Alcoa of Australia Limited

Attachment 3B: Kwinana Water Treatment Plant – Supporting Document

17 October 25

Version	Description of Changes	Date	Approved by
A	DRAFT for internal review	3 October 2025	-
0	FINAL	17 October 2025	[redacted]

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1. Introduction

1.1 Ownership

Alcoa of Australia Limited (Alcoa), is the owner and proponent of the Kwinana Alumina Refinery (Kwinana Refinery), located 27 km south of Perth CBD in the Kwinana Industrial Area (KIA) of Western Australia. The location is shown on Figure 1-1.

Operations at the Kwinana Refinery are approved via Environmental Licence L5245/1967/14. The Prescribed Premises for L5245/1967/14 is shown on Figure 1-2.

1.2 Background

The Kwinana Refinery was commissioned in 1963 and comprises the alumina refinery; tank farm; port and rail facilities; and the closed and operating Residue Storage Areas (RSAs). A portion of closed RSAs A, B and C has been rehabilitated as Perth Motorplex which opened in 2000. Six RSAs (F, H, J, K, L and N) are currently operational.

Processing of bauxite is not currently undertaken at the Kwinana Refinery, following the curtailment of the refining equipment and infrastructure in 2024. Alcoa announced the permanent closure of the refinery in September 2025. While the refinery and RSAs will be closed, the port, raw material imports and product export facilities remain operational and continue to serve Alcoa's other refineries at Pinjarra and Wagerup.

During normal operations, a closed water system is maintained with process and evaporative water losses replaced from collected stormwater, municipal supply and a network of groundwater bores. Operation of the groundwater recovery bores is a requirement of the *Contaminated Sites Act 2003* (CS Act) and the *Kwinana Groundwater Monitoring and Management Plan* (Alcoa, 2023) required under Condition W1 of Environmental Licence L5245/1967/15.

As there is no process water usage due to the bauxite refinery infrastructure being curtailed and scheduled for closure, new management approaches are required for water inflows from recovery bores, underdrains, and stormwater generated on-site now and post closure. This Works Approval application seeks authorisation to construct, commission and operate a Water Treatment Plant (WTP) to improve water quality within the ROWS Pond and to enable future disposal and reuse outlets.

1.3 Purpose

This supporting document has been prepared to support a Works Approval application for the construction, commissioning and time-limited operation (TLO) of a WTP at the Kwinana refinery Residue Storage Area (RSA).

1.4 Application Form

The Works Approval application has been prepared in accordance with the requirements of Section 59B of the *Environmental Protection Act 1986* (EP Act) and the Industry Regulation Guide to Licencing (DWER, 2019). This supporting document is Attachment 3B of the DWER Application Form.

Table 1-1 shows the DWER Application Form completion matrix and addresses each information requirement.

Table 1-1: Information Relevant to DWER Application Form

Section in Application Form		Section in this Document
Part 1	Application type	Section 1.3
Part 2	Applicant details	Refer to Application Form
Part 3	Premises details	Section 2
Part 4	Proposed activities	Section 4
Part 5	Index of Biodiversity Surveys for Assessment (IBSA)	Not required
Part 6	Other DWER approvals	Section 7
Part 7	Other approvals and consultation	Section 7
Part 8	Applicant history	Refer to Application Form
Part 9	Emissions, discharges and waste	Section 4 & 8
Part 10	Siting and location	Section 9
Part 11	Submission of any other relevant information	This supporting document
Part 12	Category checklist	Not required
Part 13	Proposed fee calculation	Section 11
Part 14	Commercially sensitive or confidential information	Not required
Part 15	Submission of application	Refer to Application Form
Part 16	Declaration and signature	Refer to Application Form
Attachments		
Attachment 1A	Proof of occupier status	Not required
Attachment 1B	ASIC company extract	Not required
Attachment 1C	Authorisation to act as a representative of the occupier	Not required
Attachment 2	Premises maps	Figure 1-1 & 1-2
Attachment 3A	Environmental commissioning plan	Section 6.3
Attachment 3B	Proposed activities	Figure 4-1, 4-2, & 4-3
Attachment 3C	Map of area to be cleared	Not required
Attachment 3D	Additional information for clearing assessment	Not required
Attachment 4	Marine surveys	Not required
Attachment 5	Other approvals and consultation documentation	Not required
Attachment 6A	Emissions and discharges	Section 8
Attachment 6B	Waste acceptance	Section 4
Attachment 7	Siting and location	Not required
Attachment 8	Additional information submitted	Not required

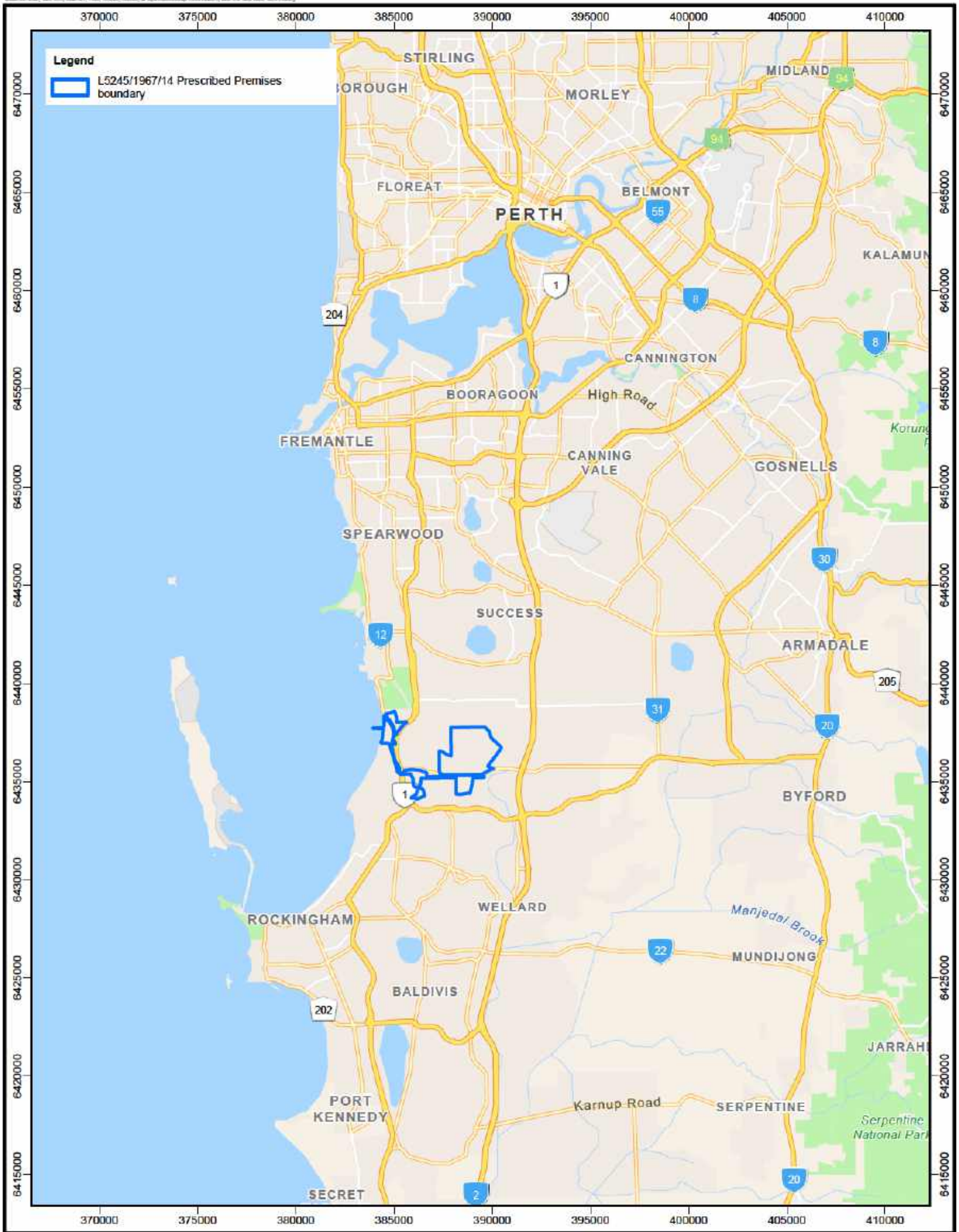
Section in Application Form		Section in this Document
Attachment 9	Category-specific checklist(s)	Not required
Attachment 10	Proposed fee calculation	Section 11
Attachment 11	Request for exemption from publication	Not required

1.5 Current Part V Applications

The status of current and recent Part V approval applications to support water management at Kwinana is provided in Table 1-2.

Table 1-2: EP Act Part V Approvals

Type	Scope	Status
Works Approval	Construction, commissioning and TLO of a WTP to treat recovered groundwater and stormwater to improve onsite water quality and enable future disposal options.	This application
Licence Amendment	Installation and operation of additional land-based evaporators at RSA F7 and the Cooling Pond	Under Assessment
Works Approval	Installation and operation of infiltration trenches and/or injection bores to dispose of treated water.	Pre-submission
Works Approval	Construction, commissioning and TLO of a separate WTP to treat water contained in the Cooling Water Pond.	Pre-submission
Works Approval	Construction, commissioning and TLO of a Brine Treatment Plant to treat brine stored in the Lake Water Pond.	Pre-submission



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km

Scale: 1:234,375

AGD 1984 AMG Zone 50

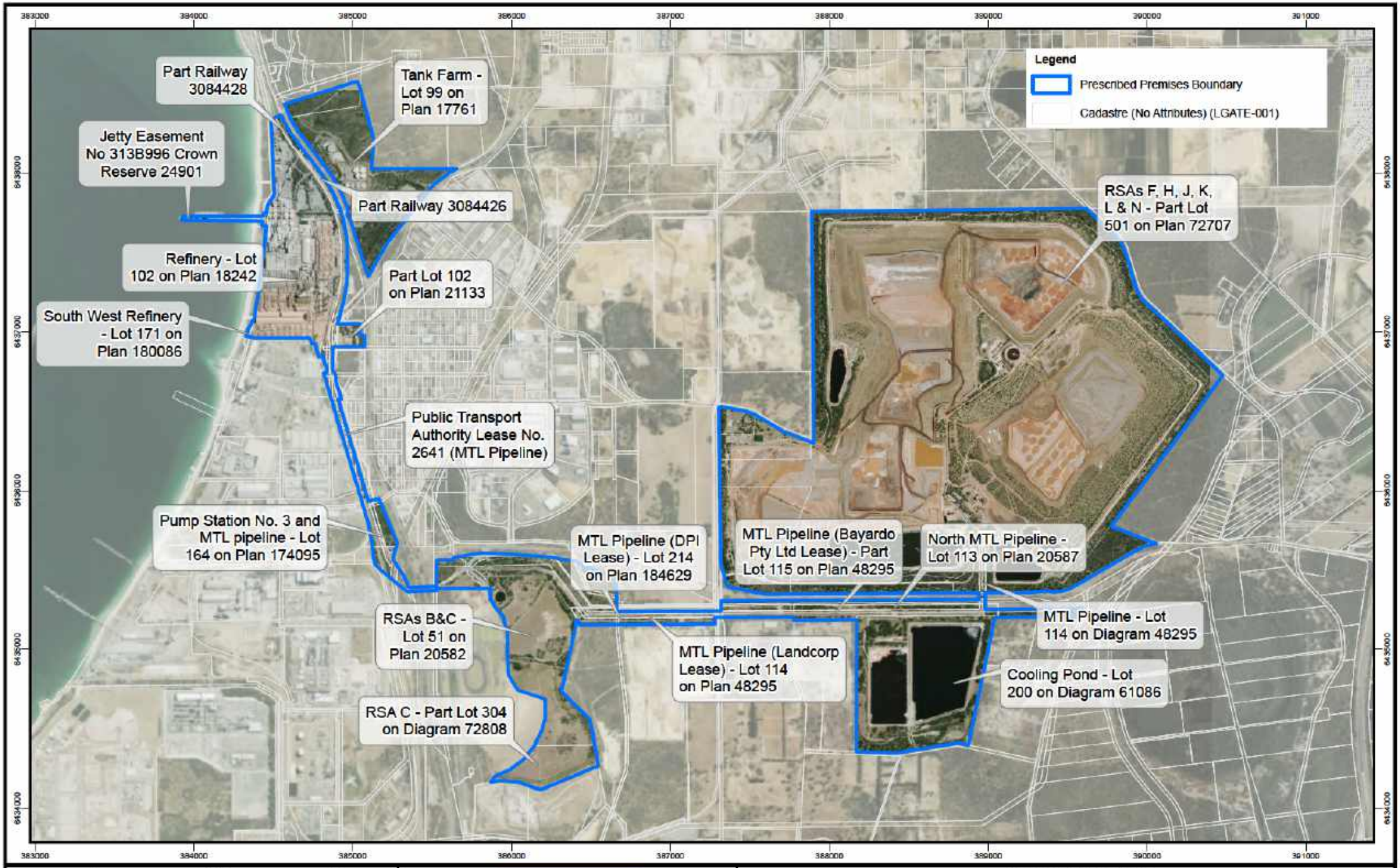
Alcoa

Kwinana Refinery WTP

Figure 1-1 Location

Drawing #: EA1P0031_D001_Figure 1-1 Location			Author: holnec
Date: 16/10/2025	Rev: A	A4	Date Printed: 16/10/2025

Path: L:\users\EApprovals\EA1P0031\Projects\EA1P0031\EA1P0031_WTP.aprx



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km

Scale: 1:30,000

AGD 1984 AMG Zone 50

Alcoa

Kwinana Refinery WTP

Figure 1-2 Prescribed Premises

Drawing #: Figure 1-2 Prescribed Premises			Author: smita
Date: 28/08/2025	Rev: A	A4	Date Printed: 28/08/2025

2. Premises Details

2.1 Prescribed Premises

The Works Approval boundary is shown in Figure 1-2 and consists of the WTP site, ROWS Pond, Cooling Pond, Lake Water Pond and associated pipeline corridors. The Works Approval Area is located entirely within the boundary of the Prescribed Premises for L5245/1967/14.

2.2 Prescribed Premises Categories

The Prescribed Premises categories on L5245/1967/14 are listed in Table 2-1. This Works Approval application is relevant to Category 46. No change to assessed design capacities is proposed.

Table 2-1: Assessed Design Capacities on L5245/1967/14

Prescribed premises category description (Schedule 1, Environmental Protection Regulations 1987)	Assessed design capacity
Category 5: Processing or beneficiation of metallic or non-metallic ore	5,000,000 tonnes per year (filter mud cake from filtration facility, dry)
Category 46: Bauxite refining	2,409,000 tonnes per year (smelter grade alumina equivalent)
Category 52: Electric power generation	76.5 MW in aggregate
Category 58: Bulk material loading or unloading	4,818,000 tonnes per year
Category 64: Class II or III putrescible landfill site	1,000 tonnes per year
Category 67: Fuel burning	65,000 m^3 per hour

2.3 Land Tenure and Ownership

The Works Approval Area consists of:

- Part Lot 501 on Plan 72707;
- Lot 200 on Diagram 61086;
- Lot 114 on Diagram 48295;
- Part of Lot 113 on Plan 20587; and
- Part of Lot 115 on Plan 48295.

3. Water Balance and Management

Following the announcement of curtailment, the refinery has been operating in the Transitional Operation Phase (TOP). Under the TOP, elements of the refinery operate to facilitate the circulation of Bayer liquor. This process results in the removal of water via evaporation, and the concentration of the liquor to produce Condensed Alumina Refinery Process solution (CARP), which is subsequently use in the Pinjarra Refinery. It is Alcoa's intention to curtail the TOP circuit once alternative water outlets have been secured to offset the current TOP refinery evaporative losses. The primary short-term alternative water outlet being progressed at the site is the installation of mechanical evaporators. At the time of this application, evaporators were established and operational on the ROWS Pond and RSA K, approvals had been granted for the installation of evaporators on RSA J, H and F6 and installation had commenced, and a Licence Amendment application was under assessment by DWER for additional evaporators on RSA F7.

Table 3-1provides the water balance for the site under average and high rainfall scenarios assuming all evaporators are operational, and the TOP circuit has been fully curtailed. Under an average rainfall scenario, the water losses exceed inputs by 102kL/hr annualised over a 12-month period. Under the high rainfall scenario, water inputs exceed water losses by 78kL/hr, and the water balance remains positive. In this scenario, the surplus water would be contained within the water storage dams onsite. It is Alcoa's intention to progress a separate Works Approval application for infiltration and/or reinjection of the treated water produced by the WTP. The introduction of infiltration and/or reinjection is estimated to provide a water loss of up to 400kL/hr to manage excess water from the site. If approved, infiltration and/or reinjection will likely be the primary water outlet for the site, with the use of evaporators being reduced over time.

Table 3-1: Water Balance Summary – Fully Curtailed Refinery and Evaporators Operational

Component	Average[1] Rainfall Year Input / Output (kL/hr)	High[2] Rainfall Year Input / Output (kL/hr)
Water Inputs		
Rainfall	310	490
Abstraction Bores	173[3]	173[3]
Potable Water	20	20
TOTAL INPUTS	**503**	**683**
Water Losses		
Pan Evaporation	(120)	(120)
ROWS and RSA K Evaporators	(111)	(111)
RSA J, H & F6 Evaporators	(257)	(257)
RSA F7 Evaporators (under assessment)	(97)	(97)
Dust Suppression	(20)	(20)
TOTAL LOSSES	**(605)**	**(605)**
To Storage / From Storage	**(102)**	**78**

[1]An average rainfall year is a 50% Annual Exceedance Probability (AEP).

