



Application for Works Approval

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

Works Approval Number W6499/2021/1

Applicant Covalent Lithium Pty Ltd

ACN 70 623 090 139

File Number DER2020/000568

Premises Covalent Lithium Hydroxide Refinery
15 Mason Road
KWINANA WA, 6966

Legal description

Lot 15 on Diagram 74883

As defined by the Premises map attached to the issued works approval

Date of Report 31/08/2021

Decision Works approval granted

Chris Malley
Manager, Process Industries

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

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1. Decision summary

This decision report documents the assessment of potential risks to the environment and public health from emissions and discharges during the construction, environmental commissioning, and time limited operations of the premises. As a result of this assessment, works approval W6499/2021/1 has been granted.

2. Scope of assessment

2.1 Regulatory framework

In completing the assessment documented in this decision report, the Department of Water and Environmental Regulation (DWER, the department) has considered and given due regard to its Regulatory Framework and relevant policy documents which are available at <https://dwer.wa.gov.au/regulatory-documents>.

2.2 Application summary

On 9 November 2020, Covalent Lithium Pty Ltd (the applicant) submitted an application for a works approval to the department under section 54 of the *Environmental Protection Act 1986* (EP Act).

The application is to undertake construction works relating to a two-processing train lithium hydroxide refinery (LHR) at 15 Mason Road Kwinana WA, Lot 15 on Diagram 74883 (the premises). The premise is approximately 2.3 km southeast of Medina residential area and located in the Kwinana Industrial Area.

The LHR will produce battery grade lithium hydroxide monohydrate (lithium hydroxide) and generate secondary refinery co-product outputs; sodium sulphate anhydrous (SSA), de-lithiated beta spodumene (DBS), polishing filter materials (PFM) and mixed salts material (MSM). While the applicant considers process generated wastes to be co-products, these materials are waste products.

The scope of assessment does not include disposal of process wastes within the premises. It is noted the applicant is exploring options for beneficial reuse of DBS, however, has proposed to send DBS, PFM and MSM back to the Mt Holland mine site for disposal. The delegated officer notes that the disposal of these wastes at the Mt Holland mine site is subject to other decision-making processes under Part IV and Part V of the EP Act.

The scope of this assessment for this decision report relates to risk of emissions and discharges during the construction, environmental commissioning, and operational phases of the LHR.

Descriptions of Category 31 and Category 44 prescribed premises as defined in Schedule 1 of the *Environmental Protection Regulations 1987* (EP Regulations) are presented in Table 1.

Table 1: Prescribed premises categories

Classification of premises	Description	Production capacity (as per application)
Category 31	Chemical manufacturing: premises (other than premises within category 32) on which chemical products are manufactured by a chemical process	50,276 dry tpa lithium hydroxide 116,531 dry tpa sodium sulphate
Category 44	Metal smelting or refining: premises on which metal ore, metal ore	382,860 dry tpa of spodumene ore concentrate

Classification of premises	Description	Production capacity (as per application)
	concentrate, or metal waste is smelted, fused, roasted, refined or processed.	

3. Overview of application / premises

3.1 Prescribed premises infrastructure

A list of key infrastructure and equipment as it relates to categories 31 and 44 is provided in Appendix 4. Ancillary infrastructure and equipment such as offices, staff amenities, workshops, carparks, and a laboratory are not within the scope of assessment.

The applicant proposed a sewage treatment facility with a production or design capacity less than 20 m³ per day which is less than the threshold for categories 85 or 54: The delegated officer therefore did not further consider the risk of emissions and discharges from the construction and operation of the small-scale sewage treatment facility.

3.2 Construction

The land parcel for the premises is classified under the *Contaminated Sites Act 2003* (CS Act) as 'contaminated – restricted use' because of historical land use activities. As per published records for the site available through the Contaminated Sites Database (www.dwer.wa.gov.au), there are restrictions and risks associated with groundwater abstraction (e.g. dewatering) and soil disturbance. The applicant has indicated it is possible, albeit unlikely that dewatering will occur as part of construction activities. Construction activities will also involve pile driving which based on the contamination status of the site, is likely to require careful management to limit the risk of existing contaminated groundwater beneath the premises spreading from the shallow unconfined aquifer to the deeper confined aquifer.

The applicant included a Construction Environmental Management Plan (CEMP), Surface Water Management Plan (SWMP) and a Dewatering Management Plan (DMP). The delegated officer has further considered proposed construction activities in the context of the contaminated sites classification in section 4.3.

The applicant proposes to construct all infrastructure within a single phase prior to any environmental commissioning. The equipment will be commissioned in an order that allows the operation to advance to the next logical sequential step. Key commissioning aspects include:

- effluent water quality confirmation;
- environmental performance testing for each individual stack system, and
- submission of compliance report, to affirm all specific requirements / conditions associated with the works approval.

A summary of the proposed commissioning plan is listed in Table 2.

Table 2: Applicant's expected sequential commissioning plan

Phase of Project	Proposed Timeline
Construction	2021
Pre-commissioning	2023
Commissioning	2024

Phase of Project	Proposed Timeline
Operation	2024-2025

3.3 Operational Aspects

The LHR will source spodumene concentrate ore from the Earl Grey Lithium Project (former Mt Holland mine site) at a rate of 2 million tonnes per annum (tpa). The Earl Grey Lithium Project is currently under construction, subject to various works approvals including W6460/2020/1 for construction of the concentrator.

The LHR will operate on a continuous 24 hour per day cycle with capacity to process approximately 382,860 dry tpa of spodumene ore concentrate to produce up to 50,276 dry tpa of lithium hydroxide. The approximate generation of secondary co-product outputs is as follows:

- 116,531 dry tpa SSA;
- 380,551 dry tpa DBS;
- 9,479 dry tpa MSM; and
- 4,394 dry tpa PFM.

Lithium hydroxide and SSA will be bagged and stored onsite while the PFM will be mixed in with the DBS. The mixed PFM/DBS and MSM will be placed into containers and once filled, transported for offsite disposal or reuse. back to Mt Holland mine in the short term (5 years) for storage.

The applicant has detailed 5 key stages in the processing of the spodumene ore refinery and they are described in Table 3 and a process flow diagram outlined in Figure 1.

Table 3: Spodumene ore refinery process from applicant

Stage	Spodumene ore refinery description
Spodumene handling, calcination and sulphation	Spodumene concentrate is received and temporarily stored in the spodumene feed handling area. Spodumene concentrate is transferred to the calcination area, where it is heated at high temperatures (above 900°C) in a rotary kiln. The spodumene is then cooled, milled, and mixed with sulphuric acid. The mixture is roasted in the rotary kiln to generate a sulphate intermediate product which is then cooled.
Leaching and impurity removal	The sulfated calcine is transferred to the leaching and impurity removal area and leached with a process liquor. The slurry is then neutralized and filtered.
Liquor purification and caustication	The filtrate is pumped into the purification area where it is passed through a filter to remove fine entrained particles that are discharged to co-product stockpile. The polished solution enters the solution caustication area where NaOH is added to convert the lithium sulphate to lithium hydroxide and generate sodium sulphate (Na ₂ SO ₄).
Sodium sulphate crystallisation	This area removes the Na ₂ SO ₄ using crystallizer and centrifuge unit operations. This process initially produces Glauber's salt (sodium sulphate decahydrate (Na ₂ SO ₄ .H ₂ O)). The Glauber's salt is further processed to anhydrous Na ₂ SO ₄ crystals. The anhydrous co-product is then bagged and stored before being transported for sale offsite.
Lithium hydroxide crystallisation	After the Glauber's salt crystallizer the rich solution of LiOH enters the lithium crystallization area, where the LiOH is crystallised. The LiOH crystals are dried, cooled, bagged and stored before transported for sale offsite.

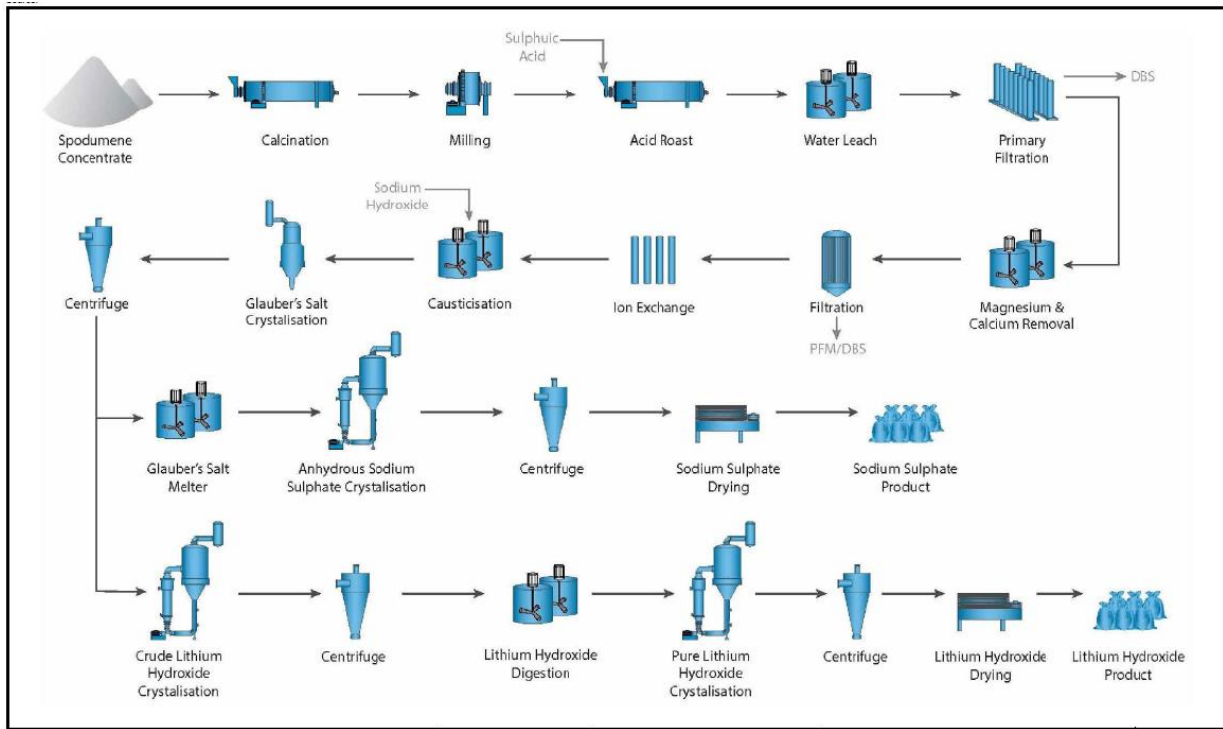


Figure 1: Covalent Lithium Hydroxide Refinery process flowsheet (spodumene to lithium hydroxide)

4. Legislative Context

4.1 Environmental Protection (Kwinana) (Atmospheric Wastes) Policy 1999

The premises is located within Area A of the *Environmental Protection (Kwinana) (Atmospheric Wastes) Policy Approval order 1999* (Kwinana EPP). Ambient air quality standards and limits for sulphur dioxide and total suspended particulates in the *Environmental Protection (Kwinana) (Atmospheric Wastes) Regulations 1992* (Kwinana EPP regulations) are therefore relevant to the assessment of air emissions from the proposed activities on site.

4.2 Part IV of the EP Act

4.2.1 EPA Assessment

The LHR proposal was referred to the Environmental Protection Authority (EPA) in September 2020. The EPA determined to assess the proposal at the level of assessed on referral information. The EPA approved a section 43A of the EP Act change to the proposal in April 2021.

In May 2021, the EPA published Report 1700 including its recommendation that the proposal may be implemented subject to conditions. Key environmental factors considered by EPA in its assessment were:

- greenhouse gas emissions; and
- terrestrial environmental quality – potential impacts to soil quality through the storage and/or disposal of waste materials and excavation of potentially contaminated soils during earthworks.

The applicant proposes to discharge treated wastewater to the Sepia Depression Ocean Outline Line (SDOOL) which is the subject to the requirements of Ministerial Statement No. 665 (MS665) held by the Water Corporation under Part IV of the EP Act .

The EPA noted that Water Corporation is prepared to receive the wastewater via an 'Effluent Services Agreement and did not further consider wastewater from the refinery in its assessment of key environmental factors. The delegated officer has further discussed the context of MS665 in section 4.2.3 below.

