Decision Report

Application for Works Approval

Division 3, Part V *Environmental Protection Act 1986*

Works Approval Number	W6301/2019/1
Applicant	Tronox Management Pty Ltd
ACN	009 343 364
File Number	DER2019/000467
Premises	Chandala Mineral Separation Plant Brand Highway MUCHEA WA 6501 Legal description – Lot M1261 on Diagram 5326
Date of Report	6 December 2019
Status of Report	Final

Overview of premises

Classification of premises

Tronox Management Pty Ltd (Tronox) operates a dry mill and synthetic rutile plant at its Chandala processing complex under licence L5939/1988/11. The premises has operated since 1989 near the township of Muchea, around 50 km north of Perth.

The dry mill processes heavy mineral concentrate (HMC), sourced from the company's mine site at Cooljarloo, into individual constituent minerals (ilmenite, rutile, leucoxene, staurolite and zircon) which are sold on local and international markets with the exception of ilmenite, which is converted into a more valuable high titanium dioxide product at the synthetic rutile plant, prior to further downstream processing at the company's pigment plant at Kwinana. Waste residue streams are treated on-site, prior to being returned to Cooljarloo for disposal in a discrete tailings storage facility.

Activities on the premises relate to the following prescribed premises categories:

Classification of Premises	Description	Premises design capacity
Category 8	Mineral sands mining or processing: premises on which mineral sands ore is mined, screened, separated or otherwise processed.	775,000 tonnes per annual period
Category 31	Chemical manufacturing: premises (other than premises within category 32) on which chemical products are manufactured by a chemical process.	275,000 tonnes per annual period
Category 87	Fuel burning: premises on which gaseous, liquid or solid fuel with a sulfur content of less than 0.25% is burnt in a boiler for the supply of steam or in power generation equipment.	35 gigajoules of natural gas per hour in aggregate

This application relates to the installation of additional coating removal facilities at the dry mill, which will allow for enhanced mechanical attritioning of HMC and chemical attritioning (caustic leaching) of ilmenite.

A works approval (W5609/2014/1) was previously granted in 2014 for the proposed modifications, however the works did not proceed prior to the approval expiring in June 2019. This application, which is to replace the expired works approval, was submitted by the applicant under Division 3 Part V of the EP Act on 28 August 2019 (the application).

Description of proposed activity

The primary purpose of the modification to the attritioning circuit at the dry mill is to enhance the processing and ultimate quality of HMC to be sourced from the proposed Dongara mine. It will also enable enhanced attritioning of zircon.

The current mechanical attritioning stage at the head of the dry mill is inadequate for the level of treatment (coating removal) required to remove the impurities from Dongara HMC. Higher energy attritioning is required and, in the case of ilmenite, caustic leaching, to improve the quality of the constituent minerals in addition to the reactivity of ilmenite in the synthetic rutile kiln.

The project comprises the following components:

- replacement of current attritioning units in the dry mill to better remove coatings from heavy mineral particles, improving beneficiation prior to separation (**mechanical attritioning**); and
- construction of a caustic leach circuit to remove coatings from ilmenite (following separation) and prior to synthetic rutile processing (**chemical attritioning**).

Mechanical attritioning

The dry mill currently contains two banks of four cell attritioners, which are closed cell hoppers with high energy agitators that use kinetic energy to remove residual surface coating from minerals. The minerals are attritioned as a water/mineral slurry.

The resultant fines wastes or slimes (fine silt and clays) are separated via cyclones prior to thickening and transfer to the waste management plant for filtering and pugging, prior to off-site transport and disposal.

The existing mechanical attritioning will not remove the coating present on minerals from the Dongara mine to a sufficient extent. As such, the circuit will be upgraded by:

- relocating one of the two existing attritioners within the dry mill to be used for attritioning zircon;
- installing two additional (larger) four cell attritioners; and
- installing waste filter units to dewater waste solids (clays) and recover water for re-use in the process.

The key components of the proposed mechanical attritioning upgrade will increase energy intensity and residence time in order to enhance coating removal on HMC and zircon circuits, manage additional clay fines that are generated, and improve water quality.

The upgraded circuit will not increase above current throughput (85 to 90 tph).

