Decision Report

Application for Amendment to Works Approval

Division 3, Part V *Environmental Protection Act 1986*

Works Approval Number	W5650/2014/1
Works Approval Holder	Tronox Management Pty Ltd
ACN	009 343 364
File Number	DER2014/000452
Premises	Dongara Mineral Sands Mine Mount Adams Road MOUNT ADAMS WA 6525 Legal description – Tenements M70/1195, M70/1196, M70/1197, M70/1198, M70/1999 & M70/1200
Date of Report	6 August 2019
Status of Report	Final

Overview of premises

Background and classification of premises

The Dongara Mineral Sands Mine (the Premises) is a heavy mineral sands deposit proposed to be mined by Tronox Management Pty Ltd (the Works Approval Holder) on the northern Swan Coastal Plain, approximately 25 km south-east of Dongara, in the Shire of Irwin. The deposit is situated over 5,304 ha of predominantly undisturbed Unallocated Crown Land (UCL) which includes regionally significant vegetation complexes and high wetland flora and fauna values.

Approvals under the *Environmental Protection Act 1986 (*EP Act), *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and *Mining Act 1978* (Mining Act) were granted in 2014, however the project did not immediately proceed due to market conditions. The Works Approval Holder has since indicated plans to commence the project in 2022.

The existing works approval (W5650/2014/1) expires in 2019. This Application is to extend the expiry by a further 5 years. The Application indicates the proposal remains unchanged, however the Delegated Officer has determined to review and update the works approval consistent with its current regulatory framework.

The proposal relates to the following Prescribed Premises category:

Classification of Premises	Description	Premises throughput (from Application)
Category 8	Mineral sands mining or processing: premises on which mineral sands ore is mined, screened, separated or otherwise processed.	8,000,000 tonnes per annual period

Description of proposal

The Works Approval Holder seeks to develop a series of mine pits, a processing plant and supporting infrastructure for the mining and processing of heavy mineral sands. The complete project involves the mining of six ore bodies in order to access a reserve of around 85 million tonnes (Mt) of titanium-bearing mineral ore, to produce around 4 Mt of heavy mineral concentrate (HMC) over a 7 to 15 year life-of-mine.

In addition to the mine pits, the proposal requires development of overburden stockpiles, tailings storage facilities (TSFs), haul roads, power supply, water supply bores, fuel storage, a wastewater treatment plant, maintenance workshop and administration facilities.

The original works approval application submitted to DWER seeks approval for a dry mining operation, involving dewatering of the superficial aquifer, to access the ore bodies. The proposal will impact, through clearing and groundwater dewatering, up to 1,305 ha of native vegetation, which includes wetlands. A summary of the proposal is provided below:

Element	Description
Premises name	Dongara Mineral Sands Mine
Mine status	Undeveloped ‘greenfield’ project
Commodity mined	Mineral sands
Life of mine	7 to 15 years
Land tenure	All mining tenements are held exclusively by the Works Approval Holder. M70/1195 comprises private freehold land. An agreement is in place to allow initial mining and processing to commence
Ore quantity	85.0 million tonnes at a rate of approximately 8.0 Mtpa
Overburden removed	53.0 million bank cubic metres
Topsoil and subsoil	3.9 million bank cubic metres
Total material disturbed	186.0 million tonnes

HMC recovered	4.6 million tonnes
Maximum pit depth	34 m below ground level
Area of disturbance	Up to 1,420 ha within an 5,304 ha development envelope
Clearing	No more than 1,200 ha of native vegetation
Dewatering	Abstraction of groundwater for dewatering purposes (from the superficial aquifer), to be used in processing
Ore processing	In-pit 'dozer trap' mining unit, wet separation plant, flocculant thickener and associated infrastructure to be used to produce a heavy mineral concentrate
Secondary processing	To be conducted off-site at the Chandala Mineral Separation Plant

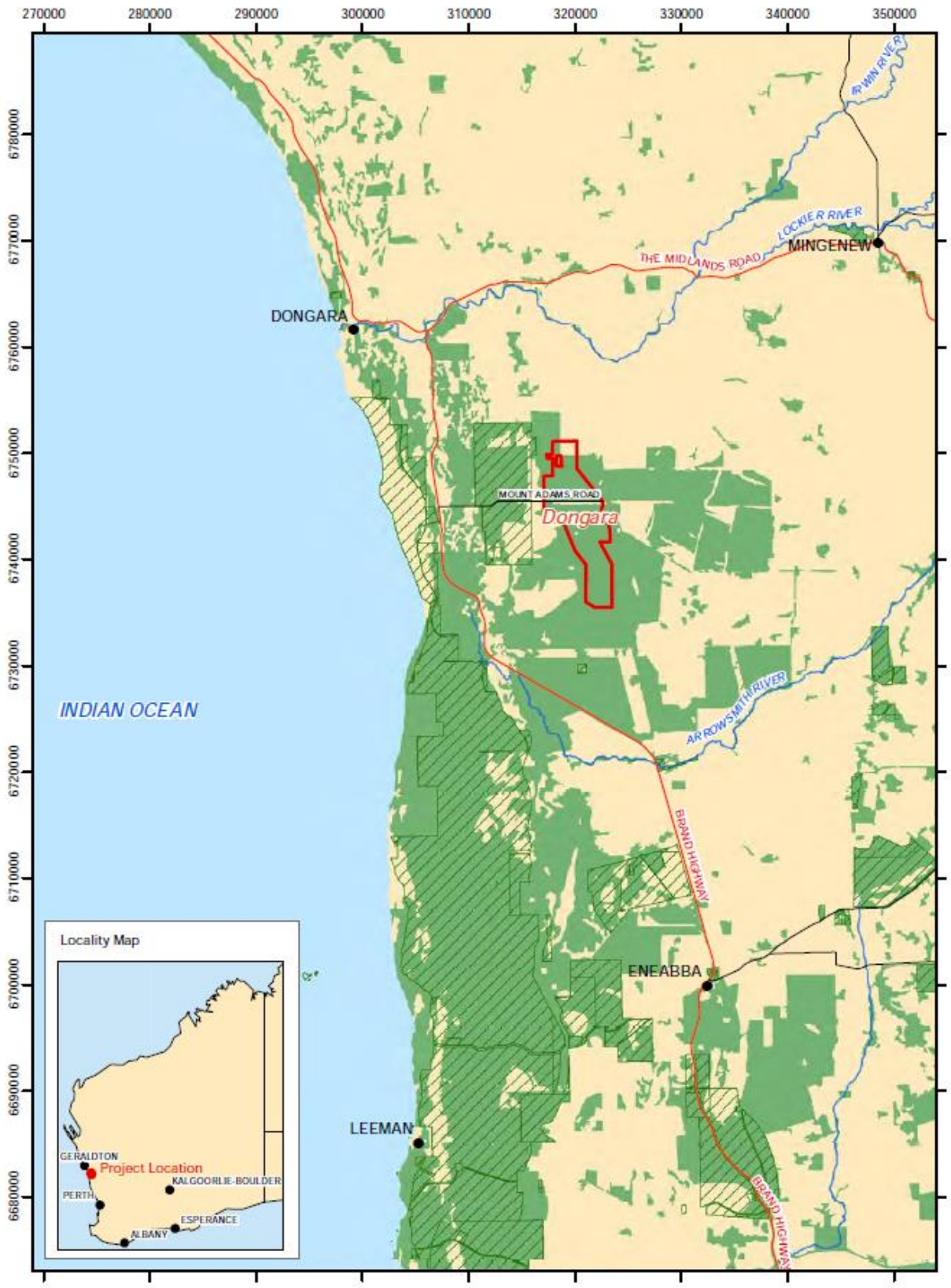
The Premises is situated on six mining leases: M70/1195, M70/1196, M70/1197, M70/1198, M70/1199 and M70/1200 encompassed by a 5,304 ha development envelope. All mining leases are on UCL, with the exception of M70/1195, which is entirely on freehold land. Access to the site will be via Mount Adams Rd, which dissects M70/1197 and includes a decommissioned gas pipeline that runs laterally along the southern edge of the road reserve.

