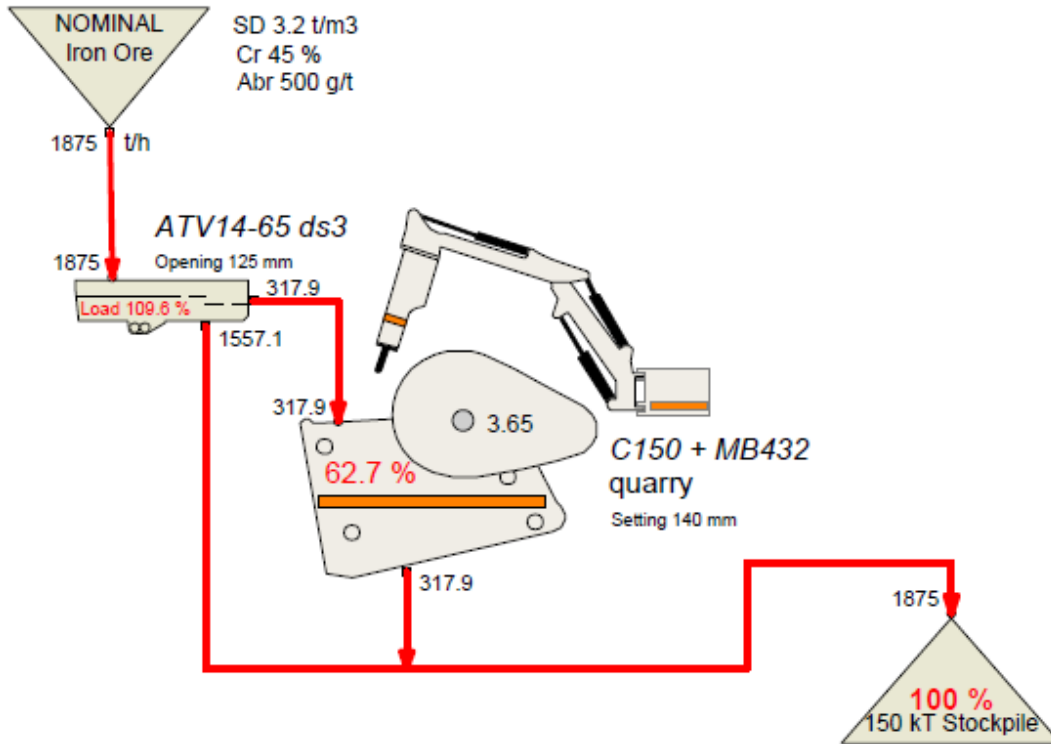


Figure 2 Indicative design of the Ore Handling Plant (OHP)

2.2.2 Category 6 activities

Dewatering will be required for some of the mining pits, as portions of the ore bodies will be located below the water table. It is anticipated that a maximum of 7.5 gigalitres (GL) per annum will be dewatered and up to 6.0 GL of water will be discharged per annum. Three discharge points, McPhee Creek, "branch of McPhee Creek" and Lionel Creek are proposed. Recent monitoring (Atlas, 2023) of McPhee groundwater shows an expected salinity of 290 mg/L total dissolved solids (TDS).

Use for the remaining 1.5 GL of dewater will include 1 GL for dust suppression within the mining areas and 0.5 GL for dust suppression within the crushing/screening area. Minor additional water will also be utilised within non-process infrastructure such as reverse osmosis plants and wastewater treatment plants. Any additional water for incidental use at the site will offset the volume discharged.

Industry Regulation has assessed pipeline management associated with dewatering activities. Mine dewater discharge has been assessed under Part IV of the EP Act, with Ministerial Statement (MS) 1224 being issued on 17 June 2024. Industry Regulation is satisfied that they have been adequately addressed in the MS and will not be duplicated under the Part V assessment (refer to section 2.3.1).

2.2.3 Category 12 activities

A mobile crushing and screening plant (Figure 6, Appendix 1) is proposed for use within the prescribed premises to crush and screen rock material for the construction of road base infrastructure. The single mobile plant will operate at up to five locations (Figure 7, Appendix 1) across the prescribed premises where the raw material for the road bases will be extracted. Once operational, the mobile plant will have the capacity to process up to 1,000,000 tonnes per annum (tpa).

Material will be extracted from borrow pits and either placed directly into the hopper of the mobile plant, or stockpile near the plant until it is required. Once the material has been fed into the mobile plant it will pass through the primary crusher, where the material will be crushed to the required size before being conveyed to a secondary crusher where material still oversized will be further crushed.

The crushed material will then pass through a screen for sorting into separate sizes and conveyed to separate stockpiles from where it will be transported to where it is needed on site.

2.2.4 Category 54 activities

Three wastewater treatment plants (WWTP) for the Prescribed Premises will be located within:

- the main accommodation camp;
- the exploration camp; and
- the mine administration building on the mine service area (MSA).

The WWTPs at the main and exploration camp will be prefabricated modular Sequence Batch Reactor (SBR) systems with associated treated effluent disposal spray fields (Table 2 below and **Error! Reference source not found.** and

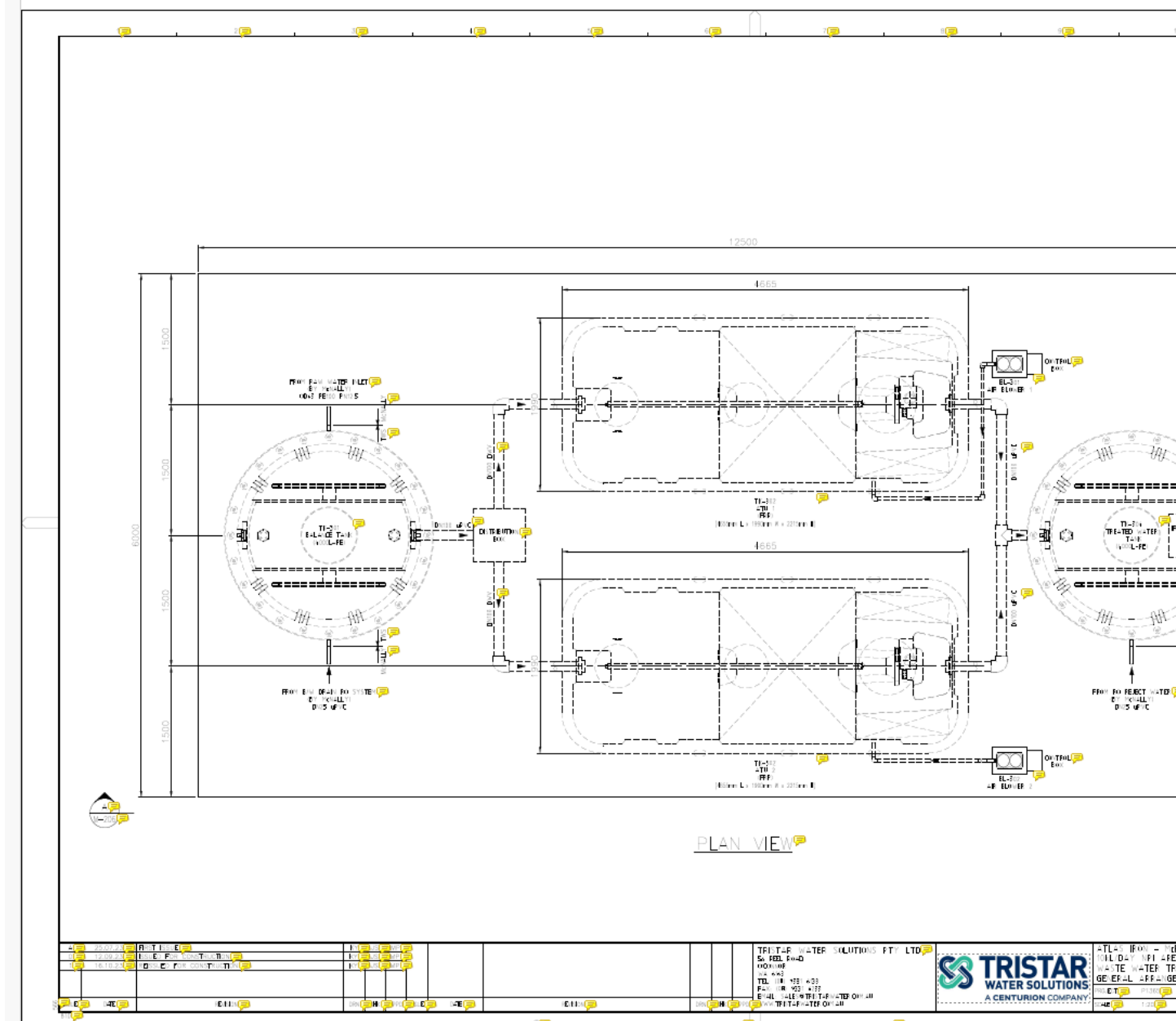


Figure 9: Indicative mine service area WWTP site layout

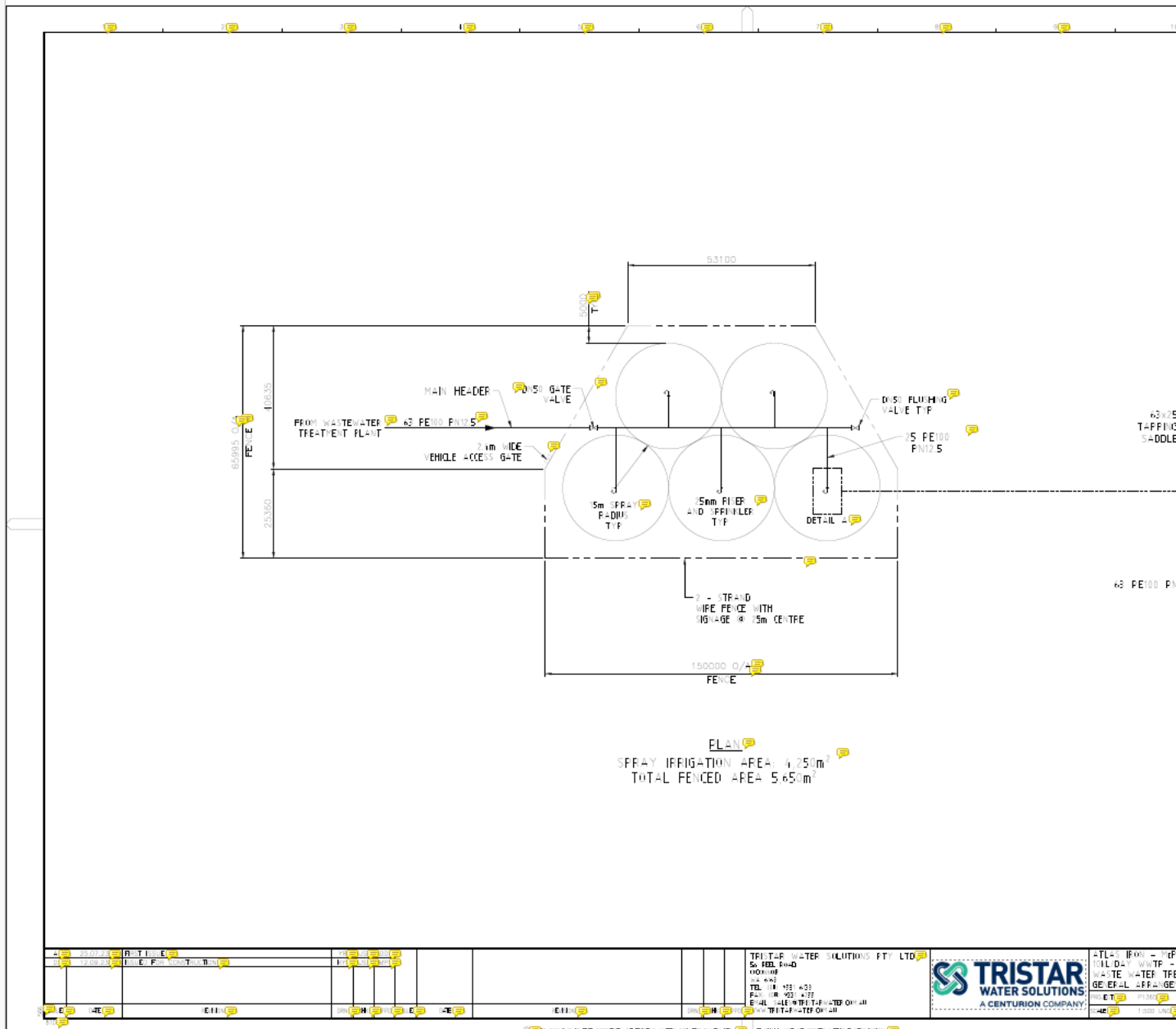


Figure 10: Indicative layout of the mine service area WWTP sprayfields

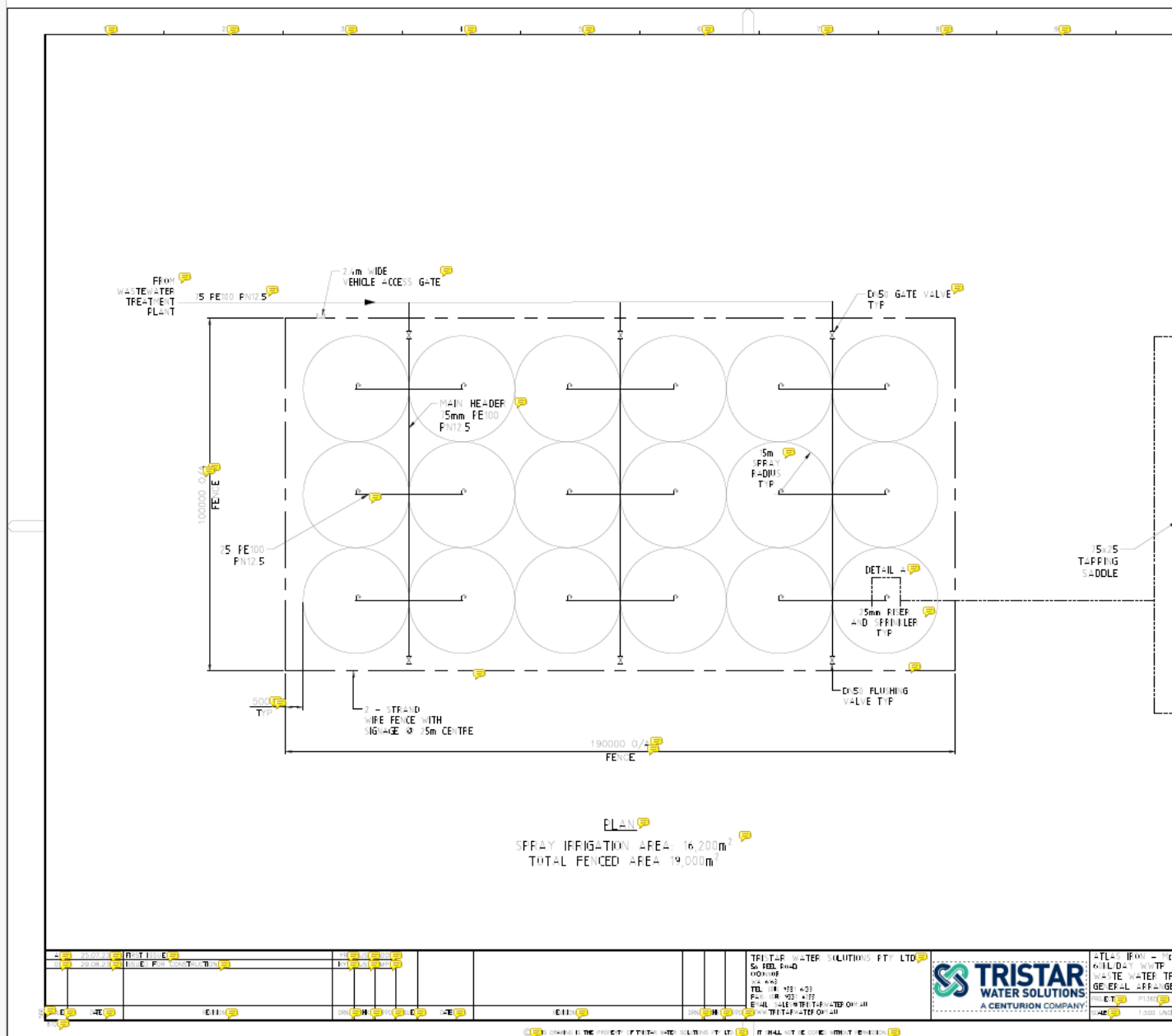


Figure 11 Indicative layout of the main camp WWTP sprayfields

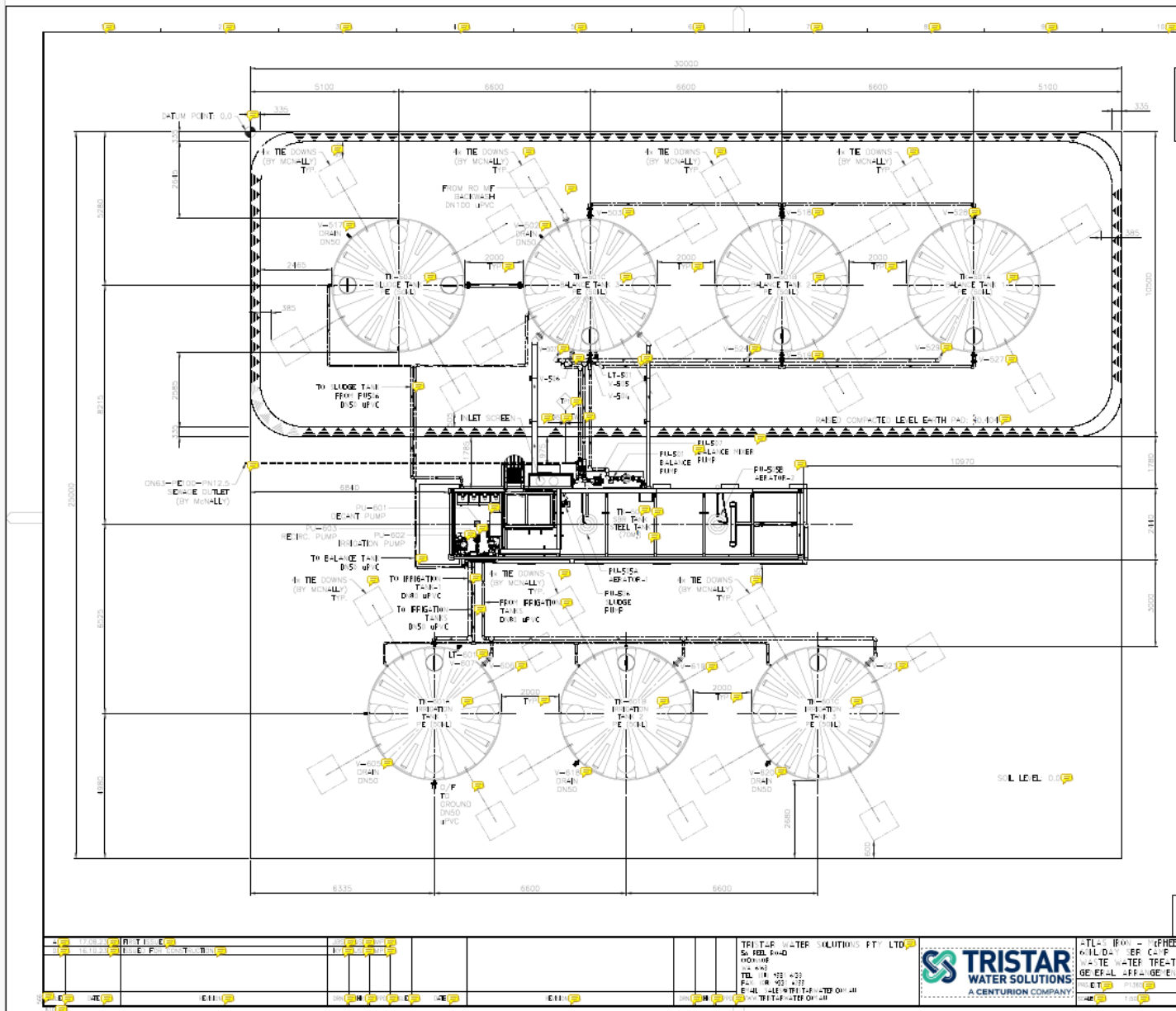


Figure 12 of Appendix 1). The MSA WWTP will use a prefabricated modular 600 series system and associated spray field.