Chemical attritioning

A pressure caustic leach circuit is proposed to process ilmenite from the dry mill. Caustic leaching of ilmenite will improve its reactivity in the synthetic rutile kiln through the removal of impurities, such as ferro alumina silicate surface coatings and intrusions.

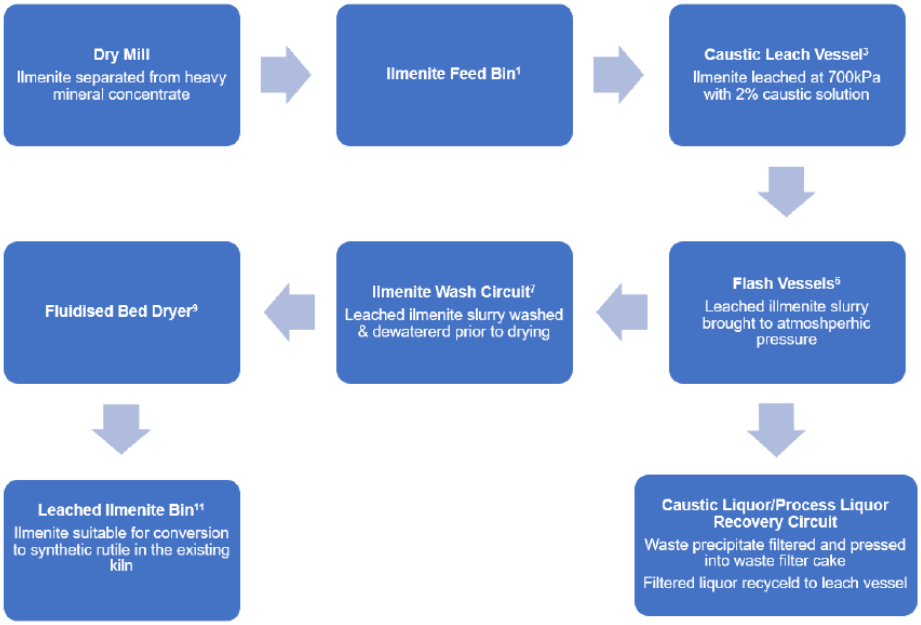
The process will involve slurrying the dried ilmenite from the dry mill in a caustic (2 – 5% NaOH) solution at higher than atmospheric temperature (up to 200 °C) and pressure (around 600 kPa) within sealed autoclaves.

The process liquor and mineral slurry will be heated via steam generated by an on-site natural gas-fired boiler. Excess steam, pressure and temperature will be flashed off, mainly within closed circuit, and the stream/condensate recovered to the process.

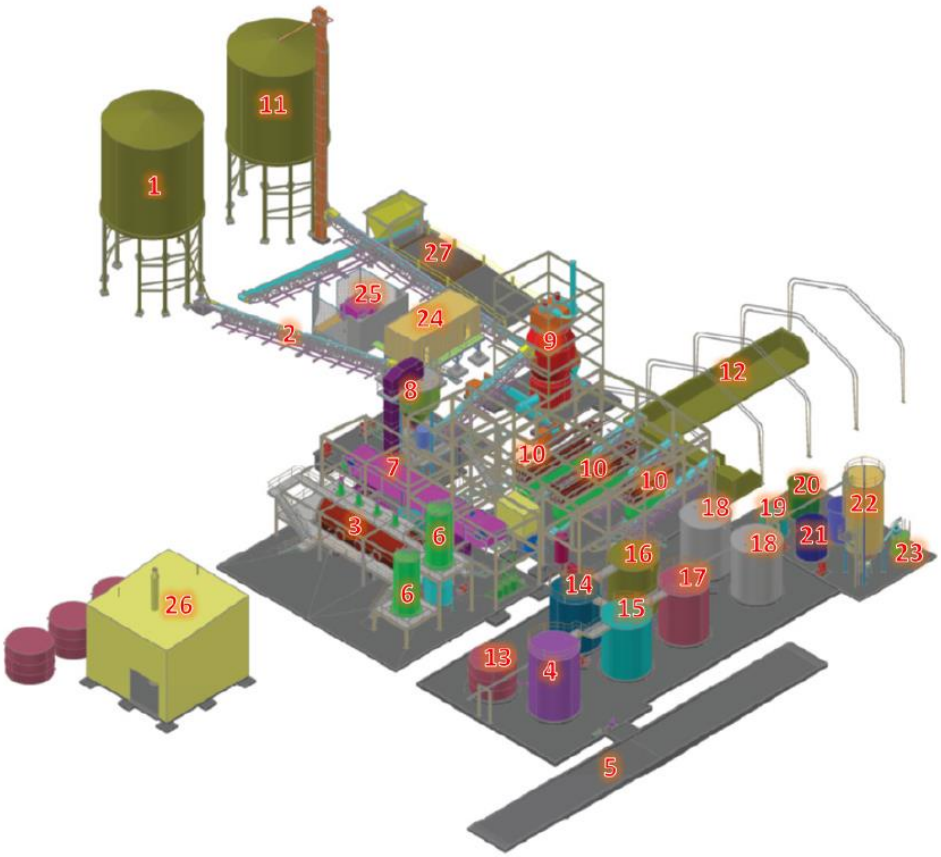
Treated (leached) ilmenite will be dried in a natural gas-fired fluidised bed dryer, prior to entering the synthetic rutile process, or being sold. The maximum design throughout is 60 t/hr, and expected operating throughput of 53.5 t/hr. A schematic of the caustic leach process flow is illustrated below.