The following matters related to Part V of the EP Act were also noted by EPA in Report 1700:

- operation of the refinery will require a licence under Part V of the EP Act;
- a licence will regulate emissions to land, groundwater or surface water including onsite processing and storage and handling of waste;
- contaminated site disturbance risks associated with construction activities can be assessed and regulated through a works approval. In particular EPA noted a CEMP will be required by DWER;
- the disposal of the LHR co-product outputs at the Mt Holland mine can be managed and regulated as a category 5 (subject to separate Part V of the EP Act approvals) until secondary options for reuse are confirmed and approved.

4.2.2 Ministerial Statement 1170

The Minister for Environment granted MS 1170 on 15 July 2021, subject to conditions, allowing the proposal to be implemented. A published copy of MS 1170 is available at www.epa.wa.gov.au. In summary, the conditions on MS 1170 relate to the following.

- Greenhouse gas emission limits, Greenhouse Gas Management Plans and reporting for the life of the facility, direct disturbance of native vegetation, with a disturbance footprint granted up to 11.2 ha.
- Terrestrial environmental quality outcomes:
 - Ensuring there is no contamination of soil through the handling and transport of refinery process derived wastes and no disposal of such waste to landfill on the Swan Coastal Plain, and
 - An Environmental Management Plan to substantiate the outcomes of terrestrial environmental quality outcome requirements.
- Waste Management:
 - Remove refinery process derived waste to Mt Holland Mine or an alternative approved reuse site within 12 months of production or ensure that storage does not exceed infrastructure storage capacity.

It is noted the limitations and extent of MS 1170 includes direct disturbance of up to 11.2 ha of native vegetation and disposal of up to 252 megalitres of wastewater to Cape Peron via SDOOL.

4.2.3 Ministerial Statement 665 (SDOOL)

The applicant proposes to discharge treated wastewater to ocean via SDOOL which is the subject of requirements in MS 665 held by Water Corporation under Part IV of the EP Act. The extent of the authorised proposal in MS 1170 includes discharge of up to 252 megalitres via SDOOL and the authorisation to discharge is subject to the applicant reaching an Effluent Services Agreement with Water Corporation. To fulfil its obligations for specific licensed premises that discharge to SDOOL under MS 665, the works approval and any future licence is likely to include requirements for the monitoring of volume and treated wastewater discharge quality.

4.3 Contaminated Sites Act 2003

The proposed LHR is to be constructed on a vacant brownfield site in the Kwinana Industrial Area. As noted in section 3.2, the land parcel for the premises is classified under the *Contaminated Sites Act 2003* (CS Act) as 'contaminated – restricted use' because of historical land use activities. A more detailed summary for the classification of the site is published on the department's website at www.dwer.wa.gov.au via the Contaminated Sites Database.

The delegated officer understands that the chemical constituents of potential concern (CCoPC) are chlorinated phenols and the herbicides 2,4-D and 2,4,5-T which historically leached or discharged into groundwater at a nearby former agricultural chemical production plant. The site is immediately underlain by the Safety Bay Sand aquifer, which consists of a sequence of silty sands that contain shell fragments. This aquifer is approximately 15m thick and is separated from the underlying Tamala Limestone aquifer by a (10-20cm thick) clayey aquitard that is not spatially continuous. Locally, gaps in the aquitard have allowed groundwater contamination from some sites to migrate from the Safety Bay Sand aquifer into the deeper confined limestone aquifer.

The applicant has proposed construction methods that include extensive use of driven piles and indicated that groundwater dewatering may be required, albeit unlikely. There is a risk that chlorinated phenols could be released in vapour form from dewatering effluent at levels of potential health concern for workers on the site and adjacent industrial sites, and the disposal of dewatering effluent would likely be problematic. Dewatering from the Safety Bay Sand aquifer may also result in the drawing of CCoPC within groundwater onto the LHR premises through the creation of a cone of depression around the dewatering area. Additional potential risks exist from piling activities which may result in the creation of a preferential pathway for contaminants from the Safety Bay Sand aquifer into the deeper confined limestone aquifer.

Furthermore, the proposed site is located adjacent to the BP refinery site, where shallow groundwater over a large area has been contaminated by petroleum hydrocarbons. Consequently, there is also a risk that pumping from the Safety Bay Sand aquifer on the LHR site could draw in contaminated groundwater from the BP site. Elevated concentrations of arsenic have also been found in shallow groundwater beneath the LHR site and it is also possible that high concentrations of ammonium sulfate from a fertiliser manufacturing facility are present in the Tamala Limestone aquifer beneath or near the LHR.

4.4 Planning Approval

The application for works approval was referred to the City of Kwinana as a direct interest stakeholder as outlined in section 7.3.

The Joint Development Assessment Panel (DAP) Application DA9534 was considered by the Metro Outer Joint DAP at its meeting on 10 September 2020 where it resolved to approve the application. DWER was provided with a copy of the DAP Determination Notice dated 21 September 2020 (DWERDT422216). It is noted that advice note 'xii' refers the applicant to comply with the Golder and Associates 2012 Management Plan.

The City further advised that the submission of a Construction Noise Plan and the provision of the wastewater treatment unit on site will be addressed by the proponent prior to the submission of a building permit.

5. Noise impact assessment

The applicant undertook a Noise Impact Assessment (NIA) of potential noise and vibration impacts for both construction and operation stages using a point source formula desktop assessment (construction) and acoustic modelling (operation) using Computer-Aided Noise Abatement (CadnaA) which is based on the CONCAWE algorithm. The nearest noise sensitive premises were identified as the residences in Medina approximately 2.87 to 3.12 kilometres

away from the centre of the proposed project. The proposed site is surrounded by established industrial premises, the nearest is 20 metres from the western and southern boundaries.

5.1.1 Construction

The proposed construction activities expected to be undertaken include building construction, equipment fabrication and installation, waste removal and materials transfer. The NIA indicated that noise levels will meet the *Environmental Protection (Noise) Regulations 1997* (Noise Regulations) at the closest sensitive receiver. The applicant proposed several noise mitigations measures. This includes construction activities occurring within the hours of 7:00 am to 7:00 pm Monday to Saturday, using the quietest equipment reasonably available and construction carried out in accordance with environmental noise practices set out in Section 6 of Australian Standards (AS) 2436-2010.

5.1.2 Operation

Primary noise sources from the operation of the lithium refinery are cooling towers, boilers, pumps, kiln burner, ball mill drive, compressors, blowers, heavy vehicles, kiln, cooler and roaster drive motors.

The applicant's modelling concluded that predicted noise levels for the LHR during worst-case meteorological conditions for residential receptors (Medina) have a LA₁₀ day noise level of 25 dBA and LA₁₀ night noise level of 25 dBA which are significantly below the assigned noise criteria levels in the Noise Regulations for both day and night. The worst-case meteorological conditions for the industrial plant boundary, was highest in the western boundary with an assigned LA₁₀ day noise level of 69dBA and LA₁₀ night noise level of 69dBA, that are compliant with the Noise Regulations.

Cumulative impacts have also been considered in the Noise Impact Assessment. Noise modelling predicted worst case meteorological conditions for the closest residential receptor of Medina. A night LA₁₀ noise level of 26 dBA was predicted that is well within the nighttime assigned noise criterion of 30 dBA in the Noise Regulations.

5.1.3 DWER findings

The delegated officer accepted that the construction and operational noise assessments were reasonable. The operational phase noise modelling was found to be technically reasonable in terms of referenced criteria, inputs, methodologies, and scenarios.

The conclusions that cumulative operational noise emissions will comply with the Noise Regulations and noise emissions are not expected to impact on the nearest sensitive receptors or industrial neighbours appeared reasonable, noting the noise controls proposed by the Applicant.

6. Applicant air quality impact assessment

6.1 Air Quality modelling

The applicant's initial air quality assessment (AQA), including dispersion modelling was reviewed by DWER and subsequently revised by the applicant to address a number of issues. The department's review of the revised AQA found that it had been updated using a more suitable set of models. The choice of models (WRF-CALMET/CALPUFF) was found to be appropriate and the model settings were deemed to be appropriate too.

Emissions from the LHR consist of products of combustion from burning natural gas: nitrogen dioxide (NO₂), sulphur dioxide (SO₂) and carbon monoxide (CO). Particulate matter (as PM₁₀) is produced from the calcining of spodumene. The key emission sources during operation are listed below:

- Calciner stacks from trains 1 and 2;
- Ball mill stacks from trains 1 and 2;
- Acid roaster stacks from trains 1 and 2;
- Steam boiler stack;
- Sodium sulphate stack; and
- Spodumene transport, delivery and storage.

Emissions from the LHR under normal operating conditions (24hours a day / 7 days a week) formed the basis of the modelling. Abnormal operating conditions consisting of startup, shut down and equipment failure were not expected to significantly increase emissions due to the plant design and emission control contingency measures, and were therefore not modelled. The delegated officer notes that this approach is consistent with the assessment of other lithium hydroxide refineries with a similar process and agrees with this approach.

Three modelling result “scenarios” were included within the assessment:

- scenario 1 – modelling of emissions from the refinery in isolation;
- scenario 2 – modelling of the cumulative impact of the refinery with other approved (but not yet operating) projects, and
- scenario 3 – modelling of emissions from scenario 2 plus existing background levels.

The modelling results were assessed against the relevant standards for the Kwinana EPP area A, Kwinana EPP area B, Kwinana EPP Area C (boundary of Area B/C), Medina (2km south-east) and Beeliar Regional Park (3km north).

6.1.2 Predicted emission rates

The applicant provided in the AQA a table with predicted emission rates of the emission sources for SO₂, NO_x, CO and PM. The delegated officer reviewed the applicant’s modelled emission rates and noted inconsistencies with the provided information. The delegated officer was unable to verify the emission rates and calculate the same emission rates from the raw data. The delegated officer recalculated these based upon the provided information which is shown in Table 4 below.

Table 4: Applicant modelled emission rates and delegated officer recalculated emission rates

Emission source	Applicant’s modelled emission rates				Delegated Officer’s calculated emission rates			
	g/s				g/s			
	SO ₂	NO ₂	CO	PM	SO ₂	NO ₂	CO	PM
Calciner train 1	0.6	2.3	1.2	0.2	0.59	3.21	1.13	0.23
Ball mill 1				0.09				0.08
Acid Roast 1	0.01	0.3	0.4		0.01	0.4	0.41	0.09
Calciner 2	0.6	2.3	1.2	0.2	0.59	3.21	1.13	0.23
Ball mill 2				0.09				0.08
Acid Roast 2	0.01	0.3	0.4		0.01	0.4	0.41	0.09
Boiler		0.7	0.4			0.7	0.39	
Sodium		0.6	0.5	0.03		0.08	0.42	0.02

Emission source	Applicant's modelled emission rates				Delegated Officer's calculated emission rates			
	g/s				g/s			
	SO ₂	NO ₂	CO	PM	SO ₂	NO ₂	CO	PM
Sulphate dryer								
Total g/s	1.22	6.5	4.1	0.61	1.2	7.92	3.89	0.82
Delegated Officer's % of Applicant's rates					98.36%	121.85%	94.88%	134.43%

Note: The delegated officer recalculated the emission rates based upon the provided information. (Calculation: Volumetric flow rate (Nm³/h) x emission concentration (mg/Nm³ (dry))/3600/1000).

Note 2: based upon the pollution control equipment on the Acid Roasters and comparing to similar industries the delegated officer believes that 30mg/m³ for PM should be included in the modelling for the two Acid Roaster stacks. The delegated officer believes that it is unlikely that 0 mg/m³ of PM emissions will be emitted from these stacks.

6.1.3 Ambient air quality guideline values

The delegated officer considered the modeling results against the ambient air quality guideline values (AGVs) as per the department's Draft *Guideline: Air Emissions*. The delegated officer notes that since the publication of this draft guideline, the National Environmental Protection (Ambient Air Quality) Measure (NEPM Air) has been amended and therefore the latest AGVs from the NEPM Air will be used (see Table 5)

Table 5: AGV's criteria for modelling assessment

Pollutant	Averaging period	Conc. Statistic	Assessment criteria µg/m ³	Source of the standard
NO ₂	1-hr	maximum	151	NEPM Air
	annual	average	28	NEPM Air
SO ₂	1-hr	maximum	700	Kwinana EPP standard
	24-hr	maximum	200	Kwinana EPP standard
	annual	average	60	Kwinana EPP standard
CO	8-hr	maximum	10,310	NEPM Air
PM ₁₀	24-hr	maximum	50	NEPM Air
	annual	average	25	NEPM Air
PM _{2.5}	24-hr	maximum	25	NEPM Air
	annual	average	8	NEPM Air

Note: for SO₂ the Environmental Protection (Kwinana) (Atmospheric Wastes) Regulations 1992 standard was used.