[2]A high rainfall year is a 1% AEP.

[3]Consists of 20kL/hr production bore water and 153kL/hr abstraction bore water as the proposed abstraction rate detailed in the revised Groundwater Monitoring and Management Plan (GMMP) currently under assessment by DWER.

The installation and operation of the WTP alone will not materially change the water balance for the site. The WTP will be commissioned and initially operated in a closed loop configuration abstracting feed water from the ROWS Pond and F-Surge and returning treated water to the ROWS Pond and brine to the Lake Water Pond. Water will continue to be removed from the system via solar and mechanical evaporation until such time as alternative outlets are secured.

4. Proposed Activities

This Works Approval application is for:

- The installation of a WTP within the footprint of RSA L to treated water from the ROWS Pond and F-Surge Pond.
- The installation of pipelines for feed water, treated water, return water, brine and centrifuge cake.
- Establishment of disposal cells for the disposal of centrifuge cake within RSA L.
- Transfer and storage of treated water in the ROWS Pond.
- Transfer and storage of brine in the existing Lake Water Pond.
- Commissioning of the infrastructure.
- Time-limited operations of the infrastructure.

The WTP and Centrifuge Cake disposal area will be located within the boundary of RSA L. A site layout is provided in Figure 4-1 and Figure 4-2.

This Works Approval application is strictly limited to the construction, commissioning, and TLO of a closed loop WTP. The WTP will operate in a recirculating configuration, with all treated water returned to the ROWS Pond and no discharge proposed under this application. Any future proposal to discharge treated water to the environment or to facilitate offsite reuse will be subject to a separate application process. Such future applications will include the specification of water quality criteria appropriate to the intended discharge or reuse scenario. Accordingly, this approval does not seek to define or seek approval for discharge or treatment water quality criteria, as these will be determined in accordance with the requirements and objectives of any subsequent discharge or reuse proposal.

4.1 Water Treatment Plant Infrastructure and Processes

The proposed WTP comprises a five-stage treatment process inclusive of neutralisation, clarification, media filtration, ultra filtration and reverse osmosis. A series of Centrifuges are also included to allow for dewatering of clarifier underflow waste to produce Centrifuge Cake, an Alumina Hydrate product primarily consisting of gibbsite and dawsonite. Plate 4-1 provides process flow diagram of the treatment process. Feed water to the plant will be feed from the ROWS Pond and F-Surge Pond. Table 4-1 provides the indicative process flow volumes corresponding to the process flow diagram. The volumes provided in Table 4-1 are indicative only and are provided as a guide to indicate the process flows through the WTP. The actual volumes during operations will fluctuate depending on treatment volumes, water quality and WTP operating parameters at the time.

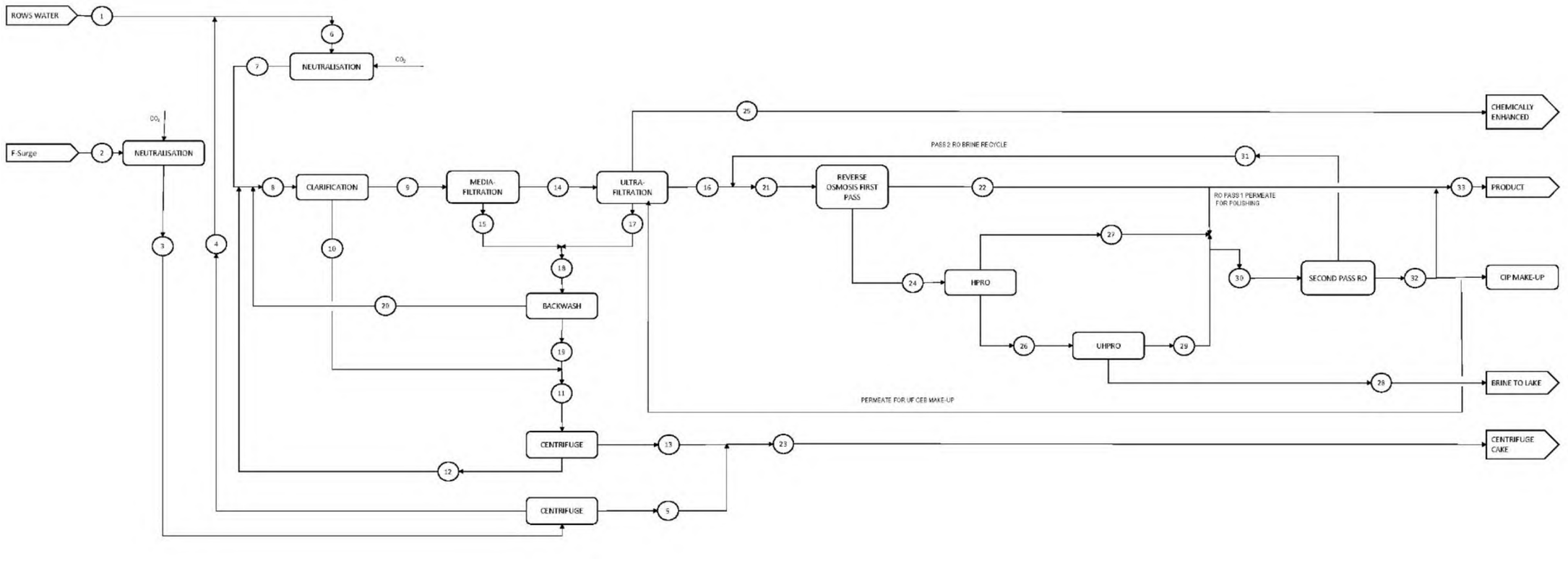

Plate 4-1: Water Treatment Plant Process Flow

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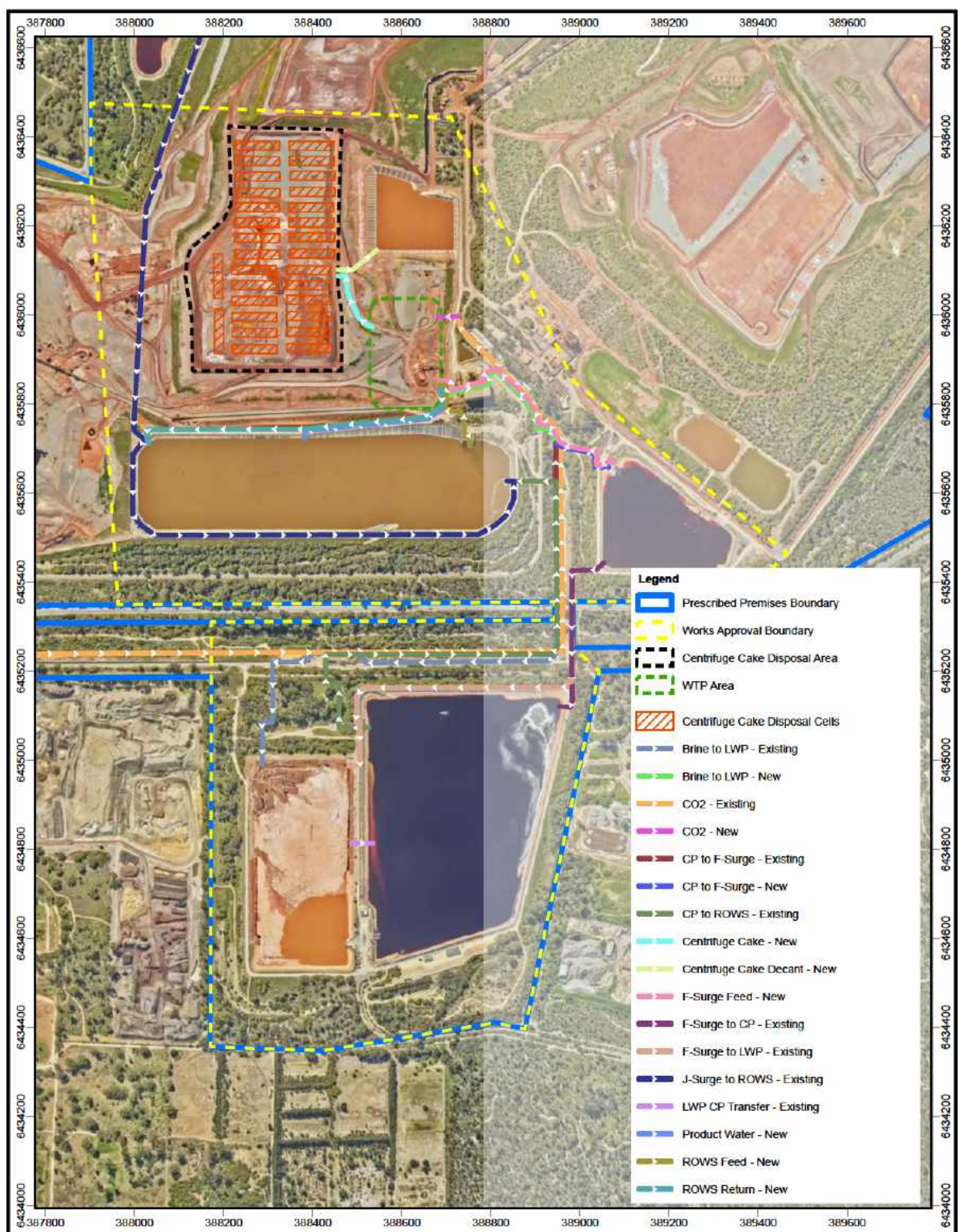
Table 4-1: Indicative Process Flow Volumes – Indicative values only, subject to changed based treatment volume, input water quality and operation parameters

Stream #		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Description	UOM	ROWS Feed	F-Surge Feed	Neutralised F-Surge	F-Surge Centrifuge Centrate	F-Surge Centrifuge Cake	ROWS + F-Surge	Neutralised Feed	Clarifier Feed	Clarifier Overflow	Clarifier Underflow	Centrifuge Feed	Centrifuge Centrate	Centrifuge Cake	MF Filtrate	MF Backwash Water	UF Filtrate	UF Backwash Water
Flow (average)	m^3/hr	324	60.3	60.3	57.4	2.88	381	381	654	589	65.4	83.7	81.9	1.77	501	88.3	379	121
Flow (instantaneous)	m^3/hr	360	67.0	67.0	63.8	3.19	424	424	727	654	72.7	93.0	91.0	1.97	556	98.1	422	135
Stream #		18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	
Description	UOM	Combined Backwash Water	Backwash Clarifier Underflow	Backwash Clarifier Overflow	RO Feed (Pass 1)	RO Permeate (Pass 1)	Combined Solids Cake	RO Brine (Pass 1)/HPRO Feed	Chemically Enhanced Backwash Water	HPRO Brine	HPRO Permeate	UHPRO Brine	UHPRO Permeate	Second Pass RO Feed	Second Pass RO Brine	Second Pass RO Permeate	Combined Product	
Flow (average)	m^3/hr	209	18.3	191	414	207	4.65	207	12.1	112	95.3	64.9	47.0	349	34.9	315	302	
Flow (instantaneous)	m^3/hr	233	20.3	212	460	230	5.17	230	13.5	124	106	72.1	52.2	388	38.8	349	335	



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km

Scale: 1:10,310

AGD 1984 AMG Zone 50

Alcoa

Kwinana Refinery WTP

Figure 4-1 Site Layout

Drawing #: EA1P0031_D003_Figure 4-1			Author: holnec
Date: 16/10/2025	Rev: A	A4	Date Printed: 16/10/2025

Path: L:\users\EApprovals\EA1P0031\Projects\EA1P0031\EA1P0031_WTP.aprx

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km

Scale: 1:4,057

AGD 1984 AMG Zone 50

Alcoa

Kwinana WTP Project

Figure 4-1 Site Layout

Drawing #: EA1P0031_D004_Figure 4-2			Author: holnec
Date: 16/10/2025	Rev: A	A4	Date Printed: 16/10/2025

Path: L:\data\EApprovals\EA1P0031\Projects\EA1P0031\EA1P0031_WTP.aprx

The WTP will produce three key streams:

- A treated water stream returned to the ROWS pond for storage and subsequent evaporation via the existing network of floating and land-based evaporators.
- A Centrifuge Cake from the centrifuge which will be conveyed via pipeline to cells within RSA L for disposal.
- A brine stream from the ultra-high pressure reverse osmosis (UHPRO). The brine will be conveyed via pipeline to the Lake Water Pond and Cooling Pond for storage. Alcoa is progressing solutions analysis and design work for Brine Treatment Plant which will concentrate and reduce the brine stream volume, whilst potentially providing a reuseable product. The Brine Treatment Plant will be addressed via a subsequent Works Approval application scheduled for submission in the first half of 2026.

Table 4-2 provides a summary of the key equipment and infrastructure associated with the works. Figure 4-3 presents the indicative layout of the WTP and identifies the discrete infrastructure and equipment. Please note, the WTP layout is indicative only, and the final installed location of individual tanks and discrete processing units may differ from the layout provided. The ‘as constructed’ layout of the plant elements will be provided to DWER via the standard Compliance Reporting conditions associated with Works Approvals.

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Table 4-2: Key Equipment and Waste Summary

Treatment Stage	Equipment summary	Inputs	Outputs
Neutralisation	Neutralisation of two separate streams by injection of CO_2. Feed stream from ROWS pond and the other from F-surge. The higher concentration stream from F-surge will be blended with a smaller stream from ROWS to achieve the required feed concentration. **ROWS stream neutralisation** 2 x Neutralisation pipe reactors (HDPE) configured in a duty/standby arrangement and a CO_2 injection pipe skid feeding to a series of 9 x Coagulation tanks. **Blended F-surge stream neutralisation** Neutralisation will be in the form of 2 x Neutralisation tank reactors (50 kL per tank) or a neutralisation pipe reactor; the final selection is dependent on pilot test work. Chemical clean in place tank (5 kL), pump and bag filter for cleaning of the neutralisation pipe reactors. The bag filter entraps solids as they are dislodged during the cleaning process.	Alkaline water from ROWS pond. Alkaline water from F-surge. CO_2 from existing onsite supply pipeline at 3,500 kg/h total. **Chemicals** Sodium Hydroxide for cleaning. Delivered and stored in a double walled 1.5 kL tank. 1 x 1 kL deliveries per month, transfer directly into site tank.	Neutralised water to Clarification. Off-spec water returned to the ROWS pond via the ROWS Return line. Chemical clean-in-place (CIP) wash water returned to ROWS pond for retreatment. CIP bag filters are manually removed after CIP and disposed to the landfill or RSAs in accordance with existing Licence Condition G6(a)(ii). On average 68 bag filters are expected to be disposed per month. The size of one bag filter is 180 mm diameter x 810 mm length, hollow inside.
Clarification	10 x Coagulation tanks (17 kL each) and 10 x Lamella Clarifiers (12.2 L x 2.6 W x 5.0 H, m) feeding to 3 x circular Clarification tanks (192 kL each). 3 x Coagulation tanks (17 kL each) and 3 x Backwash Lamella Clarifiers (12.2 L x 2.6 W x 5.0 H, m) feeding to 1 x horizontal Backwash Clarifier Product tank (65 kL).	**Coagulation tanks and Lamella Clarifiers** Neutralised water, plus recycle streams from Backwash Clarifiers and Decanter Centrifuges to Lamella Clarifiers. Recovered backwash from media filters and ultrafiltration to Backwash Lamella Clarifiers.	**Coagulation tanks and Lamella Clarifiers** Lamella Clarifier overflow to Media filtration feed tanks. Off-spec Lamella Clarifier overflow bypasses to the ROWS Return line along with backwash waters which discharge to the ROWS Pond for retreatment.

Treatment Stage	Equipment summary	Inputs	Outputs
	3 x Decanter Centrifuge Units (13 L x 3 W x 3 H, m) to remove and dewater solids. Centrifuge Feed tanks (4 x 50 kL) and Centrate tanks (4 x 50 kL).	**Decanter Centrifuge Units** Underflow from the clarifiers (feed clarifiers and backwash recovery clarifiers) combine and feed to the centrifuges. Neutralised water from F-surge feeds directly to the centrifuge area and will then either combine with the underflows from the clarifiers before feeding to the centrifuges or feed to its own dedicated centrifuge for solids removal. **Chemicals** Clarifier chemicals to aid with settling: Coagulants (Nalco 85531 or equivalent) and Flocculants (HiTex 82230 or equivalent for clarifiers, centrifuge flocculant will be Praestol 2610, Magnafloc 338 or equivalent). Coagulant stored in a 30 kL self-bunded tank. 4 x 20 kL deliveries per month. Direct transfer from bulk tanker truck to site tank. Flocculent for clarifiers stored in a 15 kL self-bunded tank. 1 x 10 kL deliveries per month. Direct transfer from bulk tanker truck to site tank. Flocculent to aid with dewatering in centrifuge. Flocculent powder delivered in 1 kL bulk bags and used for make-up of flocculent solution. 5 x 1 kL bulk bag deliveries per month. Bulk bags offloaded from truck adjacent to the powder hopper system for make-up with water. Spare bulk	**Decanter Centrifuge Units** Centrifuge Cake output of 4 - 9m^3/hr, pumped to disposal cells in RSA L. Centrate from the centrifuges is returned to the Lamella Clarifiers.