Key equipment that will be added or modified for the caustic leaching process includes:

- leach vessel – ceramic tile-lined autoclave;
- dedicated process buildings (new), largely enclosed, fully bunded;
- two filters;
- natural gas-fired fluidised bed dryer, including integral baghouse for particulate control;
- filter belt (ilmenite washing and dewatering post-leaching);
- 100 m^3 NaOH storage tank;
- modification to piping and pumping, material transfer equipment (conveyors, hoppers, etc.); and
- natural gas-fired boiler.



▲ *Caustic leach process flow chart*



Key	Equipment
1	Existing Ilmenite Bin
2	Ilmenite Feed Conveyor
3	Caustic Leach Vessel
4	50% Caustic Storage Tank
5	Caustic Unloading Bund
6	Flash Vessels
7	Product Vacuum Belt Filter
8	Dryer Surge Bin
9	Fluid Bed Dryer
10	Waste Filter Presses
11	Leached Ilmenite Bin
12	Waste Filtercake Bunker
13	Process Water Tank
14	Classifier Overflow Tank
15	Process Liquor Recycle Tank
16	Caustic Filter Feed Tank
17	Caustic Liquor Recycle Tank
18	Proposed Future Use
19	Filter Filtrate Tank
20	Liquor Bleed Tank
21	Filter Press Feed Tank
22	Dry Lime Silo
23	Lime Mixing Tank
24	Switch Room
25	Transformer Compound
26	Boiler System
27	Ilmenite Re-Claim

▲ *Caustic leach plant – proposed arrangement*

Equipment	Description
Ilmenite feed (1)	• An existing ilmenite feed bin will feed the caustic leach plant • The existing discharge will be re-routed to feed onto the tail of a new 500 mm wide covered conveyor (2) feeding the caustic leach plant