Note 2: NO₂ and CO standard deviated slightly from the standard used by the applicant. The delegated officer has decided to use these lower standards for the assessment of air emissions as they represent ambient temperature (25 Degrees C).

Note 3: ppm to mg/m³ converted at 25 Degrees C.

6.2 Summary of modelling results

Table 6 outlines the predicted ground level concentrations for the Kwinana EPP Area A (as Maximum result within the modelling domain, industrial receptor) and Area C (representing maximum result at potential residential receptor). The delegated officer used the provided ground level concentration results from the modelling and adjusted these based upon the % under 6.2.

Table 6: Summary of predicted ground level concentrations for Kwinana EPP Area A (closest receptor).

Pollutant	Averaging period	Conc. Statistic	Area A % of standard			Area C % of standard		
			SC1	SC2	SC3	SC1	SC2	SC3
NO ₂	1-hr	maximum	52.08%	95.64%	125.49%	28.13%	50.04%	79.89%
	annual	average	9.75%	16.28%	59.79%	0.26%	0.61%	44.13%
SO ₂	1-hr	maximum	5.69%	21.87%	29.46%	2.56%	11.35%	18.94%
	24-hr	maximum	3.22%	4.39%	8.82%	0.50%	3.37%	7.80%
	annual	average	1.44%	2.21%	12.05%	0.05%	0.31%	10.15%
CO	8-hr	maximum	0.40%	0.40%	6.15%	0.10%	0.12%	5.88%
PM ₁₀	24-hr	maximum	14.95%	15.78%	74.93%	1.42%	3.63%	62.78%
	annual	average	6.18%	7.31%	104.10%	0.11%	0.38%	97.16%
PM _{2.5}	24-hr	maximum	29.90%	31.56%	88.02%	2.85%	7.26%	63.72%
	annual	average	19.32%	22.85%	174.08%	0.34%	1.18%	152.41%

6.3 DWER findings

The results of the modelling as assessed against the AGV's indicates that the potential impact of the emissions from the LHR are predicted to be acceptable for most pollutants and scenarios.

The modelled impact of NO_x emissions within Area A, which is a heavy industrial area, is exceeding the NEPM standard. However, the NEPM standard is a standard for residential areas and when considering the occupational standard for NO₂ in the National Institute for Occupational Safety and Health¹ (Recommended Exposure Limit of 1ppm, 1882 µg/m³) the result is only 10.07% of that standard. While acceptable, an appropriate regulatory approach is likely to include monitoring and a NO_x limit.

The modelled cumulative impact of PM₁₀ and PM_{2.5} exceeds the NEPM standard for these pollutants. The delegated officer is aware that the background levels used for PM₁₀ and PM_{2.5} have been influenced by bushfires and prescribed burns. The additional contribution of the LHR is considered low and as such acceptable with an appropriate regulatory approach likely including monitoring and a particulate matter limit.

¹ <https://www.cdc.gov/niosh/npg/npgd0454.html>

7. Risk assessment

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

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

7.1 Source-pathways and receptors

7.1.1 Emissions and controls

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

Table 7: Proposed applicant controls

Emission	Sources	Potential pathways	Proposed controls
Construction			
Dust	Civil earthworks, wind erosion from disturbed soil surfaces, vehicle movements and infrastructure construction	Air/windborne pathway	<p>Vehicle movements restricted to 25 km/hr on any unsealed roads.</p> <p>Use defined haul route for mobile equipment on unsealed roads.</p> <p>Water spray truck used to limit dust under dust generating weather conditions (i.e. strong winds or visible dust observed).</p> <p>Daily monitoring to determine requirements for additional dust suppression measures.</p> <p>Top stripping activities restricted during high wind days and water (cease operations).</p> <p>Record, investigate and respond to any complaints.</p> <p>Construction waste collected in covered skip bins and transported to licensed landfill facility.</p> <p>Apply environmental management measures and controls to minimise impact under the Golder and Associates (2012) Construction and Operational Environmental Management Plan.</p> <p>When clearing, all soil stockpiles will have surfactant and hydro-mulch applications.</p>
Noise	Civil excavation / earthworks, building construction, equipment fabrication / installation, waste removal and construction materials transfer	Air/windborne pathway	<p>Work carried out between 7:00am to 5:30 pm (daylight) on any day which is not a Sunday or public holiday.</p> <p>Plant and machinery serviced as per manufactures specifications.</p> <p>Maximum sound power levels are specified for contractor equipment.</p> <p>Complaints relating to noise will be recorded and investigated.</p> <p>Construction carried out to section 6 Australian Standards 2436-2010 (AS2436) Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites.</p>
Contamination of soil, groundwater, and surface water bodies	Civil earthworks and disturbance of contaminated soils and groundwater	Seepage to soil and groundwater and contaminated stormwater runoff. Perforation of	<p>No movement of vehicles on contaminated sites.</p> <p>Avoid ground disturbance at locations and depths where soil contamination is known.</p> <p>Avoid ground disturbance below the water table.</p> <p>When clearing in contaminated areas, the subsurface greater than 0.1 meters is not disturbed.</p> <p>If contamination of soil or groundwater occurs the following will occur:</p>

Emission	Sources	Potential pathways	Proposed controls
		groundwater aquitard creating cross contamination between aquifers.	<ul style="list-style-type: none"> •exclusion zone demarcated; •soil is stockpiled and characterised for land fill disposal, and •implement dewatering management plan. <p>Spills will be contained and cleaned up immediately using spill kits and disposed according to MSDS guidelines.</p> <p>Bulk hydrocarbons stored in a secondary containment meeting Australian Standards 1940:2017 (AS1940)</p> <p>Spill kits located close to refueling areas, workshops, and storage areas.</p> <p>Contaminated hydrocarbons soil will be collected and disposed to an appropriate licenced waste facility.</p> <p>Large spills reported to DWER of potential contamination.</p> <p>Mobile equipment will be operated and serviced according to manufacturer's specifications.</p> <p>Servicing and refueling of mobile equipment will occur at designated servicing and refueling facilities.</p> <p>Temporary bunds and sumps will be created to reduce sediment transport from newly cleared areas.</p> <p>Installation of temporary cut off drains, silt fences or sediment traps located at stormwater drains when clearing activities occur.</p> <p>Extensive use of piling to minimise need for large footings spread.</p> <p>Earthworks and excavation limited to above ground water table.</p> <p>Building up above natural surface level with clean fill for refinery buildings and infrastructure.</p> <p>Services placed down in contaminated area are laid down at natural surface level.</p> <p>Offsite precast of footings and other civil structures will be used to reduce time of exposed soil in an open excavation.</p> <p>Stormwater swales are designed to be shallow and large to prevent extraction below groundwater level.</p> <p>Eight monitoring bores on site for bi-annual monitoring of water table. Bores monitored weekly (level and odour) and monthly (pH, dissolved oxygen, temperature, electrical conductivity and redox state, if dewatering actives occur.</p> <p>Eight groundwater bores on site for bi-annual monitoring of water table, Bores monitor PFOS, PTHxS, copper, pH and chloride.</p> <p>Any soil required to be moved from site will undergo waste characterisation prior to removal and disposed of at appropriate facility.</p> <p>Groundwater dewatering techniques provided should it be required are as follows:</p> <ul style="list-style-type: none"> • sheet piling which creates cut off drains;

Emission	Sources	Potential pathways	Proposed controls
			<ul style="list-style-type: none"> • injection grouting techniques, and • temporary storage of water from dewatering <p>Dewatering effluent disposal options should it be required are as follows:</p> <ul style="list-style-type: none"> • re-infiltration over trenched at excavation; • re-infiltrating within filtration basin • discharge to stormwater; • discharge to sewer network, and • removal from site to appropriate facility. <p>Dewatering effluent water quality monitoring including daily volume, rate, pH and conductivity. Laboratory analysis of metals, nutrients, solids, electrical conductivity.</p> <p>Supervisory civil construction personnel inspect excavations assessing groundwater and compliance.</p> <p>Apply environmental management measures and controls to minimise impact under the Golder and Associates (2012) Construction and Operational Environmental Management Plan.</p> <p>Pile driving will use the technique of dropping weight (impact hammer) driving.</p>
Operation (including time limited operations and commissioning)			
Dust	<p>Transport of material within premises</p> <p>Receipt and storage and handling of spodumene feed material</p> <p>Processing and refining materials including transfer through the process (operation and processing of</p>	Air/windborne pathway	<p>Water carts to wet down dust generating surfaces i.e. roads, earthworks, cleared areas on days with dust generating weather conditions.</p> <p>Daily visual inspections of open and activity areas.</p> <p>Daily monitoring of weather conditions and management actions for days of strong winds.</p> <p>Restriction of vehicle movements and speed (25 km/hr) on unsealed roads.</p> <p>Record, investigate and respond to any complaints.</p> <p>Water sprays operated around the ore crushing and screening plant.</p> <p>Water sprays/hoods used around transfer points on conveyor belts, chutes, and stackers</p> <p>Use defined haul route for mobile equipment.</p> <p>Spodumene ore concentrate kept at sufficient level above extinction limit.</p> <p>Spodumene concentrate and DBS kept damp and stored and handled within enclosed building with roof, walls and concrete</p>

Emission	Sources	Potential pathways	Proposed controls
	<p>ore concentrate)</p> <p>Lithium hydroxide bagging, handling and storage</p> <p>Storage and handling of byproducts and wastes</p> <p>Transport of material within premises</p> <p>Receipt and storage and handling of spodumene feed material</p>		<p>floor.</p> <p>Spodumene ore and DBS transported in an overhead conveyor with enclosed top and side treatments.</p> <p>Refinery sodium sulphate (RSS) has dedicated wet scrubber system.</p> <p>Refinery lithium hydroxide (RLH) crystallisation, drying and packaging have bled air filters.</p> <p>Lithium and sodium sulphate products processed and bagged within enclosed building with roof, walls, and concrete floor.</p> <p>Hermetically sealed conveyors and packaging rooms for lithium and sodium sulphate material handling.</p> <p>Lithium hydroxide and sodium sulphate are sealed in bags by automated process and stored in an enclosed room and placed into a sea container for shipping.</p> <p>Silo bins store calcinated spodumene, carbonate solids and filtration aid solid concentrate.</p> <p>Level instrumentation in silos to prevent overfilling and safety.</p> <p>Rejected materials are stored within spillage bunkers that are on hardstand with walls and bunding.</p> <p>Processed waste solid materials placed into containers and transported from site. Solid waste will be stored for a maximum of 10 days on site.</p> <p>Lithium hydroxide bagged in flexible intermediate bulk containers (FIBCs) and stored for transport.</p>
Noise	<p>Processing and refining materials including transfer through the process (operation and processing of ore concentrate)</p> <p>Lithium hydroxide bagging, handling and storage</p> <p>Storage and handling of byproducts and wastes</p>	Air/windborne pathway	<p>Excessive fan noise emission will have installation of suitable attenuators, acoustic lagging of ducting/pipes and orientation of outlets/inlets vents away from closest boundary to the west.</p> <p>All plant, equipment and vehicles on site will be serviced and fitted with noise mitigation devices. i.e. muffler exhausts.</p> <p>Purpose built acoustic enclosures will be provided for large plant items to achieve noise levels of less than 85dBA at 1m.</p> <p>Equipment and plant items selected to limit noise emissions. Motor drives, gearboxes, pumps would be specified and selected to achieve a noise level of less than 85dBA at 1m.</p> <p>Plant, equipment, and vehicles found to produce excessive noise to be removed from the site or stood down until repairs or modifications made.</p> <p>In event of noise complaint that have been verified above environmental authority conditions noise mitigation measure will include:</p> <ul style="list-style-type: none"> • Use of earth mounds. • Review of haul routes and other noise generated activities to move the source away from the complaint. • Acoustic shielding of stationary noise generating equipment.