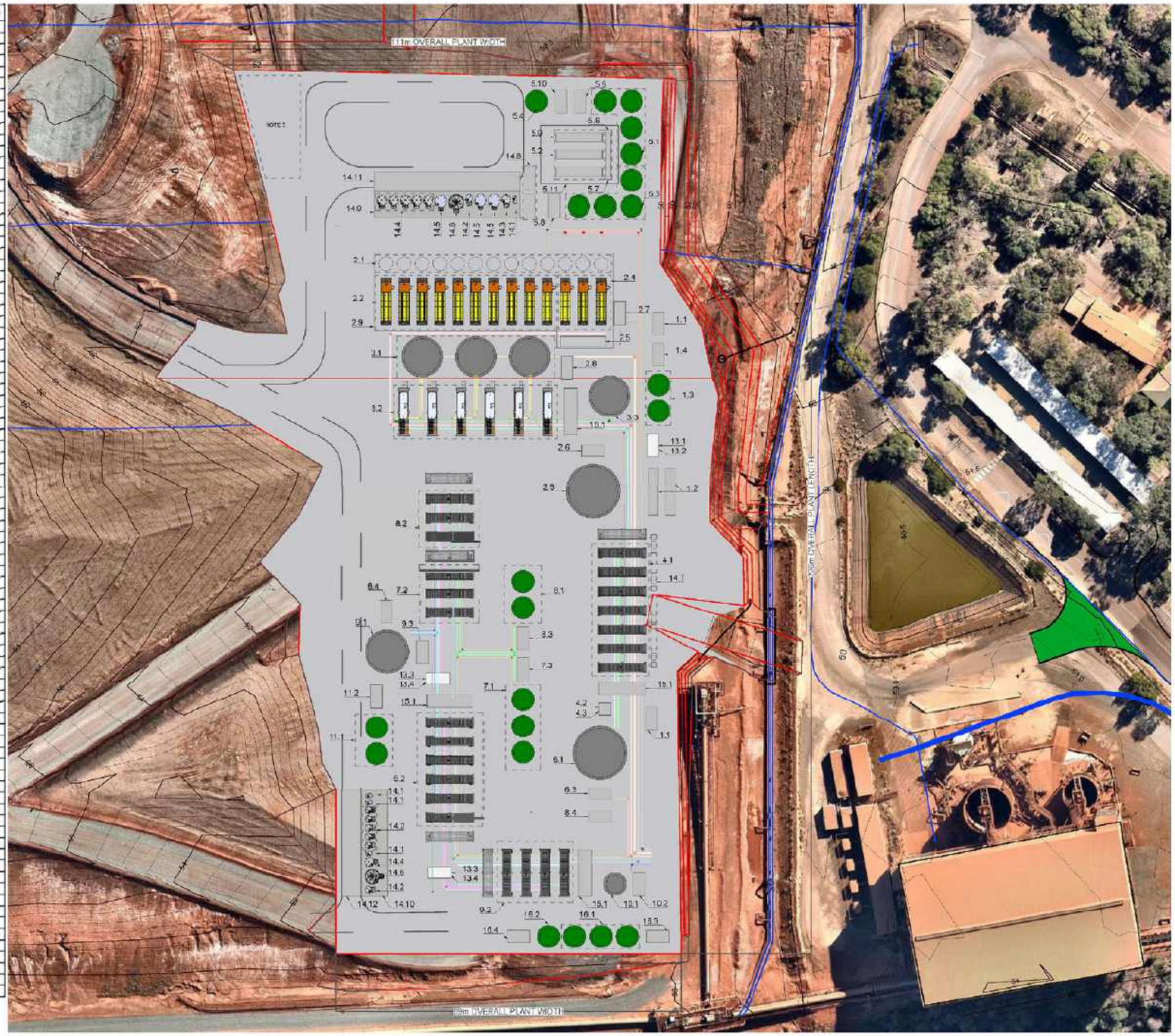
Treatment Stage	Equipment summary	Inputs	Outputs
		bags to be stored on-site in a storage container. Biocide chemical dosing to prevent biological growth in system. Typical biocide products include DBNPA and Nalco PC-22 (stabilised chlorine). Biocide stored in 10 kL self-bunded tanks (1 tank each). 2 x 5 kL deliveries per month for DBNPA and 2 x 5 kL deliveries per month for PC-22. Direct transfer from truck to site tank.	
Media Filtration	6 x horizontal media filters (~6 L x 2 W x 2 H, m). Installed in 40 ft shipping containers (one media filter per container complete with piping, valves and instrumentation). The container also houses the media filter feed and backwash pumps. Media filtration backwash feed tank (192 kL). Backwash recovery tank (327 kL) that receives backwash waste from both the media filters and Ultra-filtration filters.	Feed from the media filter feed tank. **Chemicals** Clarity aid chemical (coagulant or flocculant) to improve filtering performance of the media filter. Stored in a 1.5 kL self-bunded tank. ~1 x 1 kL deliveries per month. Direct transfer from truck to site tank.	Filtered water to the Ultra-filtration units. Backwash water to backwash recovery tank. Returns to Backwash Lamella Clarifiers from backwash recovery tank. Used media in filters are replaced every 5 years. The total volume is 86m^3 for all filters. Spent media to be disposed in onsite RSAs in accordance with existing Licence Condition G6(a)(ii).
Ultra-filtration (UF)	Multi train design (7 x Ultra-filters) that is housed in 7 x 40 ft shipping containers along with the associated pumps, valves and instruments. Chemical clean in place tanks (3 kL) for cleaning of Ultra-filtration filters, installed inside the 40 ft containers.	Flow from media filtration. Backwash water is drawn from the RO feed tank. **Chemicals** Alkali (Sodium Hydroxide), oxidant (Sodium Hypochlorite) ,acid (Sulphuric Acid), and Oxalic acid or citric acid dosing stations for chemically enhanced backwashing and CIP	Feed water to RO feed tank. Backwash water transferred to the backwash recovery tank. The blended backwash waters returned to the Backwash Lamella Clarifier. Chemically enhanced backwash waters returned to ROWS Pond via ROWS Return pipeline.

Treatment Stage	Equipment summary	Inputs	Outputs
		cleaning that happens after a set number of normal backwashes has passed. Permeate is used during chemically enhanced backwashing and is drawn from the onboard service water tank installed within every UF container. Sodium Hydroxide stored in a 15 kL self-bunded tank. ~1.5 x 10 kL deliveries per month. Direct transfer from truck to site tank. Sodium Hypochlorite stored in a 15 kL self-bunded tank. ~2 x 10 kL deliveries per month. Direct transfer from truck to site tank. Sulphuric acid stored in a 5 kL self-bunded tank. ~0.5 x 4 kL deliveries per month. Direct transfer from truck to site tank. Specialised high pH chemical for CIP stored in 3.3 kL self-bunded tank. ~0.5 x 1 kL deliveries per month. Direct transfer from truck to site tank. Specialised low pH chemical for CIP stored in 3.3 kL self-bunded tank. ~3 x 1 kL deliveries per month. Direct transfer from truck to site tank. Oxalic acid or citric acid delivered and stored in a 3.3 kL self-bunded tank. ~1.5 x 1 kL deliveries per month. Direct transfer from truck to tank.	CIP wash water is included in the common line and returned to ROWS pond via the ROWS Return pipeline. CIP bag filters are manually removed after CIP and disposed to the landfill or RSAs in accordance with existing Licence Condition G6(a)(ii). On average 60 bag filters are disposed per month. The size of one bag filter is 180 mm diameter x 810 mm length, hollow inside. The equivalent volume to landfill is 0.41m^3 per month. UF membranes have a service life of 5 years. Spent UF membranes will be disposed to the landfill or RSAs in accordance with existing Licence Condition G6(a)(ii). Total installation contains 288 x UF membranes with a size of 225 mm diameter x 2.5 m length per membrane. At the end-of-life disposal will not be all at once but as required. Averaged 5.7 m^3/yr based on complete replacement.

Treatment Stage	Equipment summary	Inputs	Outputs
Reverse osmosis (RO)	Pass 1 reverse osmosis feed tank (541 kL). Pass 1 reverse osmosis units (6 x) for primary desalination of the filtrate from ultra filtration. Pass 2 (Polishing) reverse osmosis feed tank (253 kL). Pass 2 reverse osmosis trains (4 x) for further treatment of product water from pass 1, high-pressure and ultra high-pressure RO units. High-pressure reverse osmosis feed tanks (3 x 50 kL). High-pressure reverse osmosis trains (3 x) for further treatment of reject water from pass 1 RO units. Ultra high-pressure reverse osmosis feed tank (2 x 50 kL). Ultra high-pressure reverse osmosis trains (3 x) for further treatment of reject water from high-pressure RO units. All RO units are installed in 40 ft shipping containers. Chemical clean-in-place tanks (10 kL) for cleaning of reverse osmosis filters. Two separate clean-in-place tanks and skid systems will be used to service groups of the reverse osmosis units.	Inflow from ultra filtration **Chemicals** Antiscale chemical dosing in feed to pass 1 RO units to ensure membranes do not scale up. Delivered and stored in a 1.5 kL self-bunded tank. ~0.5 x 1 kL deliveries per month. Direct transfer from truck to tank. Sodium Metabisulphite (SMBS) dosing in feed to pass 1 RO units to protect membranes against oxidation. Delivered and stored in a 3.3 kL self-bunded tank. ~2 x 1 kL deliveries per month. Direct transfer from truck to tank. Antiscale chemical dosing in feed to high-pressure RO units to ensure membranes do not scale up. Delivered and stored in a 1.5 kL self-bunded tank. ~0.5 x 1 kL deliveries per month. Direct transfer from truck to tank. Specialised high pH chemical for CIP delivered and stored in a 3.3 kL self-bunded tank. ~2 x 1 kL deliveries per month. Direct transfer from truck to tank. Specialised low pH chemical for CIP stored in 3.3 kL self-bunded tank. ~0.2 x 1 kL deliveries per month. Direct transfer from truck to tank. Sodium Hydroxide chemical for pH adjustment of the final product.	Product water to storage tanks. From there it is returned to the ROWS Pond. Brine returning to Lake Water and Cooling Pond for storage. Cartridge filters are installed to protect RO membranes from any contaminants that may enter tanks and/or piping. Cartridge filters are changed when a set differential pressure across them is reached, normally every 2 to 4 weeks. Total duty installation contains 458 x cartridge filters with a size of 65 mm diameter x 1 m length per cartridge. The average disposal volume is 1.9 m^3/month. RO membranes have a lifetime of 1.5 to 5 years, reducing with high pressures and increased brine concentrations. Total duty installation contains 1410 x RO membranes with a size of 200 mm diameter x 1 m length per membrane. At the end-of-life disposal will not be all at once but as required. Averaged 15m^3/yr based on complete replacement. CIP bag filters are manually removed after CIP and disposed to landfill. On average 216 bag filters are disposed per month. The size of one bag filter is 180 mm diameter x 810 mm length, hollow inside. The equivalent volume to landfill is 1.47m^3 per month.

Treatment Stage	Equipment summary	Inputs	Outputs
	Degasser column (3 m diameter) with packing for stripping of CO_2 from the product stream of pass 2 RO units. Service water tanks (2 x 50 kL) for storage of permeate for use in plant operations such as flush water, seal water, clean-in-place etc. Product Storage Tanks (3 x 50kL) for storage of product water before discharging to ROWS Pond. Brine Storage Tank (1 x 50 kL) for storage of brine before transfer to Lake Water Pond for storage.	Sodium Hydroxide stored in a 10 kL self-bunded tank. 1 x 5 kL deliveries per month. Direct transfer from truck to site tank.	Cartridge filters, RO membranes and CIP bag filters will be disposed of to the landfill or RSAs in accordance with existing Licence Condition G6(a)(ii).

No.	MAJOR EQUIPMENT AND TANKS	QTY	EQUIPMENT DIMENSIONS AND TANK VOLUMES
1	**BOC SYSTEM**	-	
1.1	BOC GAS HANDLING SKID	2	2.5m (L) x 2m (W) x 1.5m (H)
1.2	BOC PIPE REACTOR	2	12m (L) x 3m (W) x 3m (H)
1.3	NEUTRALISATION TANK	2	4.6m (DIA) x 3.44m (H) - 50m3
1.4	NEUTRALISATION TANK DISCHARGE PUMP SKID	1	6m (L) x 2.4m (W) x 1.5m (H)
2	**CLARIFIER SYSTEM**	-	
2.1	COAGULATION TANK	13	2.05m (DIA) x 5.775m (H) - 17m3
2.2	CLARIFIER (LAMELLA)	10	12.2m (L) x 2.64m (W) x 5m (H)
2.3	BACKWASH RECOVERY TANK	1	11.36m (DIA) x 3.23m (H) - 327m3
2.4	BACKWASH CLARIFIER (LAMELLA)	3	12.2m (L) x 2.64m (W) x 5m (H)
2.5	BACKWASH CLARIFIER PRODUCT TANK	1	12.2 (L) x 2.5 (W) x 2.9 (H) - 65m3
2.6	BACKWASH CLARIFIER FEED PUMP SKID	1	6m (L) x 2.4m (W) x 1.5m (H)
2.7	BACKWASH CLARIFIER DISCHARGE SKID	1	6m (L) x 2.4m (W) x 1.5m (H)
2.8	PRODUCT BLENDING PUMP SKID	1	6m (L) x 2.4m (W) x 1.5m (H)
2.9	CLARIFIER AREA CONCRETE PAD	1	50m (L) x 30m (W)
3	**MEDIA FILTER SYSTEM**	-	
3.1	MEDIA FILTER FEED TANK	3	6.69m (DIA) x 3.23m (H) - 192m3
3.2	MEDIA FILTER CONTAINER	6	12.2m (L) x 2.44m (W) x 2.9m (H)
3.3	MEDIA FILTER BACKWASH TANK	1	6.69m (DIA) x 3.23m (H) - 192m3
4	**ULTRAFILTER SYSTEM**	-	
4.1	ULTRAFILTER CONTAINER	7	12.2m (L) x 2.44m (W) x 2.9m (H)
4.2	ULTRAFILTER SUMP	1	1.5m (L) x 1.5m (W) x 1.2m (H)
4.3	ULTRAFILTER SUMP PUMP SKID	1	2m (L) x 2m (W) x 1.5m (H)
5	**CENTRIFUGE SYSTEM**	-	
5.1	CENTRIFUGE FEED TANK	4	4.6m (DIA) x 3.44m (H) - 50m3
5.2	CENTRIFUGE	3	13m (L) x 3m (W) x 3m (H)
5.3	CENTRIFUGE CENTRATE TANK	4	4.6m (DIA) x 3.44m (H) - 50m3
5.4	CENTRIFUGE DISCHARGE SLUDGE TANK	1	4.6m (DIA) x 3.44m (H) - 50m3
5.5	CENTRIFUGE FEED PUMP SKID	1	6m (L) x 2.4m (W) x 1.5m (H)
5.6	CENTRIFUGE CENTRATE SUMP	2	10m (L) x 1.5m (W) x 1m (H)
5.7	CENTRIFUGE CENTRATE SUMP DISCHARGE PUMP SKID	3	2m (L) x 2m (W) x 1.5m (H)
5.8	CENTRIFUGE CENTRATE DISCHARGE PUMP SKID	1	6m (L) x 2.4m (W) x 1.5m (H)
5.9	CENTRIFUGE DISCHARGE SLUDGE PUMP SKID	3	2m (L) x 1.5m (W) x 1m (H)
5.10	CENTRIFUGE DISCHARGE SLUDGE TANK DISCH. PUMP SKID	1	6m (L) x 2.4m (W) x 1.5m (H)
5.11	CENTRIFUGE AREA CONCRETE PAD	1	20m (L) x 15m (W)
6	**REVERSE OSMOSIS SYSTEM**	-	
6.1	REVERSE OSMOSIS FEED TANK	1	12.7m (DIA) x 4.27m (H) - 541m3
6.2	REVERSE OSMOSIS PASS 1 CONTAINER	6	12.2m (L) x 2.44m (W) x 2.9m (H)
6.3	REVERSE OSMOSIS LP FEED PUMP SKID	1	6m (L) x 2.4m (W) x 1.5m (H)
6.4	REVERSE OSMOSIS FLUSH PUMP SKID	1	6m (L) x 2.4m (W) x 1.5m (H)
7	**HIGH PRESSURE REVERSE OSMOSIS SYSTEM**	-	
7.1	HIGH PRESSURE REVERSE OSMOSIS FEED TANK	3	4.6m (DIA) x 3.44m (H) - 50m3
7.2	HIGH PRESSURE REVERSE OSMOSIS CONTAINER	3	12.2m (L) x 2.44m (W) x 2.9m (H)
7.3	HIGH PRESSURE REVERSE OSMOSIS LP FEED PUMP SKID	1	6m (L) x 2.4m (W) x 1.5m (H)
8	**ULTRA HIGH PRESSURE REVERSE OSMOSIS SYSTEM**	-	
8.1	ULTRA HIGH PRESSURE REVERSE OSMOSIS FEED TANK	2	4.6m (DIA) x 3.44m (H) - 50m3
8.2	ULTRA HIGH PRESSURE REVERSE OSMOSIS CONTAINER	3	12.2m (L) x 2.44m (W) x 2.9m (H)
8.3	ULTRA HIGH PRESSURE REVERSE OSMOSIS FEED PUMP SKID	1	6m (L) x 2.4m (W) x 1.5m (H)
8.4	FINAL BRINE DISCHARGE PUMP SKID	1	6m (L) x 2.4m (W) x 1.5m (H)
9	**POLISHING REVERSE OSMOSIS SYSTEM**	-	
9.1	POLISHING REVERSE OSMOSIS FEED TANK	1	8.69m (DIA) x 4.27m (H) - 253m3
9.2	POLISHING REVERSE OSMOSIS CONTAINER	4	12.2m (L) x 2.44m (W) x 2.9m (H)
9.3	POLISHING REVERSE OSMOSIS LP FEED PUMP SKID	1	6m (L) x 2.4m (W) x 1.5m (H)
10	**REVERSE OSMOSIS PERMEATE SYSTEM**	-	
10.1	DEGASSER	1	9m (DIA) x 5m (H) - TBC
10.2	PRODUCT DISCHARGE PUMP SKID	1	6m (L) x 2.4m (W) x 1.5m (H)
11	**SERVICE WATER SYSTEM**	-	
11.1	SERVICE/FLUSH WATER TANK	2	4.6m (DIA) x 3.44m (H) - 50m3
11.2	SERVICE WATER PUMP SKID	1	6m (L) x 2.4m (W) x 1.5m (H)
12	**UTILITIES / PLANT COMPRESSOR SYSTEM**	-	
12.1	NONE	-	
13	**CLEAN-IN-PLACE SYSTEM**	-	
13.1	BOC CIP SKID	1	6m (L) x 2.4m (W) x 1.5m (H)
13.2	BOC CIP TANK	1	1.95m (DIA) x 2.17m (H) - 5m3
13.3	REVERSE OSMOSIS CIP SKID	2	6m (L) x 2.4m (W) x 1.5m (H)
13.4	RO CIP TANK	2	2.8m (DIA) x 2.17m (H) - 10m3
14	**DOSING**	-	
14.1	1500L DOSING TANK	4	1.17m (DIA) x 2.25m (H) - 1.5m3
14.2	3300L DOSING TANK	7	1.8m (DIA) x 2.2m (H) - 3.3m3
14.3	5000L DOSING TANK	1	2.2m (DIA) x 2.2m (H) - 5m3
14.4	10000L DOSING TANK	6	2.5m (DIA) x 2.7m (H) - 10m3
14.5	15000L DOSING TANK	3	3.0m (DIA) x 2.9m (H) - 15m3
14.6	30000L DOSING TANK	2	3.8m (DIA) x 3.69m (H) - 30m3
14.7	FIELD IBC UNITS	12	1.1m (L) x 1.1m (W) x 1.1m (H)
14.8	FLOCULLANT MAKE UP AND DOSING SYSTEM	1	12m (L) x 2.4m (W) x 2m (H)
14.9	DOSING TANK CONCRETE PAD - CLARIFIER AREA	1	40m (L) x 8m (W)
14.10	DOSING TANK CONCRETE PAD - RO AREA	1	30m (L) x 8m (W)
14.11	TRUCK UNLOADING CONCRETE PAD - CLARIFIER AREA	1	40m (L) x 5m (W)
14.12	TRUCK UNLOADING CONCRETE PAD - RO AREA	1	30m (L) x 5m (W)
15	**ELECTRICAL**	-	
15.1	SWITCHROOMS	4	12.0m (L) x 3.5m (W) x 2.9m (H)
16	**FINAL PRODUCT AND BRINE TANK FARM**	-	
16.1	FINAL PRODUCT TANK	3	4.6m (DIA) x 3.44m (H) - 50m3
16.2	FINAL BRINE TANK	1	4.6m (DIA) x 3.44m (H) - 50m3
16.3	FINAL PRODUCT DISCHARGE PUMP SKID	1	6m (L) x 2.4m (W) x 1.5m (H)
16.4	FINAL BRINE DISCHARGE PUMP SKID	1	6m (L) x 2.4m (W) x 1.5m (H)