There will also be two septic tanks and associated leach drains installed. Atlas Iron indicated they would seek approval from the Local Government (the Shire of East Pilbara) and the Department of Health (DoH) prior to the construction of any septic tank and leach drain. Septic tanks are excluded from category 54 prescribed activities and will not be further risk assessed in this decision report.

For all five wastewater treatment facilities (Figure 8), approximately 140 m³ of effluent will be treated per day. Brine (79.5 m³ per day) will also be pumped to the wastewater treatment plants from five desalination plants on-site (pumped to the nearest WWTP). The brine will be mixed with the treated effluent in the final chamber of the WWTPs and then the mixture will be pumped to the WWTP's associated discharge. The brine from the OHP and ANSF RO plants will be piped to the holding tank for septic treated wastewater where it will be combined to minimise salinity of discharge water to the leach drains. The expected maximum salinity for discharge to the environment will be 2,000 mg/L total dissolved solids (TDS) – being brackish water.

It is noted that an existing 35 kL/day WWTP is currently operating at the exploration camp (DWER Registration: R2500/2019/1). This WWTP will be expanded to be able to process the 70 kL required

to accommodate the needs of the exploration camp, as outlined above. The applicant proposes to surrender the current registration and incorporate the expanded WWTP at the exploration camp into the overarching Works Approval (and subsequent Prescribed Premises Licence) proposed in this document.

Table 2 Wastewater treatment infrastructure

WWTP	Detail	Treatment
Main camp	<ul style="list-style-type: none"> SBR 250 people Processing 60 kL per day Estimated 30 kL RO brine per day 24/7 operation Treated effluent discharge to spray field, area 1.46 hectares (ha) 	<p>Proposed effluent quality for spray fields:</p> <ul style="list-style-type: none"> Total nitrogen: <30 mg/L Total phosphorous: <8 mg/L Biochemical oxygen demand: <20 mg/L E. Coli: <1000 MPN or cfu/100mL pH: 6.5 – 8.5 TSS: <30 mg/L TDS: 2000 mg/L (brackish)
Exploration camp	<ul style="list-style-type: none"> SBR 275 people Processing 70 kL per day Estimated 45 kL RO brine per day 24/7 operation Treated effluent discharge to spray field, area 1.64 ha 	
Mine Service Area	<ul style="list-style-type: none"> Prefabricated modular 600 series system 135 people Processing 8.4kL per day¹ Estimated 4 kL RO brine per day Treated effluent discharge to spray field, area 0.29 ha 	
OHP septic tank and leach drain	<ul style="list-style-type: none"> 4,800L septic tank 20 people Processing a maximum of 1.4kL per day Solids (settled at bottom of tanks) periodically removed by a vacuum truck for disposal at the onsite Class II landfill site. The remaining liquid to flow through a leach drain (58m long) for discharge to surrounding soil. 	<p>Proposed effluent quality for the leach drains:</p> <ul style="list-style-type: none"> E. Coli: <1000 MPN or cfu/100mL pH: 6.5 – 8.5 TSS: <30 mg/L Total chlorine: 0.2 – 2.0 mg/L
ANSF septic tank and leach drain	<ul style="list-style-type: none"> 4,800L septic tank 20 people Processing a maximum of 1.4kL per 	

	day <ul style="list-style-type: none"> Solids (settled at bottom of tanks) periodically removed by a vacuum truck for disposal at the onsite Class II landfill site. The remaining liquid to flow through a leach drain (58m long) for discharge to surrounding soil. 	
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Note 1: The amount of wastewater is lower compared to the camps as the MSA WWTP is not required to process water from the kitchen, laundry or showers.

Spray field specifications proposed by the applicant for the main camp, exploration camp and MSA are given in Table 3 below. Spray field separation distances to sensitive receptors (as provided by Atlas Iron) have been given in Table 4. A permanent pool “WMPC-18” is located 436 m from the irrigation spray field of the Main Camp.

For eutrophication risk of surface waters within 500 m of an irrigation site, Atlas Iron have assigned risk category “D” to the soils as defined in Water Quality Protection Note 22 (WQPN 22, 2008) and given in **Error! Reference source not found.**, Appendix 1 of this decision report for reference. Risk categories C and D are defined for “fine grained soils” (e.g. loam, clays or peat), which do not allow for rapid water movement through the soil profile (i.e. lower risk for eutrophication). The calculation by Atlas Iron (Table 3) for the area required for risk category D soils allows for an application rate for 30 mg/L nitrogen and 9 mg/L phosphorous (as per WQPN 22 and given in **Error! Reference source not found.**, Appendix 1 of this decision report for reference).

Table 3 Spray field specifications

Parameters	Main Camp		Exploration Camp		MSA	
	Nitrogen	Phosphorus	Nitrogen	Phosphorus	Nitrogen	Phosphorus
Number of People	250		270		135	
Hydraulic Load (kL/Day/Person)	0.24		0.25		0.05	
Total Daily Flow (m ³ /day)	60		70		8.4	
Total N/P in Effluent (mg/L)	30	8	30	8	60	14
Total N/P per Year (kg/L)	657	175.2	739.1	197.1	147.8	34.5
Total N/P allowed per ha (kg/ha/year)	480	120	480	120	480	120
Area Required (ha)	1.37	1.46	1.54	1.64	0.31	0.29
Area Required (m ²)	13,700	14,600	15,400	16,400	3,100	2,900
Required Size of Sprayfield (m ²)	14,600		16,400		2,900	

Table 4 Sprayfield separation distances from sensitive receptors

Sensitive Receptor	Existing Sprayfield	Proposed Sprayfield 1 (Main Camp)	Proposed Sprayfield 2 (New MSA)	OHP leach drain	ANSF leach drain

	(Exploration camp)				
Significant Habitat Features (caves, pools, SFEZ)	352m - SFEZ	N/A	281m - SFEZ	496m - Cave	N/A
Threatened / priority flora	283m - P3 <i>Eragrostis crateriformis</i>	279m - P3 <i>Eragrostis crateriformis</i>	623m - P4 <i>Ptilotus mollis</i>	819m - P4 <i>Ptilotus mollis</i>	482m - P3 <i>Eragrostis crateriformis</i>
Heritage site	713m	53m	386m	145m	159m
Creek	997m - Spinaway Creek	977m - Spinaway Creek	554m - Lionel Creek	180m - Branch of McPhee Creek	364m - Branch of McPhee Creek
Pool	920m - WMPC-34	436m - WMPC-18	816m - WMPC-32	525m - WMPC-01	N/A

Atlas has stated that although pool WMPC-18 is within 500 m of the main camp spray field, it is located at the base of the escarpment, upslope of the spray field and therefore is not considered a eutrophication risk from the spray field.

Figure 3 and Figure 4 depicts the distance between the wastewater treatment plants and spray fields from sensitive receptors.

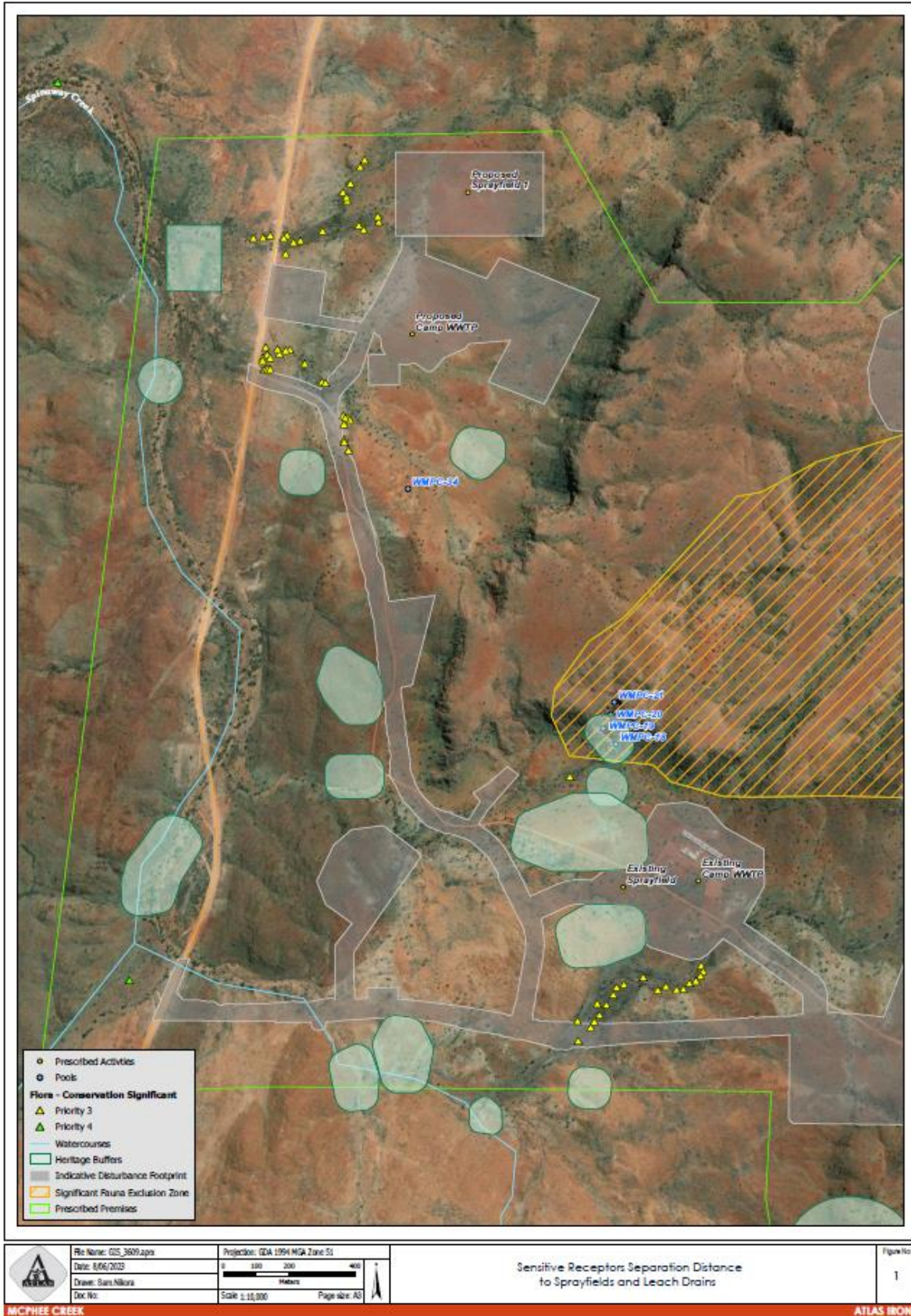


Figure 3: Distance from spray field 1 and existing spray field to sensitive receptors

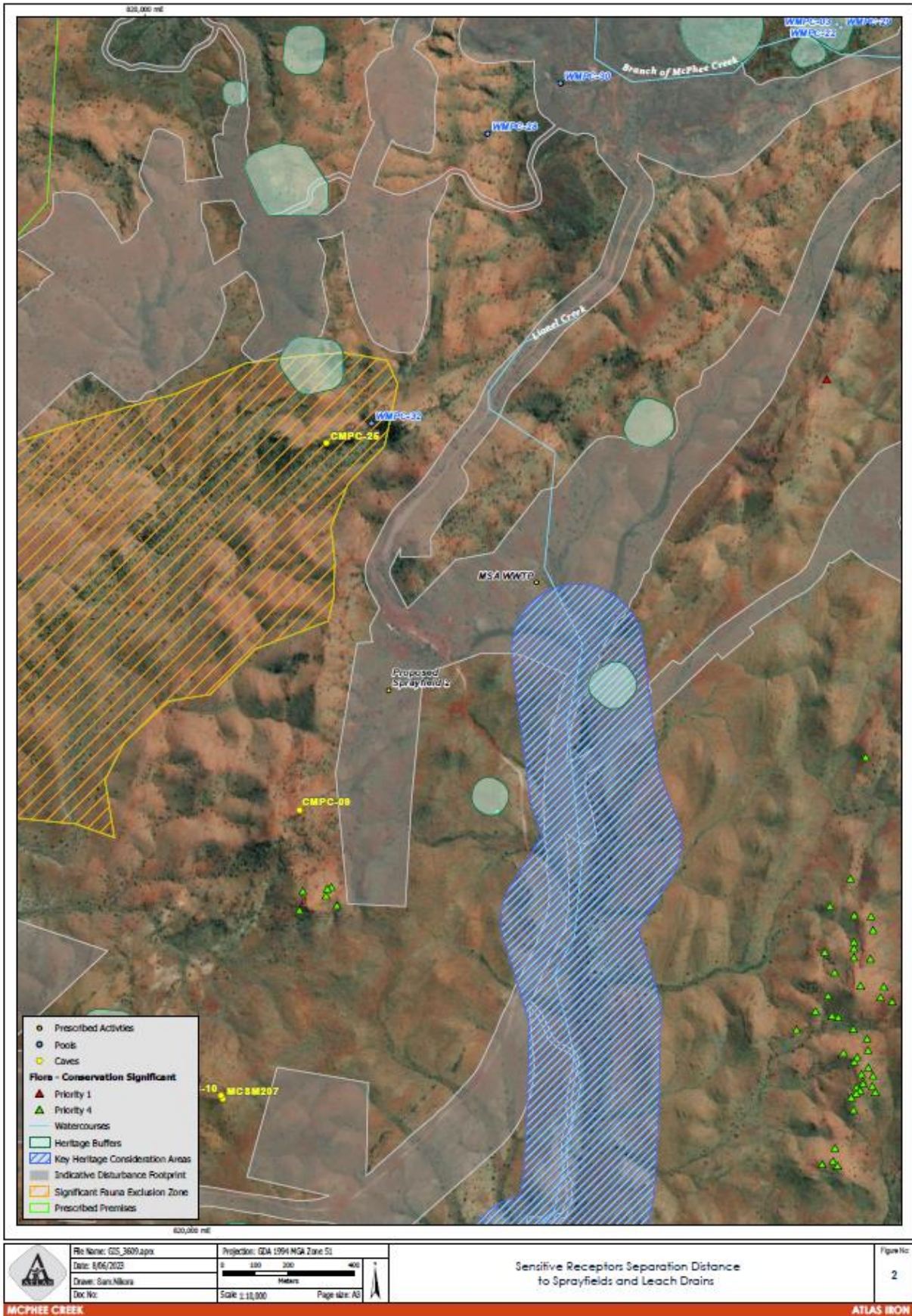


Figure 4: Distance from spray field 2 to sensitive receptors

Commissioning

The WWTPs and septic tanks will each require at least a one-week commissioning period to optimise and stabilise the wastewater treatment processes. The commissioning process will initially utilise groundwater to test the equipment and facility, with influent then slowly being introduced until a steady state has been reached. The treated effluent will be collected in the balance tank (WWTP) or monitoring containers (septic tank) until the effluent quality is able to consistently meet the effluent quality criteria required.

2.2.5 Category 57 activities

A used tyre storage facility (UTSF) is proposed within the mine service area (Figure 13, Appendix 1) of the prescribed premises, for the temporary storage of up to 1,000 tyres (including light vehicle, road train and haul truck tyres). Tyres will be delivered to the UTSF from the vehicle maintenance workshops and separated into different stacks depending on the tyre type and size. The tyre stacks will be no larger than 3 m in height, 6 m in width and 20 m long. The tyres will be stored before being transported to the western waste rock dump (WRD) for disposal (see section 2.2.7 for further detail).

2.2.6 Category 73 activities

A total of 2,820 m³ of chemical aggregate will be stored within the premises (Figure 14). This will consist of hydrocarbons, explosives and other chemicals such as ammonium nitrate, AdBlue and chlorine:

- Explosives will be stored within the magazine in a suitable location which meet the required separation distances from roads, offices and infrastructure facilities;
- Ammonium nitrate will be stored within the “Ammonium Nitrate Storage Facility” within a number of sea containers;
- Hydrocarbon storage details and quantity are given in Table 5 below; and
- Other chemicals will be stored in workshops across the site.

DWER notes that it is the applicant’s responsibility to manage and store chemicals on-site as required under the *Dangerous Goods Safety Act 2004* and the *Dangerous Goods Safety Regulations 2007*.

The applicant has also requested a commissioning period (1 week) for the chemical storage facilities.

Table 5 Hydrocarbon storage on-site

Location	Type and quantity
Mine Service Area	• Ten 102kL tanks - diesel
Exploration camp	• One 60kL tank – diesel
Main accommodation camp	• Two 60kl tank – diesel
ANSF	• One tank 50kL – diesel
OHP	• One tank 50kL – diesel
Power station	• 200kL of liquefied natural gas (LNG)

2.2.7 Category 89 activities

Two landfills proposed for construction within the premises (Figure 15) include:

- One main class II (putrescible) landfill will be constructed for all domestic waste and some industrial waste from the mine. This will be located to the east of the MSA over an area of 5.1 hectares; and
- One class II (putrescible) landfill will be constructed for the disposal of used tyres. This will be located within the western waste rock dump and consist of a number of cells to contain batches of up to 1,000 used tyres at a time.

The combined total waste for both landfill sites will be 2,030 tonnes per annum.

DMIRS has undertaken assessment, primarily relating to stability, for tyre storage within the waste rock dump and detail provided to DWER on 11 April 2023. Tyre disposal will be established on a substantial basement layer and tyres buried in the WRD will:

- Be in batches separated from each other by at least 100 mm of soil, with each batch consisting of not more than either 40 m³ of tyres reduced to pieces or 1,000 whole tyres;
- Have a 500 mm cover of topsoil or waste rock applied as soon as practicable following completion of the final waste levels in the area of tyre disposal;
- Tyre cells will be located away from the outer slopes of the WRD with at least 5m separation between the cell and final rehabilitated slope of the WRD;
- Tyres will be laid flat in cells, allowing voids to be infilled as far as practicable on cell closure and minimising the potential for subsidence;
- Have locations and quantities recorded; and
- Tyre disposal locations will be inspected routinely to ensure correct placement of used tyres.

Long term stability of the Project’s WRDs (including the West WRD) has been considered in DMIRS Environmental Risk Assessment and an Environmental Outcome, with associated Performance Criteria, drafted as provided in Table 6 below.

Table 6 Waste rock dump performance criteria

Environmental Outcome	Performance Criteria
<p>No loss of waste rock material and/or topsoil into the surrounding environment resulting in unstable landforms and impacts beyond WRD. No mass failure of WRDs.</p>	<ul style="list-style-type: none"> • No waste of low erosion stability to be placed on final WRD slopes. • Tyre disposal managed in accordance with Part V approval and WRD stability design requirements. • High stability rock will be used in areas where the interface between natural ground and the WRD may result in concentration of surface flows. • WRD will be constructed to meet closure design parameters as per Appendix F of the mine closure plan.

2.2.8 Ancillary to prescribed activities

Whilst not triggering category thresholds, the following activities are considered ancillary to prescribed activities and will consequently be included for risk assessment within this decision report:

- Construction and operation of a bioremediation facility (Figure 16) intended for treatment of soils contaminated with hydrocarbons from spills on the mine site;
- Operation of desalination plants and associated discharge of brine via the wastewater

treatment plants. Consideration for the discharge of brine will be risk assessed as part of category 54 activities; and

- Operation of turkey's nests (containing mine dewater with expected salinity of 290 mg/L).

2.3 Other relevant approvals

2.3.1 Part IV of the EP Act

The Prescribed Premises boundary aligns with the Development Envelope submitted as part of the Part IV assessment process under the *Environmental Protection Act 1986* (Assessment Number 1750); note this excludes the Significant Fauna Exclusion Zone (SFEZ). Clearing of native vegetation is also being addressed through the Part IV assessment process under the Environmental Protection Act 1986 (Assessment Number 1750).

The Ministerial Statement (MS1224) for the McPhee Creek Iron Ore Project was published on 14 June 2024. Under the MS and demonstrated in EPA Report 1750, impacts associated with dewatering have been assessed in detail, including the following:

- Impacts to pools and catchment areas;
- Indirect impacts to potential groundwater dependent vegetation;
- Indirect impacts to riparian vegetation and pools as a result of discharge to creeks;
- Impacts to stygofauna and troglifaunal habitat;

MS 1224 requires a Water Management Plan (WMP) to be approved and implemented with the objective being to maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected. The WMP includes managing impacts associated the discharge of mine dewater to surface water bodies and also includes potential impacts to groundwater, riparian and groundwater dependant vegetation and terrestrial fauna. The WMP includes proposed water quality monitoring of inland waters along with compliance reporting requirements.