The Premises covers an area of around 15 km long and up to 5.5 km wide, with a total disturbance footprint of 1,302 ha. A summary of the indicative disturbance area by type is provided below:

Disturbance type	**Mining lease**						**Total**
	70/1195	**70/1196**	**70/1197**	**70/1198**	**70/1199**	**70/1200**	
Groundwater bores	2	2	-	3	-	-	7
Operating plant	1	1	3	1	1	1	3
Administration & infrastructure	-	-	2	-	-	-	2
Overburden dumps & tailings storage areas	60	9	270	51	62	145	598
Power plant	-	-	3	-	-	-	3
Mine pit	51	50	214	90	64	65	535
Roads and infrastructure corridors	3	16	39	32	26	23	141
Water holding dam	-	-	14	-	-	-	14
Total disturbance area (ha)	**116**	**77**	**546**	**177**	**153**	**234**	**1,302**

Construction and site development

The construction and site development phase of the project will take up to 24 months and is now expected to commence in early-2022. The initial site development works will involve construction of the main mine access and internal roads, including upgrades to Mt Adams Rd and the Brand Hwy turnoff; installation of water supply and management infrastructure, construction of a power station and power supply infrastructure; development of the process plant area including the Wet Concentrator Plant (WCP), thickener and associated infrastructure.



▲ Location of the Dongara Mineral Sands project.

Pre-production mining and stockpiling:

An initial starter pit will be excavated at the beginning of the first ore body using an excavator and haul truck fleet. A 'dozer trap' mining unit will then be constructed within the starter pit, in addition to slurry pipelines, pumps and stackers, in preparation for start-up, commissioning and full mining operations.

Vegetation from the starter pit will be cleared and grubbed using a raked dozer; topsoil and subsoil will be stripped from the starter pit and stockpiled adjacent to the pit for later use in rehabilitation. Overburden removed from the starter pit will also be stockpiled adjacent to the pit, where the majority will eventually be returned to the mine void.

Ore from the starter pit will be pre-mined to basement and stockpiled adjacent to the 'dozer trap' (approx. 20,000 bank cubic metres (bcm)).

Commissioning:

Commissioning will be carried out over a 3 to 6 month period, at the completion of which the mine will become operational, and will generally include:

- Hydro-testing of pipelines and pump systems function testing;
- Commissioning of the raw water system;
- Commissioning of the process control system;
- Dry and wet commissioning of the mining unit, WCP circuit and thickener;
- Testing the sand and slimes tailings systems; and
- Commissioning of the process control system.

To wet commission the mining unit and WCP circuits and associated equipment, it will be necessary to process a volume of ore. Approximately 400,000 tonnes of ore will be processed, with the heavy mineral concentrate (HMC) stored at the HMC stockpile pad. The sand tailings and clay slimes produced during commissioning will be deposited into a tailings storage facility (TSF) (to be constructed prior to commissioning) located in the area adjacent to the WCP.

Operational aspects

The mining and processing operations will comprise conventional dry mining followed by wet screening and gravity separation to produce a HMC or intermediate products rich in ilmenite, rutile and zircon.

Many of the pits will be mined to a basement level that is below the natural groundwater table and dewatering will be initially required to facilitate dry mining conditions. Due to the project's high water demand, all dewatering water will be used as part of the mine water supply and to supplant water required from other sources.

Mine voids will be backfilled progressively throughout the life of mine with tailings and overburden, prior to rehabilitation back to native vegetation.

Mining operations

The Dongara deposit is predominantly a large undeveloped high strip, low grade ilmenite deposit. Native vegetation will be cleared and grubbed, and in addition to topsoil and subsoil, will be stockpiled separately for later use in rehabilitation. Overburden will be removed using excavators and trucks, and will be stockpiled in areas to be cleared as external overburden dumps, placed directly into the mine void, or used for the construction of infrastructure pads and internal roads.

Mining will occur on a 24-hour, 7 days per week basis to a maximum depth of 34 m below ground level (mbgl). Full production is expected to commence around 2023, following the commissioning period. The heavy minerals will be extracted from six narrow ore bodies by dry mining techniques.

Dewatering pumps will be used to evacuate groundwater from the active mining pit in areas below the water table. Bulldozers will then expose the ore body and push material into an in-pit hopper, a method known and 'dozer trap' mining.

The ore will be initially screened to remove oversize rocks, sticks and trash greater than 150 mm in size, prior to injection with water to create a slurry that will then be pumped to a trommel to remove material greater than 3 mm in size. The remaining ore will then be pumped to a wet concentrator plant (WCP), which will recover the heavy minerals by means of wet gravity separation. Oversize will be returned to the mine void or external overburden dumps.

Ore processing

The WCP will recover the heavy minerals in the screened and slurried ore, which will include the valuable titanium-bearing minerals and zircon.

The slurried ore will be passed through a series of hydrocyclones to separate out the fine slimes fraction (clay tailings), which will comprise the cyclone overflow. The cyclone underflow will be passed through a series of gravity spirals where the heavy minerals with specific gravities >3.5 flow to the inside of the spirals and are separated from the principal waste mineral, quartz, which has a specific gravity <3 and travels towards the outside of the spirals (sand tailings). This process will recover the majority of the heavy mineral as HMC, which will typically comprise 90 – 95% valuable heavy minerals (principally ilmenite, rutile, zircon and lesser amounts of monazite) on a dry weight basis.

The HMC will then be pumped to a stockpile via dewatering cyclone stackers. Cyclone overflow will be returned to the process water circuit while the underflow will be stockpiled and dried before being transported off-site for further processing. A sub-surface drainage system will capture seepage from the stockpile and return it to the process water circuit.

Tailings management

The tailings streams produced from the concentrators will comprise waste sands, clays and heavy minerals (quartz, kaolinite, goethite and ilmenite).

Sand tailings will form the majority of concentrator residues, and will be pumped as a slurry (30 – 35% solids) via polyethylene pipes and stage pumps to TSFs constructed in mined out voids (in-pit TSFs).

Clay tailings will either be:

- pumped as a slurry (25 – 35% solids) to specially constructed TSFs, located either outside of mine voids or on future mining areas, for solar drying (solar drying ponds); or
- mixed with a pre-determined amount of sand tailings and pumped to in-pit TSFs.

The clay tailings will be injected with a polyacrylamide flocculant (Flopam AN923) to assist with the release of water and to accelerate settling rates in the solar drying ponds.

<u>TSF design and operating requirements:</u>

DWER understands from the Mining Proposal the TSF deposition strategy includes:

- vacant cell maintained between the TSF and active mining area;
- facilities include above ground solar drying ponds up to 5 m in height, and in-pit TSFs up to 15 m in depth;
- below ground TSFs are constructed out of overburden or tailings within the pit; and
- it is assumed that geochemical aspects of the tailings have been considered in terms of impacting the groundwater/surface water quality.

TSF type	Location	Maximum embankment height	Wall angle	Wall crest width	Embankment construction materials
Solar drying pond	Above ground	5 m (average 3 m)	1:3	6 m	Overburden, clayey sand, sandy clay, sand tailings or a combination of the above
In-pit TSF	Below ground (in mine pit)	5 – 15 m	~1:3	~6 m	Overburden or tailings within the pit

Solar drying ponds will generally be filled to a depth of 2 m, decanted and dried. This process will take around 12 months and may be repeated up to three times to achieve a depth of dried slimes of around 2 m. Decant water will be returned to the process for reuse. Dried materials will either be used to re-establish an appropriate soil profile or be excavated as overburden.

The initial solar drying ponds will be located adjacent to and on the Zeus and Dionysus ore bodies. Around 2 million tonnes of clay tailings will be placed within 9 ponds within the first year of operating, with the pond varying in size from 4 to 40 ha (largest pond 800,000 m^3 capacity).

Sand tailings will be deposited with in-pit TSFs in a saturated state and allowed to free drain through the base of the TSF, with decant water collected where possible and returned to the process. Completed TSFs will be progressively rehabilitated during operations and the closure phase of the project.

Secondary tailings:

Tailings produced from off-site processing at the Chandala Mineral Separation Plant (MSP) will be disposed at the Cooljarloo Mineral Residue Facility, and not returned to the Premises.

The rare earth mineral monazite will be contained within the HMC, predominantly in the non-magnetic fraction, which will be separated out at the Chandala MSP. The disposal of monazite from the Chandala MSP will be managed in accordance with the approved Radiation Management Plan for this site, and will not be returned to the Premises for disposal.