Emission	Sources	Potential pathways	Proposed controls
			Noise complaints register for recording and investigating noise complaints.
Light		Air pathway	Lighting will be installed to ensure directional downward illumination.
Odour		Air/windborne pathway	No controls as no offensive odours are expected.
Gaseous emissions (NO _x , CO, SO ₂) particulates and VOCs	Processing and refining materials including transfer through the process (operation and processing of ore concentrate)	Air/windborne pathway	<p>Annual monitoring of stack emissions.</p> <p>During commissioning two stack tests per point source within first three months of operating.</p> <p>Stack emission test per point source within 10 weeks of commencing each stage.</p> <p>Stack sampling ports to meet AS4323.1-1995 stationary source emissions.</p> <p>Eight emission point stacks:</p> <ul style="list-style-type: none"> • Calcination stack Sk1 48.5 magl, natural gas fired calciner with flue gas treated in a bag filter. • Calcination stack Sk4 48.5 magl, natural gas fired calciner with flue gas treated in a bag filter • Ball mill stack Sk2 30.0 magl, has a bag filter. • Ball mill stack Sk5 30.0 magl, has a bag filter. • Acid roaster stack Sk3 26.2 magl, has a combination of natural fired indirect heating of roaster and process off-gas including wet scrubber • Acid roaster stack Sk6 26.2 magl has a combination of natural fired indirect heating of roaster and process off-gas including wet scrubber • Steam boiler stack Sk8 15 magl, has a natural gas fired package steam boiler. • Sodium sulphate stack Sk7 10.0 magl, has a natural gas-fired dryer with a bag filter. <p>Calciner train will have the following controls:</p> <ul style="list-style-type: none"> • Static cyclones to remove entrained fines and reduce dust to bag house. • A multi-compartment baghouse filter for capturing fine particles. <p>All bag filters within the calciner, ball mill, acid roast kilns and sulfate dryer on each processing train have the following specifications:</p> <ul style="list-style-type: none"> • Capable of minimising particulate emissions to less than 30mg/m³ (STP dry) during normal operating conditions. • Connected to a Process Control System (PCS) with alarms to identify deviations from normal operating conditions

Emission	Sources	Potential pathways	Proposed controls
			<p>including broken bags.</p> <ul style="list-style-type: none"> Fitted with a device to ensure bags are routinely kept clean. Fitted with a device to indicate the pressure differential clearly and accurately across filters. Capable of returning dust to the pyrometallurgical process. <p>Acid roast gas scrubber systems on each processing have the following specifications:</p> <ul style="list-style-type: none"> Capable of capturing SO₃ and H₂SO₄ gas emissions to less than 50 mg/Nm³ during normal operational conditions. Connected to a PCS with alarms to identify deviations from normal operating conditions. Scrubbers are a combined cyclonic and chevron type entrainment separator to separate out the scrubbing liquid and the gas from the venturi scrubber outlet. Quench vessel adds further cooling of the entrainment separator outlet gases. Emergency quench water tank dumps to the Venturi Scrubber and entrainment separator in the event of high temperature pressure. Packed tower scrubber to capture inlet HCl and SO₂ gases Wet electrostatic precipitator to capture fine particles A fibre bed mist eliminator for capturing remaining fine particles and acid mists. <p>A gas burner control system.</p> <p>All stacks have an induced stack draft fan to direct gas to the atmosphere.</p> <p>PCS control system has uninterrupted power supply, with a battery supply to ensure critical equipment can continue.</p> <p>Installation of a data acquisition system for real time data collating for interrogation and fault finding.</p> <p>Plant regularly maintained.</p> <p>Processing equipment operated and maintained as per manufacturers specifications.</p> <p>Process equipment operating parameters are monitored by plant control system (PCS) with alarms.</p> <p>Scrubbers and baghouses will be given high priority for action.</p> <p>In event of process equipment not functioning, processing will cease.</p> <p>Bag filters checked and replaced as per manufacturers specifications.</p>
Process water	Processing and	Groundwater,	All process effluents and process vessels are fully contained in bunds, sumps, and tanks compliant to AS3780. This includes

Emission	Sources	Potential pathways	Proposed controls
leaks, spills, overflows, containment ruptures including stormwater contamination	<p>refining materials including transfer through the process (operation and processing of ore concentrate)</p> <p>Storage and handling of ore, waste products and hydrocarbons.</p> <p>Storage of concentrated sulphuric acid, caustic soda and soda ash (solid)</p> <p>Discharge of wastewater to SDOOL</p> <p>Treatment and storage of contaminated stormwater (includes Wastewater Treatment Plant (WWTP))</p>	potential hydraulic link to marine environment (Cockburn Sound)	<p>the process liquor effluent storage infrastructure, calcination and roasting processes, reagent storage area, leaching, impurity removal and causticisation area and crystallisation area.</p> <p>Bunding around the perimeter of reagents areas includes the process liquor effluent storage infrastructure area, calcination and roasting processing area, reagent storage area, leaching, impurity removal and causticisation area, crystallisation area, and product packing and storage area.</p> <p>Combustible fuels used on site will be fully contained and stored in a self-bunding tank in compliance with AS1940-2017.</p> <p>All reagents will be stored in containers for the relevant AS for the reagent being stored.</p> <p>Compliance with Water Corporation Effluent Service Agreement and EPA approved SDOOL</p> <p>Hydrocarbon refueling and storage will take place in low permeability areas.</p> <p>All spills and contaminated stormwater within process bunded areas are collected into a centralised tank (spillage and runoff surge tank), tested for water quality and either treated within the WWTP or recycled and directed to the process water tank.</p> <p>WWTP produces clean permeate or effluent wastewater. Recovered permeate (low in salts) is returned to the process tank to minimise freshwater makeup water.</p> <p>Brine water rejected from the WWTP is directed to the SDOOL.</p> <p>All process effluent discharges are directed to the SDOOL.</p> <p>Water samples are taken to confirm discharges from the SDOOL meet Water Corporation requirements.</p> <p>Online monitoring for temperature, pH and conductivity within key areas of the plant that feedback to the PCS. The PCS will have an automatic alarm and shutdown key equipment if water quality deviates for an unacceptable period.</p> <p>The discharge point to the SDOOL has a flow metre.</p> <p>Accumulated stormwater and debris removed from refueling bunded area on a regular basis.</p> <p>Any contaminated waste will be stored within bunded areas in containers pending transport to licensed disposal facility.</p> <p>Contaminated stormwater, spills, ruptures, and overtopping are managed by:</p> <ul style="list-style-type: none"> • Bunding around all catchments with exposure to hazardous materials and pollutants. • Bunded area are concreted to prevent contamination to groundwater. • Concrete delivery aprons draining to the reagent storage bund to capture spills. • Tanks have storage level alarms. • Spill kits at the reagent storage area.

Emission	Sources	Potential pathways	Proposed controls
			<ul style="list-style-type: none"> • Spill response procedure. • Sumps will recycle all forms of contained process effluents to respective process tanks. • Bunded areas and secondary containment facilities have a minimum capacity of 110% of the largest storage vessel plus 25% of the capacity of all stored containers. • Bunded areas, including the sump pump is based on a 6-hour discharge of the volume collected from a 1 in 100-year rainfall event (AEP). • Sumps with pumping systems convey contaminated water within bunded areas to spillage and runoff collection tank. It is designed to hold large rainfall events and provide buffer in capacity in transient weather events. The collection tank feeds into the WWTP. • Sump levels linked to the PCS to trigger pump. • In event of reagent spill, the reagent will be pumped back to the storage tank. • Water requiring treatment is processed through the WWTP. • Treated water is reused as process make up water. • Water treatment is downstream of the collection system to ensure refinery can optimise discharges to SDOOL. <p>All product water from water treatment facilities will be generated for the express purpose of internal recycle and reuse.</p> <p>Clean stormwater (outside of perimeter bunded areas for process, reagent, packing and storage areas) are directed to sediment traps, vegetated perimeter swales for infiltration.</p> <p>Clean stormwater is managed to City of Kwinana requirements (1 m³ storage per 45m² catchment) or 5% AEP for retention.</p>

7.1.2 Receptors

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

Table 8 below provides a summary of potential human and environmental receptors that may be impacted because of activities upon or emission and discharges from the prescribed premises (*Guidance Statement: Environmental Siting* (DER 2016)).

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

Human receptors	Distance from prescribed activity
Closest residential receptor at Medina	2.3 km from southeastern edge of the premise's boundary
Residential receptor – East Rockingham	4.5 km from the southern edge of the premise's boundary
Industrial business <ol style="list-style-type: none"> 1. Westfarmers LPG Pty Ltd 2. Western Energy Pty Ltd 3. IPM Operation and Maintenance Kwinana Pty Ltd 4. Tiwest Pty Ltd 5. Western Aus Land 	Adjacent to premises boundary in all directions <ol style="list-style-type: none"> 1. 60 m from eastern edge of the premise's boundary 2. 70 m from eastern edge of the premise's boundary 3. 20 m from western and southern edge of the premise's boundary 4. 171 m from southern edge of the premise's boundary 5. 90 m from northern edge of the premise's boundary
Public facility (Kwinana Golf Club)	2.7 km from the southeastern edge of the premise's boundary
Beeliar Regional Park	5 km from the northeast of the edge of the premises boundary
Environmental receptors	Distance from prescribed activity
Geomorphic wetlands	There are 6 conservation, 9 resource enhancement/multiple use wetlands from the premises boundary. Closest is 1.3km southeast of the premises boundary
Bush forever site – ID 20734	1.5km east of the premises boundary
Threatened fauna	<i>Isodon fusciventer</i> (southern brown bandicoot / quenda) located within the premises and 0.2km south of Premises boundary
Threatened fauna	<i>Calyptorhynchus latirostris</i> (carnabys cockatoo) located 1km south of the premises boundary. Habitat trees located within site.

Human receptors	Distance from prescribed activity
Cockburn Sound	1km to the west of the premises boundary
Groundwater ¹	<p>Historic groundwater encountered at 2mAHD relative to ground level at 5mAHD.</p> <p>Groundwater contours indicate flow direction conservatively east to west towards Cockburn Sound.</p> <p>Geology - Quindalup South System, calcareous sand (211Qu_S13)</p>

7.2 Risk ratings

Risk ratings have been assessed in accordance with the *Guidance Statement: Risk Assessments* (DER 2017) for each identified emission source and considers potential source-pathway and receptor linkages as identified in Section 7.1. Where linkages are in-complete they have not been considered further in the risk assessment.

Where the applicant has proposed mitigation measures/controls (as detailed in Table 7), these have been considered when determining the final risk rating. Where the delegated officer considers the applicant's proposed controls to be critical to maintaining an acceptable level of risk, these will be incorporated into the works approval as regulatory controls.

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

Works approval W6499/2021/1 that accompanies this decision report authorises construction, commissioning and time limited operations. The conditions in the issued Works Approval, as outlined in Table 9 have been determined in accordance with *Guidance Statement: Setting Conditions* (DER 2015).