NOTES:

1. THE LAYOUT, EQUIPMENT LOCATIONS AND INFORMATION IS PRELIMINARY ONLY. TRUCK ROUTES ARE INDICATIVE ONLY.
2. LAYOUT DEPICTS LATEST CONCEPTUAL LAYOUT ONLY. PROXA RESERVES THE RIGHT TO CHANGE TO MEET CONTRACT OR EXECUTIONAL REQUIREMENTS.
3. AREA TO BE POTENTIALLY USED FOR PLACEMENT OF WTP SPARES STORAGE, IN THE FORM OF CONTAINERS OR PREFABRICATED BUILDINGS - TBC.

REVISION

REV	DESCRIPTION	DRAWN	CHECKED	APPROVED	DATE
A	FIRST ISSUE	JP	TD	TD	2025.08.29
B	ADDITIONAL ITEMS ADDED	JP	TD	TD	2025.09.05
C	ADDITIONAL ITEMS ADDED	JP	TD	TD	2025.09.18
D	ADDITIONAL ITEMS ADDED	JP	TD	TD	2025.09.22
E	FINAL PRODUCT AND BRINE TANKS ADDED	JP	TD	TD	2025.09.23

GENERAL ARRANGEMENT - DRAFT VERSION
PLANT LAYOUT
OVERALL SITE LAYOUT

A2
SCALE: 1:800

P148 - ALOA KWINANA WTP

proxa

SUB CONTRACTOR DWG NO		Sheet of	REV
CLIENT DWG NO		Sheet of	REV
PROXA DWG NO	P148-M-GA-003	Sheet 1 of 1	REV E

5. Detailed Process Description

5.1 Neutralisation

Both the ROWS Pond and F-Surge feed water pH is elevated and requires adjustment to facilitate treatment. The neutralisation unit has two primary functions:

1. precipitation of aluminium as aluminium hydroxide; and
2. pH adjustment to promote insolubility of the specific organics in the feed water.

Carbon dioxide (CO_2) has been selected as the preferred neutralising agent. An existing CO_2 gas supply line will supply the CO_2 to the pipe and tank reactors.

Neutralisation of the ROWS Pond feed will be via neutralisation pipe reactors, whereas neutralisation tank reactors will likely be used for the F-Surge Pond feed, due to its higher total alkalinity. For the purposes of the Works Approval, Alcoa requests provisions be included to allow for either tank or pipe reactors for neutralising F-Surge Pond feed water.

CO_2 is injected under pressure into the neutralisation reactors, which is a piping manifold (pipe reactor), or tank (tank reactor), designed to provide the required retention time for the neutralisation reaction to happen. Injection is done through dissolver nozzles, designed to effectively distribute the CO_2 into the water. pH monitoring instrumentation on the pipe and tank reactors measures pH in real-time. The output from the unit discharges directly to the clarification step.

Monitoring equipment will measure the pH as water is conveyed to the subsequent processing stage. Any water not falling within the desired pH range will be returned to the ROWS Pond or recirculated back to the CO_2 mixing tank for retreatment. Water meeting the desired pH will proceed to the clarification treatment stage.

To maintain efficient operation of the reactors, regular cleaning cycles are undertaken utilising a caustic (Sodium Hydroxide) solution. The spent cleaning wash water is returned to the ROWS pond for storage and subsequent retreatment. The returned wash water solution doesn't pose a risk to the ROWS pond water quality as it contains caustic and other impurities which already occur in the ROWS pond. Furthermore, due to the relatively small volume returned to the ROWS pond, and the significant holding capacity of the ROWS pond, any impurities will be significantly diluted and not impact the water quality within the pond in any material way.

Plate 5-1 and Plate 5-2 provide an illustration of a typical pipe and tank reactor, respectively. Two pipe and two tank reactors will be installed in a duty/standby configuration.

Plate 5-1: Typical neutralisation pipe reactor

Plate 5-2: Typical neutralisation tank reactor

5.2 Clarification

The clarification process consists of an initial coagulation and flocculation step followed by gravity separation. Precipitate formed during the neutralisation process undergoes coagulation and flocculation to enhance settling of the particles. To promote this process, chemical coagulants and flocculants are introduced and mixed with the water. Both coagulant and flocculant is mixed via motorised paddle mixers in mixing tanks.

Following the initial mixing, the pre-treated water, containing entrained solids, enters rectangular lamella-type clarifiers. The solid particles, with densities greater than the surrounding water begin to settle in the lamella tubes and are concentrated in the sludge collection hopper at the bottom of every clarifier. Multiple sludge draw-off points ensure that the settled solids are effectively removed.

Clarified water flows through the top of the lamella plates and overflows from the unit to the media filtration feed tanks. Turbidity monitoring equipment at the outflow of the lamella clarifiers confirms effective operation, and any off-specification overflow is automatically diverted to the ROWS Return line and conveyed to the ROWS Pond for retreatment.

Sludge is periodically removed from the sludge collection hoppers of the clarifiers and buffered in a tank before being conveyed via pipeline to the decanter centrifuges for dewatering.

Flocculant is added in the feed to the centrifuges to improve solids removal and dewatering.

The centrifuge units consist of a horizontal, rotating bowl that spins at high speed. Inside the bowl is a scroll conveyor (also called an auger) that rotates at a slightly different speed. The high-speed rotation creates a strong centrifugal force which pushes heavier solid particles outward to the bowl wall, whilst lighter water remains closer to the centre of the bowl. The scroll conveyor moves the separated solids (called cake) toward the discharge ports at one end into a hopper, from there they are conveyed via pipeline to the Centrifuge Cake drying Cells located in RSA L for further drying and ultimate disposal. Refer to Section 5.3 for further details regarding the Centrifuge Cake drying and disposal.

The clarified water (called centrate) flows out from the opposite end of the Centrifuge and is returned to the frontend of the clarification process for reprocessing.

A second set of lamella clarifiers are used to recover backwash water from the downstream media filtration (MF) and ultra filtration (UF) units. The backwash wastewater from the MF and UF units contain suspended solids that are removed by the lamella clarifiers before returning the clarified water to the front end of the WTP for reprocessing.

Plate 5-3 presents five lamella clarifier units discharging into tanks. The proposed WTP will incorporate up to 13 units in total. Plate 5-4 presents a typical decanter centrifuge unit. The proposed WTP will incorporate 3 units.

Plate 5-3: Lamella Clarifier

Plate 5-4: Decanter Centrifuge Unit

5.3 Centrifuge Cake Disposal

Centrifuge Cake exiting the Decanter Centrifuges will be conveyed to disposal cells within RSA L. RSA L is an existing RSA comprising a composite clay and HDPE liner with perimeter, and underdrainage systems to capture and contain any potentially impacted stormwater or seepage water. Disposal cells will be established by excavating trenches within the existing RSA L footprint. Each cell will be approximately 100m (L) x 20m (W), x 3m (D). Cells will be operated in a duty cycle pattern, where an active cell will receive Centrifuge Cake until it reaches the deposition level, at which point discharge will divert to an alternative cell. This duty cycle configuration allows for an active cell to receive Centrifuge Cake whilst other cells are decanting to remove excess water. Once a cell has decanted sufficiently, deposition will recommence in that cell on top of the decanted solids. This process will cycle through until such time as a cell reaches capacity (approximately 2.8m depth) and is capped with a 1m residue material layer. To promote water removal, excess water forming in the disposal cells will be decanted via a pump system and conveyed to the Oxalate Pond where it will supplement water inputs for the purposes of maintaining water cover over the oxalate as per Condition S1(b) of the existing licence.

Figure 4-1 shows the location of the Centrifuge Cake Disposal Area and provides an indicative layout of individual cells within the area. The specific location and orientation of the disposal cells presented in Figure 4-1 is indicative only, and the actual as construction cells within the area may differ from that presented.

It is anticipated that two to three cells will be operated on a duty cycle to support the effective disposal of Centrifuge Cake. The actual number of active cells will depend on decanting rates and weather conditions throughout the year.

When the WTP operates at its design capacity, between 96m^3/day - 216 m^3/day of Centrifuge Cake are anticipated to be produced. This material consists of 20% solids and 80% liquids and will further consolidate and dewater once deposited in the cells. Once deposited in the disposal cell and allowed to settle and consolidate further, the volume is expected to reduce by approximately 40% with water decanted from the surface via a decant pump. At the highest expected deposition rate of 216 m^3/day, it is estimated that after settling, consolidation and decanting, the remaining volume would equate to approximately 130m^3/day (60% of discharged volume).

With 30 disposal cells available, each with a storage capacity of 5600m^3 (assuming 2.8m depth), the allocated disposal area has sufficient capacity to manage the disposal of Centrifuge Cake for 3.5 years. Alcoa is investigating options for the reuse of the Centrifuge Cake as it consists predominantly of Aluminium based compounds, Gibbsite (40%) and Dawsonite (40%). Both these products have commercial value and can be refined further to produce alumina. Alcoa is actively investigating third party markets within the Kwinana Industrial Area for the products, and options to process the Centrifuge Cake at the Alcoa Pinjarra Refinery.

5.4 Media Filtration

The primary function of Media Filtration is suspended solids reduction. This consists of conveying the influent water through a bed of granular material (filter media) of various sizes. The media filters contain anthracite, silica sand and gravel specifically designed and manufactured for the application. Suspended solids are captured in the filter media and water

is allowed to pass through to the next treatment process. Regular backwashing cycles are undertaken to remove the captured suspended solids and to prevent clogging of the filter bed. All backwash water, containing elevated concentrations of suspended solids, is recirculated back to the clarification units for re-treatment. The suspended solids are removed from the system via the coagulation, flocculation and sludge removal processes.

Plate 5-5 presents a typical containerised media filtration unit. The proposed WTP will incorporate up to six of these module units.

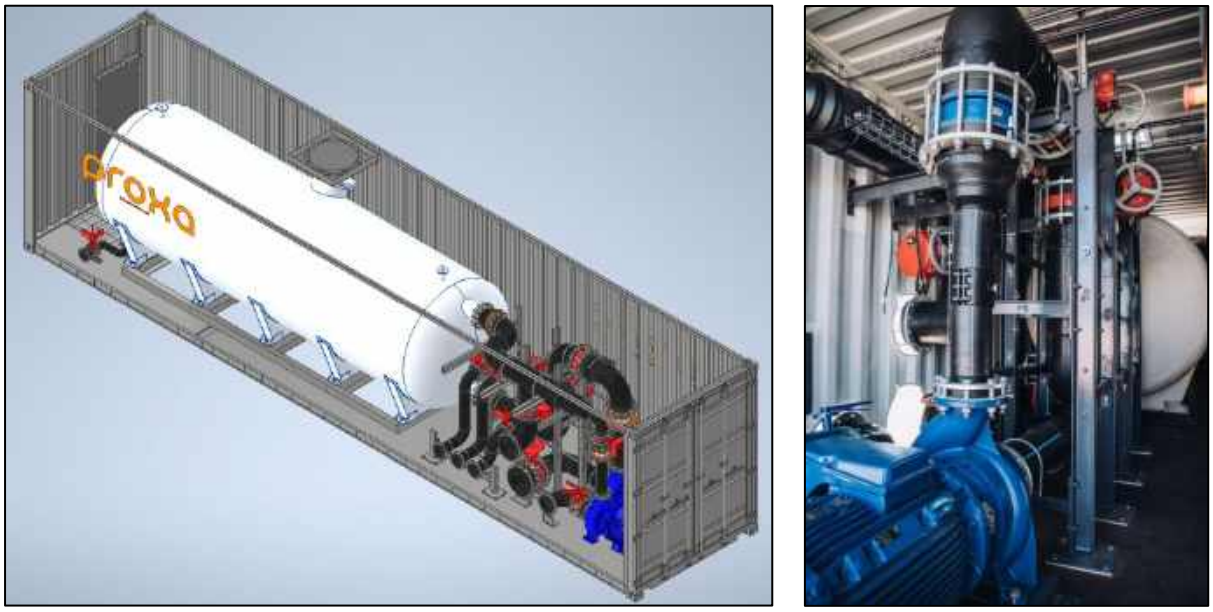


Plate 5-5: Media Filtration Unit

5.5 Ultra-filtration

The ultra-filtration (UF) units' primary function is protecting the reverse osmosis (RO) units against colloidal and particulate fouling. The UF consists of a multi-train design. Cleaning sequences include air scouring, regular backwashing, chemically enhanced backwashing (CEB), and clean-in-place backwashing.

As per the media filtration unit configuration, regular backwash water is recirculated to the clarification units for re-treatment. The filtered materials are removed from the system via the coagulation, flocculation, and sludge removal processes.

CEB sequences include alkali, oxidant, and acid additives to clean and maintain the effective operation of the filter membranes and occur less frequently than regular backwashing cycles.

Backwash water from CEB is discharged back to ROWS Pond. The large ROWS Pond provides significant dilution and buffering and allows reprocessing of the CEB waters via the WTP.

A clean-in-place (CIP) system is used for the UF units and provides further cleaning of the filters to prevent fouling. The CIP cycles occur 4-6 times per week with the resultant wash water returned to the ROWS pond for subsequent reprocessing.

The UF unit incorporates ancillary systems and equipment, including strainers, feed pumps, UF membranes, chemical dosing pumps and low-pressure blowers.

Plate 5-6 presents a typical ultra-filtration unit. The proposed WTP will incorporate up to seven of these module units.

Plate 5-6: Ultra-Filtration Unit

5.6 Reverse Osmosis

The reverse osmosis (RO) unit's primary function is removal of Total Dissolved Solids (TDS) from the filtered water. The proposed water treatment plant utilizes four different types of RO units:

(1) Pass 1 RO units,

(2) Pass 2 RO units,

(3) High-pressure RO units (HPRO), and

(4) Ultra high-pressure RO units (UHPRO).

The Pass 1 RO trains treat UF filtered water and produces treated water and a reject water (brine). Treated water exiting the Pass 1 RO units is further polished in the Pass 2 RO units to achieve the required product quality. Treated water from Pass 2 RO units contains dissolved CO_2 that is removed by feeding the water over a packed column whilst low pressure air is introduced in a counterflow arrangement. The treated water is directed to the final product storage tank and subsequently discharge to the ROWS Pond. Subject to future approvals, Alcoa intends to convey treated water to infiltration galleries and/or injection bores, or to third parties for reuse.