The EPA has stated these emissions can be regulated through reasonable conditions in the MS. Pipelines associated with dewatering activities will be assessed under Part V with associated conditions included in the works approval.

2.3.2 Aboriginal Heritage Act 1972

The department notes that the works approval holder is required to meet its obligations under the AH Act which is a separate regulatory process to that of applying for a works approval under Part V of the EP Act. The granting of the works approval does not remove Atlas Iron's obligations to comply with the AH Act.

The proposed premises overlaps with two registered and nine lodged heritage sites under the *Aboriginal Heritage Act 1972* (AH Act). The premises is also covered by the Nyamal #1 Native Title Claim (WC1999/008), represented by the Nyamal Aboriginal Corporation (AC) via Arma Legal. Atlas Iron have indicated that an Aboriginal Cultural Heritage Management Plan has been prepared and provided to Nyamal AC, EPA services and Department of Planning, Lands and Heritage (DPLH).

DPLH confirmed on 31 March 2023 (DWER reference A2167162) that Atlas Iron have submitted a Section 18 (s18) Notice for the McPhee Creek Project under the *Aboriginal Heritage Act 1972*. In an update provided on 16 May 2023 DPLH indicated that the subject notice went before the Aboriginal Cultural Material Committee (ACMC) for consideration on 14 April 2023. The ACMC considered the Notice at its 14 April 2023 meeting and resolved to defer making a recommendation to the Minister for Aboriginal Affairs relating to the Notice to allow further time for consultation with the following parties:

- Arma Legal which is the registered representative of the Nyamal #1 Native Title Claim Group; and

- Mr Michael Williams Senior, Mr Peter Woodman, Mr Fabian Walters and Mr Jonny Francis, who are noted as the Knowledge Holders for the Aboriginal Sites included in the application.

The Notice will be scheduled to be considered by the Aboriginal Cultural Material Committee (ACMC) at the first available meeting after the following parties have been consulted with regarding the project. Prior to issue of this works approval, the applicant advised on April 18 2024, the Minister issued consent with conditions for three s18 sites. The notice provides consent to impact two sites, while the third must be avoided with a 100m buffer. In May 2024, an on-going country consultation with Nyamal was held to develop a salvage management plan as per conditions issued with s18 consent. A final draft of the Cultural Heritage Management Plan has been provided to Nyamal and is awaiting NAC sign-off.

In January 2024, a Native Title Determination was made which identifies sections of the McPhee Creek Project areas as Palyku Determined Area. Heritage surveys for the relevant areas have commenced with Palyku-Jartayi Aboriginal Corporation (PJAC), relevant approvals under the *Aboriginal Heritage Act 1972* will be sought as required, and a Cultural Heritage Management Plan will be developed in consultation with PJAC.” As of the date of this report, no formal agreements are yet in place.

DWER requested comment from the Nyamal Aboriginal Corporation (Nyamal AC) regarding the proposed activities on 9 March 2023, with a follow up on 27 March 2023, and did not receive a reply.

2.3.3 The Mining Act 1978

Department of Energy, Mines, Industry Regulation and Safety (DEMIRS) responded to a request for comment on 11 April 2023, advising that a Mining Proposal was submitted in November 2022 (Reg ID 114759). The Mining Proposal has been assessed by DEMIRS under the *Mining Act 1978* and activities described within the MP are consistent with the summary of proposed activities under Part V of the EP Act. Mining Proposal Reg ID 114759 was approved by DEMIRS on 2 July 2024.

DEMIRS has noted that the applicant will need to update the MP with some minor corrections prior to finalisation to reflect some of the activities proposed under Part V. The category numbers stated in the MP for crushing and screening and sewage are not aligned with those as provided by DWER and Bulk Storage of Chemicals (category 73) is currently omitted; management of hydrocarbons and chemicals is however included. DWER informed Atlas Iron of the minor corrections required on 26 April 2023 (DWER reference A2171552).

DEMIRS also provided additional detail with respect to their assessment of tyre storage within the waste rock dump, which has been summarised in section 2.2.5.

2.3.4 Environment Protection and Biodiversity Conservation Act 1999

Due to the presence of federally listed species and communities (Section 18 and 18a) the Applicant has referred the Project pursuant to the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), reference: EPBC 2021/8897. On 20 May 2021 the Commonwealth determined that the Project would be assessed by an accredited assessment under Part IV of the EP Act.

A decision under Part IV was determined on 14 June 2024 and Ministerial Statement 1224 was issued.

2.3.5 Rights in Water and Irrigation Act 1914

Atlas Iron have applied to increase their groundwater licence (GWL175352) allocation from 100,000 kL/annum to 16 GL/annum to support the project.

3. Risk assessment

The department assesses the risks of emissions from prescribed premises and identifies the potential source, pathway and impact to receptors in accordance with the *Guideline: Risk Assessments* (DWER 2020).

To establish a risk event there must be an emission, a receptor which may be exposed to that emission through an identified actual or likely pathway, and a potential adverse effect to the receptor from exposure to that emission.

3.1 Source-pathways and receptors

3.1.1 Emissions and controls

The key emissions and associated actual or likely pathway during premises construction and operation which have been considered in this decision report are detailed in Table 7 below. Table 7 also details the control measures the applicant has proposed to assist in controlling these emissions, where necessary.

Table 7: Proposed applicant controls

Emission	Sources	Potential pathways	Proposed controls
Construction			
Dust	Construction of: <ul style="list-style-type: none"> Dry ore processing facility Wastewater treatment plants 	Air / windborne pathway causing poor vegetation health/death for adjacent priority flora and native vegetation	<ul style="list-style-type: none"> Water carts will be used for the suppression of dust during construction activities
Sediment laden / hydrocarbon contaminated stormwater	<ul style="list-style-type: none"> Putrescible landfill Bioremediation facility Desalination plant Mobilisation of mobile crushing/screening plant Vehicle movements and earthworks	Overland run-off causing impacts to sensitive surface water receptors	<ul style="list-style-type: none"> Temporary drains, bunds and sediment traps to be used during construction to capture sediment laden run-off Potentially contaminated water will not be discharged into the environment Sediment laden water storage infrastructure to be regularly cleaned when the basin capacity is less than 50% full Sediment control infrastructure to be inspected after storm events and any built up material removed
Noise		Air / windborne pathway causing impacts to sensitive fauna – Pilbara Leave-nose Bats and Ghost Bats	This has been assessed under Part IV of the EP Act and included in MS 1224.
Commissioning			
Category 54 activities (one week commissioning)			
Treated wastewater	Discharge of treated wastewater from Main Camp, Exploration Camp and MSA WWTP's to irrigation spray fields	Direct discharge to land causing potential impacts to sensitive surface water receptors	<p>The commissioning process will initially utilise groundwater to test the equipment and facility, with influent then slowly being introduced until a steady state has been reached.</p> <p>The treated effluent will be collected in the balance tank (WWTP) until the</p>

Emission	Sources	Potential pathways	Proposed controls
			effluent quality is able to consistently meet the effluent quality identified in section 2.2.4, Table 2.
Sewage, partially treated sewage, treated wastewater	Containment loss from WWTP and associated pipelines	<p>Overland flow causing potential impacts to sensitive surface water receptors.</p> <p>Infiltration through soil to groundwater causing contamination of groundwater</p>	<ul style="list-style-type: none"> • Components of the WWTPs will be fitted with alarms to warn of high-water levels in tanks or if a component has failed • WWTPs will be constructed on top of a compacted earth base and surrounded by compacted earth diversion bunds, which will feed into sedimentation traps • The sewage facilities will be regularly inspected, and equipment maintained to ensure that the effluent is treated to meet the values to be of a low exposure risk ('Guidelines for Nonpotable uses of recycled Water in Western Australia (DoH, 2011) • Suitable separation distances will be maintained between the sewage facilities and sensitive receptors
Category 73 activities (one week commissioning)			
Chemical release by loss of containment / accidental spill	Bulk storage of chemicals (hydrocarbons, ammonium nitrate, AdBlue, chlorine)	Overland flow / surface water run off causing potential impacts to sensitive surface water receptors.	<ul style="list-style-type: none"> • Design characteristics inspection, pressure testing, leakproof testing and inspections of tank markings • The applicant will implement the 'Atlas Hydrocarbon Management Procedure and Hydrocarbon (and chemical) Spill Management Procedures' at all times. • Any waste oil and lubricants generated during the maintenance of the on-site facilities will be immediately collected and stored in an appropriate storage facility within the nearest workshop. It will then either be taken to the onsite bioremediation farm or to a suitable offsite location for recycling or disposal. • If the spill is substantial, an investigation will be conducted to determine if soil sampling is required to confirm that all contaminated material has been removed. • Where contaminated water associated with the fuel farm, power station, workshops and vehicle washdown points is

Emission	Sources	Potential pathways	Proposed controls
			retrieved, it will be treated by oily water separators as required.
Operation			
Category 5 activities			
Dust	Operation of the dry processing facility (Ore Handling Plant)	Air / windborne pathway causing poor vegetation health/death for adjacent priority flora and native vegetation	<ul style="list-style-type: none"> Water sprays to be installed on but not limited to the feed bin, strategic conveyor transfer points, stacker head chute Covered transfer points will be installed for the OHP Water carts will be used for the suppression of dust along on the ROM, stockpiles roads and cleared areas as required
Noise		Air / windborne pathway causing impacts to sensitive fauna – Pilbara Leave-nose Bats and Ghost Bats	This has been assessed under Part IV of the EP Act and included in MS 1224.
Sediment laden / hydrocarbon contaminated stormwater		Overland run-off causing impacts to sensitive surface water receptors	<ul style="list-style-type: none"> Compacted earth bunds will be constructed around infrastructure to direct sediment laden storm water to the nearest sedimentation trap depending on risk of water containing contaminants. Suitable amount of freeboard will be maintained at all sedimentation basins Sedimentation basins will undergo periodic excavations to remove excess material and will be deposited at the main Class II landfill site.
Dust	Stockpiling of ore at the ROM pad	Air / windborne pathway causing poor vegetation health/death for adjacent priority flora and native vegetation	<ul style="list-style-type: none"> Water carts to be used for dust suppression for stockpiles
Sediment laden stormwater		Overland run-off causing impacts to sensitive surface water receptors (creek lines and pools)	<ul style="list-style-type: none"> Compacted earth bunds will be constructed around infrastructure to direct sediment laden storm water to the nearest sedimentation trap depending on risk of water containing contaminants. Suitable amount of freeboard will be maintained at all sedimentation basins Sedimentation basins will

Emission	Sources	Potential pathways	Proposed controls
			undergo periodic excavations to remove excess material and will be deposited at the main Class II landfill site.
Category 6 activities			
Mine dewater	Dewatering discharge to McPhee Creek, "branch of McPhee Creek" and Lionel Creek	Direct discharge of mine dewater to surface water receptors (creek lines and pools) and inundation of adjacent vegetation	This has been assessed under Part IV of the EP Act and included in MS 1224.
	Rupture of pipeline causing mine water discharge to land	Accidental release of mine dewater to land, causing impacts to sensitive surface water receptors	<ul style="list-style-type: none"> • Once assembled the dewatering infrastructure will undergo initial testing which will entail configuring the infrastructure to ensure there are no manufacturing faults and that the bores are pumping at the required rate. • The testing will also involve the pumping of groundwater down the pipes and undertaking visual inspections to ensure that there are no leaks. • Due to the nature of the infrastructure used for dewatering no environmental commissioning will be undertaken by the Applicant. • Valves will be installed along the piping network to allow shutdown in the event of leaks or failure. • Flow meters will be installed along the piping network to monitor the flow volumes. • Pipelines will be constructed in accordance with Australian Standards AS/NZS 2033:2008, AS/NZS 4129:2008 and AS/NZS 4130:2009
Category 12 activities			
Dust	Operation of mobile crushing and screening plant	Air / windborne pathway causing poor vegetation health/death for adjacent priority flora	<ul style="list-style-type: none"> • Water sprays to be installed on the plant • Covered transfer points will be installed for the mobile crushing and screening plants.
Noise		Air / windborne pathway causing impacts to sensitive fauna – Pilbara Leave-nose Bats and Ghost Bats	This has been assessed under Part IV of the EP Act and included in MS 1224.

Emission	Sources	Potential pathways	Proposed controls
Sediment laden/ hydrocarbon contaminated stormwater		Overland run-off causing impacts to sensitive surface water receptors (creek lines and pools)	<ul style="list-style-type: none"> Temporary stormwater diversion structures will be constructed at each location to divert uncontaminated stormwater around the operational areas
Dust	Stockpiling of material from the mobile crushing and screening plant	Air / windborne pathway causing poor vegetation health/death for adjacent priority flora	<ul style="list-style-type: none"> Water carts will be used for dust suppression of stockpiles
Sediment laden stormwater		Overland run-off causing impacts to sensitive surface water receptors (creek lines and pools)	<ul style="list-style-type: none"> Temporary stormwater diversion structures will be constructed at each location to divert uncontaminated stormwater around the operational areas
Category 54 activities			
Treated wastewater mixed with brine from RO plants	Discharge of treated wastewater mixed with RO brine from Main Camp, Exploration Camp and MSA WWTP's to irrigation spray fields	Direct discharge to land causing potential impacts to sensitive surface water receptors	<ul style="list-style-type: none"> Treated to quality criteria detailed in section 2.2.4, Table 2 The treated effluent will be applied over sufficiently sized spray fields to reduce the likelihood of runoff and nutrient contamination. RO brine diluted to salinity of 2,000 mg/L TDS upon mixture with treated wastewater
Sewage, partially treated sewage, treated wastewater	Containment loss from WWTP and associated pipelines	Overland flow causing potential impacts to sensitive surface water receptors. Infiltration through soil to groundwater causing contamination of groundwater	<ul style="list-style-type: none"> Components of the WWTPs will be fitted with alarms to warn of high-water levels in tanks or if a component has failed WWTPs will be constructed on top of a compacted earth base and surrounded by compacted earth diversion bunds, which will feed into sedimentation traps The sewage facilities will be regularly inspected, and equipment maintained to ensure that the effluent is treated to meet the values to be of a low exposure risk ('Guidelines for Nonpotable uses of recycled Water in Western Australia (DoH, 2011). Suitable separation distances will be maintained between the sewage facilities and sensitive receptors.
Category 57 activities			
Gaseous emissions in the event of	Storage of up to 1,000 used tyres	Air/windborne pathway causing impacts to	<ul style="list-style-type: none"> The UTSF will be constructed a "sufficient distance" away from other site buildings to reduce the

Emission	Sources	Potential pathways	Proposed controls
accidental tyre fire		health/amenity	fire risk.
Chemical laden surface water runoff in the event of an accidental tyre fire		Overland flow causing potential impacts to sensitive surface water receptors.	<ul style="list-style-type: none"> The facility will be constructed on a compacted earth surface to minimise potential soil contamination from chemicals in the event of an accidental tyre fire. The compacted earth foundation will also be surrounded by a compacted soil bund which will contain any chemicals and oily material generated.
Category 73 activities			
Chemical release by loss of containment / accidental spill	Bulk storage of chemicals (hydrocarbons, ammonium nitrate, AdBlue, chlorine)	Overland flow / surface water run off causing potential impacts to sensitive surface water receptors.	<ul style="list-style-type: none"> The applicant will implement the 'Atlas Hydrocarbon Management Procedure and Hydrocarbon (and chemical) Spill Management Procedures' at all times. Any waste oil and lubricants generated during the maintenance of the onsite facilities will be immediately collected and stored in an appropriate storage facility within the nearest workshop. It will then either be taken to the onsite bioremediation farm or to a suitable offsite location for recycling or disposal. If the spill is substantial, an investigation will be conducted to determine if soil sampling is required to confirm that all contaminated material has been removed. Where contaminated water associated with the fuel farm, power station, workshops and vehicle washdown points is retrieved, it will be treated by oily water separators as required.
Category 89 activities			
Dust	Operation of a category 89 landfill (domestic and putrescible waste)	Air/windborne pathway causing poor vegetation health/death for adjacent priority flora and native vegetation	<ul style="list-style-type: none"> The applicant has indicated "use of water carts for dust suppression during landfill construction and maintenance"
Windblown waste		Air/windborne pathway causing poor vegetation health/death for adjacent priority flora and native vegetation	<ul style="list-style-type: none"> The main landfill will be constructed within an area totally enclosed by fencing. The fencing will be designed to limit the discharge of any airborne litter into the surrounding environment.

Emission	Sources	Potential pathways	Proposed controls
		Fauna access/scavenging - impacts to fauna	<ul style="list-style-type: none"> At the end of an operational week the waste within the landfill sites will be covered with a layer of cover material, approximately 0.30 m thick The main landfill will be constructed within an area totally enclosed by fencing. The fencing will be designed prevent feral animals and livestock from accessing the site. At the end of an operational week the waste within the landfill sites will be covered with a layer of cover material, approximately 0.30 m thick It is noted that the applicant has committed to avoiding the use of barbed wire fencing as far as practicable to prevent adverse impacts to bats.
Leachate		Seepage through base and embankments to soil and groundwater causing vegetation poor health/ and groundwater contamination	<ul style="list-style-type: none"> The cells walls will be at least 100 mm thick and the floor will be constructed out of compacted soil, to reduce the likelihood of hazardous substances leaching into the surrounding soil. “Constructed in accordance with the current best industry practices” as well as the requirements under the Environmental Protection (Rural Landfill) Regulations 2002.
Contaminated surface water		Surface water run off causing contamination of nearby sensitive surface water receptors	<ul style="list-style-type: none"> If required, additional drainage controls will be implemented to divert surface flows away from landfill cells
Dust	Operation of a category 89 landfill (tyre disposal)	Air/windborne pathway causing poor vegetation health/death for adjacent priority flora and native vegetation	<ul style="list-style-type: none"> The applicant has indicated “use of water carts for dust suppression during landfill construction and maintenance”
Leachate		Seepage through base and embankments to soil and groundwater causing vegetation poor health/ and groundwater contamination	<ul style="list-style-type: none"> The cells walls will be at least 100 mm thick and the floor will be constructed out of compacted soil, to reduce the likelihood of hazardous substances leaching into the surrounding soil. “Constructed in accordance with the current best industry practices” as well as the requirements under the Environmental Protection (Rural

Emission	Sources	Potential pathways	Proposed controls
			Landfill) Regulations 2002.
Contaminated surface water		Surface water run off causing contamination of nearby sensitive surface water receptors	<ul style="list-style-type: none"> “If required, additional drainage controls will be implemented to divert surface flows away from landfill cells”.
Ancillary to prescribed activities			
Hydrocarbon contaminated water (from stormwater etc.)	Operation of bioremediation land farm	Seepage through base and embankments to soil and groundwater causing vegetation poor health/ and groundwater/surface water contamination	<ul style="list-style-type: none"> Construction of a HDPE liner with permeability of 10^{-9} m/s with a protective layer of clean material to prevent damage. All material disposed of within the facility will be recorded in the bioremediation log book The cells will be actively maintained to facilitate the bioremediation process and “sampled on a scheduled basis”
		Surface water run off - overtopping land farm embankments	<ul style="list-style-type: none"> No controls proposed
Mine dewater (TDS expected ~290 mg/L)	Operation of several Turkey’s nests containing mine dewater (capacity between 2 megalitres (ML) and 6 ML.	Seepage	<ul style="list-style-type: none"> Turkey’s nests HDPE lined
		Overtopping	<ul style="list-style-type: none"> 300 mm freeboard maintained for a typical 2 ML turkey’s nest (design capacities between 2ML and 6ML)
		Fauna access (drinking water etc)	<ul style="list-style-type: none"> Perimeter to be fenced and turkey’s nests to contain fauna egress

3.1.2 Receptors

In accordance with the *Guideline: Risk Assessment* (DWER 2020), the Delegated Officer has excluded the applicant’s employees, visitors, and contractors from its assessment. Protection of these parties often involves different exposure risks and prevention strategies, and is provided for under other state legislation.

Table 8 below provides a summary of potential human and environmental receptors that may be impacted as a result of activities upon or emission and discharges from the prescribed premises (*Guideline: Environmental Siting* (DWER 2020)).