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

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

7Risk Event					Consequence	Likelihood	Risk rating ¹	Applicant controls sufficient?	Justification for additional regulatory controls	Conditions ² of works approval/
Source/Activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls						
Construction - Earthworks and construction activities during construction phases of refinery										
Civil earthworks – wind erosion from disturbed surfaces, vehicle movements, use of equipment / machinery, subsurface constructive activities and potential dewatering	Fugitive dust	Air/windborne pathway causing impacts to health and amenity	Residences 2.3km southeast of Premises boundary	Refer to Section 7.1.1 and Table 7	Low level impact on the amenity and public health Minor	Risk event could occur at sometime Possible	Medium Acceptable subject to regulatory controls	Y	Construction works include disturbance of soils and earthworks where there is a risk of fugitive dust impacts if preventative measures are not taken to control or mitigate the risk of fugitive dust. The assessed risk is medium and the delegated officer determined that the applicant's controls are appropriate to manage the risk of offsite impacts and will be specified on the works approval. In the context of the site being a classified Contaminated Site and the risk of contaminated dust through vehicle movements and construction activities, the delegated officer notes that the applicant is required to comply with the Golders and Associates 2012 CEMP for the site which includes fugitive dust management strategies. The delegated officer has not further duplicated or contradicted these requirements.	Condition 1, Condition 4
	Noise		Industrial business adjacent to premises boundary in all directions, closest 20 m west and south.		Low level impact on the amenity Minor	Risk event is unlikely to occur Unlikely	Medium Acceptable subject to regulatory controls	Y	The delegated officer does not expect off site noise impacts from construction activities. The applicant has proposed reasonable controls (see, Section 7.1.1 and Table 7) and is subject to the Noise Regulations. Noise from construction works at a construction site is subject to specific provisions in regulation 13 that the applicant is required to comply with.	No conditions
	Spread of existing groundwater contamination, release of vapours / odour (groundwater abstraction)	Air / windborne - abstraction of groundwater (dewatering) releasing volatile chlorinated phenol vapours to air impacting on health and amenity offsite. Groundwater – construction techniques such as pile driving perforating the clayey aquitard layer to the Tamala Limestone aquifer causing further spread and impacts to beneficial use of water from that aquifer.	Proclaimed RIWI Cockburn Groundwater Area. Groundwater hydraulic link to Cockburn Sound. Industrial receptors Beneficial use of groundwater from the Tamala Limestone aquifer		Mid level impact to the environment and amenity. Adverse health impacts at a mid-level requiring frequent medical treatment. Major	Risk event will occur in most circumstances Likely	High May be acceptable subject to multiple regulatory controls	N	The delegated officer considered the contaminated sites context of the land and proposed construction activities in section 4.3. The delegated officer has determined that conditions will be included on the works approval to manage the potential risk of impacts associated with potential dewatering and subsurface construction activities. Further information and justification is provided in section 7.3.1.	Condition 1 Condition 5 Condition 6 Condition 7 Condition 8 Condition 8 Condition 15
Operation (including time-limited-operations and environmental commissioning)										
Transport of material within premises. Receipt and storage and handling of spodumene feed material	Fugitive dust	Air/windborne pathway causing impacts to health and amenity	Public facilities (golf club) located 2.7km, residences 2.3km south east of the Premises boundary.	Refer to Section 7.1.1 and Table 7	Low level impact on the amenity and public health Minor	Risk event will probably not occur in most circumstances Unlikely	Medium Acceptable subject to regulatory controls	Y	The delegated officer considered the risk of fugitive dust emissions during the operational phase to be medium. The applicant's controls (see, Section 7.1.1 and Table 7) were considered appropriate and commensurate with the risk. Conditions on the works approval will ensure that key infrastructure and equipment for the receipt, storage and handling/transfer of solid feeds, products, co-products and wastes is designed to manage the risk of fugitive dust, consistent with the applicant proposed controls. Requirements during the environmental commissioning, time limited operations and future licence phases will also be consistent with applicant proposed controls. This will ensure that materials, products, and wastes are received, handled and stored in dedicated areas with dedicated controls for fugitive dust.	Condition 1 Condition 11 Condition 21
	Noise		Industrial business adjacent to premises boundary in all directions, closest 20 m west and south		Low level impact on the amenity and public health Minor	Risk event will probably not occur in most circumstances Unlikely	Medium Acceptable subject to regulatory controls	Y	Noise emissions are predicted to be well within assigned levels in the Noise Regulations. The delegated officer considers the applicant's controls to be appropriate and will be specified in the works approval.	Condition 1
Processing and refining materials including transfer through the process (operation and processing of ore concentrate)	Odour	Air/windborne pathway causing impacts to health and amenity quality	Public facilities (golf club) located 2.7km and residences 2.3km south east of the Premises boundary.	Refer to Section 7.1.1 and Table 7	Minimal impact on the amenity and public health Slight	Risk event will probably not occur Unlikely	Low Acceptable	Y	Considering the nature of the raw materials, product, waste by products, and air emissions, the delegated officer expects odour emissions to be negligible and does not expect impacts on receptors.	No conditions
	Dust		Industrial business adjacent to premises boundary in all directions, closest 20 m west and south		Low level impact to the environment Low level impact on the amenity and public health	Risk event could occur at some time Possible	Medium Acceptable subject to regulatory controls	N	The delegated officer considered the risk of fugitive dust emissions during the operational phase to be medium. The applicant's controls (see, Section 7.1.1 and Table 7) were considered appropriate and commensurate with the risk. Conditions on the works approval will ensure that key infrastructure and equipment for the receipt, storage and handling/transfer of solid feeds, products, co-products and wastes is designed to manage the risk of fugitive dust, consistent with the applicant proposed controls. Requirements during the environmental commissioning, time limited operations and future licence phases will also be consistent with applicant proposed controls. This will ensure that materials, products and wastes are received, handled and stored in dedicated areas with dedicated controls for fugitive dust.	Condition 1 Condition 11 Condition 14 Condition 15 Condition 21

7Risk Event					Consequence	Likelihood	Risk rating ¹	Applicant controls sufficient?	Justification for additional regulatory controls	Conditions ² of works approval/
Source/Activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls						
					health Minor					
	Noise				Low level impact on the amenity and public health Minor	Risk event will probably not occur in most circumstances Unlikely	Medium Acceptable subject to regulatory controls	Y	Noise emissions are predicted to be well within assigned levels in the Noise Regulations. The delegated officer considers the applicant's controls to be appropriate and will be specified in the works approval.	Condition 1
	Gaseous emissions (NOx, CO, SO ₂ , acid gases) particulates and VOCs				Low level impact on the amenity and public health Minor	Risk event will probably not occur in most circumstances Unlikely	Medium Acceptable subject to regulatory controls	Y	Refer to Section 7.3.2	Condition 1 Condition 11 Condition 12 Condition 13 Condition 21 Condition 22 Condition 23 Condition 24
	Process water leaks, spills, overflows, containment ruptures. This includes contaminated stormwater and the wastewater treatment plant (WWTP) that treats and recycles water into the process water supply.	Groundwater, potential hydraulic link to marine environment (Cockburn Sound)	Discharge to land and infiltration to proclaimed groundwater. Groundwater, hydraulic link to Cockburn Sound		Low level impact to the environment Minor	Risk event will probably not occur in most circumstances Unlikely	Medium Acceptable subject to regulatory controls	Y	The applicant's controls (see Section 7.1.1 and Table 7) were guided by AS3780 for bunds, sumps, containments, pipes and alarms. Combustible fuel storage by AS1940. All reagent storage areas, processing areas and packaging areas have concreted perimeter bunds. All processes including effluent are held with processing vessel or containers within their individual containment bunds. Spills will be pumped back to their reagent container or pumped into the contaminated stormwater containment tank. The perimeter bunds exclude stormwater from entering processing and reagent containment areas. The uncontaminated stormwater is directed to sediment traps and swales and regulated by the City of Kwinana. Contaminated stormwater is directed to the containment tank that is either treated through the WWTP and recycled as freshwater process water or directed to the SDOOL for disposal. All container and tanks are connected to high level alarms to prevent overtopping, all bunds and sumps are based on a 6-hour discharge volume for a 1 in 100-year rainfall event. The delegated officer considers that the applicants' controls are appropriate to manage the assessed risk and will be specified in the works approval.	Condition 1 Condition 11 Condition 21
Lithium hydroxide bagging, handling and storage Storage and handling of: • Sodium sulphate anhydrous • De-lithiated beta spodumene (DBS) • Polishing filter materials and mixed salts material	Dust	Air/windborne pathway causing impacts to health and amenity quality	Public facilities (golf club) located 2.7km and residences 2.3km south east of the Premises boundary. Industrial business adjacent to premises boundary in all directions, closest 20 m west and south	Refer to Section 7.1.1 and Table 7	Mid level impact on the amenity and public health Moderate	Risk event will probably not occur in most circumstances Unlikely	Medium Acceptable subject to regulatory controls	Y	The delegated officer considered the risk of fugitive dust emissions during the operational phase to be medium. The applicant's controls (see, Section 7.1.1 and Table 7) were considered appropriate and commensurate with the risk. Conditions on the works approval will ensure that key infrastructure and equipment for the receipt, storage and handling/transfer of solid feeds, products, co-products and wastes is designed to manage the risk of fugitive dust, consistent with the applicant proposed controls. Requirements during the environmental commissioning, time limited operations and future licence phases will also be consistent with applicant proposed controls. This will ensure that materials, products and wastes are received, handled and stored in dedicated areas with dedicated controls for fugitive dust.	Condition 1 Condition 11 Condition 21
	Noise				Low level impact on the amenity and public health Minor	Risk event will probably not occur in most circumstances Unlikely	Medium Acceptable subject to regulatory controls	Y	Noise emissions are predicted to be well within assigned levels in the Noise Regulations. The delegated officer considers the applicant's controls to be appropriate and will be specified in the works approval.	Condition 1 Condition 29
	Contaminated runoff including contaminated stormwater	Groundwater, potential hydraulic link to marine environment (Cockburn Sound)	Discharge to land and infiltration to proclaimed groundwater. Groundwater hydraulic link to Cockburn Sound		Low level impact on the amenity and public health Minor	Risk event will probably not occur in most circumstances Unlikely	Medium Acceptable subject to regulatory controls	Y	The applicants' controls were guided by AS3780 for bunds, sumps, containments, pipes and alarms. All packaging areas have concreted perimeter bunds. The uncontaminated stormwater is directed to sediment traps and swales and regulated by the City of Kwinana. Contaminated stormwater is directed to the containment tank that is either treated through the WWTP and recycled as freshwater process water or directed to the SDOOL for disposal. All container and tanks are connected to high level alarms to prevent overtopping, all bunds and sumps are based on a 6-hour discharge volume for a 1 in 100-year rainfall event. The delegated officer considers that the applicants' controls are sufficient to manage emission and will be regulated within the works approval.	Condition 1 Condition 11 Condition 21
Storage of	Breach of	Groundwater, potential hydraulic	Discharge to land and infiltration to	Refer to	Low level	Risk event will	Medium	Y	The applicants' controls were guided by AS3780 for bunds, sumps, containments, pipes and alarms.	Condition 1

7Risk Event					Consequence	Likelihood	Risk rating ¹	Applicant controls sufficient?	Justification for additional regulatory controls	Conditions ² of works approval/
Source/Activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls						
concentrated sulphuric acid, caustic soda and soda ash (solid)	containment causing discharge to land or stormwater contamination.	link to marine environment (Cockburn Sound)	proclaimed groundwater. Groundwater hydraulic link to Cockburn Sound	Section 7.1.1 and Table 7	impact to the environment Minor	probably not occur in most circumstances Unlikely	Acceptable subject to regulatory controls		Combustible fuel storage by AS1940. All reagent storage areas have concreted perimeter bunds. All reagents are held within containers with their individual containment bunds. Spills will be pumped back to their reagent container or pumped into the contaminated stormwater containment tank. The perimeter bunds exclude stormwater from entering reagent containment areas. The uncontaminated stormwater is directed to sediment traps and swales and regulated by the City of Kwinana. Contaminated stormwater is directed to the containment tank that is either treated through the WWTP and recycled as freshwater process water or directed to the SDOOL for disposal. All container and tanks are connected to high level alarms to prevent overtopping, all bunds and sumps are based on a 6-hour discharge volume for a 1 in 100 year rainfall event, The delegated officer considers that the applicants' controls are sufficient to manage emissions and will be regulated within the works approval.	Condition 11 Condition 21
Discharge of wastewater to SDOOL	Direct discharge into SDOOL which discharges to Sepia Depression	Sepia Depression (Cockburn Sound)	Direct discharge	Refer to Section 7.1.1 and Table 7	Minimal impact to the environment Slight	Risk event will probably not occur Unlikely	Low Acceptable	Y	The discharge of treated wastewater via SDOOL is authorised by MS1170. SDOOL regulated under MS665 held by Water Corporation. The applicant is required to obtain an Effluent Services Agreement with Water Corporation. Consistent with other licensed premises that discharge to SDOOL, the delegated officer will specify operational conditions to monitor the discharges.	Condition 15 Condition 25
	Rupture of pipes / overtopping of holding tanks resulting in discharge to land or stormwater contamination	Groundwater, potential hydraulic link to marine environment (Cockburn Sound)	Discharge to land and infiltration to proclaimed groundwater. Groundwater hydraulic link to Cockburn Sound		Low level impact to the environment Minor	Risk event will probably not occur in most circumstances Unlikely	Medium Acceptable subject to regulatory controls	Y	The applicant's controls were guided by AS3780 for bunds, sumps, containments, pipes and alarms. The delegated officer considers that the applicants' controls are sufficient to manage emissions and will be regulated within the works approval.	Condition 1 Condition 11 Condition 21

Note 1: Consequence ratings, likelihood ratings and risk descriptions are detailed in the *Guidance Statement: Risk Assessments* (DER 2017).

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

Conditions 2,3, 9, 15, 16, 17, 18, 19, 25, 26, 27, 28, 29 and 30 are records and reporting based conditions.