Caustic leach vessel (3)	• The vessel will be 4.2 m in diameter and have an internal length of 11.25 m, to provide a contained slurry capacity of 113 m^3 when 70% full • The vessel will be constructed of mild steel, and lined with ceramic tiles for wear protection • The shell of the vessel will be 22.5 mm steel and designed for normal operating pressure of 700 kPa • Exterior of the vessel will be lagged with rock-wool insulation and sheet metal cladding
Flash vessels (6)	• The leach vessel discharges into two stages of flash vessels, where the pressure is reduced and the slurry is allowed to boil off steam • The first vessel reduces the slurry temperature to around 120 °C and operates at a pressure of around 190 kPa, whilst the second flash vessel allows the slurry to return to below boiling point and atmospheric pressure • Both vessels will be constructed of 15 mm mild steel and lined with ceramic tiles for wear protection • Each flash vessel will have a diameter of 2.6 m and be 6.5 m tall, with a contained volume of 34.5 m^3, of which around 17.2 m^3 would be filled with slurry under normal operating conditions
Wash classifier	• Proprietary 2.0 m diameter model from Weir-Linate
Vacuum belt filter (7)	• Belt filter will be 33 m^2, with allowance for three stages of counter-current washing • Includes vacuum belt assembly and ancillary equipment skid
Dryer surge bin (8)	• The vacuum belt product filter cake will discharge onto an elevating conveyor which transports the damp ilmenite to the dryer surge bin, which is similar to that already installed in the existing dry mill
Fluidised bed dryer (9)	• 3.65 m diameter unit fired by natural gas • Includes integral baghouse to return any fines to the process stream, and will be supplied as a packaged unit complete with burner system, fans, ducting, control system, motor starters and instrumentation • Gas consumption will be 327 MJ/t for throughput of 53.5 t/hr, and maximum of 343 MJ/t at anticipated design conditions (60 t/hr, 7.5 % moisture by weight and mineral feed temperature of 20 °C)
Bucket elevator	• Bucket elevator to take dried ilmenite to an existing storage bin (11) • Will be 30 m tall and designed for normal operation at maximum design throughput (60 t/hr) with buckets 70 % full
Conveyors	• Four conveyors to transfer ilmenite – all being 500 mm wide belts designed to operate at 1.0 m/s and fully covered • Three conveyors underneath the filter presses for transfer of filter press cake into bunkers – all being 750 mm wide belts designed to operate at 0.5 m/s
Tanks, hoppers and agitators	• Tanks and hoppers are sized according to process retention time requirements, with material selection varying depending on its contents • Tanks containing caustic solution and hoppers will be fabricated from carbon steel • Water tanks will be prefabricated fibre reinforced plastic • Caustic tanks will require stress relieving by post weld heat treatment to relieve residual tensile stresses and therefore eliminate caustic stress causing corrosion cracking • All tanks will be rubber lined • Agitators required for mixing to promote the caustic leaching process and to maintain suspension of solids

Pumps	• Weir Warman WBH style pumps, ranging in size from 75 to 100 WBH • Sized to handle general spillages, clean up, rainwater runoff and instances where vessels require emptying
Pressure filter press (10)	• Three plate pressure filters will be located in the caustic leach plant area – two for the caustic leach process waste and the third to filter dry mill waste
Boiler system (26)	• Natural gas-fired boiler system to provide around 12 t/hr of steam at 185 °C to the leach pressure vessel • Low NO_X type model WT 12000, with continuous rated capacity of 12,000 kW and maximum operating pressure of 1,000 kPa • Two drum 'D' type design, with all valves, fittings and controls to meet AS for unattended boilers

Water

The installation of filtering for residual clay fines will increase water recirculation within the dry mill and decrease overall losses. Currently, clay fines are dewatered using thickeners and pugging. The volume of water currently lost from the premises through fines disposal is around 26,000 kL/yr.

Mechanical attritioning will double the mass of clay fines from the dry mill. The adoption of mechanical filtering to dewater clay fines will result in a net decrease in water loss of almost 70% to approximately 8,000 kL/yr. This will be achieved by increasing the percentage of solids in clay fines removed from the premises from 25 to 75%.

The caustic leach circuit, however, will increase the site water demand by around 67,000 kL/yr. Any rainwater falling in the caustic leach plant area will be captured and reused, as all the plant areas are bunded and roadways drain into the plant area to prevent leakage of caustic fluids into the environment. The applicant has estimated this volume this may add up to 4,000 kL/yr and will displace bore water consumption.

Natural gas

A natural gas-fired boiler will be used to produce the steam required for the project, with the gas supplied via the Dampier to Bunbury Natural Gas Pipeline.

The maximum instantaneous consumption of natural gas for all additional equipment for the proposed caustic leach circuit is summarised below. To meet this demand, the gas supply line will need to be duplicated or otherwise upgraded.

Component	**Continuous usage (GJ/h)**
Caustic leach boiler	34.9
Caustic leach dryer	20.6

There will be an increase in natural gas use by around 35 GJ/hr above that expected for the fluidised bed dryer, giving a potential total of an additional 56 GJ/hr of natural gas to be used at the premises. Air emissions will contain nitrogen oxides (NO_X) and carbon monoxide (CO).