Table 8: Sensitive human and environmental receptors and distance from prescribed activity

Environmental receptors	Distance from prescribed activity
<u>Groundwater</u> Pilbara Groundwater Area – <i>Rights in Water Irrigation Act 1914</i>	<u>Groundwater depth</u> The depth of the groundwater across the Prescribed Premises ranges between 5 m to 100 m bgl. The extent of the depth is due to the topography of the main ridge which extends up to 60 m above the surrounding plains. The depth of the water table is deeper in the areas along the ridgelines (generally >50m) and

	<p>shallower in the creeklines and plains (AECOM, 2013)</p> <p><u>Groundwater quality</u></p> <p>The groundwater is considered to be fresh (typically <500mg/L) and having a near neutral to slightly alkaline pH (AECOM, 2013)</p> <p><u>Groundwater flow direction</u></p> <p>Groundwater contours produced by AECOM (2013) indicated an elevated groundwater divide along the ridgeline marking the McPhee Creek catchment, radially sloping to all directions (Figure 19, Appendix 1)</p> <p>GHD (2021) indicated that “ultimately any groundwater at the site will either discharge directly to the Nullagine River alluvium or its tributaries or evapotranspire”</p> <p><u>Nearby groundwater users</u></p> <p>A pastoral lease (cattle station) intersects with the southern portion of the prescribed premises. There are no known licensed groundwater users within 2 km of the site. DWER – noting that there may be unlicensed groundwater users.</p>
<p><u>Surface water</u></p> <p>Pilbara Surface water Area – <i>Rights in Water Irrigation Act 1914</i></p>	<p>Watercourses that intersect the Prescribed Premises are ephemeral and tend to flow sporadically during and immediately after summer storm events (SKM 2013). Tributaries of the Nullagine River flow southeast from the Prescribed Premises (Figure 17, Appendix 1), referred to as:</p> <ul style="list-style-type: none"> • McPhee Creek, • Branch of McPhee Creek; • Lionel Creek; • Spinaway Creek; and • Sandy Creek <p>Permanent pools and creek lines for McPhee Creek and Branch of McPhee were reported to support a diverse range of aquatic flora, habitats and aquatic fauna values, including conservation significant and range restricted species (Biologic, 2020).</p> <p>Fifteen surface water pools have been recorded within the Prescribed Premises including:</p> <ul style="list-style-type: none"> • five permanent; • two semi-permanent; and • eight temporary/seasonal pools. <p>An additional 28 surface water pools outside the Prescribe Premises have been identified including:</p> <ul style="list-style-type: none"> • six permanent; • five semi-permanent; and • seventeen temporary/seasonal. <p>Impacts to surface water pools has been assessed under Part IV of the EPA and sufficiently regulated in MS 1224.</p> <p>Permanent pool locations are shown in Figure 17, Appendix 1.</p>

<p><u>Priority flora and native vegetation</u></p> <p><i>Acacia aphanoclada</i> (Priority 1), <i>Rostellularia adscendens</i> var. <i>latifolia</i> (Priority 3), <i>Ptilotus mollis</i> (Priority 4), and <i>Eragrostis crateriformis</i> (Priority 3).</p>	<p>Located within the prescribed premises boundary.</p>
<p><u>Conservation significant fauna</u></p> <p>Eight conservation significant species recorded. Some of these are considered vulnerable or endangered under the EPBC Act.</p> <p>See section 2.5 and Appendix 2 for further detail.</p>	<p>Eight conservation significant species have been recorded or are likely to occur within the premises.</p> <p>Impacts to conservation significant fauna species have been assessed under Part IV of the EP Act and sufficiently regulated in MS 1224.</p>
<p><u>Subterranean fauna</u></p>	<p>None of subterranean fauna species observed within or surrounding the proposed mine pit areas are listed under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> or the <i>Biodiversity Conservation Act 2016</i> recorded during surveys of the McPhee Creek Application Area.</p> <p><u>Stygofauna</u></p> <p>Combined stygofauna surveys recorded a total of 718 stygofauna specimens, representing two named species, six morphospecies, and four indeterminate taxa from three higher order groups. All stygofauna taxa were found to be widespread species or were recorded from outside of the modelled extent of groundwater drawdown. For these reasons, the risks to stygofauna values from the current Proposal are considered low (Biologic, 2021).</p> <p><u>Troglifauna</u></p> <p>Of 87 species identified, 20 are currently known only from within the proposed pits and are therefore considered at risk of impact (Biologic, 2020).</p> <p>Impacts to subterranean fauna have been assessed under Part IV of the EP Act and sufficiently regulated in MS 1224.</p>
<p><u>Groundwater dependent ecosystems</u></p> <p>Moderate to high potential for terrestrial GDEs</p>	<p>Within premises boundary (Figure 17, Appendix 1)</p>

Note 1: Priority 1 flora (poorly known species) are species that are known from one or a few locations (generally five or less) which are potentially at risk. Such species are in urgent need of further survey.

Note 2: Priority 3 flora (poorly known species) are species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat.

Note 3: Priority 4 flora are rare, near threatened or other species in need of monitoring

3.3 Risk ratings

Risk ratings have been assessed in accordance with the *Guideline: Risk Assessments* (DWER 2020) for each identified emission source and takes into account potential source-pathway and receptor linkages as identified in Section 3.1. Where linkages are in-complete they have not been considered further in the risk assessment.

Where the applicant has proposed mitigation measures/controls (as detailed in Section 3.1), these have been considered when determining the final risk rating. Where the delegated officer considers the applicant's proposed controls to be critical to maintaining an acceptable level of risk, these will be incorporated into the works approval as regulatory controls.

Additional regulatory controls may be imposed where the applicant's controls are not deemed sufficient. Where this is the case the need for additional controls will be documented and justified in Table 9.

Works approval W6780/2023/1 that accompanies this decision report authorises construction and time-limited operations. The conditions in the issued works approval, as outlined in Table 9 have been determined in accordance with *Guidance Statement: Setting Conditions* (DER 2015).

A licence is required following the time-limited operational phase authorised under the works approval to authorise emissions associated with the ongoing operation of the premises. A risk assessment for the operational phase has been included in this decision report, however licence conditions will not be finalised until the department assesses the licence application.

Table 9: Risk assessment of potential emissions and discharges from the premises during construction, commissioning and operation

Risk events					Risk rating ¹ C = consequence L = likelihood	Applicant controls sufficient?	Conditions ² of works approval	Justification for additional regulatory controls
Sources / activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls				
Construction								
Construction of: <ul style="list-style-type: none"> Dry ore processing facility Wastewater treatment plants Putrescible landfill Bioremediation facility Desalination plant Mobilisation of mobile crushing/screening plant Vehicle movements and earthworks	Dust	Air / windborne pathway causing poor vegetation health/death for adjacent priority flora and native vegetation	Priority flora and native vegetation	Refer to Section 3.1	C = Minor L = Unlikely Medium Risk	Y	Condition 1 – dust management	The applicant proposed control for dust suppression has been placed on the works approval as a regulatory control, for all construction activities to protect adjacent priority flora and native vegetation.
	Sediment laden/hydrocarbon contaminated storm water	Overland run-off causing impacts to sensitive surface water receptors	Sensitive surface water receptors (permanent pools and creeklines)	Refer to Section 3.1	C = Minor L = Unlikely Medium Risk	Y	Condition 2 – temporary stormwater infrastructure	The applicant proposed control for temporary drains/bunds and sediment traps to be in place during construction activities (before permanent infrastructure can be installed) has been placed on the works approval as a regulatory control.
Commissioning								
Category 54 activities (one week commissioning)								
Discharge of treated wastewater from Main Camp, Exploration Camp and MSA WWTP's to irrigation spray fields	Treated wastewater	Direct discharge to land causing potential impacts to sensitive surface water receptors	Sensitive surface water receptors (permanent pools and creeklines) Shallow groundwater and associated GDEs	Refer to Section 3.1	C = Minor L = Unlikely Medium Risk	Y	Condition 10 – commissioning requirements	Commissioning is of short duration and unlikely to pose significant risk. The applicant proposed controls are considered sufficient and have been placed on the works approval as regulatory controls.

Risk events					Risk rating ¹ C = consequence L = likelihood	Applicant controls sufficient?	Conditions ² of works approval	Justification for additional regulatory controls
Sources / activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls				
Containment loss from WWTP and associated pipelines	Sewage, partially treated sewage, treated wastewater	Overland flow causing potential impacts to sensitive surface water receptors. Infiltration through soil to groundwater causing contamination of groundwater	Sensitive surface water receptors (permanent pools and creeklines) Shallow groundwater and associated GDEs	Refer to Section 3.1	C = Minor L = Unlikely Medium Risk	Y	Condition 10 – commissioning requirements	Commissioning is of short duration and unlikely to pose significant risk. The applicant proposed controls are considered sufficient and have been placed on the works approval as regulatory controls.
Category 73 activities (one week commissioning)								
Bulk storage of chemicals (hydrocarbons, ammonium nitrate, AdBlue, chlorine)	Chemical release by loss of containment / accidental spill	Overland flow / surface water run off causing potential impacts to sensitive surface water receptors.	Sensitive surface water receptors (permanent pools and creeklines) Shallow groundwater and associated GDEs	Refer to Section 3.1	C = Minor L = Unlikely Medium Risk	N	<u>Condition 10 – clean up requirements</u>	DWER has conditioned additional requirements for spill clean-up, including disposal of hydrocarbons at the bioremediation land farm or other chemicals off-site at a suitably licensed waste disposal facility.
Operation (including time-limited-operations operations)								
Category 5 activities								
Operation of the dry processing facility: Ore Handling Plant (OHP)	Dust	Air / windborne pathway causing poor vegetation health/death for adjacent priority flora and native vegetation	Priority flora and native vegetation	Refer to Section 3.1	C = Moderate L = Unlikely Medium Risk	Y	Condition 3 – design and construction requirements Condition 15 – time limited operations	The applicant proposed controls for dust suppression have been placed on the works approval as a regulatory controls.
	Sediment laden / hydrocarbon contaminated stormwater	Overland run-off causing impacts to sensitive surface water receptors	Sensitive surface water receptors (permanent pools and	Refer to Section 3.1	C = Minor L = Unlikely Medium Risk	N	Condition 3 – design and construction requirements <u>Condition 15 – time</u>	In addition to applicant proposed controls, DWER has conditioned that excavated sediment from the sedimentation basins must be deposited at the bioremediation land

Risk events					Risk rating ¹ C = consequence L = likelihood	Applicant controls sufficient?	Conditions ² of works approval	Justification for additional regulatory controls
Sources / activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls				
			creeklines)				limited operations	farms if hydrocarbon contaminated.
Stockpiling of ore at the ROM pad	Dust	Air / windborne pathway causing poor vegetation health/death for adjacent priority flora and native vegetation	Priority flora and native vegetation	Refer to Section 3.1	C = Moderate L = Unlikely Medium Risk	N	Condition 15 – time limited operations	Applicant proposed controls for dust management have been placed on the works approval as regulatory controls.
	Sediment laden stormwater	Overland run-off causing impacts to sensitive surface water receptors	Sensitive surface water receptors (permanent pools and creeklines)	Refer to Section 3.1	C = Minor L = Unlikely Medium Risk	N	Condition 3 – design and construction requirements Condition 15 – time limited operations	In addition to applicant proposed controls, DWER has conditioned that excavated sediment from the sedimentation basins must be deposited at the bioremediation land farms if hydrocarbon contaminated.
Category 6 activities								
Rupture of pipeline causing mine water discharge to land	Mine dewater	Accidental release of mine dewater resulting in direct discharge to land and/or surface water receptors, causing impacts to sensitive surface water receptors	Sensitive surface water receptors (permanent pools and creeklines)	Refer to Section 3.1	C = Moderate L = Unlikely Medium Risk	N	Condition 3 – design and construction requirements Condition 15 – time limited operations	In addition to applicant proposed controls, DWER has conditioned a requirement that pipelines meet the relevant Australian standards. DWER has also conditioned inspection requirements and earthen v-bunds to contain spills in the event of an accidental release.
Category 12 activities								
Operation of mobile crushing and screening plant	Dust	Air / windborne pathway causing poor vegetation health/death for adjacent priority flora	Priority flora and native vegetation	Refer to Section 3.1	C = Moderate L = Unlikely Medium Risk	Y	Condition 3 – design and construction requirements Condition 15 – time limited operations	The applicant proposed dust controls will be placed on the works approval as regulatory controls.
	Sediment laden/hydrocarbon contaminated stormwater	Overland run-off causing impacts to sensitive surface water receptors	Sensitive surface water receptors (permanent pools and	Refer to Section 3.1	C = Minor L = Unlikely	Y	Condition 3 – design and construction requirements	Applicant proposed controls for installation of stormwater diversion structures are considered sufficient and have been placed on the works

Risk events					Risk rating ¹	Applicant controls sufficient?	Conditions ² of works approval	Justification for additional regulatory controls
Sources / activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls	C = consequence L = likelihood			
		(creek lines and pools)	creeklines)		Medium Risk			approval as a regulatory control.
Stockpiling of material from the mobile crushing and screening plant	Dust	Air / windborne pathway causing poor vegetation health/death for adjacent priority flora	Priority flora and native vegetation	Refer to Section 3.1	C = Moderate L = Unlikely Medium Risk	Y	Condition 15 – time limited operations	The applicant proposed control for dust suppression with water cart has been placed on the works approval as a regulatory control.
	Sediment laden stormwater	Overland run-off causing impacts to sensitive surface water receptors (creek lines and pools)	Sensitive surface water receptors (permanent pools and creeklines)	Refer to Section 3.1	C = Minor L = Unlikely Medium Risk	Y	Condition 3 – design and construction requirements	Applicant proposed controls for installation of stormwater diversion structures are considered sufficient and have been placed on the works approval as a regulatory control.
Category 54 activities								
Discharge of treated wastewater, mixed with RO brine, from Main Camp, Exploration Camp and MSA WWTP's to irrigation spray fields	Treated wastewater mixed with RO brine	Direct discharge to land by irrigation causing potential impacts to sensitive surface water receptors	Sensitive surface water receptors (permanent pools and creeklines)	Refer to Section 3.1	C = Moderate L = Possible Medium Risk	N	<u>Condition 3 – design and construction requirements</u> <u>Condition 15 – time limited operations, including vegetation and weed monitoring in irrigation sprayfields and a TDS concentration limit in wastewater discharged to land</u> Condition 18 – authorised discharge <u>Condition 19 – monitoring during time limited operations</u>	Refer to section 3.4 for detailed risk assessment
Containment loss from WWTP and associated	Sewage, partially treated sewage, treated	Overland flow causing potential impacts to sensitive	Sensitive surface water receptors	Refer to Section 3.1	C = Moderate L = Unlikely	N	<u>Condition 3 – design and construction</u>	In addition to applicant proposed controls, to mitigate risk associated with containment loss, the Delegated

Risk events					Risk rating ¹ C = consequence L = likelihood	Applicant controls sufficient?	Conditions ² of works approval	Justification for additional regulatory controls
Sources / activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls				
pipelines	wastewater	surface water receptors. Infiltration through soil to groundwater causing contamination of groundwater	(permanent pools and creeklines) Shallow groundwater – 5m bgl		Medium Risk		<u>requirements</u> <u>Condition 15 – time limited operations</u>	Officer has conditioned the requirement for volumetric flow metres, contingency storage capacity, and minimum storage requirements for treatment chemicals.
Category 57 activities								
Storage of up to 1,000 used tyres	Smoke, including particulates and air emissions containing hydrocarbons and other toxic elements released in the event of a fire.	Air/windborne pathway causing impacts to surrounding fauna and vegetation	Conservation significant fauna Priority flora and native vegetation	Refer to Section 3.1	C = Major L = Unlikely Medium Risk	N	<u>Condition 15 – time limited operations, specifications for used tyre storage</u> <u>Condition 16 – no waste burnt on premises</u>	The applicant proposed controls are not considered sufficient to mitigate the risk of a fire associated with tyre storage. DWER has placed additional controls involving minimum separation distances and other fire management controls on the works approval.
	Chemical laden surface water runoff in the event of an accidental tyre fire	Surface water run off causing contamination of nearby ephemeral creek lines	Sensitive surface water receptors (permanent pools and creeklines)	Refer to Section 3.1	C = Moderate L = Unlikely Medium Risk	N	Condition 3 – construction requirements - bunding <u>Condition 17 – notification for discharge of fire-fighting material</u>	The applicant proposed controls for bunding surrounding the tyre storage area has been placed on the works approval as a regulatory control. DWER has placed an additional control require notification of any events involving discharge of fire fighting material.
Category 73 activities								
Bulk storage of chemicals (hydrocarbons, ammonium nitrate, AdBlue, chlorine)	Chemical release by loss of containment / accidental spill	Overland flow / surface water run off causing potential impacts to sensitive surface water receptors.	Sensitive surface water receptors (permanent pools and creeklines)	Refer to Section 3.1	C = Moderate L = Unlikely Medium Risk	N	<u>Condition 3 – construction requirements</u> <u>Condition 15 – time limited operations, spill cleanup and recording</u>	The applicant proposed controls for bulk chemical storage are not considered sufficient to mitigate the risk of a spill. DWER has placed additional storage requirements, including concrete bunding and minimum 110% containment volume for liquid chemicals. Additional spill cleanup and reporting requirements have also been conditioned.

Risk events					Risk rating ¹ C = consequence L = likelihood	Applicant controls sufficient?	Conditions ² of works approval	Justification for additional regulatory controls
Sources / activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls				
Category 89 activities								
Operation of a category 89 landfill (domestic and putrescible waste)	Dust	Air/windborne pathway causing poor vegetation health/death for adjacent priority flora and native vegetation	Priority flora and native vegetation	No controls proposed	C = Minor L = Unlikely Medium Risk	Y	Condition 15 – time limited operations, dust suppression	The applicant proposed control for dust suppression with water cart has been placed on the works approval as a regulatory control.
	Windblown waste	Air/windborne pathway causing poor vegetation health/death for adjacent priority flora and native vegetation	Conservation significant fauna Priority flora and native vegetation	Refer to Section 3.1	C = Minor L = Unlikely Medium Risk	Y	Condition 3 – construction requirements	The applicant proposed controls (fencing and covering waste) are considered sufficient and have been placed on the works approval as regulatory controls.
		Fauna access/scavenging - impacts to fauna	Conservation significant fauna	Refer to Section 3.1	C = Minor L = Unlikely Medium Risk	Y	Condition 3 – construction requirements	The applicant proposed controls (fencing and covering waste) are considered sufficient and have been placed on the works approval as regulatory controls.
	Leachate	Seepage through base and embankments to soil and groundwater causing vegetation poor health/ and groundwater contamination	Sensitive surface water receptors (permanent pools and creeklines) Shallow groundwater – 5m bgl	Refer to Section 3.1	C = Moderate L = Unlikely Medium Risk	N	<u>Condition 3 – construction requirements, landfill separation distances</u> <u>Condition 4 – monitoring well installation</u> <u>Condition 5 – groundwater baseline monitoring</u> <u>Condition 15 – time limited operations</u>	The applicant proposed controls are not considered sufficient to mitigate risk associated with leachate from the landfill. As groundwater is shallow in some places on-site (~5m bgl), a requirement that the base of the landfill be at least 5m above groundwater level has been conditioned along with monitoring bore installation to monitor compliance with this condition. To protect sensitive surface water receptors, the landfill is not to be located within 100m of either permanent or perennial watercourses.