7.3 Justification of regulatory controls – additional information

7.3.1 Construction and operational phase – management of contaminated sites risks

Having regard to information in section 4.3, the applicant's CEMP, SWMP and DMP were reviewed and the delegated officer noted that construction techniques that could be used at the LHR are constrained by the hydrogeological conditions at the site, and by the spatial distribution of groundwater contamination beneath and adjacent to the site. The delegated officer concluded that these issues had not been adequately addressed at the site by the applicant.

The follow summarise the reasons for this conclusion:

Construction dewatering

It is not clear from the information provided whether the CCoPC's were detected in groundwater beneath the site. However, there is a risk that contaminated groundwater would be drawn into the LHR if extensive groundwater dewatering occurs. This would likely have high risk implications as the CCPoC's are highly volatile, and the inhalation of vapours from pumped contaminated groundwater can produce respiratory problems in sensitive individuals. In addition, odours from dewatering sites may be readily detected at large distances from the site while drilling or dewatering is in progress.

The applicant indicated that dewatering was not expected to be required during construction, however provided a contingency plan to undertake some dewatering if necessary. The delegated officer concluded that the control measures put forward by the applicant were unlikely to be adequate for controlling local air quality issues that may be associated with dewatering at the site. It is understood other methods of installing infrastructure below the water table are available that could replace the need for dewatering, including various trenchless technologies and ground freezing techniques. The works approval will include a condition that prohibits dewatering on the premises unless a further Dewatering Management Plan is submitted that addresses vapour emissions and their management.

Pile driving

The applicant provided information indicating that much of the construction at the site would involve pile driving. The delegated officer considered this to be a suitable construction method, however the hydrogeological conditions present beneath the site mean that this would have to be carefully managed by the applicant to limit the risk of existing groundwater contamination near the site spreading. The risk relates to the early discussed aquifer formations.

Poorly managed pile driving that can penetrate through the clayey aquitard at the base of the Safety Bay Sand aquifer could provide a preferential pathway for contaminated groundwater to migrate into the limestone aquifer. The limestone aquifer is understood to be relatively uncontaminated and used for industrial water supply in the area.

The delegated officer is aware that the applicant will be using the technique of a pile driving using a weighted hammer. This will be conditioned as the technique is likely to minimise contamination risk. Furthermore, additional sampling of the groundwater within the two aquifers will be monitored to detect for any contaminate movement between the aquifers.

Groundwater monitoring

The delegated officer did not have any concerns with respect to the monitoring bore locations proposed by the applicant. However, there was no information in the CEMP about the depths and construction details for the bores. The delegated officer took the presumption that bores are likely to be monitoring the shallow sand aquifer. It was concluded that at least two additional monitoring bores are installed to monitor groundwater quality in the limestone aquifer. Identified locations were near the south-eastern corner of the LHR to monitor groundwater flow into the

site; and one near the north-western corner of the LHR to monitor groundwater flow in the limestone aquifer out of the facility.

Bores will require careful drilling to prevent seepage of contaminated groundwater from the shallow aquifer into the limestone aquifer. The department's review identified a preferred construction technique for these bores would be to firstly drill and install a conductor casing into the top few centimetres of the aquitard, which is then pressure cemented into place. A second borehole should then be drilled through this cement plug into the limestone aquifer. This construction technique would ensure that a good seal is maintained between the two aquifers.

Groundwater monitoring beyond construction phase should be considered. An appropriate approach is likely to involve review of monitoring results to refine the number of necessary monitoring bores and sampling frequency for the operational phase of the LHR. During the construction phase and environmental commissioning, monitoring should align with the same analytical suite applied by Golder and Associates (2019) and include Metals, PFAS, MBAS, PAH, MAH, VOCs, TRHs, dioxin/furans, and OC/OP pesticides. Initial sampling monthly should be considered, with likely reduction after a period of one year subject to review of the groundwater quality data.

After construction and during the operation of the facility, analytes relevant to the operation phase are arsenic, lithium, uranium, gross-alpha, gross-beta and major-ions.

7.3.2 Operational phase – point source emissions to air

Noting the discussion and findings of the applicant's AQA in section 6, the delegated officer found that the predicted impact of point source air emissions on receptors for most pollutants and scenarios was acceptable. The delegated officer made specific findings with respect to predicted NO_x emission and particulate matter emissions.

The applicant has proposed a range of pollution control equipment and as these engineering design measures are intrinsic to predicted emission control outcomes, the equipment and process control systems will be specified in the works approval. This includes dust treatment systems on the calciner, ball mill, acid roast kiln and sulfate dryer circuits and an acid gas scrubbing system on the acid roast kiln.

Stack monitoring validation will be required through environmental commissioning so that DWER can review data as part of compliance reporting and consideration of a future licence application. Significant sources that will be the subject of monitoring requirement must have monitoring locations and ports that meet AS4323.1 to ensure data is accurate and reliable.

The baghouse filters will be required to meet a TSP emission concentration of less than 50 mg/m³ which is an appropriate and achievable standard of concentration for this type of equipment and specified in Schedule 3 (non-ferrous industries) of the *NSW Protection of the Environment Operations (Clean Air) Regulations 2010*. A concentration of 500 mg/m³ as NO₂ equivalent at STP Dry 10% O₂ is also specified in Schedule 2 of the *NSW Protection of the Environment Operations (Clean Air) Regulations 2010* and an appropriate and achievable standard of concentration for the acid roast kiln scrubber system. Air emission limits that will be applied to the environmental commissioning and time limited operations phase are listed in Table 10

Table 10: Proposed emission limits

Parameter	Stack reference	Recommended Limit	Justification for the limit value proposed
NO _x	Calcination stack Sk1 Calcination stack Sk4	500 mg/m ³ dry at 10%O ₂	Limits derived from Schedule 2 and 3 of the <i>NSW Protection of</i>

Parameter	Stack reference	Recommended Limit	Justification for the limit value proposed
TSP	Calcination stack Sk1 Calcination stack Sk4 Ball mill stack Sk2 Ball mill stack Sk5 Acid roaster stack Sk3 Acid roaster stack Sk6 Steam boiler stack Sk8 Sodium sulphate stack Sk7	50 mg/m ³	<i>the Environment Operations (Clean Air) Regulations 2010</i>

7.4 Licence controls

The works approval allows the applicant to undertake works, subject to conditions, in addition to allowing a finite period of emissions and discharges from the LHR during environmental commissioning and a time limited operations phase. It is expected the applicant will apply for a licence towards the completion of environmental commissioning as it proceeds into a six-month period of time limited operations. This allows DWER a period to review validation data and the licence application. Subject to works approval reporting and the licence application, the delegated officer expects that conditions of a licence will be generally consistent with environmental commissioning and time limited operations under the works approval. This will include point source emissions to air limits and ongoing stack monitoring on at least a biannual basis.

8. Decision

Based on the assessment in this report, the delegated officer has determined that a works approval will be granted, subject to conditions commensurate with the determined controls necessary for administration and reporting requirements. Applicant proposed controls were generally found to be reasonable and appropriate to manage the assessed risk of emissions and discharges. The delegated officer specified additional controls with respect to managing the assessed high risk of groundwater and odour impacts associated with the site being a classified contaminated site with restricted use.

The applicant's air dispersion modelling was generally found to be technically reliable, with some anomalies identified in the calculation of emission input estimates. The delegated officer did not consider these changed the risk assessment outcome that air emissions will be acceptable and not result in LHR or cumulative impacts on receptors. The delegated officer has required the applicant to undertake commissioning validation of emissions and specified limits.

The applicant will also be required to undertake a range of baseline and ongoing groundwater monitoring.

9. Consultation

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

Table 11: Consultation

Consultation method	Comments received	Department response
Application advertised on the department's	None received	N/A

website (10/02/2021)		
City of Kwinana advised of proposal (10/02/2021)	The City of Kwinana replied on 25/02/2021 (DWERDT420219) confirming that a Planning Approval was issued by the Joint Development Assessment Panel on 10/09/2020. The layout diagram provided by DWER has been significantly changed to what was approved. An amendment will be required by the Applicant.	The delegated officer notes this information.
Water Corporation advised of proposal (10/02/2021)	The Water Corporation replied on the 23/04/2021 (DWERDT447681). The Water Corporation were working with the applicant to obtain an Effluent Services Agreement. Water Corporation indicated that the predicted effluent volumes and quality will not affect the overall volumes and quality of the combined SDOOL wastewater stream and ecological and social environmental values for the marine waters in the vicinity of the sepia depression.	The delegated officer notes this information.
Department of Health advised of proposal (10/02/2021)	The Department of Health replied on the 25/03/2021 (DWERDT432423). The department had no objections to the development and that they were required to connect to scheme water and be in accordance with the Government Sewerage Policy 2019.	The delegated officer notes this and considers the matter to be managed under the City of Kwinana <i>Planning and Development Act 2005</i> .
The Department of Jobs, Tourism, Innovation and Science advised of proposal (10/02/2021)	The Department of Jobs, Tourism, Innovation and Science responded on the 11 June 2021. They had no comments on the proposal.	The delegated officer notes the no comment.
Kwinana Industry Council (KIC) advised of proposal (10/02/2021)	KIC replied on the 9/03/2021 (DWERDT427977). KIC were in favour of the lithium refinery facility and considered that it was well located within the Kwinana Industrial Area.	The delegated officer notes KICs response.
Applicant was provided with draft documents on 6 August 2021	Refer to Appendix 1	Refer to Appendix 1

10. Conclusion

Based on the assessment in this decision report, the delegated officer has determined that a works approval will be granted subject to the submission of the above documentation and subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

After the completion of the construction of the refinery the applicant is to submit compliance reporting for commissioning and is permitted to operate under time limited operations for 180 days. Around the commencement of time limited operations, the delegated officer expects the applicant to apply for a licence for ongoing operations.

References

1. Adeola, A.O., 2020. Fate and Toxicity of Chlorinated Phenols of Environmental Implications: A Review. *Medicinal & Analytical Chemistry International Journal*, 2(4).
2. Covalent Lithium Ltd Pty 2020, *Application and supporting documents*, Perth, Western Australia.
3. Department of Environment Regulation (DER) 2016, *Guidance Statement: Environmental Siting*, Perth, Western Australia.
4. DWER 2020, *Guideline: Risk Assessments*, Perth, Western Australia.
5. DER 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
6. DWER 2020, *Guideline: Environmental Siting*, Perth, Western Australia
7. DWER 2019, *Guideline Industry Regulation Guide to Licensing*, Perth, Western Australia
8. Environmental Protection Authority (EPA) 2021, *Covalent Lithium Hydroxide Refinery, Report 1700*, Environmental Protection Authority, Perth, WA.
9. Golder Associates, 2012. *Former Petrochemical Industries: Construction and Operational Environmental Management Plan*, Perth, Western Australia.
10. Golder and Associates 2019. *Soil and groundwater Baseline Investigation at Lot 15 Mason Road, Kwinana Beach*, Perth, Western Australia.
11. Environmental Protection Authority 2015, Ministerial Statement 665, Use of the Cape Peron outlet pipeline to dispose of industrial wastewater to the sepiia depression, Kwinana, Perth, Western Australia.

Appendix 1: Summary of applicant's comments on risk assessment and draft conditions

	Condition	Summary of applicant's comment	Department's response
	DWER RFI		
1		Covalent is not aware that the exiting bores are located within the Tamala Limestone Aquifer	DWER notes this information
	Decision Report		
2	Section 7.3.1 Construction dewatering	Update and removal of the requirement to prevent dewatering as Covalent believe that dewatering is: <ul style="list-style-type: none"> • a regular occurrence throughout the Kwinana Industrial Area • Vapours are not a significant risk to human health where groundwaters COPC concentrations are compliant with HIL-D, and • Odour from drill rig and surrounding industrial areas would have a more noticed odour than the volatiles than release. These volatiles are considered unlikely as it would require volatilisation through the topsoil into the atmosphere. 	DWER advises that in principle dewatering can be used at this site however a rigorous plan indicating how workers would be protected from gaseous emissions and how this would be monitored is required before the control of no dewatering would be removed. Therefore, the requirement for no dewatering will remain with the additional requirement of submitting a dewatering plan that addresses the emission issues if dewatering is required.
3	Section 7.3.1 Pile driving	Update the report to allow installations of the piles into the Tamala Limestone Aquifer, as if it is not allowed it would be prohibitive to the construction of the refinery.	DWER has updated the decision report to allow for pile driving into the Tamala Limestone and added the additional information on pile driving technique. Additional sampling of groundwater for the detection of groundwater contamination between aquifers will be added to the licence.
4	Section 9 Table 11	Remove requirement that planning and effluent services agreement is required before works approval is granted	DWER has updated the decision report and removed these requirements as the matters are currently untaken.
5	Figure 3	Process flow diagram of effluent recovery is confidential.	DWER has updated the decision report and removed the Figure and reference text to the Figure.
	Works Approval		
6	Schedule 1, Figure 3	Updated layout map provided	DWER notes this information
7	Front page	Registered business address is Level17 and not Level 18.	DWER has updated this information in the Works Approval.