Pipeline network

Slurried materials will be transferred around the Premises using high density polyethylene pipelines. The pipelines, which will be in 6 m lengths with flanged sections (butt flange welded to the end of the line and bolted to a corresponding flange) will be used to transfer the following:

- ore from the mining unit to the WCP;
- HMC from the WCP to the HMC stockpile;
- clay fines to solar drying pond(s) and sand tailings to mine voids (in-pit TSFs); and
- return of water recovered from tailings deposition facilities and stockpiles.

Pipelines will be placed within service corridors that are around 10 m wide and generally located between a light vehicle track and a powerline corridor, to ensure that any solids from spills or leaks due to pipeline failure are contained and water allowed to soak into the sandy soil. All pipelines will be placed away from surface waters and wetlands, and if unavoidable, higher specifications will be used, e.g. steel or double-lined pipe.

Mine water management

Large volumes of groundwater will be used in transporting slurried ore and separating HMC from sand and clay tailings. A large portion of the water will be returned to the aquifer via seepage from tailings deposition areas:

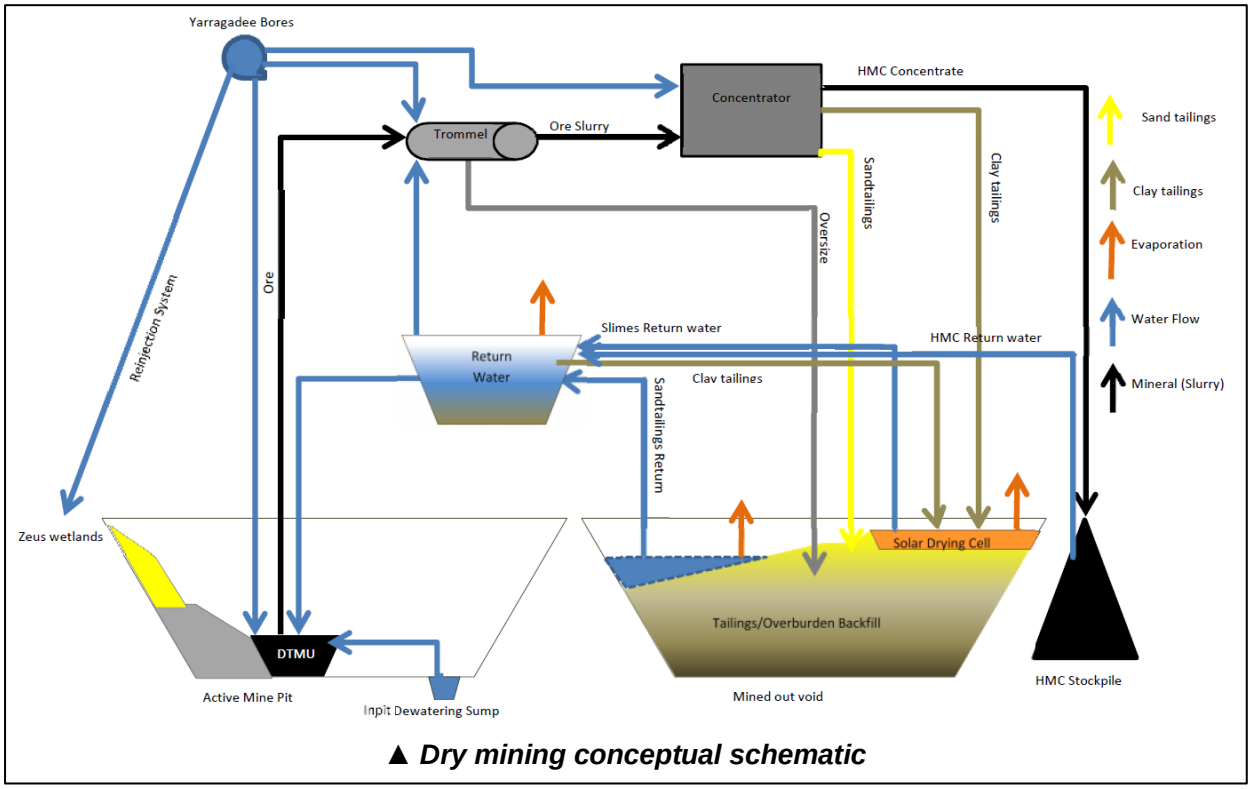
Dewatering:

Three of the six ore bodies will be excavated to below water table level, where dewatering of the superficial aquifer will be required to enable dry mining to occur. Groundwater inflows will be abstracted temporarily via passive dewatering, i.e. pumping from in-pit sumps, and used as part of the mine water supply.

A schedule for dewatering volumes, by ore body, as derived from groundwater modelling is set out below. At Demeter, Dionysus and Hades no or minimal dewatering will be required. At the Zeus, Hebe and Heracles ore bodies some dewatering will be required.

Ore body	Ave flow* (GL/a)	Mining time (years)
Demeter	0	0.4
Dionysus	0	1.5
Hades	0	1
Zeus	0.35	4.5
Heracles	0.336	4.5
Hebe	0.292	2

** denotes water flowing into the active pit thereby being removed from the aquifer (gain).*



▲ ***Dry mining conceptual schematic***

Dewatering of the superficial aquifer will only be conducted as necessary to enable the mining of ore. All dewatering water will be used as part of the mine water supply and will supplant water required from other sources.

Water balance:

The Works Approval Holder has developed a water balance model to forecast water use for the life of the mine, and this is detailed within the Groundwater Operating Strategy for the project (Tronox, 2014). The water demand for dry mining is summarised in the table below. For those ore bodies that intersect the water table, gross demand is offset by inflows from dewatering. The maximum volume of bore water required per year over the life of the project is ~3.4 gigalitres (GL) based on the water balance predictions, as indicated below.

		Min	Max	Ave
Ore mined/processed	kt	2,915	5,782	5,311
Water requirement:				
Mining and ore processing	GL/a	0	3.05	2.0
Artificial recharge (infiltration)	GL/a	0	0.4	0.25
Input from dewatering	GL/a	0	0.42	0.22
Total bore water	GL/a	**0.1**	**3.44**	**2.26**

The water balance indicates the annual project water demand far exceeds the volumes of water abstracted from pit dewatering, therefore there will not be a requirement to discharge surplus dewatering water.

Water distribution network:

The Works Approval Holder intends to obtain the mine water supply from production bores screened within the Yarragadee Formation. Abstracted water will be transferred to a central process water dam, from where it will be distributed to processing facilities and associated activities.

Water from tailings deposition areas and seepage recovered from product stockpiles will be returned to a water reclamation pond using a gravity decant system consisting of polyethylene

pipeline and weir box fitted with adjustable boards to control rising water levels.

The majority of surface water falling on the site is expected to rapidly infiltrate due to the sandy nature of the sand and sandy loam soils present. However where possible, all potential drainage lines will be directed away from infrastructure and mining areas. Surface water runoff from concrete plant areas and buildings will be collected via sumps and returned to the process water dam.

Infrastructure

Prescribed Activity Category 8	
Mineral sands ore will be mined using dry and dredge mining methods, and primary processing using wet separation to produce a heavy mineral concentrate	
Fixed operations	
1	Dozer trap, including in-pit hopper/oversize screen and associated slurry pipelines and pumps
2	WCP, including hydrocyclones, gravity spiral circuits and associated pumps
3	HMC product stockpile
4	Sand tailings and clay fines system, including pipelines, booster pumps and stackers
5	Process water dams (2)
6	Solar drying dams (9)
7	Return water pipeline network
8	Soil stockpiles – overburden (9), topsoil/subsoil (6)
Mobile equipment	
1	1 x Front End Loader (for HMC)
2	2 x Bulldozers (for dozer trap)
3	1 x Excavator (for overburden)
4	4 x Dump Trucks
5	3 x Carry Graders (for topsoil)
6	1 x IT carrier (for tailings)
Directly related activities	
Groundwater abstraction (dewatering) of the Superficial aquifer to allow dry mining conditions, with mine water used to supplement mine water demand	
1	In-pit sumps and pumps, including water pipelines
Other activities	
1	Groundwater abstraction (Yarragadee aquifer) for processing
2	Aquifer re-injection (Zeus wetlands)
3	Construction of a power station (7.5 MW natural gas)
4	Construction of a small sewage treatment plant (4 m^3/d)

Environmental siting

The Premises is located in the Mid West region, about 25 km south-east of Dongara. It is located on the eastern side of the Eneabba Plain about 3 km west of the Gingin Scarp, a prominent landform feature of the area. The Brand Highway, a major infrastructure route between the Mid West region and Perth, runs adjacent to the coast about 5 km to the west of the Premises.