Risk events					Risk rating ¹ C = consequence L = likelihood	Applicant controls sufficient?	Conditions ² of works approval	Justification for additional regulatory controls
Sources / activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls				
	Contaminated surface water	Surface water run off causing contamination of nearby sensitive surface water receptors	Sensitive surface water receptors (permanent pools and creeklines)	No controls proposed	C = Moderate L = Unlikely Medium Risk	N	<u>Condition 3 – construction requirements, landfill separation distances</u> <u>Condition 15 – time limited operations</u>	The applicant proposed controls are not considered sufficient to mitigate risk associated with contaminated surface water run-off from the landfill. To protect sensitive surface water receptors, the landfill is not to be located within 100m of either permanent or perennial watercourses
Operation of a category 89 landfill (tyre disposal)	Dust	Air/windborne pathway causing poor vegetation health/death for adjacent priority flora and native vegetation	Priority flora and native vegetation	Refer to Section 3.1	C = Minor L = Unlikely Medium Risk	Y	Condition 15 – time limited operations, dust suppression	The applicant proposed control for dust suppression with water cart has been placed on the works approval as a regulatory control.
	Leachate	Seepage through base and embankments to soil and groundwater causing vegetation poor health/ and groundwater contamination	Sensitive surface water receptors (permanent pools and creeklines) Shallow groundwater – 5m bgl	Refer to Section 3.1	C = Moderate L = Unlikely Medium Risk	N	<u>Condition 3 – construction requirements, landfill separation distances</u> <u>Condition 15 – time limited operations</u>	The applicant proposed controls are not considered sufficient to mitigate the risk from leachate to sensitive surface water receptors. To protect sensitive surface water receptors, the landfill is not to be located within 100m of either permanent or perennial watercourses. Additionally, the landfill cells are not to be located within areas of the waste rock dump which have potentially acid forming material.
	Contaminated surface water	Surface water run off causing contamination of nearby sensitive surface water receptors	Sensitive surface water receptors (permanent pools and creeklines)	No controls proposed	C = Moderate L = Unlikely Medium Risk	N	<u>Condition 3 – construction requirements, landfill separation distances</u> <u>Condition 15 – time limited operations</u>	The applicant proposed controls are not considered sufficient to mitigate risk associated with contaminated surface water run-off from the landfill. To protect sensitive surface water receptors, the landfill is not to be located within 100m of either permanent or perennial watercourses. Additionally, the landfill cells are not to be located within areas of the waste rock dump which have potentially acid

Risk events					Risk rating ¹ C = consequence L = likelihood	Applicant controls sufficient?	Conditions ² of works approval	Justification for additional regulatory controls
Sources / activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls				
								forming material.
Ancillary to prescribed activities								
Operation of bioremediation land farms	Hydrocarbon contaminated water (from stormwater etc.)	Seepage through base and embankments to soil and groundwater causing vegetation poor health/ and groundwater/surface water contamination	Sensitive surface water receptors (permanent pools and creeklines) Shallow groundwater – 5m bgl	Refer to Section 3.1	C = Moderate L = Unlikely Medium Risk	N	<u>Condition 3 – construction requirements</u> <u>Condition 15 – time limited operations</u>	The applicant proposed controls are not considered sufficient to mitigate risk associated with seepage of hydrocarbon contaminated water. DWER has consequently specified liner permeability, stormwater diversions and specified location of the landfarms (>50m from a surface water course)
		Surface water run off - overtopping land farm embankments	Sensitive surface water receptors (permanent pools and creeklines)	Refer to Section 3.1	C = Minor L = Unlikely Medium Risk	N	<u>Condition 3 – construction requirements</u> <u>Condition 15 – time limited operations</u>	The applicant proposed controls are not considered sufficient to mitigate risk associated with overtopping of hydrocarbon contaminated water following a rainfall event. DWER has consequently conditioned that the cells be designed so that any potentially contaminated run off from the cells is contained.
Operation of Turkey's nests containing mine dewater (used for dust suppression)	Mine dewater (fresh TDS ~290 mg/L)	Seepage through base and embankments to soil and groundwater	Sensitive surface water receptors (permanent pools and creeklines) Shallow groundwater – 5m bgl	Refer to Section 3.1	C = Slight L = Unlikely Low Risk	Y	Condition 3 – construction requirements Condition 15 – time limited operations	Applicant proposed controls have been placed on the works approval as regulatory controls.
		Overtopping	Sensitive surface water receptors (permanent pools and creeklines)	Refer to Section 3.1	C = Slight L = Unlikely Low Risk	Y	Condition 3 – construction requirements Condition 15 – time limited operations	Applicant proposed controls have been placed on the works approval as regulatory controls.

Risk events					Risk rating ¹ C = consequence L = likelihood	Applicant controls sufficient?	Conditions ² of works approval	Justification for additional regulatory controls
Sources / activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls				
		Fauna access (drinking water etc)	Fauna	Refer to Section 3.1	C = Minor L = Unlikely Medium Risk	Y	Condition 3 – construction requirements Condition 15 – time limited operations	Applicant proposed controls have been placed on the works approval as regulatory controls.

Note 1: Consequence ratings, likelihood ratings and risk descriptions are detailed in the *Guideline: Risk Assessments* (DWER 2020).

Note 2: Proposed applicant controls are depicted by standard text. **Bold and underline text** depicts additional regulatory controls imposed by department.

3.4 Risk Assessment – Discharge of treated effluent from the Wastewater Treatment Plants and RO plants to land via irrigation

3.4.1 Description of risk event

The risk events associated with the direct application of salt and nutrient rich wastewater to land via irrigation include adverse impacts to vegetation leaf tissue, growth and health and the potential for infiltration of wastewater with elevated nutrients and salts past the root zone causing degraded soil structure and soil and groundwater contamination.

3.4.2 Characterisation of emission and potential adverse impacts

The following volumes of mixed effluent (RO plant brine and WWTP effluent) is to be discharged to the respective irrigation areas each year:

- Main Camp – about 32,850 kl (90 kL/day)
- Exploration Camp - about 41,975 kl (115 kL/day)
- Mine Services Area - about 3,066 kl (12.4 kL/day)

For the purposes of this assessment, the maximum predicted concentration of TN in treated wastewater is about 20 mg/L and TP is 5 mg/L (once blended with RO brine). Following blending with RO brine, TDS levels are predicated to be up to 2,000 mg/L in the discharge stream.

Excessive nutrient loading

An excessive nitrogen loading in soil can alter plant morphology and leach to groundwater. Slow growing native species are adapted to low levels of nitrogen and are therefore less able to effectively utilise additional nitrogen, and can be out-competed by exotic species. Excessive phosphorus is an issue given several native vegetation species are adapted to low-phosphorus soils.

The potential for soil and groundwater contamination in an irrigation setting is predominantly dependent on the long-term capacity for vegetation and the upper soil profile to accommodate the nutrient loading applied to the area. Factors that determine the risk of seepage to groundwater are soil hydraulic conductivity and depth to water table, both of which have not been investigated at the irrigation areas. However, groundwater is anticipated to be greater than 5 m bgl across the premises, including the irrigation areas.

Excessive salt loading

The discharge of RO brine, particularly when blended with WWTP effluent, can cause adverse impacts to vegetation from not only salinity, but also radionuclides and metal contamination. Wastewater with elevated salt content in the long-term can result in the accumulation of salts, causing soils to become saline. A disproportionately high concentration of sodium ions compared to calcium and magnesium ions may result in sodic and dispersive soils. Sodium salts are of particular concern, as excessive sodium levels relative to calcium and magnesium can adversely affect plant growth, soil structure and permeability.

Soil sodicity is a condition that degrades soil properties by making the soil more dispersible and erodible, restricting water entry and reducing hydraulic conductivity (the ability of the soil to conduct water). These factors also limit leaching so that salt accumulates over long periods of time, giving rise to saline subsoils. Furthermore, a soil with increased dispersibility becomes more susceptible to erosion by water and wind.

Soil permeability and aeration problems can occur when it is irrigated with water that has a

sodium absorption ratio (SAR) above 6. However, these ions are not currently monitored at the premises and therefore cannot form part of this assessment.

Excessive hydraulic loading

An irrigation rate that exceeds the hydraulic loading capacity of a given area is likely to result in waterlogging, overland runoff and seepage, particularly during wetter months. An excessive hydraulic loading therefore increases the risk of impacts to surface water bodies via transport of contaminants through groundwater or overland runoff, especially if wastewater is not treated to a sufficiently high level

3.4.3 Criteria and assessment

Nutrient concentration limits in treated wastewater and nutrient loading limits to land based on criteria set out in Water Quality Protection Note 22: Irrigation with nutrient –rich wastewater (DoW 2008) are not based on site-specific data. In the absence of site-specific data on vegetation salt and nutrient tolerance, and soil structure and nutrient retention capacity, the Department's contaminated sites experts recommend applying methods set out in the NSW EPA 1998 *Guidelines for On-Site Sewage Management* (NSW EPA, 1998) to estimate sustainable hydraulic and nutrient loading rates at the premises based on irrigation volumes and treated wastewater quality. This hydraulic and nutrient loading assessment process aligns with the approach used for assessing wastewater irrigation schemes in other Australian state jurisdictions.

The *National Water Quality Management Strategy: Australian Guidelines for Water Recycling and Managing Health and Environmental Risk* (Natural Resource Management Ministerial Council Environment Protection and Heritage Council 2006) recommend a critical limit of 1,500 mg/L for TDS, above which operational corrective actions are recommended.

Nutrient loading assessment

The department generally does not support wastewater irrigation at sites where the amount of nitrogen in the discharged wastewater exceeds the land area required for vegetation to take up this nutrient. The department will generally also require that there is net export of biomass (harvested crops and grazing livestock) that is produced on a wastewater irrigation area to limit the extent to which nutrient recycling takes place on a site. This removal of biomass does not occur when applied to native vegetation.

The department has undertaken a preliminary assessment of nutrient loading rates based on the information provided by the applicant and applying the NSW EPA 1998 *Guidelines for On-Site Sewage Management* (NSW EPA 1998). A preliminary estimate of the land area required to ensure that vegetation takes up all of the nitrogen and phosphorus applied in a disposal area is given by the following formula (NSW EPA, 1998):

$$A_N = (C \times Q) / L_x$$

Where: A_N = land area required for nutrient uptake by crops (m²)

C = concentration of nutrient in the wastewater (mg/L)

Q = daily wastewater flow rate (L/day)

L_x = critical loading rate of nutrient (mg/m²/day), based on the ability of vegetation to use nutrients before they pass through the root zone

As a first approximation, L_x is considered to be 36 mg/m²/day (about 131 kg/ha/year) for nitrogen and 6.6 mg/m²/day (24.09 kg/ha/year) for phosphorus, which is the upper limit for perennial pastures and applied as a proxy for native vegetation for this assessment. Substituting the treated effluent nitrogen concentration (20 mg/l), phosphorus concentration (5 mg/l) and daily flow rates for each irrigation area into the above equation gives the minimum spray field sizes specified in Table 10. These results indicate that the proposed irrigation areas

have insufficient capacity to accommodate the predicted nitrogen and phosphorus loading.

Table 10: Calculated minimum WWTP irrigation spray field sizes

WWTP	Applicant proposed irrigation spray field size	DWER calculated irrigation spray field size	
		To accommodate nitrogen loading	To accommodate phosphorus loading
Main Camp	1.46 ha	5 ha	6.82 ha (TP is limiting factor)
Exploration Camp	1.64 ha	6.39 ha	8.71 ha (TP is limiting factor)
Mine Service Area	0.24 ha	0.69 ha	0.94 ha (TP is limiting factor)

The potential for excessive phosphorus loading impacting native vegetation is considered low given most phosphorus will be adhered or captured in the soil profile and not used by native vegetation. Excessive nitrogen presents the higher risk to native vegetation, in particular the risk increased weed growth in the irrigation area.

Salt loading assessment

TDS levels in blended, treated wastewater are predicted to be up to 2,000 mg/L. This is slightly higher than the recommended critical limit of 1,500 mg/L identified above.

The increased risk of sodicity in soils from excessive SAR cannot be assessed due to a lack of site data. However, the risk of soil sodicity increases the longer an irrigation system is operational due to the accumulation of salts. Given the operational timeframe of the mine is 15 years, it is less likely that the accumulation of salts will result in adverse impacts to soil structure.

In the absence of SAR data, a limit on TDS concentration in irrigated water is recommended. Should the applicant consider that the limit cannot be met, the department recommends managing RO brine via lined evaporations ponds to avoid discharging to land where possible.

Hydraulic loading assessment

A preliminary estimate of the land area required to ensure that wastewater can be applied to land at a suitable hydraulic loading can be calculated using the following equation (US EPA, 2006):

$$A = (365 \times Q) / (L \times T_{app})$$

Where: *A* = land area (hectares)

Q = flow rate of wastewater (m³/day)

L = wastewater hydraulic loading to soil (cm/week)

T_{app} = period of wastewater application each year (weeks)

As a first approximation, the acceptable hydraulic loading for soils can be assumed to be about 4 cm/week (US EPA, 2006) for 52 weeks of the year (given evaporation rates exceed rainfall in all months). Substituting the predicted flow rate in each irrigation scheme at the premises, the results indicate the irrigation areas proposed by the applicant are sufficiently large to enable wastewater to be discharged to land on a long-term basis without excessive seepage of water and dissolving chemical constituents into groundwater. Hydraulic loading is therefore not considered to be a limiting factor in the irrigation scheme.

3.4.4 Key Findings

The Delegated Officer has reviewed the information regarding the discharge of blended WWTP and RO brine effluent to land and has found:

1. The irrigation areas for the three spray fields are not sufficiently sized to accommodate the predicted nutrient loadings. In particular, the predicted nitrogen loading is a concern, due to the increased risk of weed growth in the irrigation area.
2. The concentration of nitrogen and phosphorus in treated wastewater would have to be lowered significantly to 5-7 mg/L and 1-2 mg/L, respectively, to avoid excessive nutrient loading at the proposed discharge rates.
3. Further, it is recommended that the predicted TDS concentration be reduced to 1,500 mg/L to avoid risks associated with increased salinity.
4. If improved wastewater treatment is not possible to reduce the predicted nutrient or salt concentrations in treated wastewater, additional controls are recommended to mitigate or monitor potential impacts, such as regular weed monitoring and harvesting, increasing the proposed irrigation areas and storing RO brine in evaporation ponds.

3.4.5 Consequence

Based on predicted effluent quality, the sensitivity of receptors (soils, vegetation and nearby surface waters) and current licence holder controls, the Delegated Officer has determined that the impact of discharging nutrient and salt rich wastewater to land (leading to excessive nutrient or salt loading) is mid-level, on-site impacts and therefore considered **Moderate**.

3.4.6 Likelihood of Risk Event

The Delegated Officer has determined that the likelihood of the impact of irrigation to the spray fields will be **Possible**.

3.4.7 Overall rating of wastewater treatment plants

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix and determined that the overall rating for the risk is **Medium**.

3.4.8 Regulatory controls

To mitigate risk to receptors, in addition to applicant proposed controls, the Delegated Officer has specified the following conditions in the works approval:

- A volumetric flow meter be installed on the discharge pipe outlet to monitor out-going volume;
- Daily volumetric discharge limits to each irrigation field;
- A limit of 1,500 mg/L for TDS in treated wastewater so that RO brine is sufficiently diluted before discharge via irrigation;
- Monitoring and harvesting of weeds during time-limited operations; and
- To verify expected WWTP performance, a single sampling event be undertaken during time-limited operations.

The Delegated Officer considers the proposed irrigation areas to be adequately sized, if the controls listed above are implemented. However, the effectiveness of controls will require regular review during the operation of the irrigation system.

4. Consultation

Table 11 provides a summary of the consultation undertaken by the department.

Table 11: Consultation

Consultation method	Comments received	Department response
Application advertised on the department's website on 9 March 2023 and in West Australian advert on 27 March 2023	None received	N/A
Nyamal Aboriginal Corporation was advised of the proposal on 9 March 2023, and follow up request sent on 27 March 2023.	None received.	Please refer to section 2.3.2 of this decision report for further detail.
Local Government Authority (Shire of East Pilbara) advised of proposal on 9 March 2023	None received	N/A
Department of Mines, Industry Regulation and Safety (DMIRS) advised of proposal 9 March 2023	Comments received from DMIRS on 11 April 2023 are summarised in section 2.3.3 of this decision report.	The department notified Atlas Iron on 26 April 2023 of DMIRS comment regarding updates to the mining proposal. Refer to section 2.3.3 of this decision report for further detail.
Department of Planning, Lands and Heritage (DPLH) advised of proposal on 9 March 2023	Comments received from DPLH on 31 March and 16 May 2023 are summarised in section 2.3.2 of this decision report.	Refer to section 2.3.2 of this decision report.
Department of Health (DoH) advised of proposal on 9 March 2023	Comments received from DoH on 24 March 2023 indicating no objection to the proposal provided that: <ul style="list-style-type: none"> a specific site and soil evaluation report undertaken by a qualified consultant is conducted during the wettest time of the year; To consider all aspects of the Government Sewerage Policy requirements to ensure minimum setbacks are met from natural water bodies such as creeks and streams and public drinking water catchments; 	The department has considered DoH's advice and separation distances between sensitive receptors (i.e. creeks etc) and the WWTP and irrigation spray field.

	<ul style="list-style-type: none"> Approval is required for any on-site wastewater treatment process (by DoH or local government) in accordance with the following publications¹ 	
Applicant was provided with draft documents on 12 August 2024	Comments received 2 September 2024	Refer to Appendix 2

5. Conclusion

Based on the assessment in this decision report, the Delegated Officer has determined that a works approval will be granted, subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

References

1. AECOM 2013, *McPhee Creek Iron Ore Project, Phase 2 Groundwater Investigation*
2. Biologic 2020, *McPhee Creek Project: Aquatic Ecology Survey and Assessment*
3. Department of Environment Regulation (DER) 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
4. Department of Water and Environmental Regulation (DWER) 2020, *Guideline: Environmental Siting*, Perth, Western Australia.
5. Department of Water and Environmental Regulation (DWER) 2020, *Guideline: Risk Assessments*, Perth, Western Australia.
6. Department of Water (DoW) 2008, *Water Quality Protection Note 22*.
7. GHD 2021, *McPhee Creek Iron Ore Project, Water Management Studies, H3 Groundwater Report*
8. Natural Resource Management Ministerial Council Environment Protection and Heritage Council 2006, *National Water Quality Management Strategy: Australian Guidelines for Water Recycling and Managing Health and Environmental Risk*.
9. NSW EPA 1998, *On-Site Sewage Management for Single Households: Environment & Health Protection Guidelines*, Victoria
10. SKM 2013, *McPhee Creek Regional Groundwater Model, Model Report and Appendices*, Adelaide, South Australia

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- 1 https://ww2.health.wa.gov.au/Articles/A_E/Apply-to-install-a-wastewater-system
 - https://ww2.health.wa.gov.au/Articles/S_T/Supplement-to-Regulation-29-and-Schedule-9-Wastewater-system-loading-rates
 - https://ww2.health.wa.gov.au/Articles/A_E/Certification-for-installation-of-wastewater-treatment-system