Brine from Pass 2 RO units is returned to the Pass 1 RO units. Brine from the Pass 1 RO units is directed to the HPRO units. The primary function of the HPRO is to further decrease the volume of brine.

Treated water exiting the HP-RO units combines with the treated water from the Pass 1 RO units and is fed to the Pass 2 RO units. HP-RO brine feeds to the UHPRO step before the brine is buffered in a tank for subsequent transfer to the Lake Water Pond for storage. Treated water exiting the UHPRO units combines with the treated water from the Pass 1 and HPRO RO units and is fed to the Pass 2 RO units.

The RO units incorporate ancillary systems and equipment, including cartridge filters, feed pumps, booster/high-pressure pumps, RO membranes, chemical dosing pumps, pressure vessels. For practical purposes and to optimize site layout, three clean-in-place (CIP) systems will be used to serve the RO units. The RO units will be grouped per CIP system.

Plate 5-7 presents a typical containerised RO unit. The proposed WTP will incorporate up to a total of sixteen of these module units for the pass 1 RO units (six), pass 2 (Polishing) RO units (four), HP-RO units (three), and UHPRO units (three).

Plate 5-7: Reverse Osmosis Unit

5.7 Interim Brine Storage

When operating at design capacity the WTP is expected to produce approximately 1.56ML/day of brine from the UHPRO units. The brine will be conveyed to the existing composite lined Lake Water Pond for interim storage. To manage Lake Water Pond volumes, brine will be transferred to the composite lined Cooling Pond via the existing piping infrastructure for storage and subsequently transferred to the ROWS Pond and/or F-Surge for treatment via the WTP. The Lake Water Pond and Cooling Pond have a storage capacity of 170ML and 1200ML, respectively, providing brine storage for approximately 1.4 years of operations based on 1.56ML/day brine input, existing 1.06ML/day F-Surge input, assuming no transfers to the ROWS Pond, and not accounting for evaporative losses which are greater than rainfall inputs.

Alcoa is progressing engineering design and Works Approval applications for separate dedicated treatment plants to treated water contained in the Cooling Pond and brine in the Lake Water Pond. Alcoa is aiming to have the Cooling Pond treatment plant commissioned and operational in Q4 2026, and the Brine Treatment Plant commissioned and operational in Q1 2027. These treatment plants will further reduce the volume of brine and improve the sites' ability to remove contaminants from the water system.

5.8 Pipelines

New pipelines to support the Project include:

- Feed water pipelines from the ROWS Pond and F-Surge Pond to the WTP.
- Treated water pipeline from the WTP to the ROWS Pond.
- Brine pipeline from the WTP to the Lake Water Pond.
- Return and wash water pipeline from the WTP to the ROWS Pond for the conveyance of treatment unit wash water and off specification water.

- Centrifuge Cake pipeline from the WTP to the disposal area.
- CO_2 supply pipeline from an offsite supplier to the WTP.

Where possible, existing pipelines will be utilised for the brine and CO_2 lines. Refer to Figure 4-1 for the indicative locations of new and existing pipelines.

6. Project Execution

6.1 Preparatory Works

The water treatment plant will be assembled in modules off site. To facilitate timely execution of the Project, Alcoa will undertake preparatory works, which are not subject to this Works Approval application. Preparatory works will include levelling, contouring, conditioning and compaction of the land for the development of a hardstand at the WTP area to allow for safe and efficient delivery and receipt of the WTP modules, and associated infrastructure. KCB Engineering Consulting an assessment of the hardstand and proposed WTP. KCB's assessment considered the RSA L slope stability impact due to construction of the hardstand and the static load imposed by the WTP. The assessment concluded the hardstand, associated earthworks, and operation of the WTP was not expected to negatively impact the geotechnical stability of RSA L. A copy of the assessment report is provided in Appendix 1.

The delivery and receipt of the WTP modules and associated infrastructure requires the use of specialist cranage contractors. It is Alcoa's intention to limit the number of high-risk crane lifts to the minimum number required. As WTP modules and heavy infrastructure (e.g. concrete module bases) are delivered to the hardstand, they will be craned into place for safe storage until such time as a Works Approval is granted and construction activities can commence.

6.2 Construction

Construction activities will comprise of the:

- installation of feed, discharge, and interconnecting pipelines throughout the WTP.
- installation of concrete bunds at chemical storage areas.
- connection of services such as CO_2, water and electricity.
- establishment of chemical unloading areas.
- pressure testing of pipelines.

6.2.1 Pipeline Testing

Newly installed pipelines will be hydrostatic pressure tested in accordance with the requirements of AS/NZS 2033 – Installation of Polyethylene Pipe Systems following installation. The testing will be undertaken by a suitably experienced and qualified person. Test reports will be provided as part of the normal construction compliance reporting requirements in the Works Approval.

The purpose of this testing is to verify the structural integrity, strength, and leak tightness of the installed HDPE pipeline prior to it being placed into service. Hydrostatic testing ensures that all joints, fittings, and sections of the pipeline can safely withstand their designated operating pressures without leakage or failure. This procedure applies to all newly installed HDPE pipelines and associated fittings used for the conveyance of water or wastewater on site. It shall be executed after completion of installation, jointing, and backfilling (where applicable), and prior to operational commissioning or connection to live systems.

6.3 Commissioning

There is no environmental commissioning proposed to be undertaken as part of the Project. The WTP does not require environmental commissioning as the treated water is not proposed to be discharged to the environment but rather returned to the existing lined ROWS Pond in a closed-loop configuration. Standard operational commissioning (consisting of dry and wet commissioning) will be undertaken to ensure the WTP operates as intended.

6.3.1 Operational Commissioning

After construction, each module will undergo dry and wet commissioning to ensure the equipment is functioning as intended.

The following dry commissioning activities will take place:

- Visual inspections of pipes, tanks and bunds.
- Testing of electrical services and sensors.
- Repair of any defects.

Wet commissioning will consist of:

- Filling tanks and vessels with feed water or suitable water from prior treatment stages.
- Starting and running modules.
- Verification that each module is running as designed.
- Testing and verification that output water meets plants operational design specifications.

Modules will be commissioned individually or in series with output water from prior treatment stages providing input water for commissioning of the next stage. As needed during commissioning, temporary tanks and pipelines may be used to:

- Provide feed water from the ROWS pond or from other process stages.
- Temporarily store treated water for use in commissioning subsequent processing steps.
- Discharge treated water and waste streams back into the ROWS Pond or into prior phases of the WTP.
- Emptying one or more WTP Stages to the ROWS Pond, if required.

6.4 Time Limited Operations

A time limited operations provision will be required in the Works Approval to allow for the operation of the WTP until such time as a Licence Amendment is granted which contains operational conditions pertaining to the WTP. A period of 180 days is requested.

7. Other Approvals and Consultation

7.1 Stakeholder and Community Consultation

7.1.1 DWER

Alcoa has a regular monthly meeting with representatives of the Industry Licencing; Water and Contaminated Sites branches of DWER. These meetings have included discussions on the water treatment plant, suitable locations and product and waste streams.

Alcoa provided DWER a description of proposed preparatory works by email on 28 July 2025.

7.1.2 Community

Alcoa provides regular updates to stakeholders on RSA water management programs through consultation programs such as the Kwinana Refinery Community Consultation Network (CCN) and the Kwinana Refinery Long Term Residue Strategy (LTRMS) Stakeholder Reference Group.

Alcoa initially presented information regarding the intent to establish a WTP at Kwinana to the CCN on 26 February 2024. The project was further raised and discuss at the CCN meeting held on 12 February 2025. Alcoa will continue to provide information regarding the WTP via the quarterly CCN meetings.

7.2 Other Legislation and Approvals

A summary of other relevant legislation and approvals is provided in Table 7-1.

Table 7-1: Other Relevant Legislation

Legislation	Approvals
Commonwealth	
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	**Not Required.** Significant impacts to Matters of National Environmental Significance (MNES) or other matters protected under the EPBC Act are not anticipated. Referral to the Department of Climate Change, Energy, the Environment and Water (DCCEEW) is not required.
Western Australia	
EP Act (Part IV)	**Not Required** The Proposal is not anticipated to have a significant impact on the environment or results in any key environmental factor objectives being compromised. Referral to the Environmental Protection Authority (EPA) is not required.
Rights in Water and Irrigation Act 1914 (RIWI Act)	**Not Required** No construction of abstraction bores, abstraction of water, or interference with the bed and banks of a watercourse is proposed as part of the Project.
EP Act (Part V, Division 2)	**Not Required** No clearing of native vegetation is proposed and a clearing permit or clearing referral is not required.

Legislation	Approvals
Alumina Refinery Agreement Act 1961	**Not Required** An amendment to the State Agreement is not required for the Project.
Dangerous Goods Act	**Required** The sites Dangerous Goods Licence will be updated to account for the additional chemical storage tanks associated with the WTP.
City of Kwinana	
Planning Approval	**Not Required** The *Alumina Refinery Agreement Act 1961* exempts Alcoa from planning approvals.

8. Emissions and Discharges

Emissions and Discharges are listed in Table 8-1. It is important to note that there are no environmental discharges associated with the operation of the WTP. All process waters and wastes are discharged to existing lined containment infrastructure.

8.1 Noise

Noise from the Project has been modelled and compared against the assigned levels specified in the *Environmental Protection (Noise) Regulations 1997* (Noise Regulations) at noise sensitive receivers (NSRs). NSRs are shown on Figure 9-1.

Noise at these receivers has been assessed by Wood utilising SoundPLAN v 8.2 in accordance with the Noise Regulations and DWER Draft Guideline on Environmental Noise for Prescribed Premises. A copy of the Noise Report (Wood, 2025) is provided in Appendix 2. The assumptions adopted for the assessment included:

- All WTP equipment will operate concurrently.
- All equipment (field and containerised) will be situated externally.
- Equipment which does not radiate noise (such as storage tanks) have been included in the model to account for potential screening/barrier effects.

The noise assessment also accounted for cumulative noise from existing equipment, including the proposed Minetek evaporators scheduled for installation at the site over the later part of 2025 and early 2026 (subject to separate Licence Amendments). As a conservative approach, the cumulative RSA noise level at each receiver was assumed to be tonal and meet the Assigned Levels, as per the previous assessments.

The results of the modelling are presented in Table 8-2 for the day, evening, and night-time periods. Noise contour for daytime and evening and nighttime are presented in Plate 8-1 and Plate 8-2, respectively.

The results indicate the proposed WTP is unlikely to contribute to the received noise levels at the identified NSRs. Additionally, due to the insignificant contribution of the proposed WTP to received noise levels, it is predicted any tonal characteristics from the WTP will not be perceptible at the NSRs.

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Table 8-1: Emissions and Discharges

Source of Emission or Discharge	Emission or Discharge Type	Volume and Frequency	Proposed Controls	Location
Construction				
Minor earthworks and construction including vehicle movements	Dust	Volume: Minor Frequency: Daily during construction (~3 months)	Application of water via water carts or other means to limit dust generation	Works Approval Area – Figure 4-1
Minor earthworks and construction including vehicle movements	Noise	Volume: Minor Frequency: Daily during construction (~3 months)	Equipment maintained to prevent unwanted noise generation.	Works Approval Area – Figure 4-1
Construction wastes	Waste	Volume: Minor Frequency: Infrequent (~months)	Existing waste management process. Waste disposal either onsite in accordance with the existing Licence conditions or offsite at licenced facilities.	Existing Licence - Attachment 2
Commissioning & Time Limited Operations				
WTP Off-specification waters	Process liquid waste	Volume: Minor Frequency: Infrequent	Conveyed via pipeline to the existing lined ROWS Pond for reprocessing.	Works Approval Area – Figure 4-1
WTP Backwash and Cleaning Water	Process liquid waste	Volume: Estimated 290kL/day Frequency: During operations	Conveyed via pipeline to the existing lined ROWS Pond for reprocessing.	Works Approval Area – Figure 4-1
WTP Centrifuge Cake	Process solid waste	Volume: Estimated 4 - 9m^3/hr. Dependant on feed water quality and clarifier performance. Frequency: During operations	Conveyed via pipeline to disposal cells in the composite lined RSA L, which is serviced by perimeter and underdrainage systems.	Works Approval Area – Figure 4-1
WTP Brine	Process liquid waste	Volume: Estimated 65kL/hr Frequency: During operations	Conveyed via pipeline to the existing lined Lake Water Pond for storage.	Works Approval Area – Figure 4-1

Source of Emission or Discharge	Emission or Discharge Type	Volume and Frequency	Proposed Controls	Location
			(Further treatment via Brine Treatment Plant – subject to separate approval)	
WTP Leaks & Spills	Process water & waste	Volume: Minor volumes Frequency: Infrequent	WTP is sited within composite lined RSA with perimeter and underdrainage system. WTP tanks and modules will be fitted with overflow collection system discharging to the ROWS pond. Chemical storage tanks to be double skinned.	Works Approval Area – Figure 4-1
WTP Pumps, Motors & Equipment	Noise	Volume: Not a significant contributor Frequency: During Operations	Siting of the WTP within existing RSA at distance from sensitive receptors.	Works Approval Area – Figure 4-1
WTP spent media and filters	Process solid waste	Volume: Estimated 70m^3 Frequency: During Operations	Waste to be disposed of in existing lined RSAs and/or Landfill area in accordance with existing conditions.	Existing Licence - Attachment 2
WTP Operations	Dust	Volume: Negligible Frequency: Infrequent	Wet treatment process. Application of water via water carts or other means, if required	Works Approval Area – Figure 4-1

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Table 8-2: Cumulative Noise Modelling Results

DAY				EVENING/SUNDAYS/PUBLIC HOLIDAYS				NIGHT			
NSR#	Assigned Level	WTP Noise Level, dB(A)	WTP Noise Level + Existing, dB(A)*	NSR#	Assigned Level	WTP Noise Level, dB(A)	WTP Noise Level + Existing, dB(A)*	NSR#	Assigned Level	WTP Noise Level, dB(A)	WTP Noise Level + Existing, dB(A)*
R2	60	26	**60**	R2	60	26	**60**	R2	60	26	**60**
R4	54	17	**54**	R4	49	17	**49**	R4	44	17	**44**
R5	45	15	**45**	R5	40	15	**40**	R5	35	15	**35**
R6	47	9	**47**	R6	42	9	**42**	R6	37	9	**37**
R7	48	19	**48**	R7	43	19	**43**	R7	38	19	**38**
R8	55	23	**55**	R8	50	23	**50**	R8	45	23	**45**
R9	51	29	**51**	R9	46	29	**46**	R9	41	29	**41**
R10	51	28	**51**	R10	46	28	**46**	R10	41	28	**41**
R11	51	29	**51**	R11	46	29	**46**	R11	41	30	**41**

* existing noise levels from the Kwinana facility have been conservatively assumed to be at the assigned level for each NSR for the purposes of determining cumulative noise impacts from the WTP.