	Condition	Summary of applicant's comment	Department's response
8	Condition 5	Covalent Lithium requests that the requirement for no dewatering is removed and that the works approval allows Covalent to undertake dewatering in accordance with their Dewatering Management Plan. This is required to allow Covalent to successfully complete the construction of the facility.	See item 2.
9	Condition 6	Condition 6 is deleted. The installation of piles into the Tamal Limestone is common in Kwinana Industrial Area. Similar conditions have not been applied to other projects. The success of the project relies on piles to limit the settlement of structures.	DWER has updated the condition to reflect the additional information supplied on the type of pile driving technique proposed, and the limits have been removed. DWER has added additional monthly sampling of groundwater to detect for any groundwater contamination between aquifers
10	Condition 7. Table 2	Covalent wish to have the bores implementation timeframe changes from 90 to 180 days. The shortage of drillers in the industry means that a 90-day timeframe cannot be meet.	DWER has updated the works approval and made the timeframe change to 180 days.
11	Condition7, Table 2	MW14 changes to MW16 as there is a MW14 existing, the locations remain.	DWER has updated the decision report and works approval to change MW14 to MW16.
12	Condition 7 Table 2	Construction method should reflect drilling for an unconfined aquifer. Covalent believe there is no clayey aquitard between Safety Bay Sands and Tamala Limestone Aquifer.	DWERs requirements are the standard approach to maintain and prevent contamination between two aquifers. DWERs bore requirements remain to ensure that chlorinated phenol contamination does not occur.
13	Condition 11 Table 4	All commissioning periods stated less than 545 should be changed to 360. This will align to commissioning periods. Acid <u>rostered</u> solids to be changed to Acid <u>roasted</u> solids. Solid material should be kept above and not to extinction levels. Change MW14 to MW16. Several bores monitored are not in Covalents occupied lease area or authorised access.	DWER has updated the works approval. DWER notes that several bores are not within Covalent leased area. DWER has relocated MW15 within Covalent leased boundary. DWER has modified the monitoring bore requirements, Bores located outside of lease area GBH2, MW1, MW7, MW10 and MW13 are sampled within construction only.
14	Condition 13 Table 6	Covalent Calcination stack SK1 and SK4 NOx limit should be changed from 350 to 770mg/Nm ³ dry @ 3%O ₂ With regards to NOx emissions from the Calciner, the findings from the modelling indicated the design concentrations (of Concentration of NO = 274 mg/Nm ³ dry at 9.9% O ₂ , and Concentration of NO ₂ = 12 mg/Nm ³ dry at 9.9% O ₂) Covalent proposes applying design values along with an operating allowance of circa 10%. On this basis Covalent proposes the following NOx limit SK1 and SK4 = NOx design assumption	DWER has updated the emission limit to 500mg/m ³ dry at 10% O ₂ . This is inclusive of the770mg/Nm ³ dry @ 3%O ₂ .

	Condition	Summary of applicant's comment	Department's response
		(model supported) + 10% transience margin = 770mg/Nm3 dry @ 3% O2 Covalent suggests DWER apply the following parameters to the Works Approval: Calcination stack SK1 NOx limit = 770mg/Nm3 dry @ 3% O2 Calcination stack SK4 NOx limit = 770mg/Nm3 dry @ 3% O2	
15	Condition 15 Table 7	E1 SDOOL volume is required to meet annual volume commitment. Reporting the volume discharge weekly is considered an unnecessary compliance impost. Covalent proposed to report six monthly.	DWER does not believe that recording the flow meter on a weekly basis to be an imposition on Covalent. Only two reporting periods are required under the works approval for volume reporting. They are under Condition 18 within the Environmental Commissioning Plan and Condition 28-time limited operations reporting.
16	Figure 2	Remove the typographical error of F! to F1	DWER has updated the works approval.
17	Figure 3	Layout map has been updated with minor changes in service corridor and utilities area and swale capacity added to reflex perimeter drainage.	DWER has updated the works approval.
18	Figure 4	Figure updates to reflect MW16 (change from MW14)	DWER has updated the works approval.
19	Schedule 2 Table 9 <u>Item 1</u> – Spodumene ore storage area/building warehouse <u>Item 2</u> - Lithium monohydrate storage and bagging building <u>Item 3</u> - Conveyors <u>Item 5</u> - Bag filters <u>Item 6</u> • Acid roast kilns and wet scrubbing systems <u>Item 7</u> Stationary equipment	<u>Item 1</u> Delete requirement for water sprayers. Conveyors now have side and top treatments. <u>Item 2</u> -Following changes are required to reflect the operation. <ul style="list-style-type: none"> Hermetically sealed rooms within the Lithium hydroxide packaging building. The automated lithium bagging plant is located within the Hermetic envelope". The sodium sulphate packaging plant is located within an enclosed building. The automated bagging equipment for sodium sulphate is located behind a textile curtain partially screening the packing area." Conveyors which transport the material operating within and adjacent to the building are sealed." "A racking system within an enclosed storage building is used for interim storage of bagged lithium products prior to loading into containers / despatching product". The facility handles bagged Lithium and sodium sulphate product within enclosed buildings. As such spillage is limited and perimeter drainage eternal to the building is free of contamination. To prevent stormwater from accessing enclosure, the storage area's concrete floor is raised relative to the outside area" 	<u>Item 1, 2, 3</u> , -DWER has updated the works approval to include additional information. <u>Item 5</u> – DWER has update the changes to the bag filter to only the calcination area is capable to return dust to the pyrometallurgical process. The control provided by Covalent for bag filters were capable of minimising particulate emissions to less than 30mg/m ³ (STP dry) during normal operating conditions. The baghouse filters will be required to meet a TSP emission concentration of less than 50 mg/m ³ which is an appropriate and achievable standard of concentration for this type of equipment and specified in Schedule 3 (non-ferrous industries) of the <i>NSW Protection of the Environment Operations (Clean Air) Regulations 2010</i> . DWER will not change the emission or control limits.

	Condition	Summary of applicant's comment	Department's response
		<ul style="list-style-type: none"> • Delete sixth sentence. Gravity fed sumps are not required as per (dot point above). <p><u>Item 3</u> -Delete the need for water sprayers, as the design has matured the addition of side and top treatments replaced sprayers.</p> <p><u>Item 5</u> –</p> <ul style="list-style-type: none"> • Capable of minimising particulate emissions to less than 50mg/m3 (STP dry) during normal operating conditions” • The bag filter in the calcination area is capable of returning dust to the pyrometallurgical process.” <p><u>Item 6</u> -Capable of capturing SO3 and H2SO4 gas emissions to less than 100 mg/Nm3 during normal operational conditions.</p> <p><u>Item 7</u></p> <ul style="list-style-type: none"> • To achieve a specified sound pressure level of 85 dBA at 1 m from an equipment item, various noise treatments and design features are used, these include: <ul style="list-style-type: none"> o Purpose-built noise-attenuating enclosures. o Locating equipment within a building and/or o <u>Use of a noise attenuating insulation.</u> • Passive design principles may also be applied such as positioning of equipment such that noisy outlet and inlet vents are oriented away from receptors such as the closest boundary to a public road” 	<p><u>Item 6</u>- the controls provide by Covalent where gas scrubbers were able to capture SO₃ and H₂SO₄ gas emissions to less than 50 mg/Nm³ during normal operational conditions. This is a control provided by Covalent. The licence limits for SO₃ has been removed.</p> <p><u>Item 7</u>- DWER notes the request for an inclusion of the use of a noise attenuation insulation and has included this additional information in the works approval.</p>

Appendix 2: Application validation summary

VALIDATION CHECKLIST: WORKS APPROVAL, LICENCE, REGISTRATION, AND AMENDMENT APPLICATIONS

SECTION 1: APPLICATION SUMMARY				
Application type				
Works approval	<input checked="" type="checkbox"/>			
Licence	<input type="checkbox"/>	Relevant works approval number:		None <input type="checkbox"/>
		Has the works approval been complied with?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
		Has time limited operations under the works approval demonstrated acceptable operations?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>	
		Environmental Compliance Report submitted?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
		Date Report received:		
Renewal	<input type="checkbox"/>	Current licence number:		
Amendment to works approval	<input type="checkbox"/>	Current works approval number:		
Amendment to licence	<input type="checkbox"/>	Current licence number:		
		Relevant works approval number:		N/A <input type="checkbox"/>
Registration	<input type="checkbox"/>	Current works approval number:		None <input type="checkbox"/>
Date application received	9 November 2020			
Applicant and Premises details				
Applicant name/s (full legal name/s)	Covalent Lithium Pty Ltd			
Premises name	Covalent Lithium Hydroxide Refinery			
Premises location	Lot 15 on Diagram 74883, 15 Mason Road KWINANA			
Local Government Authority	City of Kwinana			
Application documents				
HPCM file reference number:	DER2018/001042-4~35			
Key application documents (additional to application form):	<i>Covalent Lithium Refinery Project Works Approval Application Supplementary Information Document. Includes: Appendix 9, Covalent Lithium Air Quality Impact assessment Appendix 11, Covalent Lithium Noise Impact Study RFI Submitted to DWER 13/1/2012 DWERDT401432</i>			
Scope of application/assessment				

<p>Summary of proposed activities or changes to existing operations.</p>	<p>Works approval for a lithium refinery within the Kwinana Industrial Area.</p> <p>The proposal will process spodumene ore concentrate, sourced from Covalent Mt Holland Lithium Project, to produce battery grade lithium hydroxide monohydrate. The refinery will generate secondary refinery products consisting of the following.</p> <ul style="list-style-type: none"> • Sodium sulphate anhydrous, considered to be a saleable by product. • De-lithiated beta spodumene, polishing filter materials and mixed salts material. These are considered waste products, however Covalent is considering long term recycling options such as road base and aggregate in cement. In the short term Covalent will be transporting all waste to the Mt Holland mine site. <p>The proposal consists of the construction and commissioning and time limited operations phases for a lithium refinery that has a peak production design capacity of 61,685tpa and a production throughput of 536,185tpa of spodumene ore concentrate per year.</p> <p>The application includes proposed clearing of 12.9ha of degraded vegetation which includes two black cockatoo habitat trees.</p> <p>The proposed project schedule as presented in the application is:</p> <ul style="list-style-type: none"> • Construction commences 2021. • Commissioning commences 2024. • Time limited operations 2024 -2025. • Operational from 2024 to 2064.
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Category number/s (activities that cause the premises to become prescribed premises)

Table 1: Prescribed premises categories

Prescribed premises category and description	Proposed design capacity	Proposed production throughput
Category 31 Chemical manufacturing: premises (other than premise within category 32) on which chemical products are manufactured by a chemical process	Details provided. Cat 31 Nominal production capacity 121 tpd / 44,165tpa Peak processing capacity 169tpd / 61,685tpa	
Category 44 Metal smelting or refining: premises on which metal ore, metal ore concentrate, or metal waste is smelted, fused, roasted, refiner or processed.	Cat 44 Nominal production capacity 1,049 tpd / 382,885 tpa Peak processing capacity 1,469tpd / 536,185 tpa	
Category 85 or 54 Sewerage facility: premises- (a) On which sewerage is treated (excluding septic tanks): or (b) From which treated sewerage is discharged onto land or into waters.	Applicant stated that less than 20m ³ of sewerage wastewater. This is under the capacity for Category 85. Sewerage category not required.	