Reagents

The proposed caustic NaOH input is a 50% solution at around 1.1 t/hr. Around 100 m^3 of storage will be required in addition to the current 60 m^3 of storage at the synthetic rutile plant.

A packaged natural gas boiler system is required to provide around 12 t/hr of steam at 185 °C to the leach pressure vessel. Some steam may also be used for heating process liquor outside of the pressure vessel during a plant start-up from cold conditions.

Waste

Waste streams resulting from the mechanical attritioning process will be managed via existing

waste management procedures. The dry mill currently produces between 5 and 7 ktpa of clay fines (around 2% of the total mass of mineral residue produced at the premises). This residue is thickened and pugged, typically with activated carbon, prior to disposal. This proposal will increase the volume of clay fines from the dry mill to around 20 ktpa or around 6% of the total volume.

Clay fines will be dewatered via mechanical filtering. This will recover a significantly greater portion of contained water, reducing water losses, demand for pugging media and haulage volumes. Filtercake will be around 70% solids to facilitate transport and storage.

The proposal will not result in changes to the composition of the clay fines, which is predominantly alumina-silicates.

Waste streams resulting from the chemical attritioning process will be dealt with via existing waste management practices. Process residues will be precipitated from process liquors and then dewatering via mechanical filtering with waste solids temporarily stockpiled, pending off-site removal and disposal. Some flocculation and/or coagulation may be required. Waste solids will comprise alumina-silicates (solid precipitate or gels) and residual caustic soda (very high pH). Caustic soda will be recovered from the waste streams via filter belts and process water will be recovered via evaporation and vapour recovery. Lime kiln dust may be used as a filter aid.

Liquor may be bled to maintain caustic concentrations and to prevent liquor build-up in the circuit. Bleed will be utilised elsewhere in the circuit of the synthetic rutile plant or waste management plant, in the neutralisation of wastes from the acid leach circuit.

Construction and commissioning

Construction is scheduled to commence around February 2022, and is expected to take approximately 6 months to complete. Commissioning will occur directly following completion of construction, with full operation scheduled for late-2022.

Commissioning will involve running the fluidised bed dryer and the natural gas boiler at various capacities, including full capacity, to test whether the infrastructure meets design specifications and to rectify any issues. During commissioning, a diesel-fired boiler will be required temporarily until the natural gas-fired boiler is properly commissioned.

Infrastructure

Prescribed Activity Category 8	
Mechanical attritioning	
1	2 x new four cell attritioning circuits
2	Upgrades to water and slurry pumps and lines, electrical delivery and process control
3	Additional filter units for dewatering clay fines
Chemical attritioning	
1	Leach vessel – ceramic tile lined autoclave
2	Dedicated process buildings (new), enclosed and fully bunded
3	Two filters
4	Natural gas-fired fluidised bed dryer, including baghouse
5	Filter belt (ilmenite washing and dewatering)
6	NaOH storage tank (100 m^3 capacity)
7	Natural gas-fired boiler

Environmental siting

The premises is located on farmland to the north of Muchea, around 50 km north of Perth on the Swan Coastal Plain. The site has a total area of 314 ha and comprises the whole of Lot M1261 of Swan Location 1352, incorporating tenements associated with processing facilities, comprising 53 ha of the site, which are surrounded by artificially created wetlands. The site is bounded to the west by the Midland railway line and the Brand Highway, to the east by a closed public road, and to the north and south by agricultural land. The southern boundary is around 4 km from the township of Muchea.

The majority of the site has been previously cleared for agricultural purposes. The surrounding land use is predominantly cattle and sheep grazing, and rural lifestyle development. The nearest residential receptors are located about 2.5 km northwest and south of the plant site, and the Brand Highway and Midland railway line, being major infrastructure routes between the Mid West region and Perth, run adjacent along the western boundary of the site.

The Chandala Brook reserve is located about 3 km upstream of the premises, in addition to the Twin Swamps Nature Reserve, about 13 km downstream. No other specified ecosystems or areas of high conservation value have been identified in proximity that may be directly impacted from the proposed activities.

Surface water

The site is located on the upper reaches of the Ellen Brook surface water catchment. Natural drainage at the site is via the Chandala Brook which has its course through the western part of the area to the west of the plant site. Minor seasonal drain/creek flows occur from the eastern side of the site along a course which is generally to the southwest contributing to Chandala Brook downstream of Garbara Pool, which is a section of deeper water in the brook.