The proposed mine is located on a greenfield site which is almost undisturbed and, including most of the land surrounding it, is vested in the State Government. It comprises a largely intact block of remnant native vegetation in pristine to excellent condition, which contains several

conservation significant flora species and also supports foraging habitat for the Carnaby's Cockatoo. Groundwater dependent ecosystems (GDEs) containing a series of wetlands also occur along the western side of the Premises, and are considered to be equivalent to Conservation Category Wetlands.

Three conservation reserves are located within the vicinity of the Premises: Yardanogo Nature Reserve (Class C) located about 1.5 km west, Beekeeper's Nature Reserve (Class C) located about 10 – 15 km west, and a small un-named nature reserve (Class A) located about 6 km south-west of the site.

There are no residential dwellings within 5 km of the Premises. The surrounding area has had substantial natural gas exploration and development, with the Mondarra and Beharra Springs gas fields overlying the mine area in parts. Subsurface gas pipelines (Dampier to Bunbury Natural Gas Pipeline and the Parmelia Natural Gas/Petroleum Pipeline) also traverse the mine area, running north-south between the ore bodies.

Climate

The Premises is located in the north of the Southwest Land Division, which experiences a Mediterranean-type climate with hot dry summers and cool wet winters. Weather patterns are dominated by the regular passage of rain-bearing cold fronts from the Indian Ocean in winter, and dry easterly air flows from the arid interior in summer. Rainfall progressively declines in northerly and easterly directions, as distance from the coast increases. There are no Bureau of Meteorology weather stations in proximity to the site – from interpolation of annual rainfall isohyets, average annual rainfall at the Premises would be in the order of 450 mm.

Hydrogeology (groundwater)

The following information is summarised from Hydrosearch, 2011.

The Premises occurs within the Eneabba Plain sub-unit of the Swan Coastal Plain physiographic unit, which is described as an area of undulating but gently rising plain between the Tamala Limestone to the west, and the Gingin Scarp to the east.

The Premises is underlain by two major groundwater-bearing formations:

- the superficial formation, which is an unconfined to semi-confined aquifer extending typically 30 m below ground and up to 55 m below ground; and
- the Yarragadee formation, which is a semi-confined aquifer extending to approx. 1 km below ground.

<u>Superficial formation:</u>

The sediments of the superficial formations comprise the Bassendean Sand (Quaternary age), overlying the Guildford Formation (Quaternary age) and Yoganup Formation (Tertiary age). The Bassendean Sand tends to exist only at depths of less than 10 mbgl and mostly above the water table. The Guildford and Yoganup Formations, which host the heavy mineral ore bodies, are comprised mainly of a mixture of sand and silty or clayey sand and constitute the main aquifers in the superficial formations.

Saturated thickness of the formations increases westward from the limit of groundwater in superficial formations near the Demeter and Hades ore bodies (i.e. 0 m), to about 20 m at the Zeus orebody. Salinity of the superficial aquifer generally increases westward from approximately 500 mg/L to 1,600 mg/L Total Dissolved Solids, attributable to a concentrating of salts by evapotranspiration in areas where the water table is shallow.

Recharge of the superficial aquifer occurs via winter rainfall, stream runoff (highly periodic) and upwards leakage from the Yarragadee aquifer in areas towards the coast. Discharge is by downwards leakage into the Yarragadee aquifer, evapotranspiration (where the water table is shallow), and outflow to the ocean.

<u>Yarragadee Formation:</u>

The Yarragadee Formation underlies the superficial formations and comprises mainly of sand

beds that are randomly distributed in both thin (typically 1 m thick) and thick (typically 6 m thick) beds throughout the thickness of the formation. These sand beds constitute leaky confined aquifers, with the degree of confinement increasing with depth. The uppermost Yarragadee Formation aquifers have a hydraulic connection to the superficial formations where the dipping aquifers subcrop on the base of the superficial formations.

Recharge of the aquifer is via rainfall, downward leakage from the superficial aquifer and surface runoff east of the Gingin Scarp where the Yarragadee Formation is exposed. Similar to the superficial aquifer, groundwater generally flows east-west, discharging to the ocean.

Hydrology (surface water)

Surface water hydrology within the Premises is characterised by the presence of the Gingin Scarp to the east, which reaches a maximum elevation of 256 m at Mt Adams. Watercourses arise from the scarp and drain towards the west, terminating in swamps or lakes in inter-dunal depressions within the Premises.

The most notable watercourses in the local area are Mt Adams Creek and Tomkins Road Creek which flow into, and terminate within, the Premises as a series of deltaic fans that recharge groundwater locally. These creeks are ephemeral as a result of seasonal variations in rainfall and the high permeability of watercourse beds, with flows that are infrequent and episodic.

Flora and vegetation

The Premises is located at the northern end of a contiguous area of largely intact native vegetation which extends approximately 10 km to the east, and southwards to Eneabba. It extends westwards to the Indian Ocean and links Dongara with the northern Perth suburbs along the coast.

The proposal includes clearing of up to 1,200 hectares of native vegetation that includes both terrestrial and groundwater dependent vegetation. Native vegetation within the Premises is largely undisturbed, is in pristine to excellent condition, and supports Carnaby's Cockatoo foraging habitat.

Three vegetation systems, comprising eight vegetation associations, have been recorded within the Premises. Twenty five conservation significant flora species have been identified, including one Declared Rare Flora species (Sandplain Duck Orchid) and numerous Priority flora species, that would be impacted either directly (by clearing) or indirectly (by dewatering drawdown) by the proposal.

The location and authorised extent of clearing has been limited by Ministerial Statement 953 (MS 953). In order to offset the significant residual impact from vegetation clearing and loss of habitat, MS 953 also includes extensive requirements in the form of land acquisition, habitat improvement, mine closure and rehabilitation (see below).

<u>Wetlands</u>

The Premises lies within the Beharra Spring consanguineous wetland suite, which contains a relict palaeo-lake system blanketed by Bassendean Sands forming damplands or irregular morphology. The stratigraphy within this system is highly variable and complex; the hydrological connectivity with the underlying superficial aquifer varies from 'unconfined' (direct expression of the superficial aquifer) to 'perched'.

Three wetlands have been identified in the vicinity of the Premises and occur west of the proposed Zeus, Heracles and Hebe ore bodies. The majority of these wetlands are only seasonally inundated, with inundation dependent upon winter rainfall. As the native vegetation within and surrounding these areas is undisturbed and in pristine to excellent condition, these wetlands are considered to be equivalent to 'Conservation Category Wetlands'. These wetlands are almost entirely contained within the area identified as potentially supporting groundwater dependent vegetation. Surveys have determined the wetland vegetation to be in the least partially dependent on groundwater, either as a perched watertable or the superficial

aquifer watertable.

All areas with a depth to groundwater of less than 10 m have been considered to be potentially groundwater-dependent (in total 4,369 ha).

Legislative context and other approvals

Relevant approvals

Legislation	Number	Approval
Environment Protection and Biodiversity Conservation Act 1999 (Cth)	EPBC 2009/5032	Commonwealth environmental approval under the EPBC Act for implementation of the proposal
Part IV of the EP Act	MS 953	Ministerial approval for implementation of the proposal (to construct and operate the Dongara mine) The Works Approval Holder has submitted an application to extend the time limit for substantial commencement of the proposal
Mining Act 1978 (WA)	Reg ID 48003	Mining Proposal & Mine Closure Plan for the Dongara Titanium Minerals Project
Rights in Water and Irrigation Act 1914 (WA)	GWL 162324(1)	Licensed allocation 3.5 GL/yr from the Arrowsmith Groundwater Area, Yarragadee North aquifer, for the purposes of mineral ore processing, mining camp purposes and conservation purposes
	GWL 174989(1)	Licensed allocation 2.0 GL/yr from the Arrowsmith Groundwater Area, Yarragadee North aquifer, for the purposes of mineral ore processing, mining camp purposes and conservation purposes
	GWL 162349(1)	Licensed allocation 1.0 GL/yr from the Arrowsmith Groundwater Area, Superficial Swan aquifer, for the purposes of mineral ore processing and dewatering

Part IV of the EP Act

Background

The original mine proposal was formally assessed by the Environmental Protection Authority (EPA) at the level of Public Environmental Review (PER), with approval being granted through the issue of MS 953 in 2013.