Plate 8-1: Day Time Noise Contours

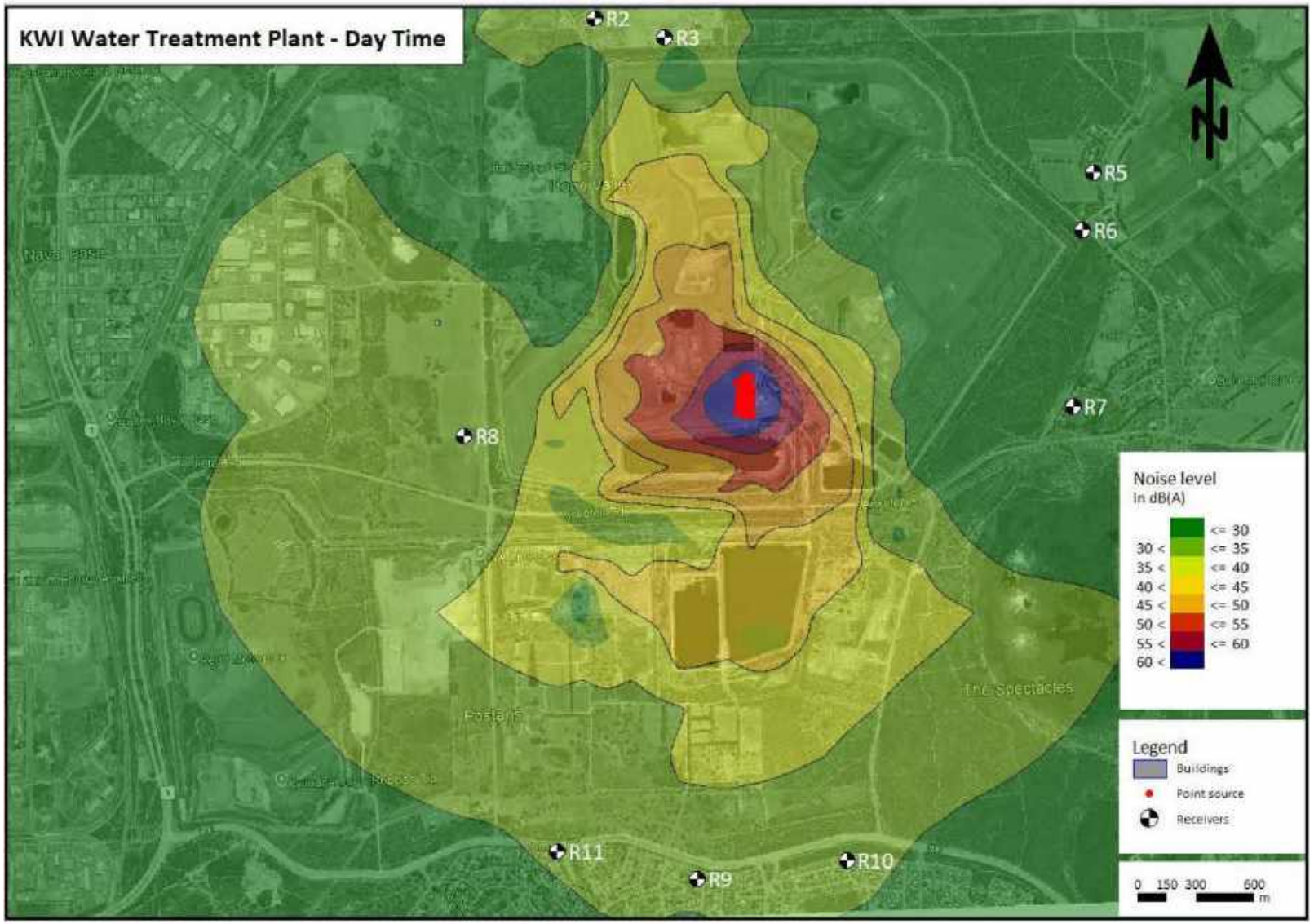
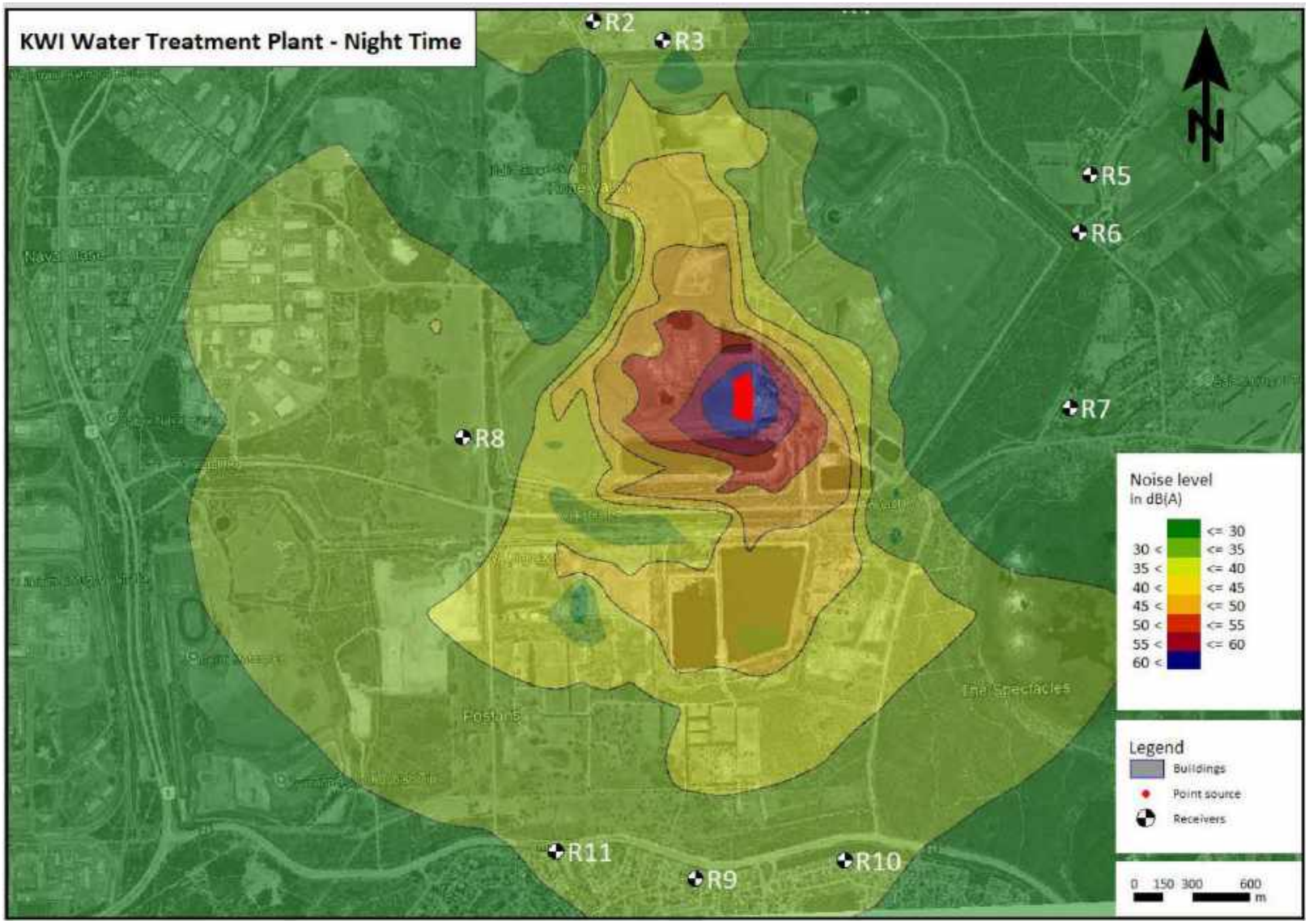


Plate 8-2: Evening and Night Time Noise Contours



9. Siting and Location

Table 9-1 summarises the siting and location consideration relevant to the proposed works.

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Table 9-1: Siting and Location

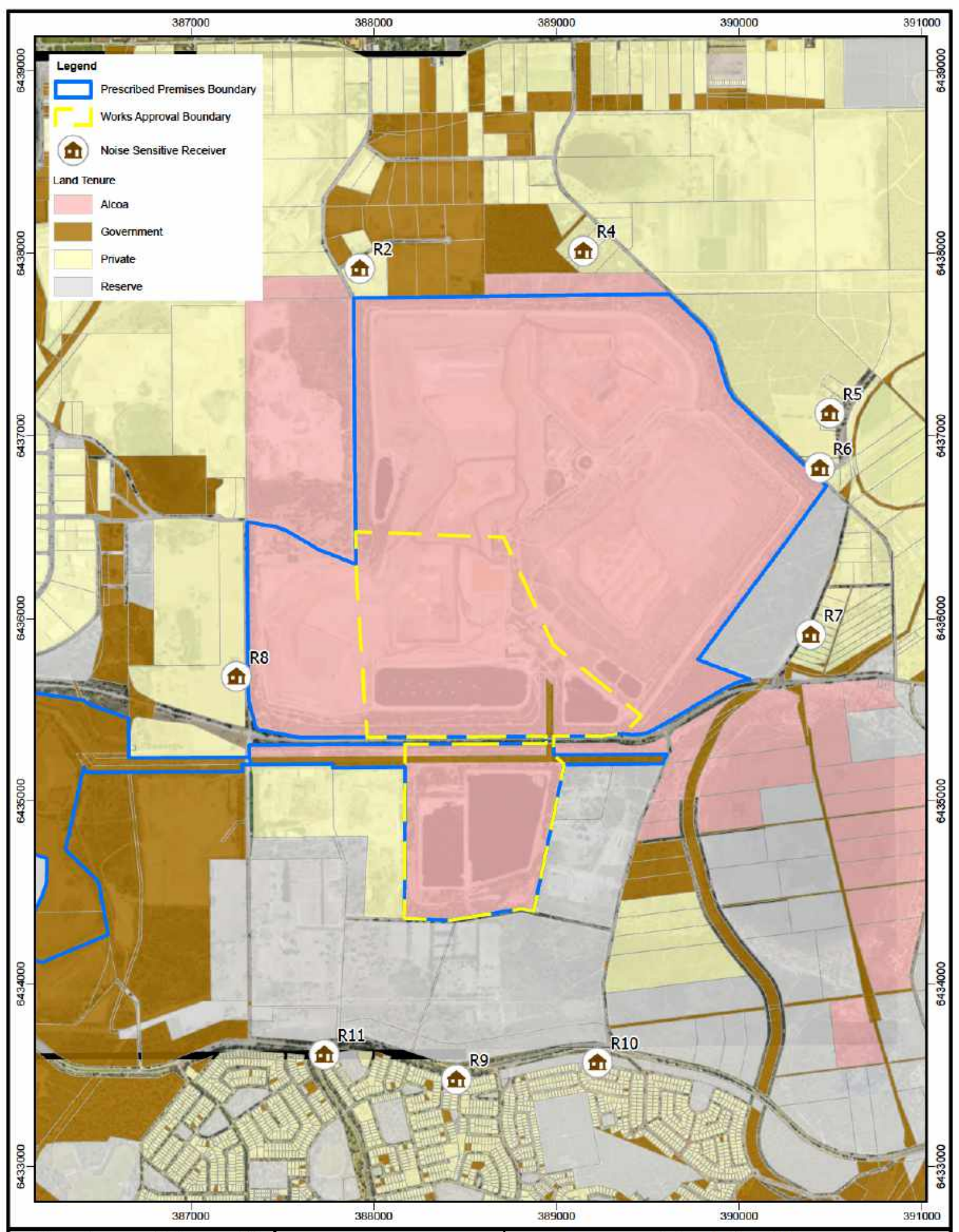
Type / Classification	Description	Distance to Premises Boundary	Proposed controls to prevent or mitigate adverse impacts (if applicable)
Sensitive Land Uses / Users	Land users are shown in Figure 9-1. The proposed works are in the Kwinana Industrial Area. Neighbouring properties include industrial land, state-owned land and residential properties. There are residential receptors to the west, north and east of the prescribed premises boundary. Limited dust emissions and noise emissions are anticipated due to the nature of the works and distance from sensitive receptors. Significant impacts to adjacent properties are not anticipated.	Residential premises range from adjacent to over 400m from Prescribed Premises boundary. The closest noise sensitive receptor is located approximately 1.3km west of the WTP.	• No specific controls proposed for the WTP.
Environmentally Sensitive Areas (ESA)	Environmentally Sensitive Areas (ESAs) mapped by DWER (DWER-046) are shown in Figure 9-2. The spatial boundaries of ESA SCP26a (*Melaleuca huegelii – Melaleuca systena* shrublands on limestone ridges (T) (ID 18704)) partially overlay the ROWS pond. The area in the ESA dataset is buffered around the actual boundaries of the TEC. A portion of Bush Forever site BFA 268 is inside the Prescribed Premises, but over 800m from the WTP. Bush Forever sites (BFA 267 / 269 / 393) are less than 600m from the Prescribed Premises. No additional disturbance is proposed and wastes will be directed into existing lined RSAs and ponds. Impacts to ESAs are not anticipated.	Inside Prescribed Premises: • ESA SCP26a. • BFA 268 Near Prescribed Premises: • BFA 267: ~20m North • BFA 269: ~50m southeast • BFA 393: ~550m north	• WTP and pipelines sited to avoid clearing. • Water discharges directed to lined ponds. • Solid waste disposed of to the landfill or RSAs in accordance with existing Licence Condition G6(a)(ii).

Type / Classification	Description	Distance to Premises Boundary	Proposed controls to prevent or mitigate adverse impacts (if applicable)
Threatened / Priority Ecological Communities (TEC / PEC)	As no additional disturbance is proposed, no impacts to PECs, TECs or other native vegetation are anticipated. Flora surveys and DBCA regional mapping indicate the following TECs and PECs are present in and near the Prescribed Premises: • *Melaleuca huegelii – Melaleuca systena* shrublands on limestone ridges (Critically Endangered). • Banksia woodlands of the Swan Coastal Plain (Priority 3). • Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain (Priority 3). All of these are also listed under the EPBC Act. No additional disturbance is proposed, and wastes will be directed into existing lined RSAs and ponds. Impacts to TECs are not anticipated.	Inside and around Prescribed Premises.	• WTP and pipelines sited to avoid clearing. • Water discharges directed to lined ponds. • Solid waste disposed of to the landfill or RSAs in accordance with existing Licence Condition G6(a)(ii).

Type / Classification	Description	Distance to Premises Boundary	Proposed controls to prevent or mitigate adverse impacts (if applicable)
Threatened and/or priority fauna	The following conservation significant species are likely to occur in remnant habitat in and around the Prescribed Premises (Ecologia, 2021) (BC Act/DBCA statuses provided after EPBC Act statuses): • Forest red-tailed black cockatoo (Vu, Vu) • Carnaby's cockatoo (En, En) • Quenda (Priority 4) • Perth slider (Priority 4) The following conservation significant species possibly occur (BC Act/DBCA statuses provided after EPBC Act statuses): • Peregrine falcon (Not listed, OS) • Western quoll (Vu, Vu) • South-western brush-tailed phascogale (Not listed, CD) • Western brush wallaby (Priority 4) • Western false pipistrelle (Priority 4) • Black-lined snake (Priority 3) • Swan Coastal Plain trapdoor spider (Priority 3) No additional disturbance is proposed, and wastes will be directed into existing lined RSAs and ponds. Significant impacts to fauna are not anticipated.	Conservation significant fauna may be present in and around the Prescribed Premises.	• WTP and pipelines sited to avoid clearing. • Water discharges directed to lined ponds. • Solid waste disposed of to the landfill or RSAs in accordance with existing Licence Condition G6(a)(ii).
Threatened and/or priority flora	No threatened or priority flora have been recorded in surveys around the Cooling Pond and in the northwest of the Prescribed Premises, although conservation significant species may be present in other areas in and around the Prescribed Premises. No additional disturbance is proposed, and wastes will be directed into existing lined RSAs and ponds. Significant impacts to flora and vegetation are not anticipated.	Conservation significant flora may be present in and near the Prescribed Premises.	• WTP and pipelines sited to avoid clearing. • Water discharges directed to lined ponds. • Solid waste disposed of to the landfill or RSAs in accordance with existing Licence Condition G6(a)(ii).

Type / Classification	Description	Distance to Premises Boundary	Proposed controls to prevent or mitigate adverse impacts (if applicable)
Aboriginal and other heritage sites	Aboriginal Heritage Sites. Local Heritage Sites (DPLH-008) and State Registered Heritage Sites (DPLH-006) are shown in Figure 9-4. Lodged Aboriginal heritage site Place ID 17582 (Scarred Trees) is inside the Prescribed Premises boundary and overlaps existing infrastructure. Site ID 17582 was historically disturbed and advice from DPLH in 2015 was that this site does not meet the criteria to be registered as an Aboriginal site. Local Heritage Site Mandogalup Town Site (P12125) intersects the Prescribed Premises boundary. Heritage Farm (P8582) is in the west of the Prescribed Premises; however, the homestead has been removed. There are other Local Heritage Sites within 1 km. There are two State Registered Heritage Sites near the Prescribed Premises which are ~3.5 km and ~3 km from the RSA. A search of the EPBC Act Protected Matters search tool in February 2025 indicated there are no national heritage sites in or near the Prescribed Premises. No additional disturbance is proposed, and wastes will be directed into existing lined RSA ponds. Impacts to heritage are not anticipated.	**Local heritage sites:** • Mandogalup Town Site (P12125) – inside Prescribed Premises. • Heritage Farm (P8582) • Spectacles Wetland (P12098) ~60m southeast • Long Swamp (P12102; ~230 m west). • Frederick Postans' Cottage (P3894; 500 m west). • Hope Valley Area Townsite (P12124, ~650 m west). **State Registered Heritage Sites:** • Peel Town Archaeological Sites (P-17868) ~3.5 km northwest of RSA. • Kwinana Town Signal Box (P-3112) ~3km southwest of RSA.	• WTP and pipelines sited to avoid clearing. • Water discharges directed to lined ponds. • Solid waste disposed of to the landfill or RSAs in accordance with existing Licence Condition G6(a)(ii).
Public drinking water source areas	The Prescribed Premises is not inside a Public Drinking Water Source Area (PDWSA). The nearest PDWSA is the Jandakot Underground Water Pollution Control Area (JUWPCA), ~2.5 km east and up-gradient of the Prescribed Premises.	The JUWPCA is ~2.5 km east of the Prescribed Premises.	None.