Chandala Brook is the major surface water body nearby and all the site lies within this brook's catchment. The brook flows southwards into Ellen Brook which eventually enters the Swan River, 22 km to the south of Muchea. The Chandala Brook flow is maintained by surface water runoff especially from more clayey terrain, by discharges from shallow aquifers by seepages which reach the brook often via agricultural drains and natural tributaries. There are also contributions from mound springs in the head waters of some of the western tributaries and some leakage upwards from confined aquifers.

The salinity of Chandala Brook waters varies between 300 and 16,000 mg/L TDS with the higher salinity due to the onset of winter rains and the associated flushing of salts from the catchment.

Groundwater

Beneath the premises the Superficial formation sediments overlie the Leederville Formation, and are sandy in nature with some silty complexes as depth increases. The water table at the site is shallow, commonly near ground level or within a few metres of the surface, and is often associated with strongly cemented sand.

Groundwater beneath the premises has been contaminated primarily from the current and historic process liquor ponds and other site practices. Contamination was first detected in 1994 and an extensive groundwater monitoring and containment recovery program (targeted abstraction) has been ongoing since this time. The property has been classified as 'Contaminated – remediation required' under the *Contaminated Sites Act 2003*.

Legislative context and other approvals

Relevant approvals

Legislation	Details
Part IV of the EP Act	The existing operation was originally assessed by the EPA and approved by the Minister for Environment in two parts:

	• Dry mill in accordance with Ministerial Statement (MS) 50, as amended by MS 67 of; and • Synthetic rutile plant in accordance with MS 59 of, superseded by MS 412 of 1996, and then by MS 958 of 2014 No approvals are required under MS 50 for this proposal
Part V of the EP Act	Operation of both the dry mill and synthetic rutile plant are regulated under Licence L5939/1988/11. An amendment to this licence will be required following construction of the works subject to this proposal
Mineral Sands (Cooljarloo) Mining and Processing Agreement Act 1988	Operations at the premises are subject to a State Agreement which is overseen by the Department of Jobs, Tourism, Science and Innovation (JTSI) on behalf of the Minister for State Development. The State Agreement terminates on 1 March 2020.
Mining Act 1978 (WA)	Approved Mining Proposal (Registration ID: 43639) for the Chandala Processing Facility Coating Removal Mining Proposal Amendment of G70/88, G70/89, G70/90, G70/165, G70/166, G70/167 and G70/168 approved in March 2014
Rights in Water and Irrigation Act 1914 (WA)	Licensed allocation 1,200,000 kL/yr from the Gnangara Groundwater Area, Perth – Superficial Swan aquifer via off-site borefield for plant water supply (GWL59054)
	Licensed allocation 263 ML/yr from the Gingin Groundwater Area, Perth – Superficial Swan aquifer, for the purpose of groundwater remediation and general use (GWL60344)
	Licensed allocation 10 ML/yr from the Gingin Groundwater Area, Perth – Leederville aquifer for general use and irrigation (GWL171790)
Contaminated Sites Act 2003 (WA)	Site registered as 'Contaminated – Remediation Required'

Part V of the EP Act

The overarching legislative framework of this assessment is the EP Act and EP Regulations.

The guidance statements which inform this assessment are listed in Appendix 1.

Works approval and licence history

Instrument	Issued	Nature and extent of works approval, licence or amendment
L5939/1988/10	18/09/2008	Licence renewal. Issued for 5 years
W4606/2009/1	31/12/2009	Works approval for activated carbon circuit upgrades
L5939/1988/11	03/10/2013	Licence renewal. Issued for 5 years
W5488/2013/1	16/01/2014	Works approval for graded sands project
W5563/2013/1	06/03/2014	Works approval for SR plant upgrade
W5609/2014/1	12/06/2014	Works approval for coatings removal project
L5939/1988/11	29/04/2016	Amendment by notice – expiry extended to 2038
W5563/2013/1	08/03/2018	Amendment Notice 1 – extend the expiry of works approval for SR plant upgrade to 2023
W6301/2019/1	06/12/2019	Replacement works approval for expired W5609 (this Works Approval)