The proposal was also considered a 'Controlled Action' under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) based on the potential impacts on habitat for listed threatened species. The proposal was assessed under the bilateral agreement with the State, and was approved with conditions in April 2014.

Ministerial Statement 953

EPA Report 1478 (June 2013) provides the EPA's assessment of the original mine proposal. The key environmental factors identified are generally related to the residual impacts on conservation significant native vegetation, which would be cleared or impacted by dewatering. The EPA concluded that although the proposal would significantly impact local populations it is not expected to alter their conservation status, and that these impacts could be offset, in the form of land acquisition and habitat improvement activities.

MS 953 contains a number of conditions that relate to ensuring there are no impacts to native vegetation values and groundwater-dependent ecosystems (GDEs) from dewatering of the superficial aquifer. In addition, the total amount of clearing is restricted to 1,200 ha, and all areas of native vegetation cleared on the Premises are to be adequately rehabilitated and

revegetated. The Works Approval Holder is also required to offset at least 2,000 ha of habitat for the Carnaby's Black Cockatoo and the Sandplain Duck Orchid, in addition to revegetating a further 600 ha of off-site cleared land.

Key finding:

The Delegated Officer notes MS 953 requires substantial commencement of the proposal within 5 years of the date of the statement (i.e. December 2018), and that the Works Approval Holder has sought an extension of this time limit from the Minister for Environment.

Mining Act 1978 (WA)

The Department of Mines, Industry Regulation and Safety (DMIRS) has approved a Mining Proposal (Registration ID: 48003) to develop the mineral sands deposit on tenements M70/1195, M70/1196, M70/1197, M70/1198, M70/1199 and M70/1200.

DMIRS has also approved a Mine Closure Plan (MCP) for the project, which pre-dated the current closure guidelines. A number of issues were identified that required addressing in the 2017 revision regarding closure obligations, stakeholder consultation and refinement of completion criteria.

Key findings:

The Delegated Officer notes:

1. The Mining Proposal remains valid until the mine closes or all of the activities proposed under the approval have been undertaken.
2. The Works Approval Holder may require further approvals under the Mining Act, depending on whether there are any changes to the original mining proposal.
3. Approval of the 2017 revision of the MCP is currently pending DMIRS assessment.

Rights in Water and Irrigation Act 1914 (WA)

Groundwater is a key component of the mining operation and will be used in various mining and processing facilities across the site, including potable water supply.

The Premises lies within the Eneabba Plains and the Twin Hills sub-areas of the Arrowsmith Groundwater Area. The licensed entitlements within these sub-areas are currently greater than 70% of the allocation limit, which reflects the high groundwater demand and associated competition for the available resources in the area.

Groundwater abstraction in gazetted areas is regulated by DWER under section 5C of the RIWI Act. Section 5C Licences to Take Water were issued in 2014 from the Yarragadee aquifer for the purpose of mineral ore processing, conservation purposes and mining camp purposes – 3.5 GL/yr from the Eneabba Plains sub-area and 2.0 GL/yr from the Twin Hills sub-area. In addition, a section 5C licence has been issued from the Eneabba Plains superficial aquifer (1.0 GL/yr) for the purpose of dewatering.

Due to the large volumes of high quality water to be abstracted from the two aquifers spread across two different groundwater areas in a region where GDEs and other users are present, the groundwater licences require a Groundwater Operating Strategy (GOS) to supplement licence conditions. The GOS for the project (Tronox, 2014) describes the water use and abstraction regime, the water sources being accessed and relevant outcomes which need to be achieved to manage impacts on the environment and other users. It includes a series of commitments, clearly defining the responsibilities for managing and monitoring the impacts of taking the water, and reporting requirements.

Key finding:

The Delegated Officer notes that as these water entitlements are yet to have been used, and are likely to remain unused until at least 2022, and given the high groundwater demand and competition for available resources in the area, these entitlements are being reviewed in accordance with DWER policy document *Management of unused licensed water entitlements (November 2003)*.

Radiation Safety Act 1975 (WA)

Deposits of mineral sands contain levels of naturally occurring radioactive materials (NORM). The radioactive constituents are mostly thorium with smaller amounts of uranium, and their respective decay products. Monazite is the most common radioactive mineral and typically constitutes less than 0.5% of the mined ore; however any operation in which radioactive containing material is extracted from the ground and processed can potentially concentrate NORM in product, by-product or waste streams.

The management of radiological risk (to human health and the environment) from NORM is undertaken jointly by DMIRS and the Radiological Council of WA (RCWA). Prior to the commencement of any stage of mining to which radiation regulations apply, the Works Approval Holder is required to obtain approval for a Radiation Management Plan (RMP) and a Radiation Waste Management Plan (RWMP) for the proposed activities at that stage. Both plans are reviewed by DMIRS and RCWA against defined requirements before the grant of approval to operate.

Works approval history

Instrument	Issued	Nature and extent of works approval or amendment
W5650/2014/1	15/08/2014	Works approval to authorise initial mine construction works.
W5650/2014/1	22/01/2015	Amendment to remove requirement for 'no visible dust to cross the Premises boundary'.
W5650/2014/1	06/08/2019	Amendment for extension of expiry date (this Application).

Clearing of Native Vegetation

Clearing of native vegetation in Western Australia requires a clearing permit, unless exemptions apply. Under Schedule 6 of the EP Act, clearing assessed under s.40 of the EP Act as part of a proposal referred under s.38 of the EP Act does not require a clearing permit, providing that clearing is done in accordance with the Implementation Agreement or Decision.

The EPA has assessed the clearing of native vegetation and wetlands within the mine disturbance envelope, which is documented within the PER. The authorised extent of clearing has been limited to 1,200 ha, as described and spatially defined in MS 953.

Modelling and monitoring data

Acid sulfate soils

An acid sulfate soils (ASS) risk assessment has been conducted in accordance with DWER guidelines (SWC, 2013). The results of screen testing and detailed laboratory analyses indicate that sulfidic sediments (potential ASS, PASS) are likely to occur in discrete locations at the contact between the Yarragadee and Yoganup formations, and confined to areas of black and dark grey soils, including within 2 m above and below these materials in the profile due to the presence of a halo of sulfides.

PASS material that is likely to be intersected and disturbed by mining is restricted to the southern end of the Zeus ore body, at a maximum of 10 m in depth. No directly or indirectly disturbed PASS material (i.e. exposed through groundwater drawdown) was identified in any of the other ore bodies.