Appendix 1: Additional Figures

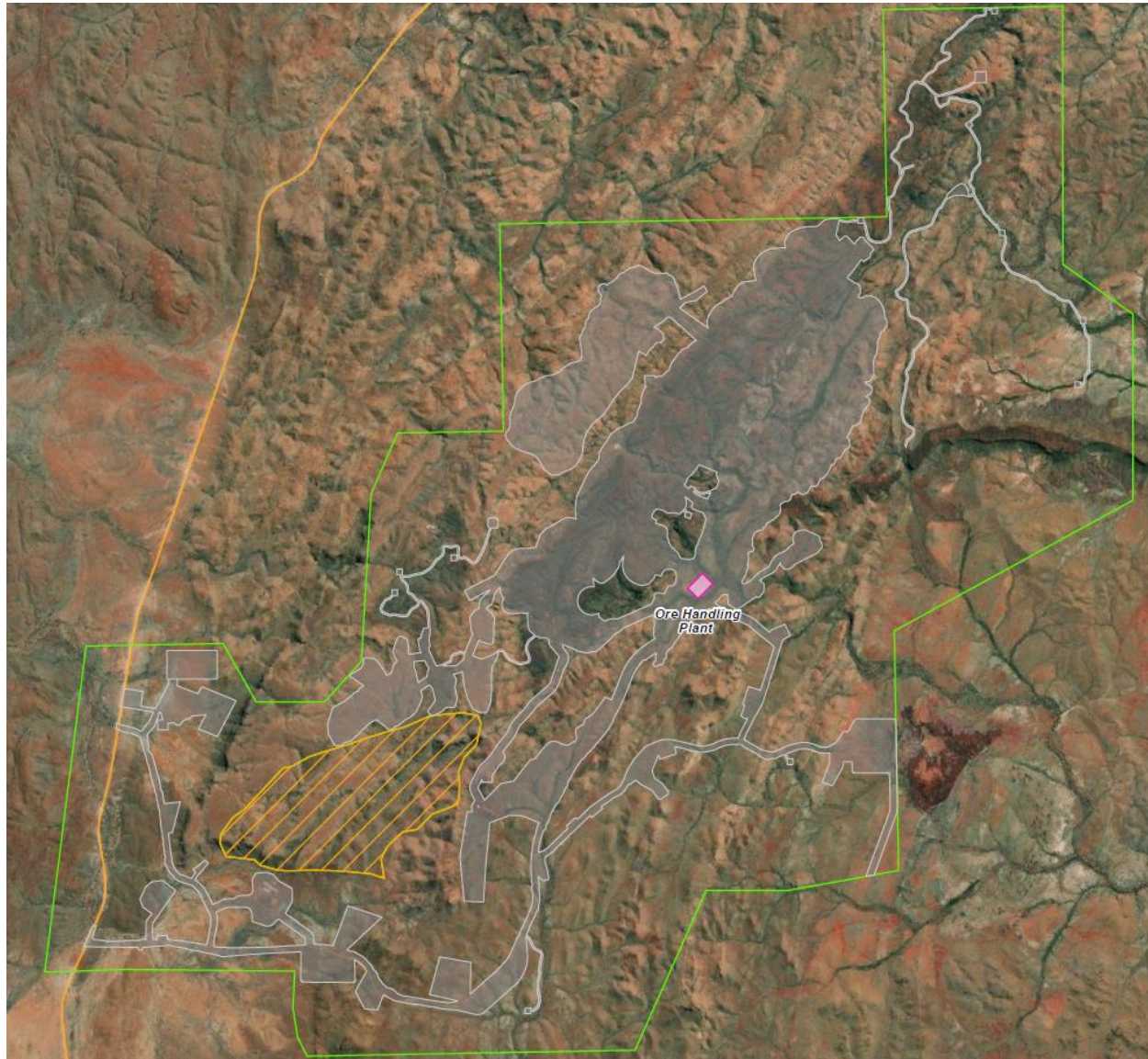


Figure 5 Location of ore handling plant

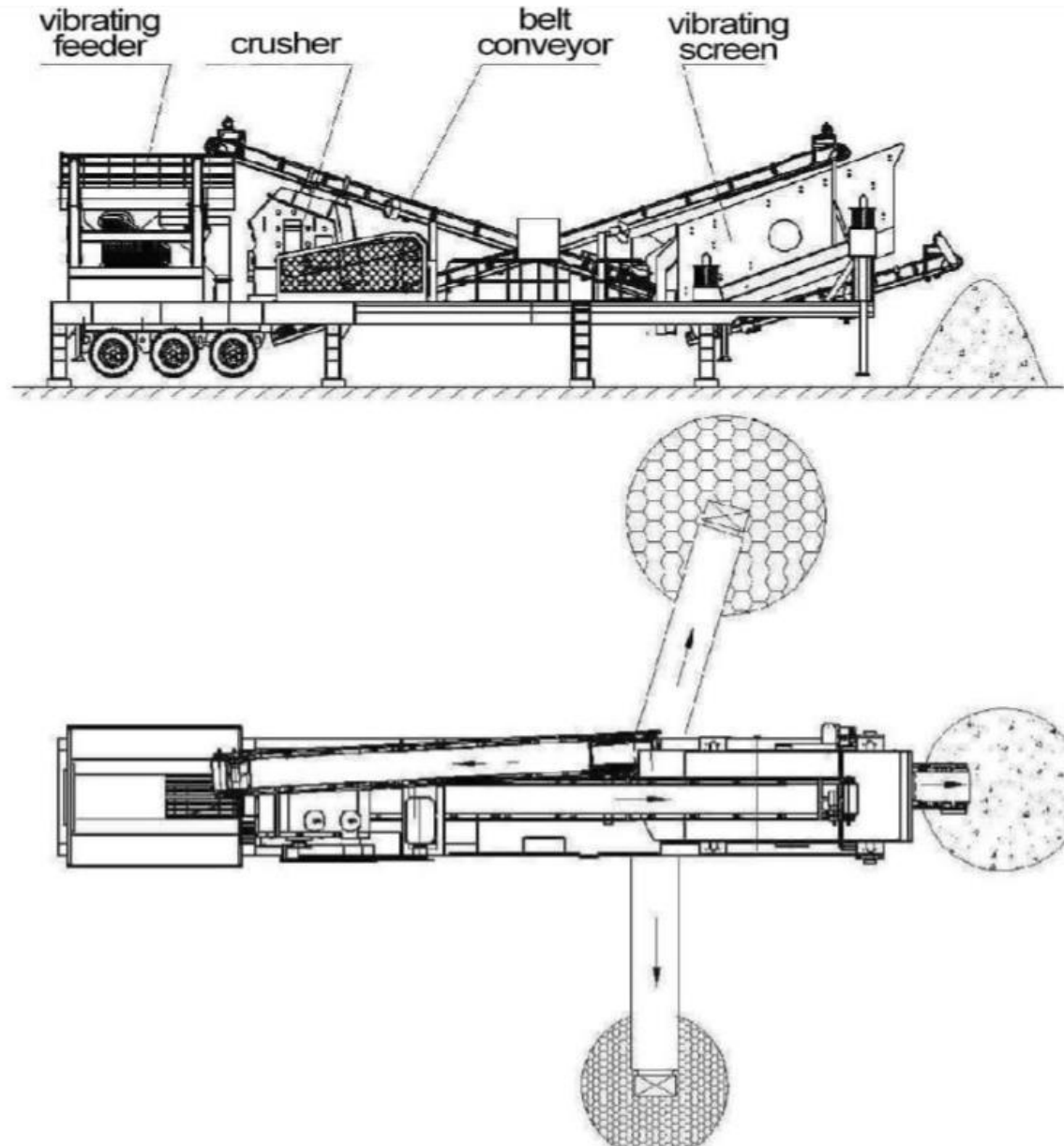


Figure 6 Indicative design of the crushing and screening plant

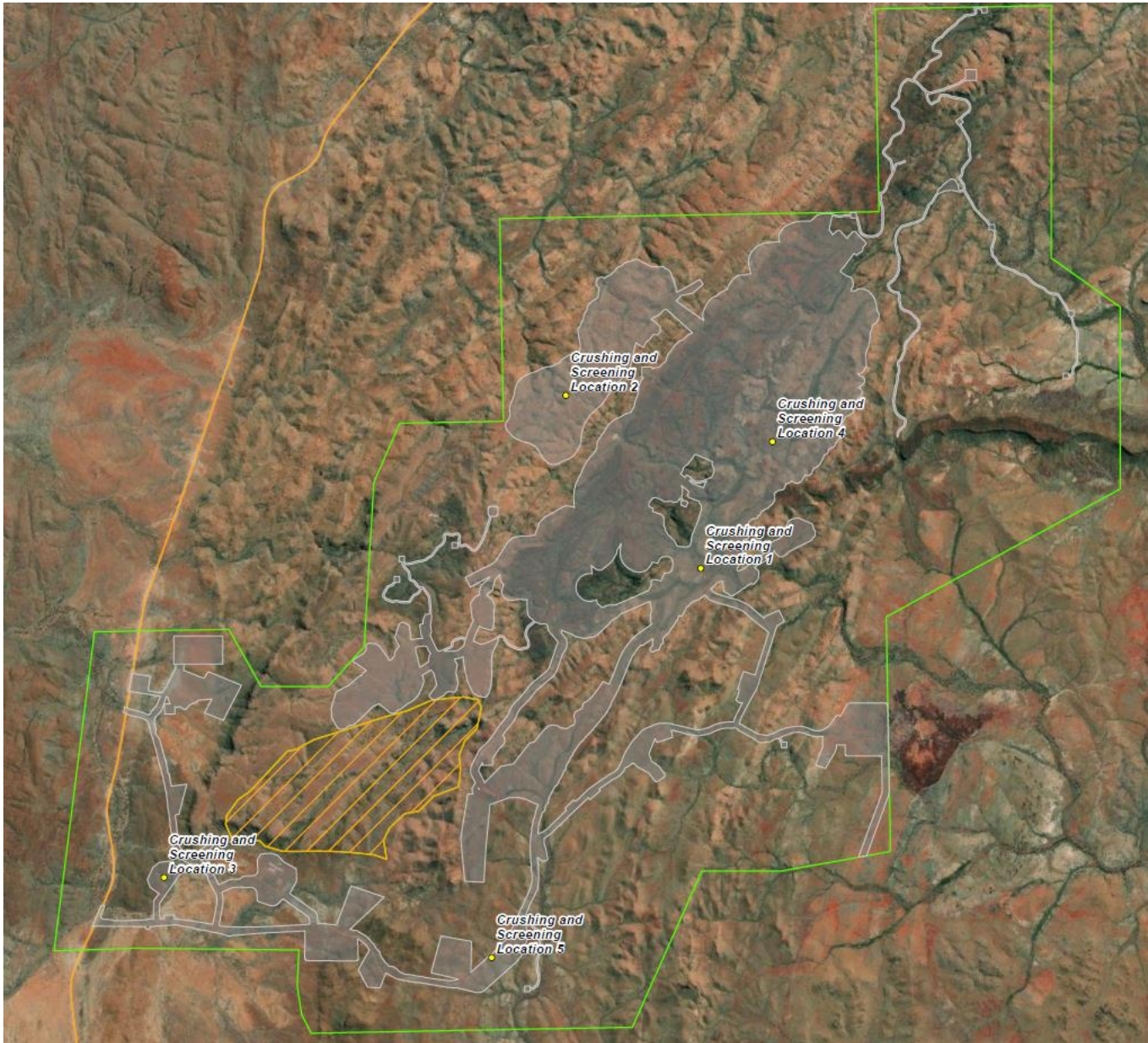


Figure 7 Indicative locations of the mobile crushing and screening plant operation

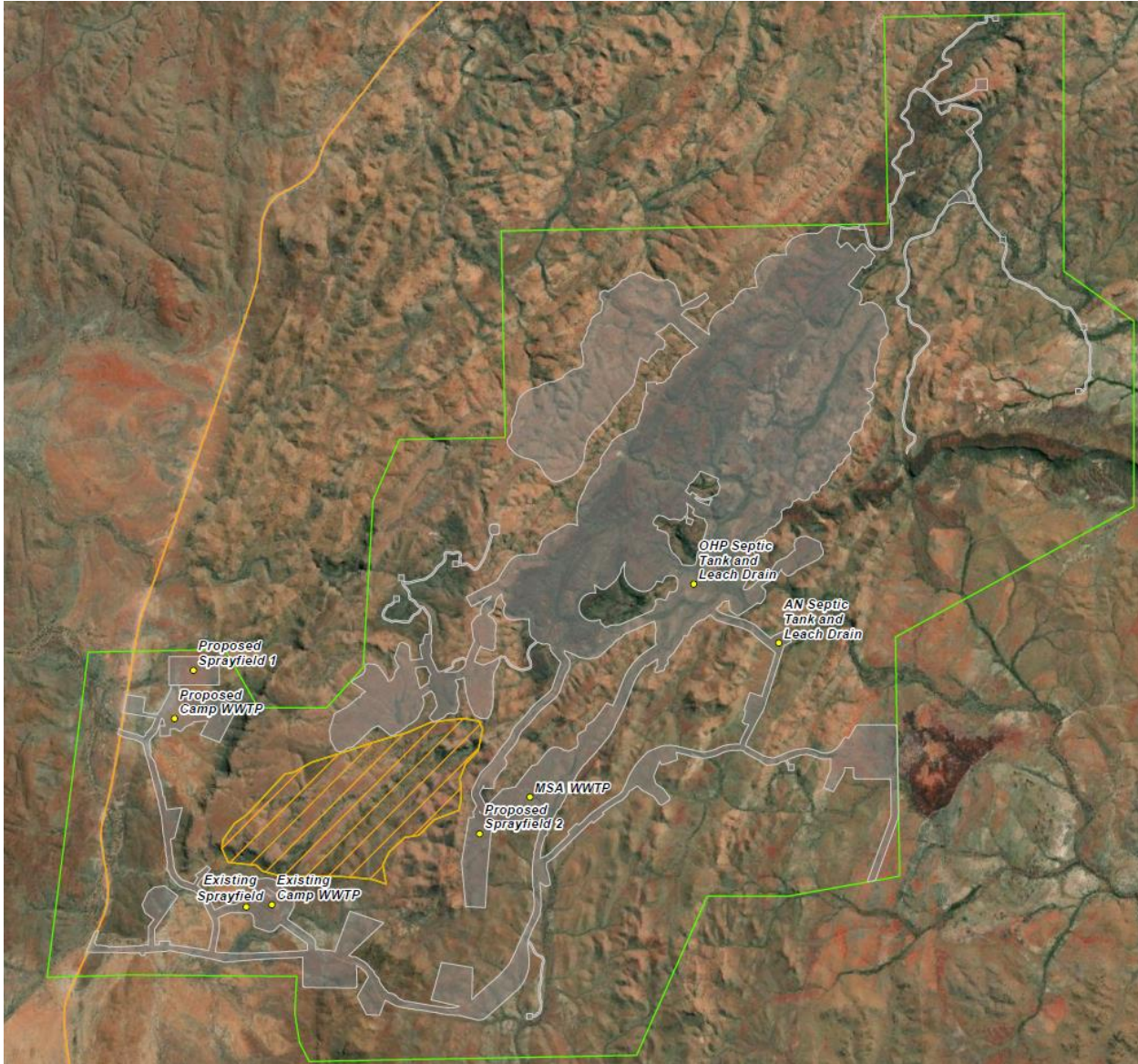


Figure 8 Indicative locations for site wastewater treatment plants, spray fields and septic tanks