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)**					
Category 8 ***Construction, mobilisation, positioning of infrastructure and other pre-processing works***	Installation of additional mechanical attritioning circuits, construction of caustic leach circuit and associated infrastructure	Noise and dust	Users of Brand Hwy Rural/residential dwellings located >2.5 km from plant site	Air / wind dispersion, causing amenity impacts/ health impacts	Minimal impacts to amenity on local scale **Slight**	Not likely to occur in most circumstances **Unlikely**	**Low** Acceptable, not subject to controls	Some additional noise and dust is expected during construction and installation works, however this is not considered to be significantly different from noise and dust levels during normal operations or maintenance outages at the premises.	None specified.
Category 8 ***Commissioning and time limited operations*** ***Full operation of upgraded attritioning circuits***	Operation of new circuits	Noise	Users of Brand Hwy Rural/residential dwellings located >2.5 km from plant site	Air / wind dispersion, causing amenity impacts/ health impacts	Mid level impact to amenity on local scale **Moderate**	Not likely to occur in most circumstances **Unlikely**	**Medium** Acceptable, subject to Licence Holder controls conditioned	Noise emissions are not expected to significantly differ from current noise levels during normal operations or maintenance outages at the premises.	None specified.
		Dust			Low level impact to amenity on local scale **Minor**	Not likely to occur in most circumstances **Unlikely**	**Medium** Acceptable, subject to Licence Holder controls conditioned	Operations will be conducted within an enclosed shed with sealed floors, where dust is not expected to be significant. Conveyors located external to process buildings have the potential to create dust issues, unless fully enclosed. In accordance with DWER's Guidance Statement: Risk Assessments (DER, 2017a), as this control lowers the risk of impacts, it will be imposed on the Works Approval.	Works Approval controls: - Requirement for all conveyors external to a building to be fully enclosed.
	Operation of caustic leach circuit – fluidised bed dryer	Particulate emissions	Users of Brand Hwy Rural/residential dwellings located >2.5 km from plant site	Air / wind dispersion, causing amenity impacts/ health impacts	Mid level impact to amenity on local scale **Moderate**	Not likely to occur in most circumstances **Unlikely**	**Medium** Acceptable, subject to Licence Holder controls conditioned	The fluidised bed dryer will comprise a baghouse filter to capture and return particulate emissions to the process. No information has been provided on the design performance of the baghouse, however the Delegated Officer expects a brand new, modern baghouse to be designed to meet current air emissions standards. Given the close proximity of the Brand Hwy and other residential receptors, an operational limit of 50 mg/m^3 will be applied to the works approval during the time limited operational phase and full production, in addition to periodic air emissions monitoring to validate the performance of the baghouse.	Works Approval controls: - Requirement to install baghouse on FBD; - Requirement to monitor PM emissions to validate performance during commissioning and time limited operations - Emissions limit of 50 mg/m^3 following commissioning Licence controls: - Requirement to maintain baghouse in good operational condition - Operating emissions limit of 50 mg/m^3 - Requirement to monitor particulate emissions during operations
		Contaminated surface water runoff	Soil, surface water Chandala Brook	Direct discharge, causing surface water contamination	Mid level on-site impacts, low level off-site impacts **Minor**	Could occur at some time **Possible**	**Medium** Acceptable, subject to regulatory controls conditioned	Contaminated stormwater will be contained on-site and recycled within the SR plant wet circuit.	Managed under existing licence conditions.
	Operation of natural gas fired boiler	NO_X and CO emissions	Users of Brand Hwy Rural/residential dwellings located >2.5 km from plant site	Air / wind dispersion, causing health impacts	Low level impact to amenity on local scale **Minor**	Not likely to occur in most circumstances **Unlikely**	**Medium** Acceptable, subject to regulatory controls conditioned	The proposed boiler system will be fired by natural gas with a low NO_X burner. Limited information has been provided on design performance of air emissions, however the Delegated Officer expects NO_X and CO emissions in the order of <20 mg/m^3. In accordance with DWER's Guidance Statement: Risk Assessments (DER, 2017a), as these controls lower the risk of impacts, they will be imposed on the Works Approval.	Works Approval controls: - Specify minimum design and construction requirements for the boiler - Installation, commissioning and operation in accordance with AS 2593-2004.