Risk assessment

Risk Event						Consequence rating	Likelihood rating	Risk	Reasoning	Regulatory controls (Refer to conditions of the granted Works Approval)
Source/Activities		**Potential emissions**	**Potential receptors**	**Potential pathway**	**Receptor (impact)**					
Construction, mobilisation, positioning of infrastructure and other pre-production works	Civil excavation/ earthworks/ vehicle movements on unsealed roads Construction of processing plant, tailings storages, etc. Clearing of native vegetation, topsoil removal in starter pit area	Noise associated with construction works	Fauna and flora in proximity Users of Brand Hwy (5 km) Dongara town site (27 km)	Air / wind dispersion	Amenity impacts/ health impacts	Slight	Unlikely	Low	Some noise and dust is expected during construction works, however based on the separation to off-site receptors (<5 km), the Delegated Officer does not reasonably foresee off-site receptors being impacted.	None specified in WA.
		Dust associated with machinery and vehicle movements				Slight	Unlikely	Low		None specified in WA.
		Groundwater acidification associated with disturbance (oxidation) of ASS	Groundwater	Leaching from in situ ASS material	Groundwater contamination (acidification)	Minor	Rare	Low	Construction works will not extend below the natural water table (10 mbgl). The Delegated Officer therefore considers the risk of disturbing ASS from excavations to be Low.	None specified in WA.
	Pre-production mining and stockpiling	Noise associated with heavy vehicle movements	Fauna and flora in proximity Users of Brand Hwy (5 km) Dongara town site (27 km)	Air / wind dispersion	Amenity impacts/ health impacts	Slight	Unlikely	Low	Some noise and dust is expected during pre-production mining and stockpiling, however based on the separation to off-site receptors (>5 km), the Delegated Officer does not reasonably foresee off-site receptors being impacted.	None specified in WA.
		Dust associated with heavy vehicle movements				Slight	Unlikely	Low		None specified in WA.
		Dust lift-off from ore stockpile(s)				Slight	Unlikely	Low		None specified in WA.
Commissioning works and restricted operating period	Commissioning and time-limited operation of WCP and associated infrastructure	Noise associated with operation of fixed plant		Air / wind dispersion	Amenity impacts/ health impacts	Slight	Unlikely	Low	Some noise is expected during commissioning and the time-limited operational phase, however based on the separation to off-site receptors (>5 km), the Delegated Officer does not reasonably foresee off-site receptors being impacted.	None specified in WA.
	Stockpiling of HMC	Seepage of water entrained within HMC	Soil, groundwater	Through base of stockpile pad	Soil, groundwater contamination	Slight	Unlikely	Low	HMC will be stockpiled on an unsealed surface and allowed to drain to around 5% w/w. The wash water used on the HMC will be production water sourced from the Yarragadee aquifer, therefore any seepage will be of good quality. Surface water runoff from the HMC stockpile may lead to erosion and sedimentation of nearby wetlands. The HMC stockpile pad must be sloped and diversion drains in place in order to contain water runoff from the stockpile (for reuse in processing). In accordance with DWER's Guidance Statement: Risk Assessments (DER, 2017a), as the proposed controls lower the risk of water runoff causing impacts, it will be imposed on the Works Approval.	None specified in WA.
		Surface water runoff		Direct discharge		Minor	Unlikely	Medium		WA to specify infrastructure controls: - HMC stockpile surface water controls – diversion drain and sump.
		Dust lift-off from stockpile(s)	Fauna and flora in proximity Users of Brand Hwy (5 km) Dongara town site (27 km)	Air / wind dispersion	Amenity impacts/ health impacts	Slight	Unlikely	Low	Some dust lift-off is expected from stockpiles, however based on the separation to off-site receptors (>5 km), the Delegated Officer does not reasonably foresee off-site receptors being impacted.	None specified in WA.

Risk Event						Consequence rating	Likelihood rating	Risk	Reasoning	Regulatory controls (Refer to conditions of the granted Works Approval)
Source/Activities		Potential emissions	Potential receptors	Potential pathway	Receptor (impact)					
	Stockpiling of sand tailings on temporary unlined tailings storage area, prior to disposal to mine void	Seepage of water entrained in the sand tails to groundwater	Soil, groundwater	Through base of storage area	Soil, groundwater contamination	Minor	Rare	Low	Sand tailings (consisting principally of silica sand (83%) with other minor impurities) will have undergone physical separation only and therefore unlikely to contain contaminants that might otherwise be present in sand tailings that have undergone secondary processing (i.e. mostly clean sand). The Delegated Officer therefore considers the risk of groundwater contamination from the temporary stockpiling of sand tailings to be Low.	None specified in WA.
					Groundwater mounding	Moderate	Unlikely	Medium	Relatively high water losses are expected from seepage beneath the initial tailings storage area given the clean sandy nature of the soils. The Delegated Officer notes there has been significant emphasis on potential impacts from dewatering drawdown on groundwater dependent vegetation and wetlands west of the Zeus ore body, and that this aspect has been subject to rigorous assessment under Part IV and the RIWI Act. In order to offset drawdown impacts, aquifer re-injection using production water (and dewatering water where available) has been considered a key mitigation strategy for minimising the risk of impacts beyond a specified dewatering zone of impact. The Delegated Officer therefore considers the material risk of groundwater mounding to be Medium.	None specified in WA.
		Rupture of pipeline causing mine tailings discharge to land	Vegetation, including GDV and wetlands adjacent to pipeline alignment	Direct discharge	Soil and groundwater contamination	Minor	Possible	Medium	Ruptures of tailings pipelines may cause impacts to native vegetation through sedimentation or erosion. Flow meters and pressure gauges on pipelines should enable early detection of spills and leaks.	WA to specify: - pipelines must be constructed with automatic cut-outs/secondary containment/ pressure sensors.
	Disposal of clay slimes to solar drying dams (initial)	Seepage of water entrained in the clay slimes to groundwater	Soil, groundwater	Through base of solar drying ponds	Soil, groundwater contamination	Slight	Unlikely	Low	The percentage of clay slimes within the ore is expected to be minimal. Clay slimes will settle and consolidate, and effectively self-seal the ponds given the natural water retention properties (>40% clay content). Some seepage is expected, but is not considered to be significant. The Delegated Officer therefore considers the risk of groundwater contamination and mounding from clay slimes to be Low, providing they are disposed in the manner and location(s) as per the Application and the Mine Closure Plan for the site.	WA to specify: - construction requirements for solar drying ponds; - location of drying ponds for disposal.
					Groundwater mounding	Slight	Unlikely	Low		
		Rupture of pipeline causing mine tailings discharge to land	Vegetation, including GDV and wetlands adjacent to pipeline alignment	Direct discharge	Soil, groundwater contamination	Minor	Possible	Medium	Ruptures of tailings pipelines may cause impacts on native vegetation through sedimentation or erosion. Flow meters and pressure gauges on pipelines should enable early detection of spills and leaks.	WA to specify: - automatic cut-outs/secondary containment/ pressure sensors to be maintained on pipelines.
		Dust lift-off from solar drying ponds	Fauna and flora in proximity Users of Brand Hwy (5 km) Dongara town site (27 km)	Air / wind dispersion	Amenity impacts/ health impacts	Slight	Unlikely	Low	Solar drying ponds will be located adjacent to the WCP, where there is sufficient separation to off-site receptors (>5 km). Any dust lift-off is not expected to be significant, or impact on off-site receptors.	None specified in WA.