Legislative context and other approvals

<p>Has the applicant referred, or do they intend to refer, their proposal to the EPA under Part IV of the EP Act as a significant proposal?</p>	<p>Yes <input checked="" type="checkbox"/> No <input type="checkbox"/></p>	<p>Referral decision No: Managed under Part V <input type="checkbox"/> Referral reference CMS17669 Assessed under Part IV <input type="checkbox"/> EPA have received an application but have not decided whether to assess it. The application is out for public comment https://www.epa.wa.gov.au/proposals/covalent-lithium-hydroxide-refinery</p>
<p>Does the applicant hold any existing Part IV Ministerial Statements relevant to the application?</p>	<p>Yes <input checked="" type="checkbox"/> No <input type="checkbox"/></p>	<p>Ministerial statement No: MS1118 in relation to the Mt Holland Lithium Mine site. EPA Report No:</p>
<p>Has the proposal been referred and/or assessed under the EPBC Act?</p>	<p>Yes <input type="checkbox"/> No <input checked="" type="checkbox"/></p>	<p>Reference No:</p>
<p>Has the applicant demonstrated occupancy (proof of occupier status)?</p>	<p>Yes <input type="checkbox"/> No <input type="checkbox"/></p>	<p>Certificate of title <input type="checkbox"/> General lease <input type="checkbox"/> Expiry: Mining lease / tenement <input type="checkbox"/> Expiry: Other evidence <input type="checkbox"/> Expiry: Letter provided indicating that a lease arrangement is under way. This will be required before granting.</p>
<p>Has the applicant obtained all relevant planning approvals?</p>	<p>Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A <input type="checkbox"/></p>	<p>Approval: Expiry date: If N/A explain why? The Applicant has indicated that planning approvals application has been submitted to City of Kwinana but has not provided evidence of approval being granted.</p>
<p>Has the applicant applied for, or have an existing EP Act clearing permit in relation to this proposal?</p>	<p>Yes <input type="checkbox"/> No <input checked="" type="checkbox"/></p>	<p>CPS No: 12.9ha is proposed to be cleared. Applicant has requested assessment to be included within this proposal. Advice from NVR indicate that the Applicant will have to apply for clearing direct to NVR. As offset maybe required and this cannot be managed under a works approval. (DWERDT371920). If the project is not assessed under Part IV of the EP Act a separate clearing permit will be required.</p>

Has the applicant applied for, or have an existing CAWS Act clearing licence in relation to this proposal?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Application reference No: N/A Licence/permit No: N/A No clearing is proposed.
Has the applicant applied for, or have an existing RIWI Act licence or permit in relation to this proposal?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Application reference No: Licence/permit No: A licence to dewater maybe required at time of construction.
Does the proposal involve a discharge of waste into a designated area (as defined in section 57 of the EP Act)?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Name: Cockburn Groundwater Area Type: Proclaimed Groundwater Area Has Regulatory Services (Water) been consulted? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A <input type="checkbox"/> Regional office: Kwinana /Peel
Is the Premises situated in a Public Drinking Water Source Area (PDWSA)?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Name: N/A Priority: P1 / P2 / P3 / N/A Are the proposed activities/ landuse compatible with the PDWSA (refer to WQPN 25)? Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input checked="" type="checkbox"/>
Is the Premises subject to any other Acts or subsidiary regulations (e.g. <i>Dangerous Goods Safety Act 2004, Environmental Protection (Controlled Waste) Regulations 2004, State Agreement Act xxxx</i>)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	<i>Dangerous Goods Safety Act 2004, Dangerous Good Safety (Major Hazard Facilities) Regulations 2001 Dangerous Goods Safety (Storage and Handling of Non-explosives) Regulations 2007, Health (treatment of sewerage and Disposal of Effluent and Liquid Waste) Regulations 1974,</i>
Is the Premises within an Environmental Protection Policy (EPP) Area?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Kwinana EPP
Is the Premises subject to any EPP requirements?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Site is subject to SO ₂ requirements of Kwinana EPP.

<p>Is the Premises a known or suspected contaminated site under the <i>Contaminated Sites Act 2003</i>?</p>	<p>Yes <input checked="" type="checkbox"/> No <input type="checkbox"/></p>	<p>Former Petrochemical Industries Lot 15 Mason Road Kwinana</p> <p>CLASSIFICATION</p> <p>Remediated for restricted use</p> <p>Date of classification: 10/01/2017</p> <p>Recommend send an internal referral to CS</p>
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Appendix 4: Prescribed premises infrastructure

The following table lists key infrastructure or equipment as it relates to Categories 44 and 31.

<p>Prescribed Activity, Category 44</p> <p>Approximately 382 860 dry tpa of spodumene concentrate will be received by truck and processed to produce lithium hydroxide along with waste by-products sodium sulphate, de-lithiated beta spodumene and mixed salts material.</p>		
<p>Prescribed Activity Category 31</p> <p>Approximately 50,276 dry tpa of lithium hydroxide monohydrate will be chemically manufactured to supply lithium for battery manufacturing, and 116,531 dry tpa sodium sulphate will be produced as a commercial byproduct.</p>		
<p>Site Infrastructure</p>	<p>Location</p>	
<p>1</p>	<p>Enclosed stockpile storage building for spodumene ore including an undercover unloading area.</p> <p>Enclosed sodium sulphate and lithium monohydrate product bagging and storage buildings</p>	<p>As depicted in Schedule 1, Figure 2, Labelled as:</p> <p>1</p> <p>6</p>
<p>2</p>	<p>2 Processing Trains consisting of 8 stacks:</p> <ul style="list-style-type: none"> • Train 1 Calcination stack 48.5m high (SK1) • Train 2 Calcination stack 48.50m high (SK4) • Train 1 Ball mill stack 30.0m high (SK2) • Train 2 Ball mill stack 30.0m high (SK5) • Train 1 Acid roaster stack 26.2m high (SK3) • Train 2 Acid roaster stack 26.2m high (SK6) • Steam boiler stack 15.0m high (SK8) • Sodium sulphate stack 10.0m high (SK7) 	<p>As depicted in Schedule 1, Figure 2, Labelled as: SK1</p> <p>SK4</p> <p>SK2</p> <p>SK5</p> <p>SK3</p> <p>Sk6</p> <p>SK8</p> <p>SK7</p>
<p>3</p>	<p>Hermetically sealed conveyors</p> <p>Enclosed conveyors</p>	<p>As depicted in Schedule 1, Figure 2, Labelled as: 6</p> <p>1</p>
<p>4</p>	<p>Calciner trains 1 and 2 contain</p> <ul style="list-style-type: none"> • Static cyclone to remove entrained fines. • Multi-compartment bag house filters. • Induced draft stack fans 	<p>As depicted in Schedule 1, Figure 2, Labelled as: 2</p>

Prescribed Activity, Category 44		
<p>Approximately 382 860 dry tpa of spodumene concentrate will be received by truck and processed to produce lithium hydroxide along with waste by-products sodium sulphate, de-lithiated beta spodumene and mixed salts material.</p>		
Prescribed Activity Category 31		
<p>Approximately 50,276 dry tpa of lithium hydroxide monohydrate will be chemically manufactured to supply lithium for battery manufacturing, and 116,531 dry tpa sodium sulphate will be produced as a commercial byproduct.</p>		
Site Infrastructure		Location
5	<p>All bag house filters are:</p> <ul style="list-style-type: none"> • Able to filter particulate matter emissions to $\leq 30 \text{ mg/m}^3$ • Connected to the Process Control System (PCS) with alarms to identify broken bags. 	As depicted in Schedule 1, Figure 2, Labelled as: 2 , 5
6	<p>Acid roast trains 1 and 2 contain:</p> <ul style="list-style-type: none"> • Venturi scrubber. • Combined cyclonic / chevron -type entrapment separator • A quench vessel • An emergency quench vessel • Wet electrostatic precipitator • A fibre bed mist eliminator • Draft stack fan. 	As depicted in Schedule 1, Figure 2, Labelled as: 2
7	<p>Sodium sulphate dryer contains:</p> <ul style="list-style-type: none"> • Multi-compartment bag house filters. • Induced draft stack fan 	As depicted in Schedule 1, Figure 2, Labelled as: 5
8	<p>Liquor effluent containment and transfer pipes compliant with AS3780-2008 including:</p> <ul style="list-style-type: none"> • All process tanks, sumps and bunds. • Spillage and runoff surge tank, sumps and bunds • Wastewater treatment plant tanks, sumps and bunds • SDOOL brine tank, sump and bunds • Discharge pipework and connection point to SDOOL (E1). 	<p>No reference</p> <p>As depicted in Schedule 1, Figure 2, Labelled as E1</p>
	Acid, caustic, chemical and oil storage areas with bunds (reagents)	As depicted in Schedule 1, Figure 2, Labelled as: 3
	Contaminated Stormwater system	No reference

Schedule 1 Premises Maps

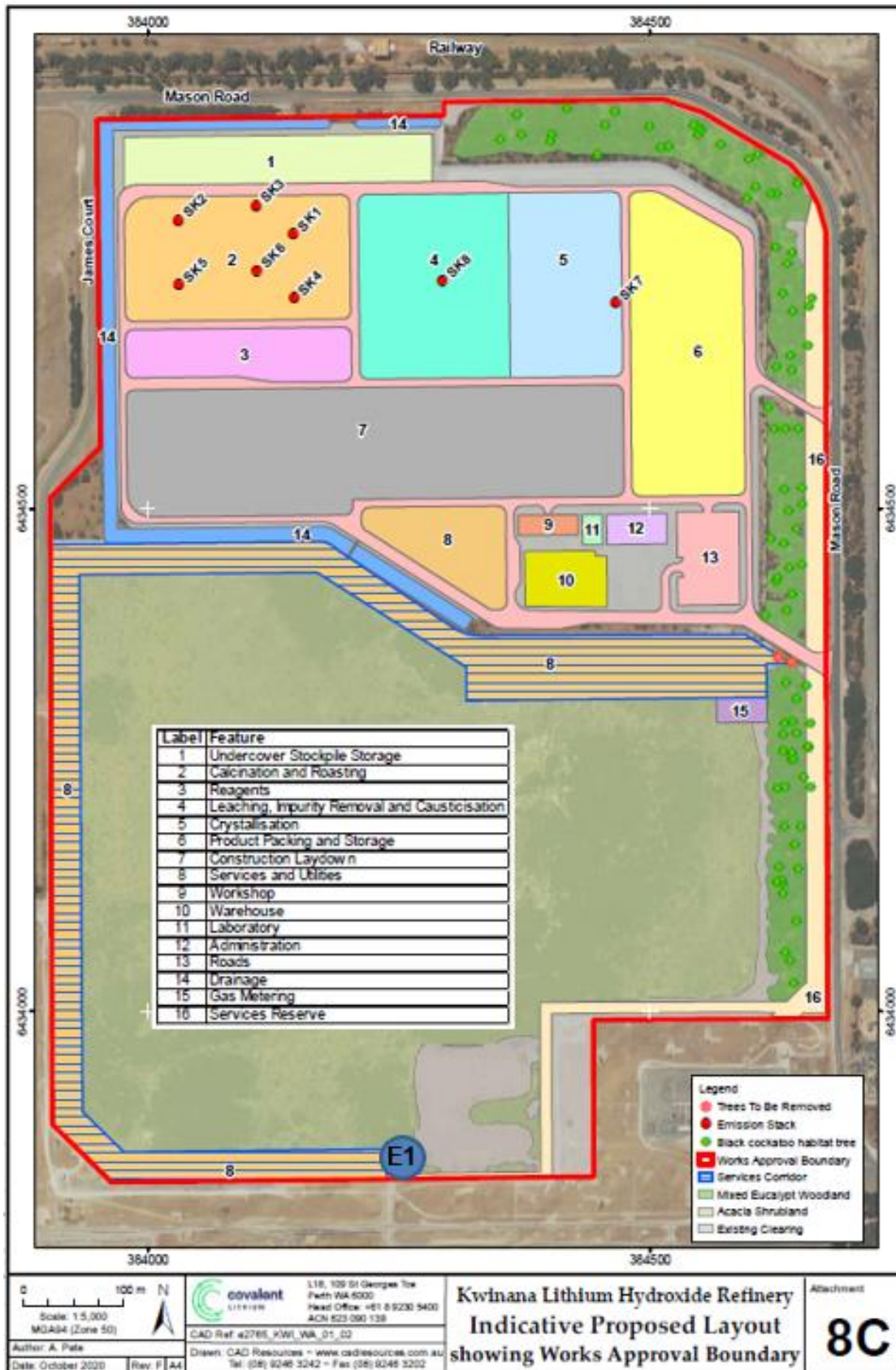


Figure 2– Site plan of premise

Works Approval: W6499/2021/1