	Temporary storage of clay slimes in sealed bunker	Leakage of water and clay slimes from bunker	Groundwater, surface water	Direct discharge, causing contamination of surface and/or groundwater	Mid level on-site impacts, low level off-site impacts **Minor**	Not likely to occur in most circumstances **Unlikely**	**Medium** Acceptable, subject to regulatory controls conditioned	Clay fines will be managed in accordance with existing practices, i.e. thickened and pugged (with activated carbon), prior to dewatering via mechanical filtering and stockpiling in a sealed bunker for eventual off-site disposal. Therefore there is no change to the existing risk profile.	Managed under existing licence conditions.
	Temporary storage of process liquor waste filter cake in a sealed bunker	Leakage of water and filter cake from bunker	Groundwater, surface water	Direct discharge, causing contamination of surface and/or groundwater	Mid level on-site impacts, low level off-site impacts **Minor**	May occur in exceptional circumstances only **Rare**	**Medium** Acceptable, subject to regulatory controls conditioned	Wastes will be precipitated from the process liquors and dewatered via mechanical filtering, with waste solids stockpiled in a sealed bunker for eventual off-site disposal.	<u>Works Approval controls:</u> - Specify minimum design and construction requirements for bunker
	Storage of NaOH	Spills, leaks, containment failure	Soil, groundwater, vegetation adjacent to plant site Chandala Brook	Direct discharge, leading to contamination	High level on-site impacts **Major**	May occur in exceptional circumstances only **Rare**	**Medium** Acceptable, subject to Licence Holder controls conditioned	The NaOH storage tank will be wholly contained within a low permeability ($1x10^{-9}$ m/s) and chemically resistant compound designed to contain at least 110% of the largest storage vessel. The compound will be graded to a sump to enable recovery of spills and ensure bund capacity, and designed to capture jetting from the tank. In accordance with DWER's Guidance Statement: Risk Assessments (DER, 2017a), as these controls lower the risk of impacts, they will be imposed on the Works Approval.	<u>Works Approval controls:</u> - Specify minimum design and construction requirements for bunded containment

Consultation

The Application was publicly advertised on DWER's website in November 2019. No submissions were received within the specified timeframe.

The Applicant was provided with drafts of the Decision Report and Works Approval on 22 November 2019 and with the exception of clarifying a minor aspect, provided no further comments.

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 (listed in Appendix 1).

Based on this assessment, it has been determined that the replacement Works Approval 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

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Date: 2019.12.06 15:16:59 +08'00'

Tim Gentle
MANAGER, RESOURCE INDUSTRIES
REGULATORY SERVICES

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

Appendix 1: Key documents

Document title	In text ref	Availability
Tronox Management Pty Ltd – Coating Removal Project – Works Approval application – Chandala Processing Plant (Revision 1, October 2019)	Application	DWER records (A1819434)
Tronox, 19 September 2019. Application for a works approval under the Environmental Protection Act 1986 – Request for further information	RFI#1	DWER records (A1849049)
Tronox, 6 November 2019. Request for further information – Existing waste management procedures for slimes and process liquor solids	RFI#2	DWER records (A1849093)
Tronox, 8 November 2019. Request for further information – Solid & liquid waste management procedures for the proposed caustic leach circuit	RFI#3	DWER records (A1849053)
Strategen, October 2013. Chandala Processing Facility – Coating Removal Mining Proposal. Report prepared for Tronox Management Pty Ltd by Strategen Environmental Consultants	Mining Proposal	accessed at: minedexext.dmp.wa.gov.au
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	
Works Approval W5609/2014/1 – Chandala Coatings Removal Project	W5609/2014/1	
Licence L5939/1988/11 – Tronox Chandala Processing Plant	L5939/1988/11	
Ministerial Statement 50	MS 50	accessed at www.epa.wa.gov.au
Report and recommendations of the Environmental Protection Authority – Synthetic Rutile Plant Muchea, Cooljarloo Joint Venture Pty Ltd (January 1989)	EPA Bulletin 369	

Attachment 1: Works Approval W6301/2019/1