Risk Event						Consequence rating	Likelihood rating	Risk	Reasoning	Regulatory controls (Refer to conditions of the granted Works Approval)
Source/Activities		**Potential emissions**	**Potential receptors**	**Potential pathway**	**Receptor (impact)**					
		Overtopping/ breach of containment causing discharge to land	Vegetation, including GDV and wetlands Groundwater	Direct discharge	Soil, groundwater contamination	Minor	Unlikely	Medium	Providing solar drying ponds are appropriately constructed and maintained, the risk of overtopping and breach of containment is considered to be Low, i.e. would not occur in most circumstances. In accordance with DWER's Guidance Statement: Risk Assessments (DER, 2017a), as the proposed controls lower the risk of overtopping or breach of containment causing impacts, it will be imposed on the Works Approval.	WA to specify: - construction requirements for solar drying ponds; - must maintain operational freeboard whilst in use.
Pre-mining works	Clearing of vegetation, topsoil and overburden removal	Groundwater acidification associated with disturbance (oxidation) of ASS	Groundwater	Leaching from in situ ASS material	Groundwater contamination (acidification)	Minor	Rare	Low	Clearing activities and topsoil/overburden removal will not occur below the natural water table (10 mbgl). The Delegated Officer therefore considers the risk of disturbing ASS from clearing, topsoil and overburden removal to be Low.	None specified in Licence.
		Noise associated with heavy machinery movements	Fauna and flora in proximity Users of Brand Hwy (5 km) Dongara town site (27 km)	Air / wind dispersion	Amenity impacts/ health impacts	Slight	Unlikely	Low	Some noise and dust is expected during pre-mining works, however based on the separation to off-site receptors (>5 km), the Delegated Officer does not reasonably foresee off-site receptors being impacted.	None specified in Licence.
		Dust associated with heavy machinery movements				Slight	Unlikely	Low		None specified in Licence.
Category 8: Mineral sands mining or processing	Mining and processing of ore	Groundwater acidification associated with disturbance (oxidation) of ASS	Groundwater	Leaching from in situ ASS material	Groundwater contamination (acidification)	Moderate	Possible	Medium	PASS material is likely to be intersected and disturbed by mining at the southern end of the Zeus ore body (SWC, 2013). The Works Approval Holder has proposed controls for managing the risk of PASS disturbance either directly (by mining) and indirectly (by groundwater drawdown), which has been assessed by DWER as being adequate. In accordance with DWER's Guidance Statement: Risk Assessments (DER, 2017a), as the proposed controls lower the risk of impacts from PASS, they will be imposed on the Licence.	Licence to specify: - Must monitor dewatering water quality; - Dewatering water trigger values – to trigger management actions; - Field surveys of overburden; - Treatment of PASS in overburden and ore; - Groundwater monitoring of ASS parameters; - Setting of ASS triggers based on UTC
		Noise associated with mobile and fixed plant operation	Fauna and flora in proximity Users of Brand Hwy (5 km) Dongara town site (27 km)	Air / wind dispersion	Amenity impacts/ health impacts	Slight	Unlikely	Low	Some noise and dust is expected during mining and processing operations, however based on the separation to off-site receptors (>5 km), the Delegated Officer does not reasonably foresee off-site receptors being impacted.	None specified in Licence.
		Dust associated with mining fleet movements				Slight	Unlikely	Low		None specified in Licence.
		Dust lift-off from stockpiles				Slight	Unlikely	Low		None specified in Licence.
		Surface water runoff	Soil, groundwater	Direct discharge	Soil, groundwater contamination, sedimentation	Slight	Unlikely	Low	Due to the sandy nature of the soils, it is expected the majority of surface water will rapidly infiltrate from mining areas. The local area has relatively low average annual rainfall (~450 mm/yr).	None specified in Licence.
	Stockpiling of HMC	Seepage of water entrained within HMC		Through base of stockpile pad	Soil, groundwater contamination	Slight	Unlikely	Low	HMC will be stockpiled on an unsealed surface and allowed to drain to around 5% w/w. The wash water used on the HMC will be production water	None specified in Licence.

Risk Event						Consequence rating	Likelihood rating	Risk	Reasoning	Regulatory controls (Refer to conditions of the granted Works Approval)
Source/Activities		Potential emissions	Potential receptors	Potential pathway	Receptor (impact)					
		Contaminated stormwater runoff		Direct discharge		Minor	Unlikely	Medium	sourced from the Yarragadee aquifer, therefore any seepage will be of good quality. Surface water runoff from the HMC stockpile may lead to erosion and sedimentation of nearby wetlands. The HMC stockpile pad must be sloped and diversion drains in place in order to contain water runoff from the stockpile (for reuse in processing). In accordance with DWER's Guidance Statement: Risk Assessments (DER, 2017a), as the proposed controls lower the risk of water runoff causing impacts, it will be imposed on the Works Approval.	Licence to specify infrastructure controls: - HMC stockpile surface water controls – diversion drain and sump.
		Dust lift-off from stockpile(s)	Fauna and flora in proximity Users of Brand Hwy (5 km) Dongara town site (27 km)	Air / wind dispersion	Amenity impacts/ health impacts	Slight	Unlikely	Low	Some dust lift-off is expected from stockpiles, however based on the separation to off-site receptors (>5 km), the Delegated Officer does not reasonably foresee off-site receptors being impacted.	None specified in Licence.
	Disposal of sand tailings to mine void	Seepage of water entrained in the sand tails to groundwater	Soil, groundwater	Through base of storage area	Soil, groundwater contamination	Minor	Rare	Low	Sand tailings (consisting principally of silica sand (83%) with other minor impurities) will have undergone physical separation only and therefore unlikely to contain contaminants that might otherwise be present in sand tailings that have undergone secondary processing (i.e. mostly clean sand). The Delegated Officer therefore considers the risk of groundwater contamination from sand tailings to be Low, providing they are disposed in the manner and location(s) as per the Application and the Mine Closure Plan for the site.	Licence to specify: - location of sand tailings for disposal: - groundwater monitoring to detect
					Groundwater mounding	Moderate	Unlikely	Medium	Relatively high water losses are expected from seepage beneath the initial tailings storage area given the clean sandy nature of the soils. The Delegated Officer notes there has been significant emphasis on potential impacts from dewatering drawdown on groundwater dependent vegetation and wetlands west of the Zeus ore body, and that this aspect has been subject to rigorous assessment under Part IV and the RIWI Act. In order to offset drawdown impacts, aquifer re-injection using production water (and dewatering water where available) has been considered a key mitigation strategy for minimising the risk of impacts beyond a specified dewatering zone of impact. The Delegated Officer therefore considers the material risk of groundwater mounding to be Medium.	None specified in Licence.
		Rupture of pipeline causing mine tailings discharge to land	Vegetation, including GDV and wetlands adjacent to pipeline alignment	Direct discharge	Soil, groundwater contamination	Minor	Possible	Medium	Ruptures of tailings pipelines may cause impacts to native vegetation through sedimentation or erosion. Flow meters and pressure gauges on pipelines should enable early detection of spills and leaks.	Licence to specify: - automatic cut-outs/secondary containment/ pressure sensors to be maintained on pipelines.
	Drying of clay slimes	Seepage of water entrained in the clay slimes to	Soil, groundwater	Through base of solar drying ponds	Soil, groundwater contamination	Slight	Unlikely	Low	The percentage of clay slimes within the ore is expected to be minimal. Clay slimes will settle and consolidate, and effectively self-seal the ponds	Licence to specify: - ongoing construction requirements for solar drying ponds;

Risk Event						Consequence rating	Likelihood rating	Risk	Reasoning	Regulatory controls (Refer to conditions of the granted Works Approval)
Source/Activities		Potential emissions	Potential receptors	Potential pathway	Receptor (impact)					
		groundwater			Groundwater mounding	Slight	Unlikely	Low	given the natural water retention properties (>40% clay content). Some seepage is expected, but is not considered to be significant. The Delegated Officer therefore considers the risk of groundwater contamination and mounding from clay slimes to be Low, providing they are disposed in the manner and location(s) as per the Application and the Mine Closure Plan for the site.	- location of drying ponds for disposal.
		Rupture of pipeline causing mine tailings discharge to land	Vegetation, including GDV and wetlands adjacent to pipeline alignment	Direct discharge	Soil, groundwater contamination	Minor	Possible	Medium	Ruptures of tailings pipelines may cause impacts to native vegetation through sedimentation or erosion. Flow meters and pressure gauges on pipelines should enable early detection of spills and leaks.	Licence to specify: - automatic cut-outs/secondary containment/ pressure sensors to be maintained on pipelines.
		Dust lift-off from solar drying ponds	Fauna and flora in proximity Users of Brand Hwy (5 km) Dongara town site (27 km)	Air / wind dispersion	Amenity impacts/ health impacts	Slight	Unlikely	Low	Solar drying ponds will be located adjacent to the WCP, where there is sufficient separation to off-site receptors (>5 km). Any dust lift-off is not expected to be significant, or impact on off-site receptors.	None specified in Licence.
		Overtopping/ breach of containment causing discharge to land	Vegetation, including GDV and wetlands Groundwater	Direct discharge	Soil, groundwater contamination	Minor	Unlikely	Medium	Providing solar drying ponds are appropriately constructed and maintained, the risk of overtopping and breach of containment is considered to be Low, i.e. would not occur in most circumstances.	Licence to specify: - ongoing construction requirements for solar drying ponds; - must maintain operational freeboard whilst in use.
	Naturally Occurring Radioactive Materials (NORM)	Seepage to groundwater	Soil, groundwater	Lateral or vertical seepage through base of mine void		Moderate	Unlikely	Medium	Radiological risks regulated by DMIRS and RCWA.	N/A.
Other	Dewatering of the superficial aquifer	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Regulated under Part IV and the RIWI Act.	N/A.