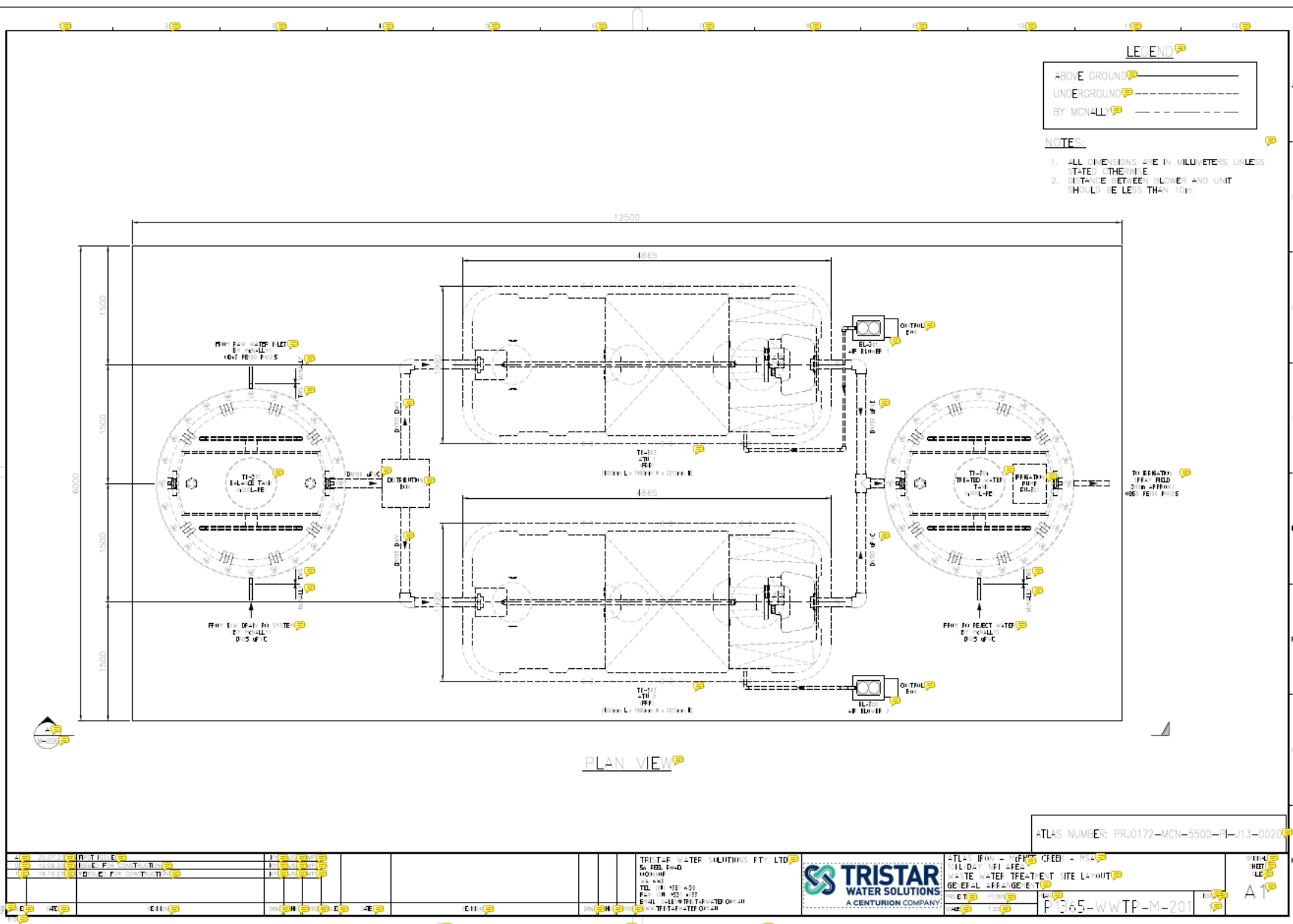


Figure 9: Indicative mine service area WWTP site layout

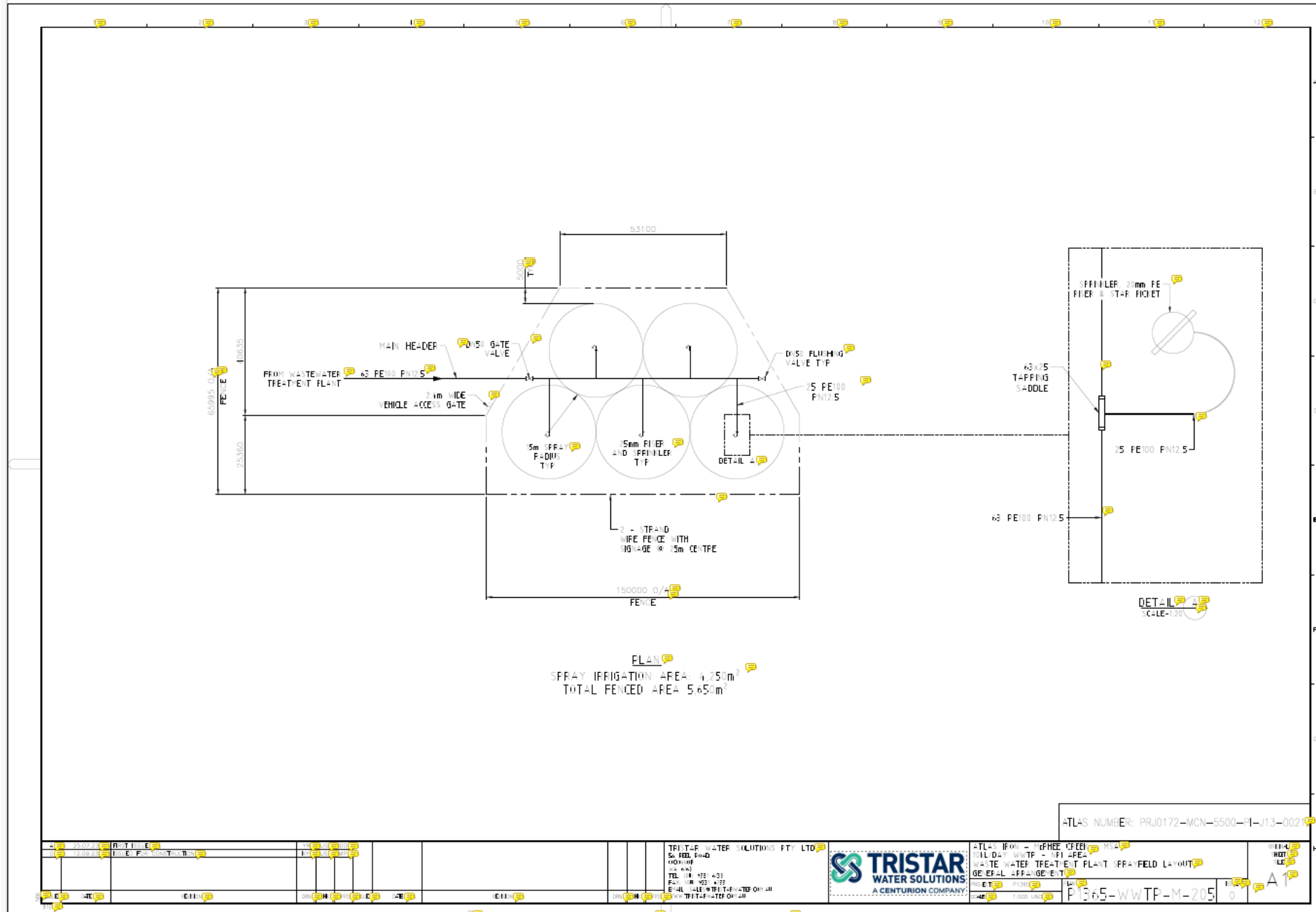


Figure 10: Indicative layout of the mine service area WWTP sprayfields

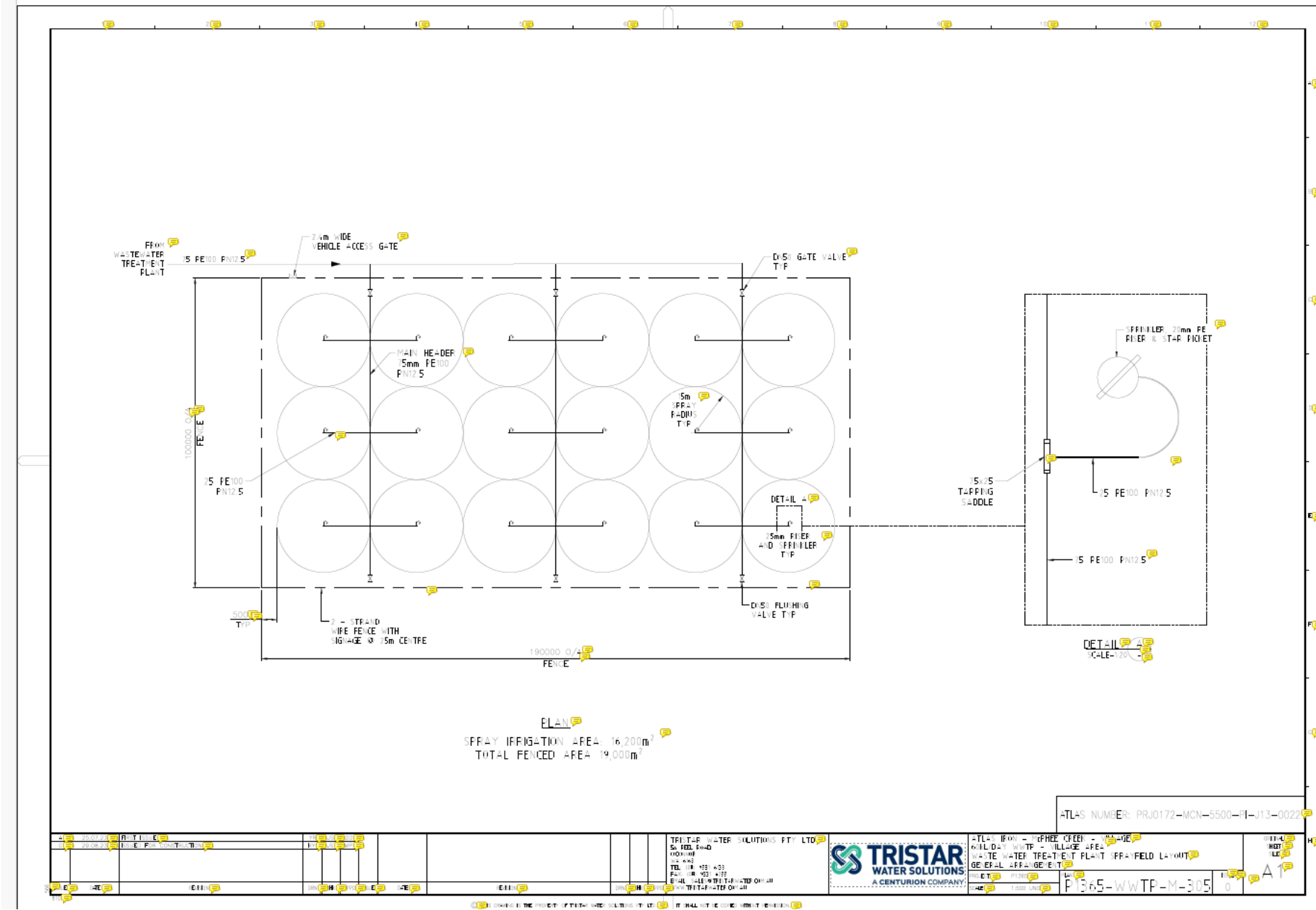


Figure 11 Indicative layout of the main camp WWTP sprayfields

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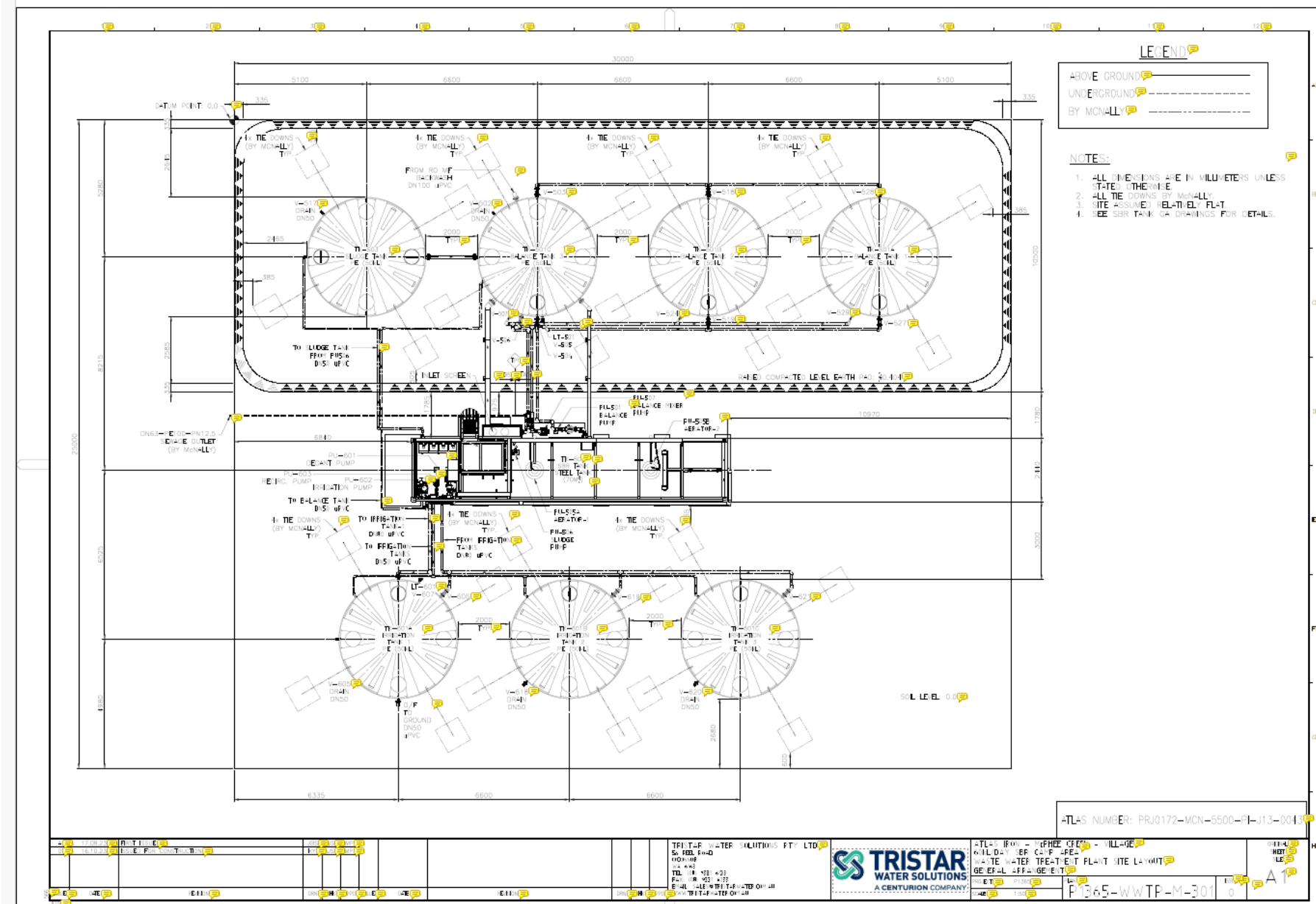