Type / Classification	Description	Distance to Premises Boundary	Proposed controls to prevent or mitigate adverse impacts (if applicable)
Rivers, lakes, oceans, and other bodies of surface water, etc.	The RSA is ~3 km east of Cockburn Sound. Wetlands are shown in Figure 9-3. There are multiple wetlands within 1 km of the RSA. The closest conservation category wetlands are: • Spectacles Wetlands (Large Eye Swamp and Small Eye Swamp) • Long Swamp The Spectacles Wetlands are included in the Directory of important Wetlands of Australia. The closest RAMSAR wetland is Thomsons Lake Nature Reserve, ~3 km north.	• Spectacles Wetlands - ~450 m southeast (Labelled Spectacles North and Spectacles South on Figure 9-3). • Long Swamp is ~400 m northwest.	• Liquid discharges directed to lined ponds. • Solid waste disposed of to the landfill or RSAs in accordance with existing Licence Condition G6(a)(ii). • Lake Water Pond freeboard maintained. • Existing groundwater monitoring program in place for the RSA facility.
Acid sulfate soils	Acid sulphate soil (ASS) risk areas (DWER-055) are shown in Figure 9-5. No ASS risk areas have been identified in the Prescribed Premises, and no groundwater drawdown or disturbance of ASS is proposed.	Risk areas identified: • Immediately west of Prescribed Premises. • ~350 m northwest of Prescribed Premises. • ~350 m north of Prescribed Premises.	• None



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Scale: 1:25,000

AGD 1984 AMG Zone 50

Alcoa

Kwinana Refinery WTP

Figure 9-1 Land Users

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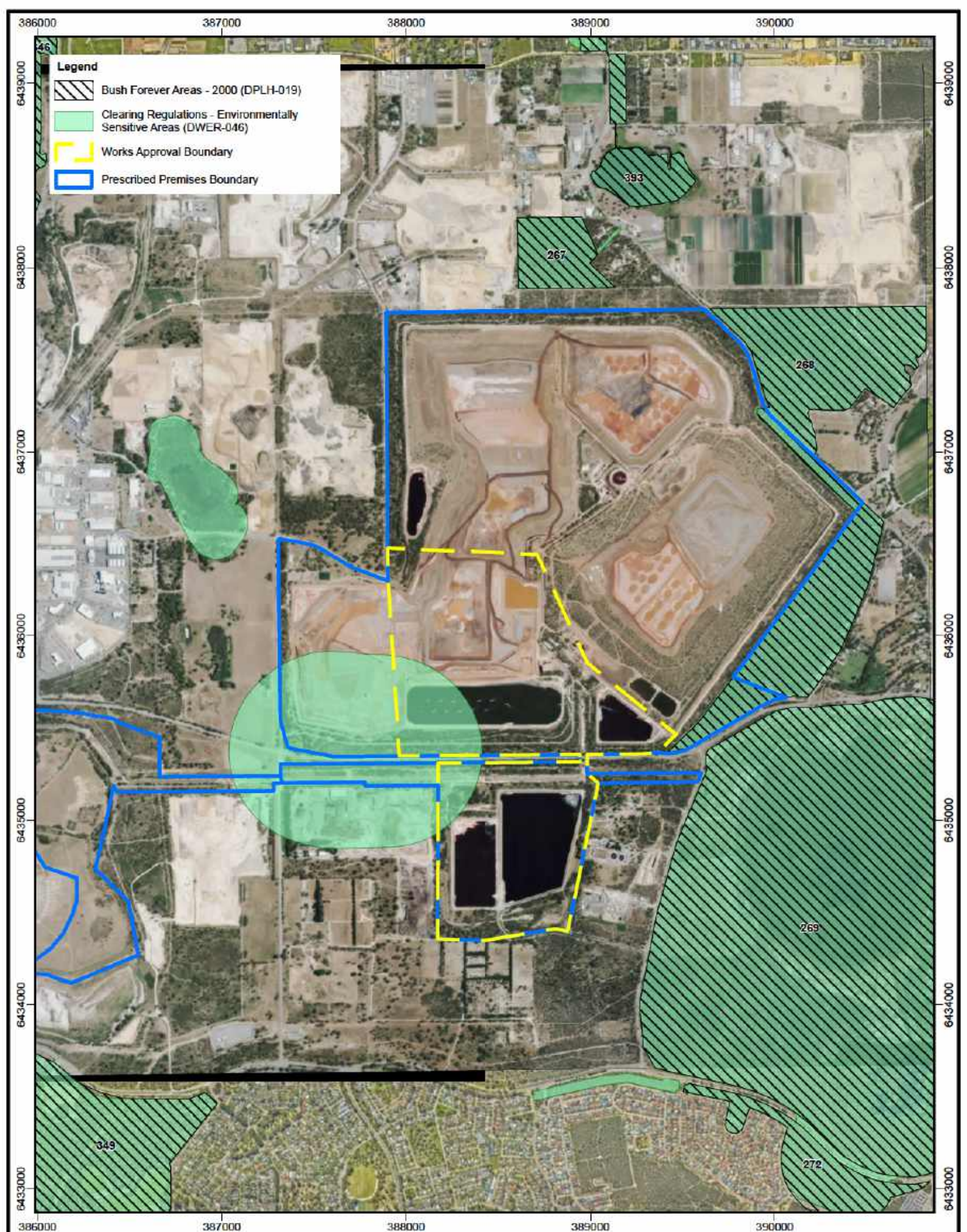

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Alcoa

Kwinana Refinery WTP

Figure 9-2 Environmentally Sensitive Areas

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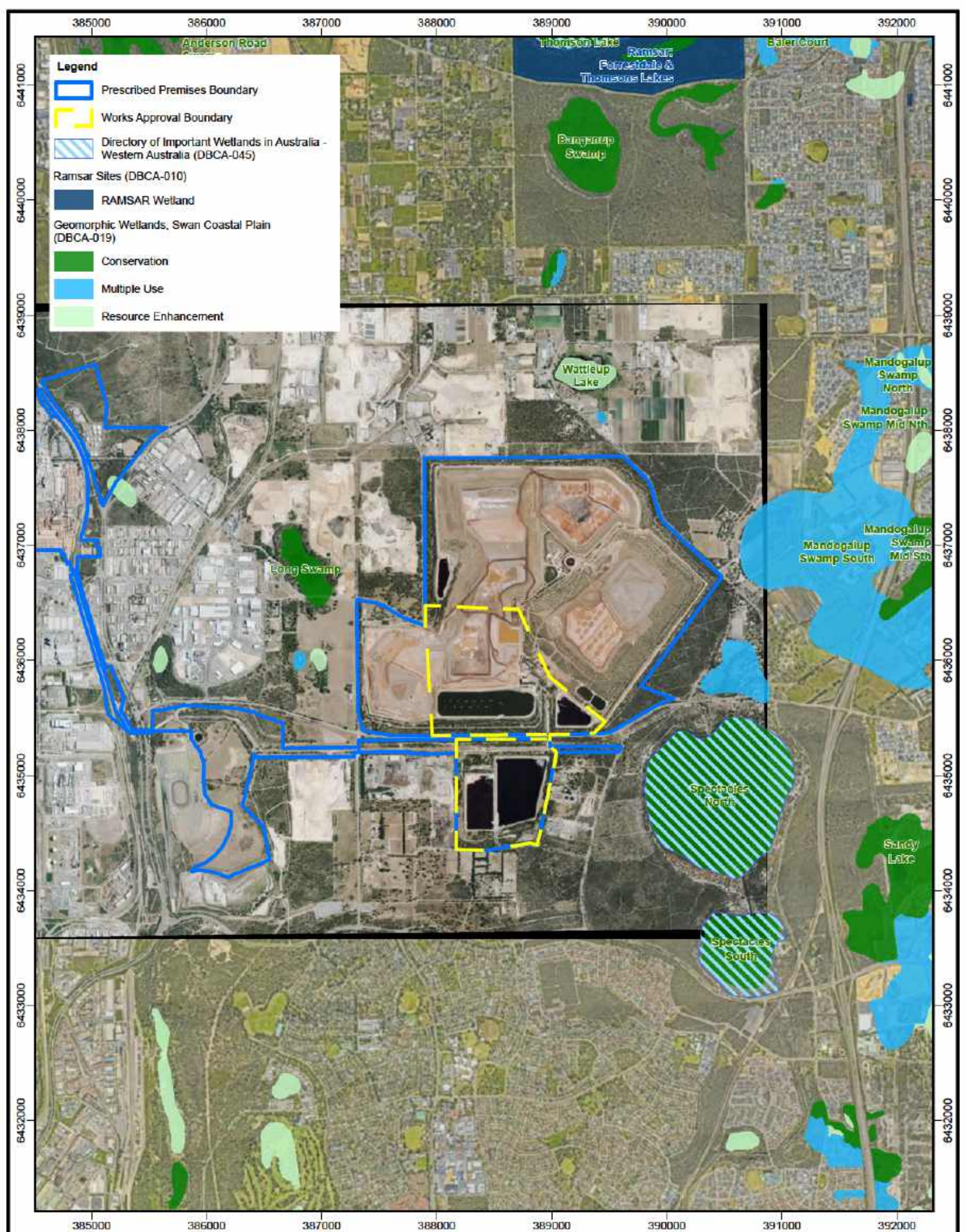

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Alcoa

Kwinana Refinery WTP

Figure 9-3 Wetlands

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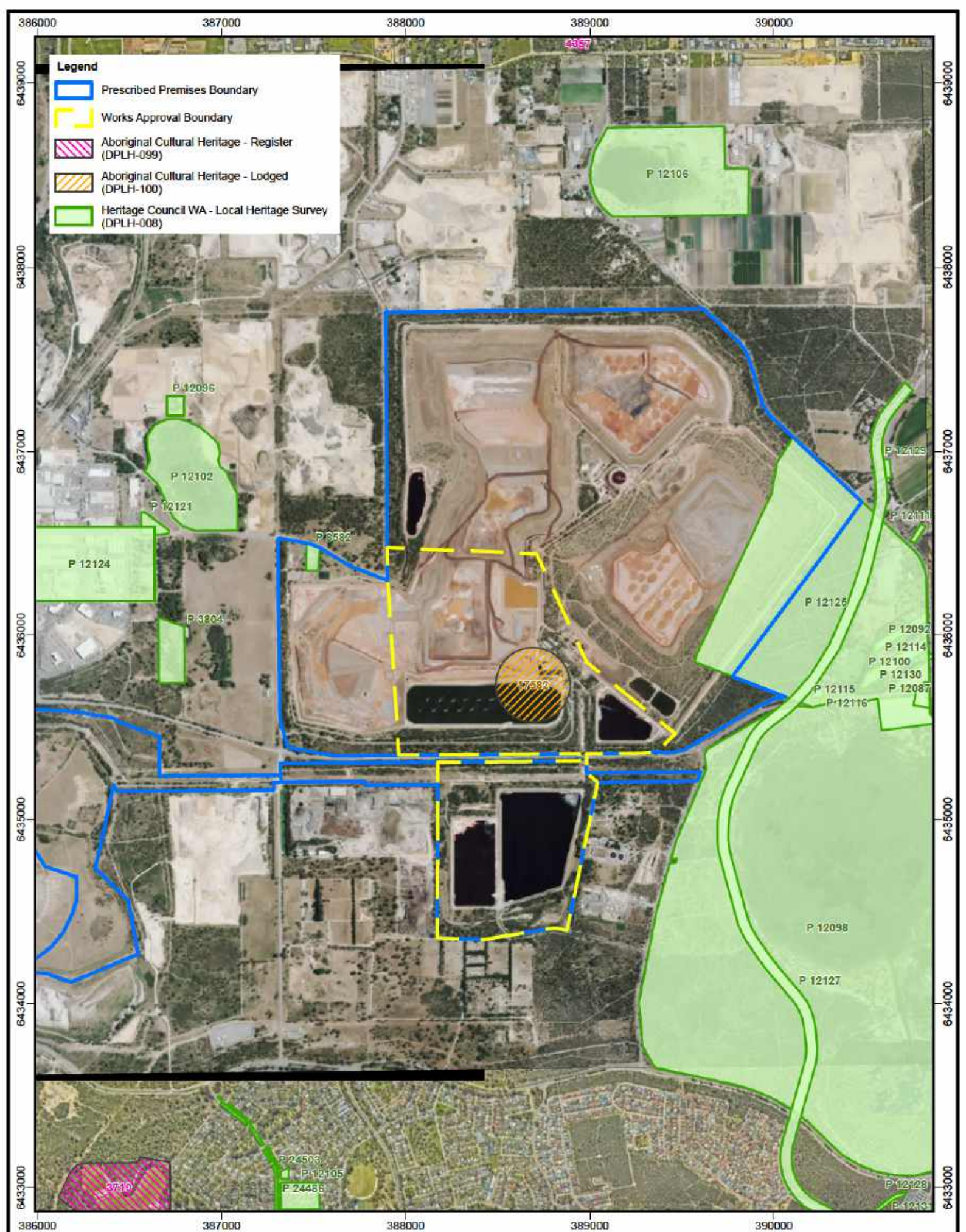

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Alcoa

Kwinana Refinery WTP

Figure 9-4 Heritage Sites

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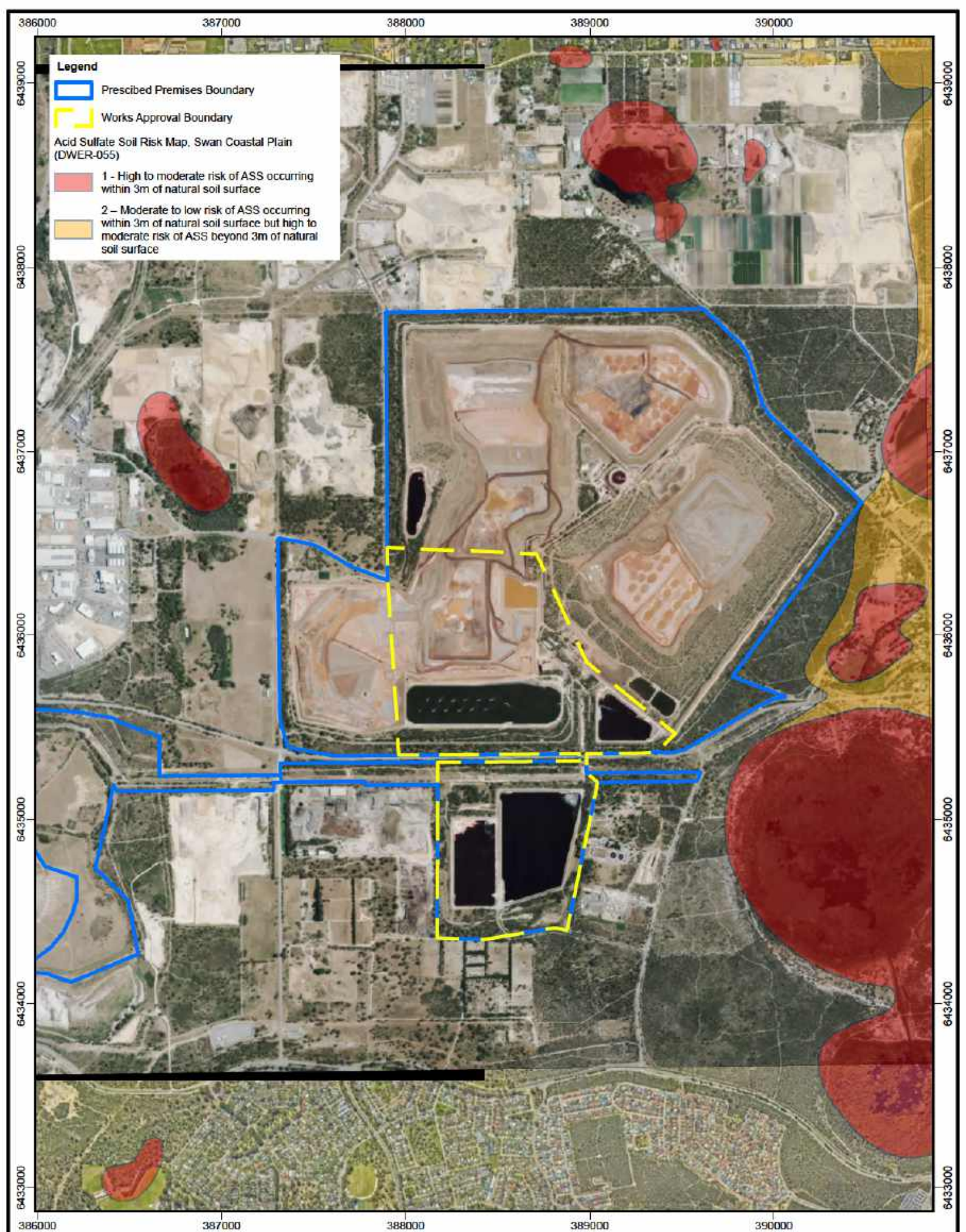

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Scale: 1:25,000

AGD 1984 AMG Zone 50

Alcoa

Kwinana Refinery WTP

Figure 9-5 Acid Sulfate Soil Risk Areas

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10. Risk Assessment

10.1 Risk Assessment Overview

A risk assessment of the proposed activities was completed in accordance with the DWER (2020) Guideline for Risk Assessments. Consequence criteria are in Table 10-1, Likelihood criteria in Table 10-2 and the risk matrix in Table 10-3.

Table 10-1: Consequence Matrix

Consequence	Consequence Description	
	Environment	Public health* and amenity (such as air and water quality, noise and odour)
Severe	• Onsite impacts: catastrophic • Offsite impacts local scale: high level or above • Offsite impacts wider scale: mid-level or above • Mid to long-term or permanent impact to an area of high conservation value or special significance^ • Specific Consequence Criteria (for environment) are significantly exceeded	• Loss of life • Adverse health effects: high level or ongoing medical treatment • Specific Consequence Criteria (for public health) are significantly exceeded • Local scale impacts: permanent loss of amenity
Major	• Onsite impacts: high level • Offsite impacts local scale: mid-level • Offsite impacts wider scale: low level • Short-term impact to an area of high conservation value or special significance^ • Specific Consequence Criteria (for environment) are exceeded	• Adverse health effects: mid-level or frequent medical treatment • Specific Consequence Criteria (for public health) are exceeded • Local scale impacts: high level impact to amenity
Moderate	• Onsite impacts: mid-level • Offsite impacts local scale: low level • Offsite impacts wider scale: minimal • Specific Consequence Criteria (for environment) are at risk of not being met	• Adverse health effects: low level or occasional medical treatment • Specific Consequence Criteria (for public health) are at risk of not being met • Local scale impacts: mid-level impact to amenity
Minor	• Onsite impacts: low level • Offsite impacts local scale: minimal • Offsite impacts wider scale: not detectable • Specific Consequence Criteria (for environment) likely to be met	• Specific Consequence Criteria (for public health) are likely to be met • Local scale impacts: low level impact to amenity
Slight	• Onsite impact: minimal • Specific Consequence Criteria (for environment) met	• Local scale: minimal impacts to amenity • Specific Consequence Criteria (for public health) criteria met

^ For areas of high conservation value or special significance, we will use the Guideline: Environmental siting to inform our decision

* In applying public health criteria, we may use the Department of Health's Health risk assessment (scoping) guidelines

'Onsite' means within the prescribed premises boundary

Table 10-2: Likelihood Matrix

Likelihood	Likelihood Description
Almost certain	The risk event is expected to occur in most circumstances
Likely	The risk event will probably occur in most circumstances
Possible	The risk event could occur at some time
Unlikely	The risk event will probably not occur in most circumstances
Rare	The risk event may only occur in exceptional circumstances

Table 10-3: Risk Matrix

Likelihood	Consequence				
	Slight	Minor	Moderate	Major	Severe
Almost Certain	Medium	High	High	Extreme	Extreme
Likely	Medium	Medium	High	High	Extreme
Possible	Low	Medium	Medium	High	Extreme
Unlikely	Low	Medium	Medium	Medium	High
Rare	Low	Low	Medium	Medium	High

10.2 Risk and Impact Assessment

Potential impacts, controls and risk evaluation is presented in Table 10-4.