Consultation

Submitter	Comment	DWER response
Department of Mines, Industry Regulation and Safety	The project has been approved under a mining proposal (Reg ID 48003) which does not have a time limit and can be commenced at any time. An updated approval would only be required if the activities proposed in the original mining proposal have changed. A revised mine closure plan submitted in 2017 has been registered by DMIRS and is currently being assessed.	Noted.
	Further information should be provided on TSFs including: tailings data sheets, schematic of TSF locations and disposal strategy that demonstrates the offset between operating and tailings disposal areas, description of in-pit TSF pit wall construction, details on the standards for in-pit construction (including plans and cross-sections) and a description of any impact to the groundwater system from mounding.	Noted. Further details on tailings strategy to be submitted under condition of WA, prior to construction of TSFs.
Department of Biodiversity, Conservation and Attractions	As the proposal has not changed since the original approval in 2014, DBCA has no further comments pursuant to its responsibilities under the *Biodiversity Conservation Act 2016* and *Conservation and Land Management Act 1984*.	Noted.
Department of Planning, Lands and Heritage	DPLH understands that based on the information provided as part of the PER process there are no reported Aboriginal sites or heritage places within the proposed area. Any Aboriginal heritage issues that may arise can be addressed through the provisions of the *Aboriginal Heritage Act 1972*.	Noted.
Shire of Irwin	No response received within timeframe provided.	N/A.

Conclusion

This assessment of the risks of activities on the premises has been undertaken with due consideration of a number of factors, including the documents and policies specified in this decision report (summarised in Appendix 2).

Based on this assessment, it has been determined that the Works Approval amendment will be granted subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

DWER notes that it may review the appropriateness and adequacy of controls at any time and that, following a review, DWER may initiate amendments to the approval under the EP Act.

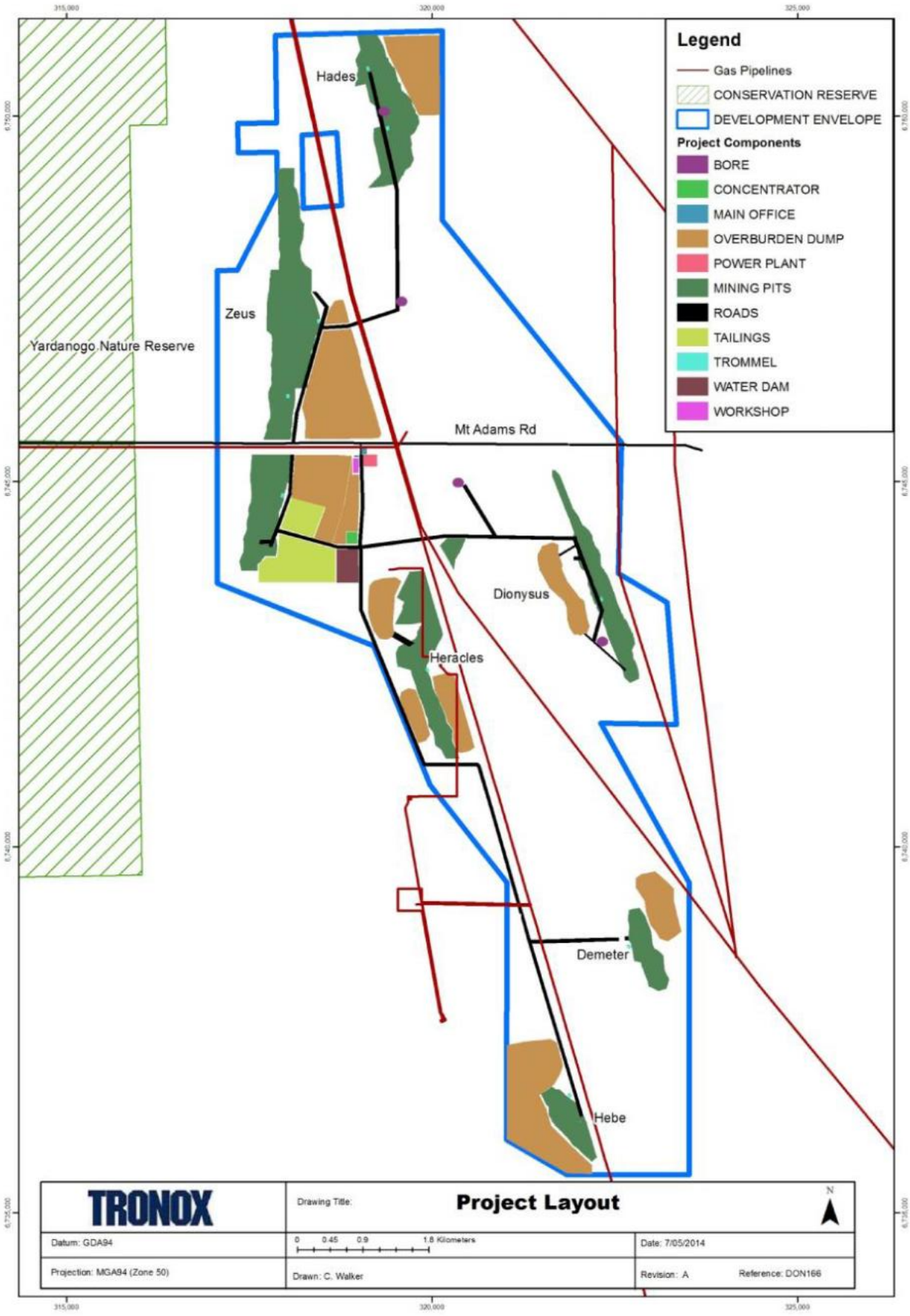
Tim Gentle

Digitally signed by Tim Gentle
Date: 2019.08.06 14:55:54 +08'00'

TIM GENTLE
MANAGER, RESOURCE INDUSTRIES
REGULATORY SERVICES

Delegated Officer
Under section 20 of the *Environmental Protection Act 1986*

Appendix 1: Proposed mine layout



Appendix 2: Key documents

Document title	In text ref	Availability
Tronox Management Pty Ltd – Dongara Titanium Minerals Project – Works Approval application and supporting information (December 2013)	Application	DWER records (A722361)
DER, July 2015. *Guidance Statement: Regulatory principles.* Department of Environment Regulation, Perth.	DER, 2015a	accessed at: www.der.wa.gov.au
DER, October 2015. *Guidance Statement: Setting Conditions.* Department of Environment Regulation, Perth.	DER, 2015b	
DER, February 2017. *Guidance Statement: Risk Assessments*. Department of Environment Regulation, Perth.	DER, 2017a	
DER, February 2017. *Guidance Statement: Decision Making*. Department of Environment Regulation, Perth.	DER, 2017b	
Tronox, August 2014. Water Resource Operating Strategy for groundwater abstraction at the Dongara Titanium Minerals Project (Rev 3).	GOS Tronox, 2014	DWER records (A1804525)
Hydrosearch, November 2011. Hydrogeological appraisal of the proposed titanium minerals project near Dongara, Western Australia. Report prepared for Tiwest Pty Ltd by Hydrosearch Pty Ltd.	Hydrosearch, 2011	DWER records (A1804529)
Ministerial Statement 953	MS 953	accessed at: www.epa.wa.gov.au
Report and recommendations of the Environmental Protection Authority – Dongara Titanium Minerals Project, Tronox Management Pty Ltd (June 2013)	EPA Report 1478	
Tronox Management Pty Ltd, May 2014. *Dongara Titanium Minerals Project – Mining Proposal for the dry and dredge mining and concentration of titanium minerals*.	Mining proposal	accessed at: minedexext.dmp.wa.gov.au
Strategen, April 2012. Dongara Titanium Minerals Project – Draft Mine Closure Plan. Prepared for Tiwest Pty Ltd by Strategen Environmental Consultants Pty Ltd.	Mine closure plan	
Soilwater, October 2013. Dongara Acid Sulphate Soil (ASS) Survey. Report prepared for Tronox Management Pty Ltd by Soilwater Consultants Pty Ltd.	SWC, 2013	DWER records (A1804528)
Strategen, May 2012. Dongara Titanium Minerals Project – Public Environmental Review. Prepared for Tiwest Pty Ltd by Strategen Environmental Consultants Pty Ltd.	PER	accessed at: www.epa.wa.gov.au
Works Approval W5650/2014/1 – Dongara Mineral Sands Project	W5650/2014/1	accessed at: www.der.wa.gov.au

Attachment 1: Amended Works Approval W5650/2014/1