Figure 12: Main camp WWTP site layout

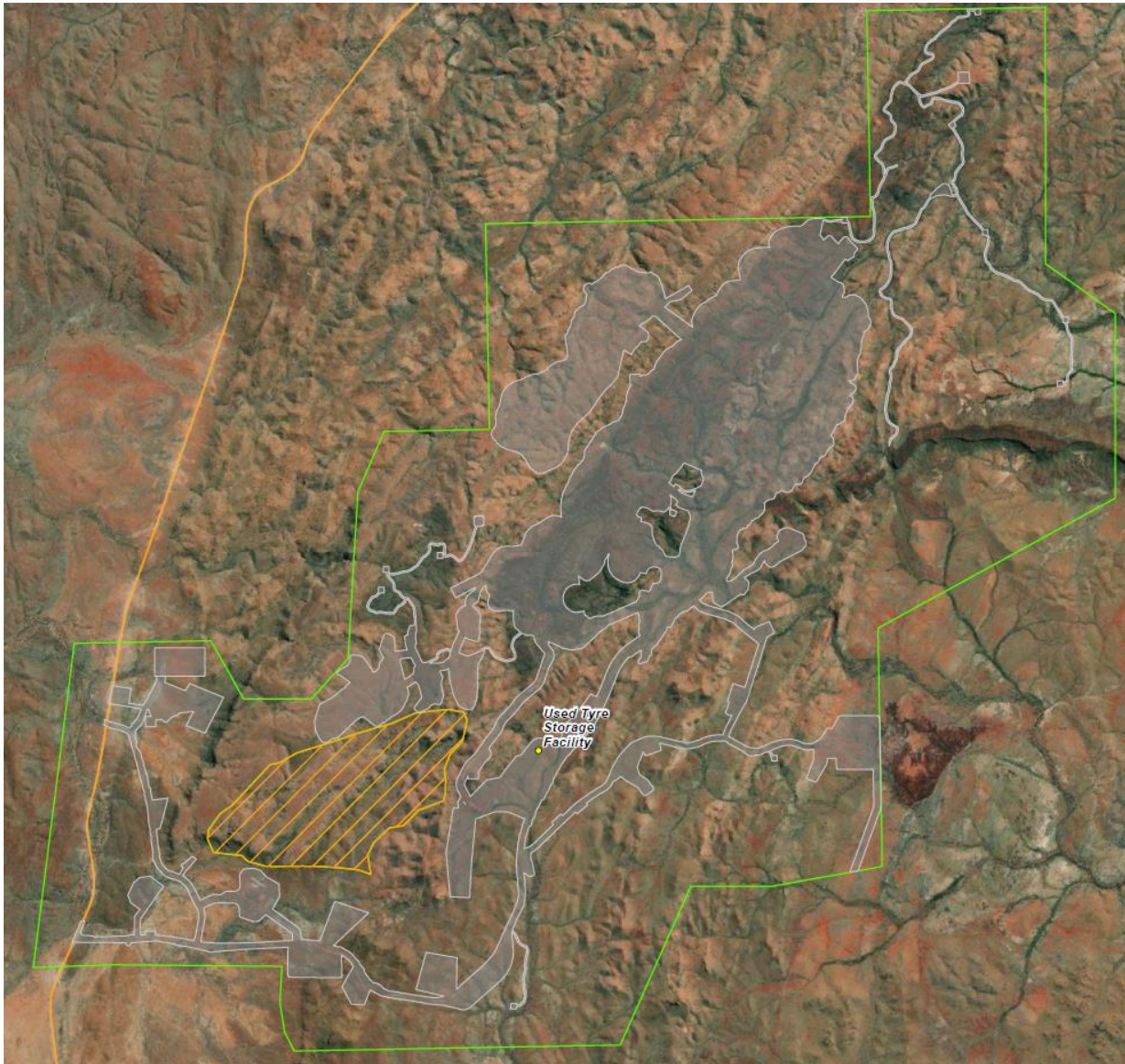


Figure 13 Indicative location of the used tyre storage facility

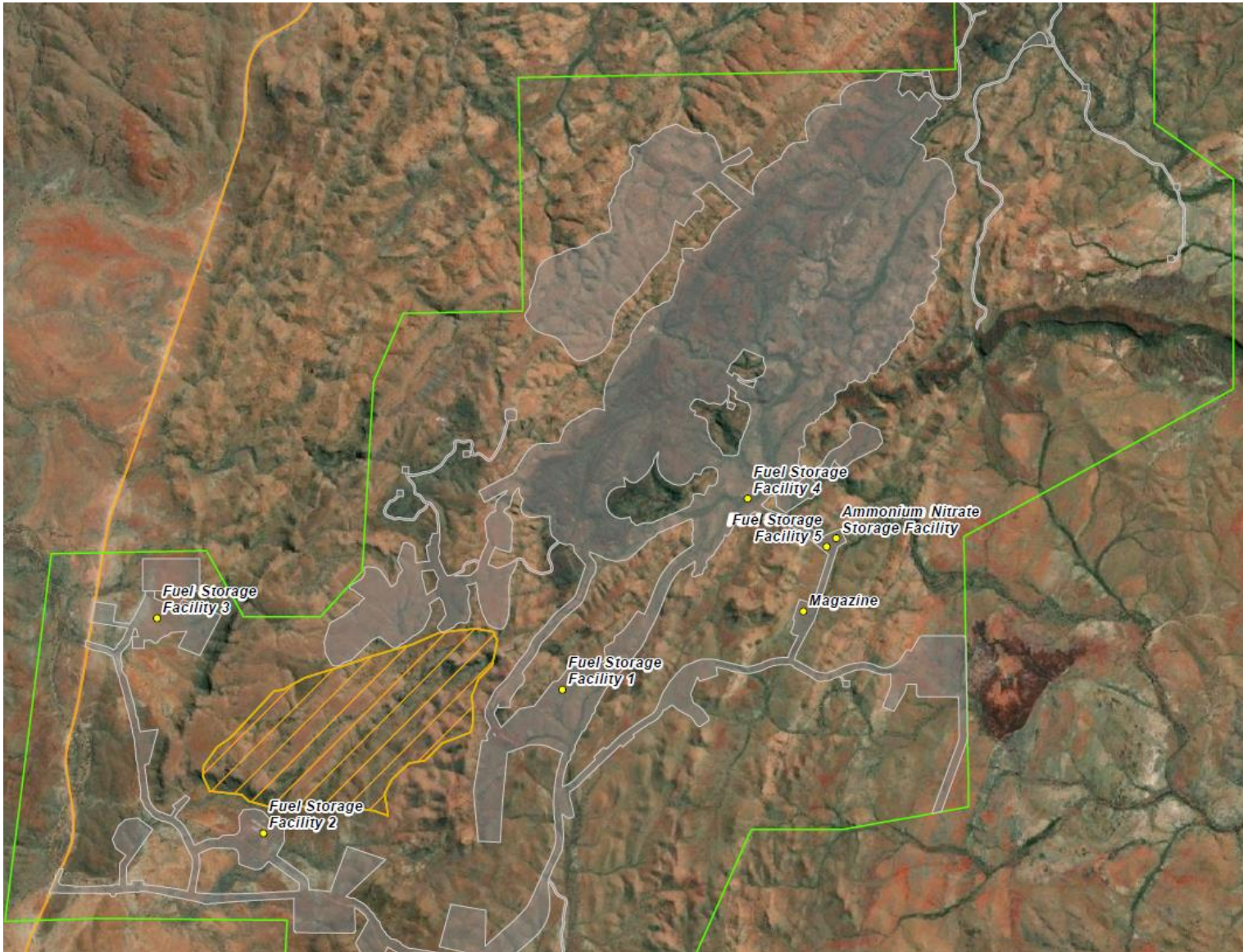


Figure 14 Indicative bulk chemical storage locations

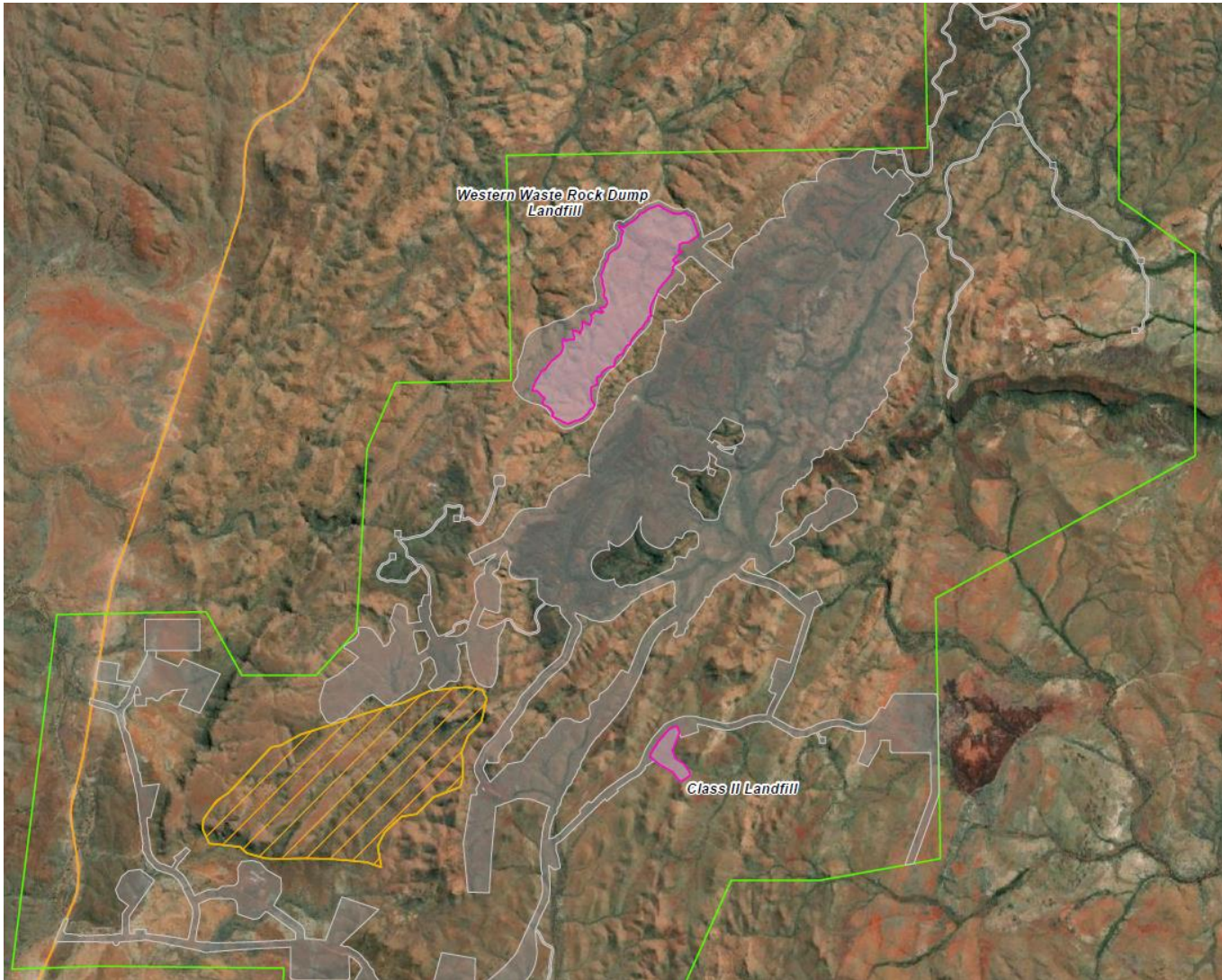


Figure 15 Indicative landfill locations

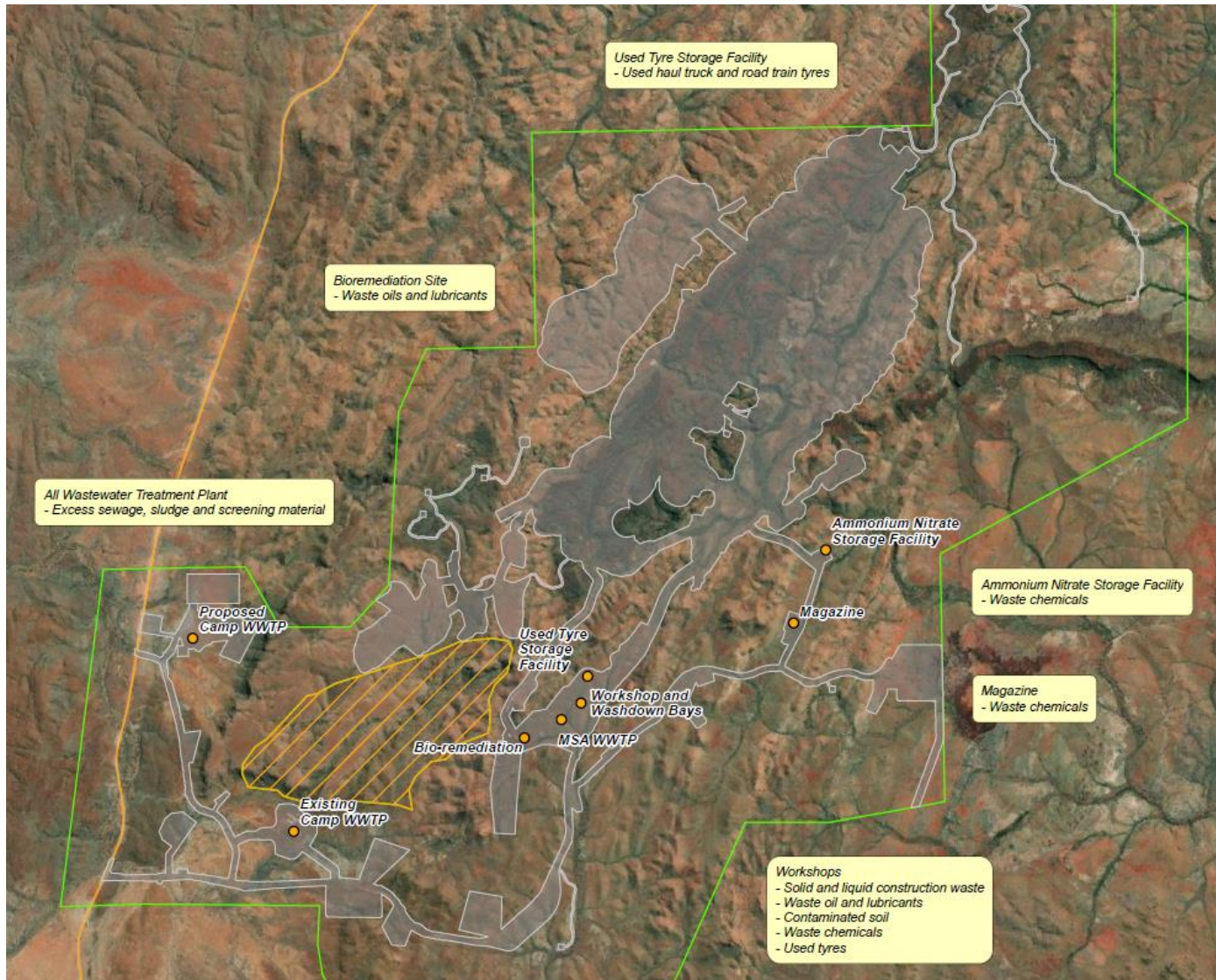


Figure 16 Indicative location of bioremediation facility

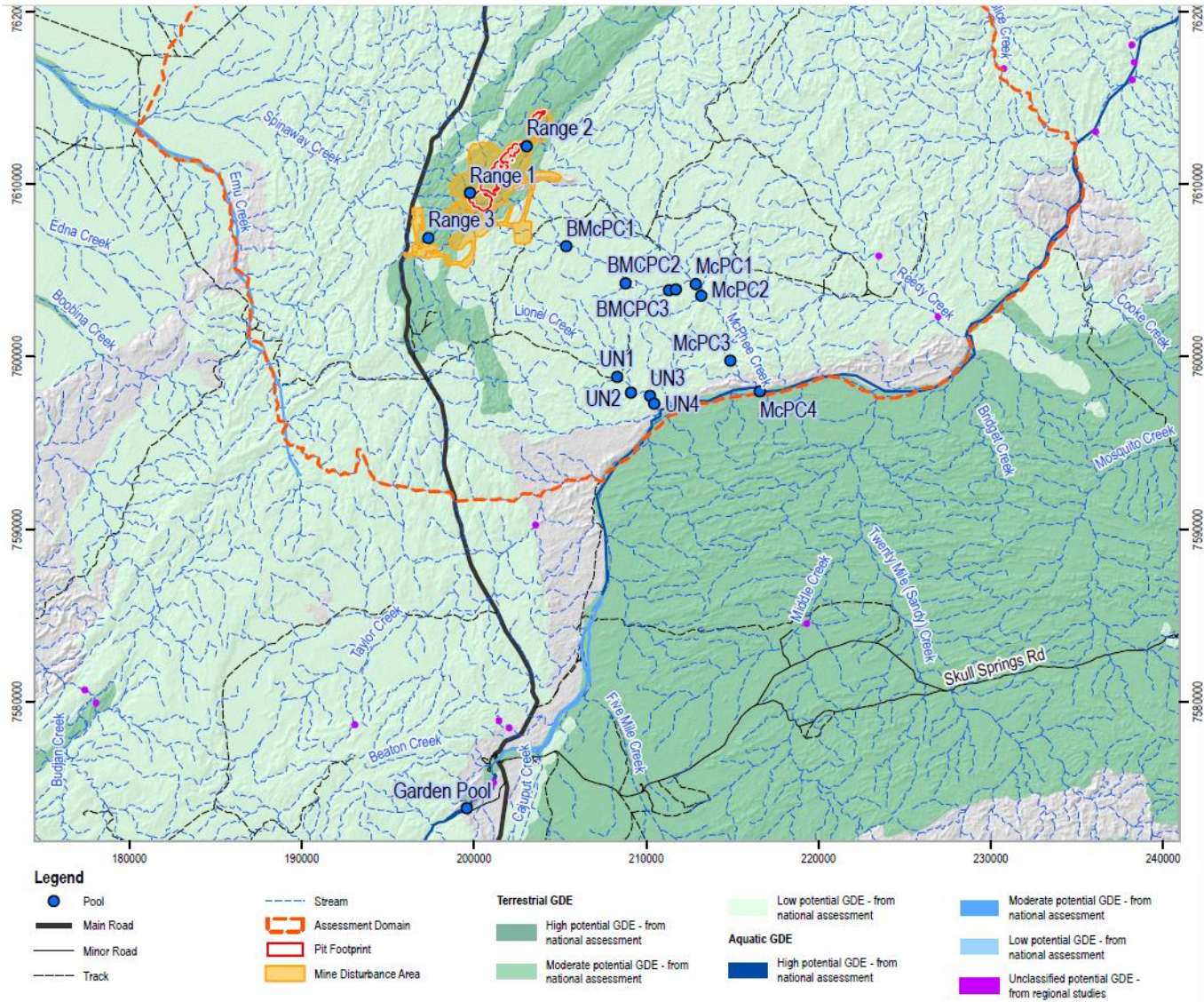


Figure 17 Potential for terrestrial groundwater dependent ecosystems (GHD, 2021)

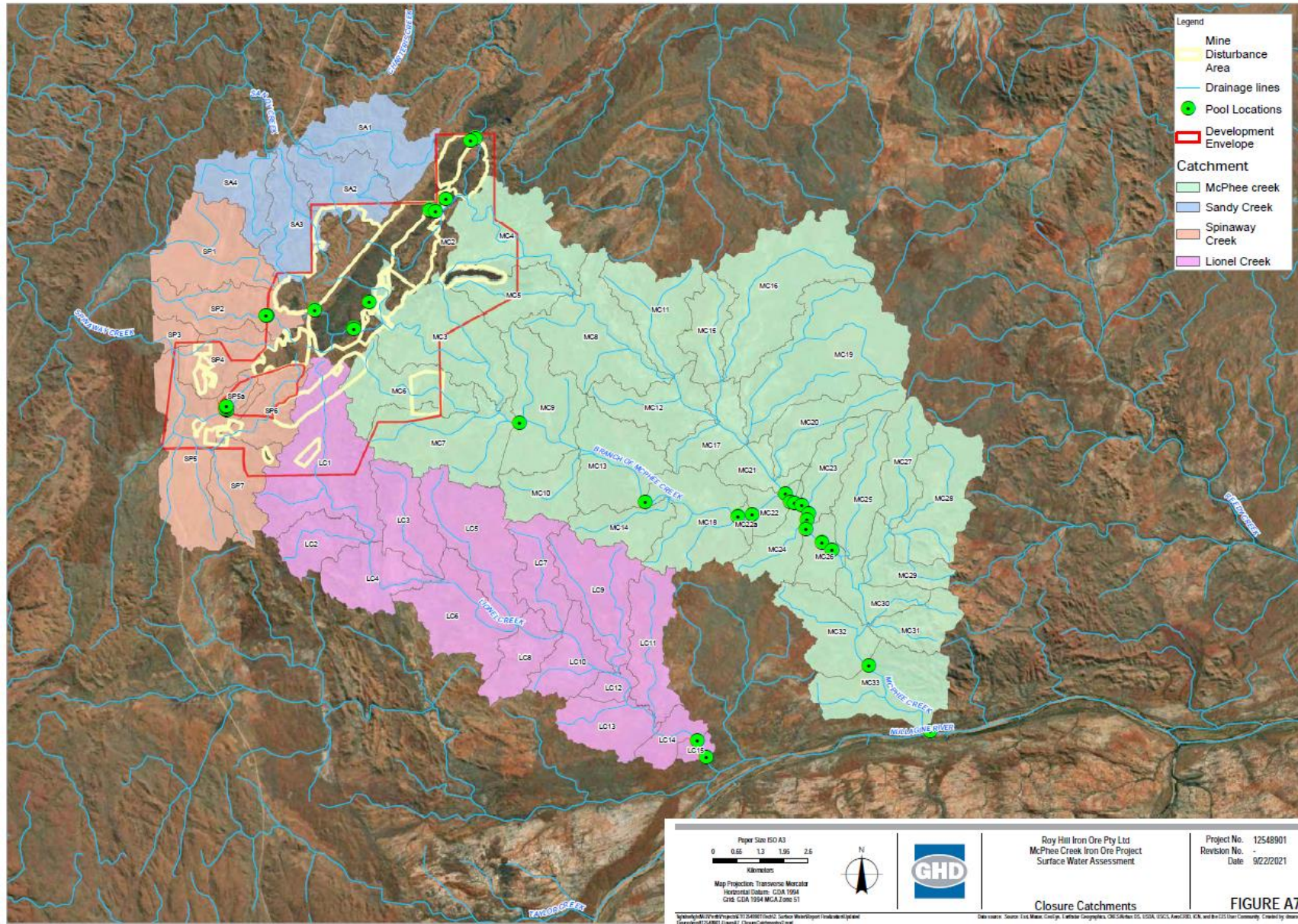


Figure 18 Location of creek lines and permanent pools

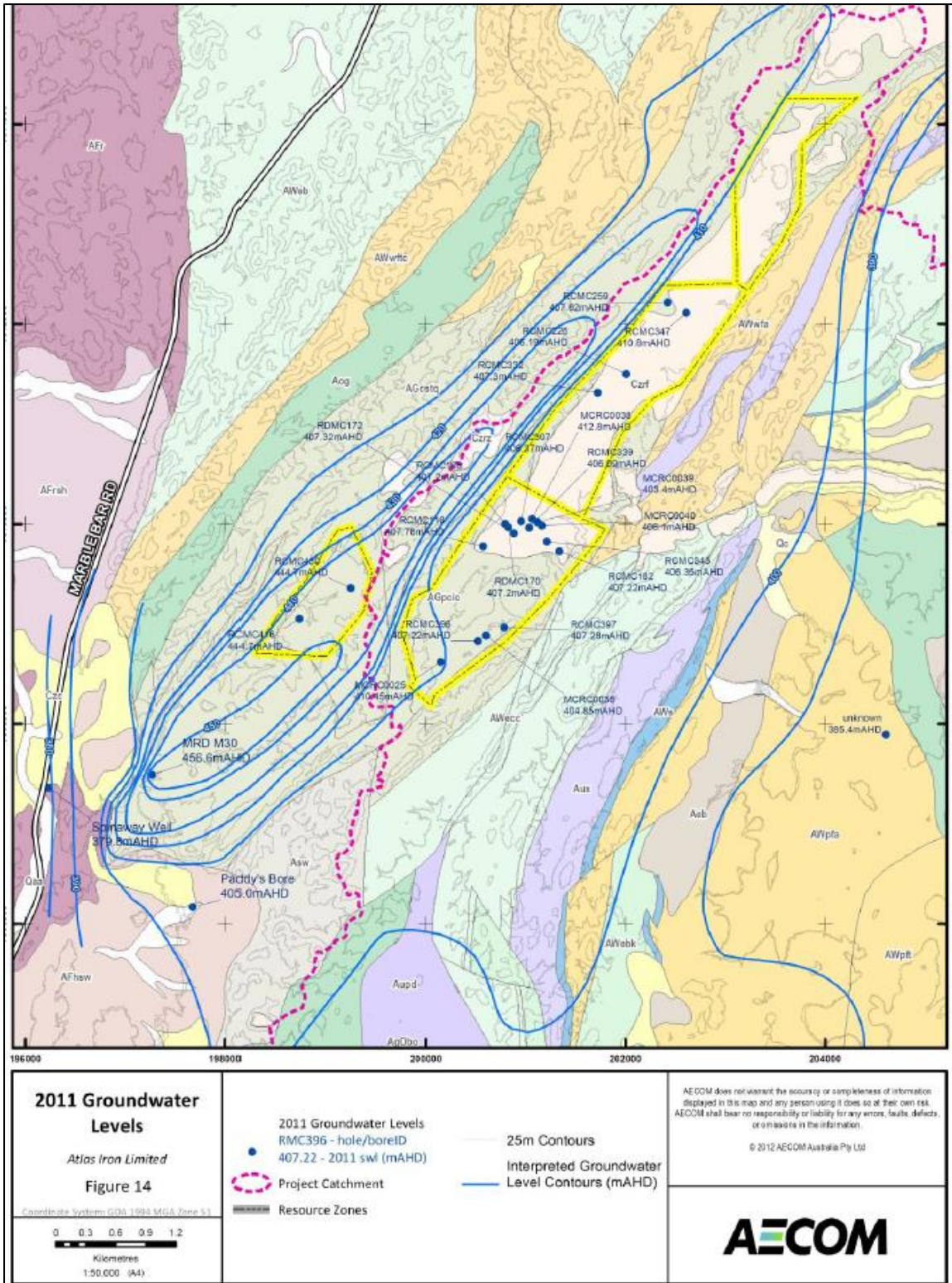


Figure 19 Groundwater contours for the site (2011 data presented by AECOM, 2013)

Appendix 2: Summary of applicant's comments on risk assessment and draft conditions

Condition	Summary of applicant's comment	Department's response
Schedule 1	Tenement labels are incorrect. The two E 46/158 labels should be L 46/158 (southern label) and L 45/598 (northern label)	Noted and corrected.
Front page	Business address for Atlas is now 1314 Hay St West Perth WA 6005	Address updated.
Table 4	Sprayfield sizes inconsistent with those in Table 1. Sizes should be as per Table 1.	Noted and corrected.
'Soil investigation requirement'	This heading is redundant	Heading removed.
Table 1, item 2(b)	<p>The pipeline cannot be constructed in a dedicated V-drain bund in all locations. However, the following is what we are proposing regarding surface water containment of the dewatering pipelines:</p> <ul style="list-style-type: none"> • Where the pipeline is laid along a haul road, it will be located in the drainage channel on one side of the road. The road and its drainage channels are contained with earthen windrows on both sides. • Where the pipeline is located in the stockyard area (adjacent to / part of the Ore Handling Plant), it will be within the area captured by the OHP's surface water drainage controls. • Where the final sections of a pipeline run along the creeklines in which the pipeline will terminate at the discharge point, there will be no specific containment. This is to avoid creating additional disturbance from constructing containment structures in the creek. • In any other location not specified above, the pipeline will be located in an earthen V-drain bund. 	Comment noted. Requirement changed to reflect proposed pipeline containment infrastructure.
Definitions	Typographical error in 'suitably qualified engineer'	Noted and corrected.

Condition	Summary of applicant’s comment	Department’s response
Table 1, Item 1	<p>Applicant was requested to provide information on the following: “Sedimentation traps constructed with minimum xxx dimensions”</p> <p>Applicant response: “Sedimentation traps constructed and designed for 10% annual exceedance probability (AEP) 6-hour event.</p> <p>Sedimentation traps are sized to treat run-off from the run-of-mine (ROM) and stockyard footprint by capturing coarse silts and larger particle sizes in flows up to the 10% AEP 6-hour event, which is also equivalent to 50% AEP, 72-hour event. Sediment ponds have overflow provisions for large events up to 1% AEP magnitude, 72-hour event.</p> <p>We suggest revising the condition to: <i>Sedimentation traps sized to accommodate the 10% AEP 6-hour event</i>”</p>	<p>Proposed amendment accepted with requirement updated to: “<i>Sedimentation traps sized to accommodate a 10% AEP 6-hour rainfall event.</i>”</p>
Table 1, Item 2	<p>Applicant was requested to provide information on the following: “(c) fitted with valves at xxx meter intervals to allow shutdown in the event of leaks.”</p> <p>Applicant response: “As the dewatering system is not linear, it is not straightforward to specify regular intervals.</p> <p>The dewatering pipeline network is designed to have isolation valves (consisting of resilient seated manual valves) fitted at each headworks, discharge point and branch/truckline connection.</p> <p>The dewatering system consists of seven (7) borehole pumps discharging to three (3) creeks and two (2) mine process users (MSA and CSA).”</p>	<p>Proposed amendment accepted with requirement updated to: “<i>fitted with isolation valves at each headworks, discharge point and branch/truckline connection to allow shutdown in the event of leaks.</i>”</p>
Table 1, Item 2	<p>Applicant was requested to provide information on the following: “(d) flow meters installed at xxx meter intervals to monitor the flow volumes”</p> <p>Applicant response: “Flow meters will be installed at the headworks of each bore (MCP0001, MCP0005, MCP0152, MCP0153, MCP0209, MCP0214 & MCP0218) and at each discharge point (D1, D2 & D3) and water user (MSA, CSA)</p>	<p>Proposed amendment accepted with requirement updated to: “<i>Flow meters will be installed at the headworks of each bore, at each discharge point and each water user to monitor the flow volumes</i>”</p>

Condition	Summary of applicant's comment	Department's response
Table 4	<p>Applicant was requested to provide information on the following:</p> <p>(v) Residual free chlorine xxx</p> <p>Applicant response:</p> <p>"Residual free chlorine will be 0.2 to 2 mg/L."</p>	<p>Comment noted and <2 mg/L has been specified under water treatment criteria.</p>
Table 5, Item 1	<p>Applicant was requested to provide information on the following:</p> <p>(c) minimum xxx metre freeboard maintained on sedimentation basins</p> <p>Applicant response:</p> <p>"Minimum 500mm freeboard maintained on sedimentation basins"</p>	<p>Comment noted and 500 mm freeboard has been specified in this condition.</p>
Table 5, Item 4	<p>Applicant was requested to provide information on the following:</p> <p>WWTPs and irrigation sprayfields:</p> <p>(l) Applicant to detail a proposed vegetation and/or weed growth monitoring requirement in irrigation fields</p> <p>(m) Applicant to detail a proposed weed harvesting requirement</p> <p>Applicant response:</p> <p>(l) Quarterly photographic monitoring will be conducted from fixed GPS points of the irrigation sprayfields. This will include:</p> <ul style="list-style-type: none"> (a) A general environmental description of the site (b) Recording any changes to vegetation health/composition (c) Recording of any new weeds not previously recorded in the area (d) Identifying high risk areas requiring harvesting/control <p>(m) Weed harvesting/control will occur monthly. This will be achieved by:</p> <ul style="list-style-type: none"> (a) Physical removal of weeds 	<p>The Delegated Officer is satisfied with the proposed monitoring and weed removal controls, which have been added to the condition.</p>