Table 10-4: Risk Assessment

Risk Event					Controls	Final Risk After Controls		
Activities	Potential Emission	Potential Pathway	Potential Receptor	Potential Adverse Impact		Likelihood	Consequence	Risk
Construction works (e.g., general earthworks, equipment installation)	Dust	Windborne particulate matter generated during construction activities	Sensitive residential receptors	Human health and amenity impacts, including, respiratory illness and nuisance dust.	• Siting of WTP within existing RSA facility at distance from potential receptors. • Dust will be managed in accordance with Alcoa's existing standard operating procedures and dust suppression methods. • Watercarts, or similar, will be maintained onsite to dampen trafficable and open area during construction to minimise dust lift off. • Speed limits will be implemented on site to minimise dust generation from vehicle movements.	Rare	Minor	Low
			Environmental values: Wetlands, Priority/threatened flora, flora, and habitat.	Impacts to biodiversity, flora, and fauna health.		Rare	Minor	Low
	Noise	Noise emissions propagated through the atmosphere.	Sensitive residential receptors	Nuisance noise and amenity impacts.	• Siting of WTP centrally within existing RSA facility at distance from potential receptors. • Noise generating construction works will be predominantly conducted between the hours of 0700 and 1900 Monday to Saturday, excluding public holidays. Evening and nighttime period works will be restricted to activities that don't generate significant noise. • Any new Alcoa vehicles or mobile equipment to be added into Alcoa's existing vehicle and mobile equipment maintenance programme. • Speed limits will be implemented onsite to reduce engine noise emissions.	Rare	Minor	Low
	Sediment laden stormwater	Overland flow	Environmental values: Wetlands, Priority/threatened flora, flora, and habitat.	Increase suspended solids impacting wetland function, sedimentation resulting in impact to Priority / threatened flora, flora, and habitat.	• Erosion and sediment transport are not a material risk associated with the proposal due to the location of the WTP. The proposed location of the WTP is within the existing RSA L which is serviced by a perimeter drainage system. All stormwater is retained within the RSA and conveyed to existing onsite water storage dams.	Rare	Slight	Low
	Hazardous Chemical	Direct discharge to land and indirect discharge to groundwater and surface waters.	Soil, groundwater, and Spectacles wetland	Impact to down-gradient wetlands, soils, biodiversity, flora, and fauna health.	• Hazardous chemicals utilised during the construction phase shall be stored in bunds to capture and contain any spills / leaks. • Spill kits shall be made available at the construction area to facilitate management responses to spills and leaks. • All hazardous chemical spills / leaks shall be contained and cleanup immediately.	Unlikely	Slight	Low
WTP commissioning and operation	Untreated Water	Direct discharge, tank over topping, equipment failure	Soil, groundwater, and Spectacles wetland	Contamination of soils, groundwater, and down-gradient wetlands	• WTP installed on engineered and compacted fill material within existing composite lined RSA L which is serviced by perimeter and underdrainage systems. • High level alarms and overflow piping installed to convey any overflows back to the ROWS Pond. • Water discharge to ROWS Pond during environmental commissioning. • Pipelines pressure/leak tested during commissioning and routinely inspected in accordance with Alcoa's existing inspection regimes.	Rare	Slight	Low

Risk Event						Final Risk After Controls		
Activities	Potential Emission	Potential Pathway	Potential Receptor	Potential Adverse Impact	Controls	Likelihood	Consequence	Risk
	Hazardous Chemical	Direct discharge to land and indirect discharge to groundwater and surface waters.	Soil, groundwater, and Spectacles wetland	Contamination of soils, groundwater, and down-gradient wetlands	• Chemicals stored in accordance with Australian Standards, either in double skinned tanks or located within bunded compounds. • Chemical unloading area bund to contain spill or leaks during transfers. • Chemical storage areas located within composite lined RSA L which is serviced by perimeter and underdrainage systems. • Regular servicing/maintenance and inspection of products and containment infrastructure.	Unlikely	Slight	Low
	Noise	Noise emissions propagated through the atmosphere.	Sensitive residential receptors	Nuisance noise and amenity impacts.	• Siting of WTP centrally within existing RSA facility at distance from potential receptors. Modelling indicate compliance with Environmental Protection (Noise) Regulation limits. • Regular servicing/maintenance and inspection of products and containment infrastructure.	Rare	Slight	Low
	Waste (RO brine, treatment media, filters, and centrifuge cake)	Direct discharge to land and indirect discharge to groundwater and surface waters.	Soil, groundwater, and Spectacles wetland	Contamination of soils, groundwater, and Spectacles wetland	• RO Brine stored in existing composite lined Lake Water Pond. • Centrifuge Cake disposed within discrete cells located with composite lined RSA L and covered with 1m of residue sand or mud. • Pipelines pressure/leak tested during commissioning and routinely inspected in accordance with Alcoa's existing inspection regimes. • Spent treatment media and filters disposed of within lined RSAs or landfill in accordance with existing Licence conditions.	Rare	Slight	Low
	Dust	Windborne particulate matter generated during operations of the WTP and Centrifuge Disposal.	Sensitive residential receptors	Human health and amenity impacts, including, respiratory illness and nuisance dust.	• The WTP and Centrifuge Cake disposal are a wet process which are unlikely to generate dust emissions. • Visual inspections of the Centrifuge Cake disposal cells will be undertaken to monitor for any potential dust emissions • Siting of WTP within existing RSA facility at distance from potential receptors. • Watercarts, or similar, will be maintained onsite to dampen trafficable and open areas, and the disposal cells to minimise dust lift off, as required. • Speed limits will be implemented on site to minimise dust generation from vehicle movements.	Rare	Slights	Low

11. Capital Costs

The cost associated with the construction and establishment of the works proposed under the Works Approval application include earthworks, hardstands, drainage, plant hire, equipment, processing plant, relocation of equipment and labour hire.

Costs exclude:

- the cost of land;
- the cost of buildings to be used for purposes unrelated to the purposes in respect of which the premises are, or will become, prescribed premises;
- costs for buildings unrelated to the prescribed premises activity or activities; and
  - consultancy fees relating to the works.

Table 11-1: Capital Cost Summary

Project Element	Cost ($AUD)
Site Establishment	[redacted]
Equipment (WTP & associated pipelines)	[redacted]
Labour	[redacted]
TOTAL	[redacted]

11.1 Works Approval Fee Calculation

Schedule 3 of the Environmental Protection Regulations detail the Works Approval fee structure. The works cost is [redacted] which attracts the following fee units:

- [redacted]

Based on this, the total fee units applicable to the works is:

- [redacted].

At the time of preparing this application a Works Approval fee unit was valued at $43.45. The applicable Works Approval for this application is:

- [redacted]

12. References

Alcoa. (2023). *Kwinana Groundwater Monitoring and Management Plan.* Perth: Alcoa of Australia.

DWER. (2019). *Industry Regulation Guide to Licensing: Activities Regulated Under the Environmental Protection Act 1986 and Envrionmental Protection Regulations 1987.* Perth: Department of Water and Environmental Regulation.

DWER. (2020). *Guideline: Risk Assessments: Part V, Division 3, Environmental Protection Act 1986.* Perth: Department of Water and Environmental Regulation.

Ecologia. (2021). *Alcoa Kwinana Refinery Flora and Fauna Survey.* Perth: Unpublished Report prepared for Alcoa of Australia.

Appendix 1

KCB RSA L Stability Assessment

26 August 2025

Alcoa of Australia
Level 2, 235 St Georges Terrace
Perth WA 6000
Electronic delivery only

David Anstey
Kwinana Residue Superintendent

Dear David:

Kwinana Residue Storage Areas
RSA L – Water Treatment Plant Impact on RSA Stability

1 INTRODUCTION AND BACKGROUND

Alcoa of Australia (Alcoa) proposes to construct a water treatment plant (WTP) which will operate during the curtailment period of the Kwinana Refinery to reduce the quantity of water stored at the residue storage area.

The WTP will be constructed downstream of RSA L on an engineered earthworks platform with an area of 1.5 Ha, referred to as the "hardstand". The approximate footprint of the WTP is shown on Figure 1-1.

In support of a works approval for the construction of the WTP, Alcoa requested KCB Australia Pty Ltd (KCB) to assess the impacts of the hardstand, associated earthworks, and the WTP infrastructure on the dam safety of RSA L. KCB's assessment is provided in this letter.

KCB Australia Pty Ltd.
Level 3, 150 Mary St ▪ Brisbane QLD 4000 ▪ Australia
t +617.3004.0244 ▪ www.klohn.com

Figure 1-1 Approximate footprint of WTP hardstand indicated by red rectangle

2 DESCRIPTION OF HARDSTAND AND WTP

The hardstand area conceptual layout and design was provided to KCB by Alcoa in drawing model file *KW-RES-WTP-10539 Water Treatment Plant Pad rev B (002).dxf.*

The hardstand is a rectangular area with approximate dimensions 200 m x 100 m. It will be constructed as an engineered cut-to-fill earthworks platform onto which the WTP will be built. The hardstand will be constructed mainly from compacted residue and sand. A typical east-west section is shown in Figure 2-1.

The general arrangement of the WTP and its components was provided to KCB on drawing number *P148-M-GA-002* drawn by Proxa. Equipment schedules were also provided by Proxa. The WTP comprises a variety of infrastructure equipment such as electrical switchrooms, tanks, vessels, pumps and reverse osmosis containers.

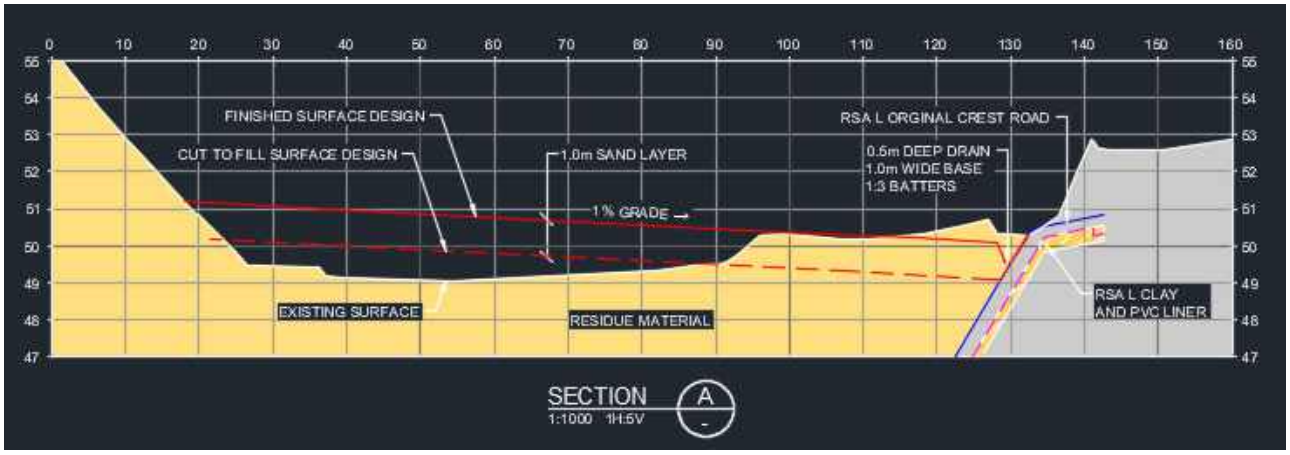

Figure 2-1 Typical east-west section of the proposed hardstand (from design file provided by Alcoa)

3 ASSESSMENT OF IMPACTS

KCB's assessment considered the RSA L slope stability impact due to construction of the hardstand and the static load imposed by the WTP.

KCB carried out 2-dimensional limit equilibrium stability analysis of RSA L embankment transects L.4 and L.5 which are aligned on the eastern batter of RSA L, adjacent to the hardstand. Static peak undrained and post-peak strength (post-liquefied) scenarios were analysed. Pore pressures at the time of construction were assumed to be the same as at the time of the assessment, and it was assumed that construction would not induce excess pore pressure in the RSA due to the slow rate and distance from RSA L.

The analysis found there is expected to be no appreciable reduction of the stability of the RSAs in terms of the factor of safety against slope failure, compared with the current stability.

The static load imposed by the WTP does not negatively impact the geotechnical stability of RSA L.

Operation of the WTP is expected to have negligible impact on the dam safety of RSA L.

4 RECOMMENDATIONS

During and after construction of the hardstand, the monitoring instrumentation installed at RSA L, including piezometers, inclinometers, and surface displacement prisms must be monitored at least at the current frequency of monitoring.

The RSA must continue to be inspected daily.

KCB should be consulted regarding the final design layout and loads of the hardstand and WTP, and layout and details of any pressurized pipelines to and from the WTP.

5 CONCLUSIONS

The hardstand, associated earthworks, and operation of the WTP is not expected to negatively impact the geotechnical stability of RSA L.

6 CLOSING

This report is an instrument of service of Klohn Crippen Berger (KCB). The report has been prepared for the exclusive use of Alcoa of Australia (Client) for the specific application to the Kwinana Residue Storage Areas, and it may not be relied upon by any other party without KCB's written consent.

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1. The report is to be read in full, with sections or parts of the report relied upon in the context of the whole report.

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5. This report is electronically signed and sealed and its electronic form is considered the original. A printed version of the original can be relied upon as a true copy when supplied by the author or when printed from its original electronic file.

Yours truly,

KCB AUSTRALIA PTY LTD.

[redacted]
Senior Geotechnical Engineer

DJ:DJ

Attachments:
1. WTP general arrangement drawing P148-M-GA-002 (supplied by Alcoa/Proxa)

Appendix 2

Water Treatment Plant Noise Assessment Report

ALCOA KWINANA RSA WATER TREATMENT PLANT NOISE ASSESSMENT

ALCOA

Rpt01-AU03129-Rev0-16 Oct 2025

www.woodplc.com
Specialist Technical Services
Vibration, dynamics and noise

DOCUMENT CONTROL & REVIEW INFORMATION

Customer: **Alcoa**

Customer Contact: [redacted]

Wood Contact: [redacted]

Wood Office: Perth

Wood Job No: AU03129

Wood Document No: **Rpt01-AU03129-Rev0-16 Oct 2025**

Rev	Date	Description	Prepared	Reviewed	Approved Proj Manager	Approved Customer
A	13 Oct 25	Issued for Review	[redacted]	[redacted]	[redacted]	[redacted]
0	16 Oct 25	Issued for Use	[redacted]	[redacted]	[redacted]	[redacted]

Item	Page	Section	Comments

* *Use after Rev. 0*

Disclaimer

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EXECUTIVE SUMMARY

Alcoa are proposing to install a Water Treatment Plant (WTP) in the existing Kwinana Residue Storage Area (RSA). The proposed WTP equipment has the potential to have noise impacts on nearby Noise Sensitive Receivers (NSRs) to the RSA.

Wood has been engaged to undertake a noise assessment to determine if received noise levels will exceed the assigned levels for nearest receivers. Operational scenarios associated with the WTP have been assessed for day, evening and night periods.

Alcoa is required to comply with the Environmental Protection (Noise) Regulations 1997 (the Regulations), which prescribes standards for noise emissions in Western Australia. Assigned levels have been determined for the closest noise-sensitive receivers to the RSA in accordance with the Regulations.

The existing Alcoa Kwinana predictive noise model was used to predict noise levels at the nearby NSRs. The noise model considers noise emissions from the proposed WTP equipment only, with noise from existing operations assumed to be at a level equal to the assigned level for each receptor based on recent noise impact assessment works undertaken by Wood for the Kwinana RSA.

The outputs from the predictive noise modelling show that noise levels from the WTP are significantly below the assigned levels for all sensitive receivers assessed. As such, it is unlikely that the WTP equipment will contribute materially to the cumulative noise levels received at the nearby NSRs.

Based on the results of the noise assessment, it is expected that no noise controls or additional management measures are required for the proposed project. However, where noise levels and site footprint are found to differ significantly to that used in this report, it is recommended that this assessment be updated.

TABLE OF CONTENTS

1 INTRODUCTION

1.1 Background

Alcoa are proposing to install a Water Treatment Plant (WTP) in their Kwinana Residue Storage Area (RSA). The WTP will treat water contained in onsite storage ponds to improve water quality and to enable future disposal and reuse outlets.

The equipment associated with the WTP has the potential to give rise to adverse noise impacts on nearby Noise Sensitive Receivers (NSRs). As such, an environmental noise impact assessment of the WTP has been undertaken to predict any potential impacts.

1.2 Scope

The following points summarise the scope of work for the assessment:

- Review the WTP equipment list and derive sound power levels using provided Sound Pressure Levels (SPL) at 1 m;
- Undertake acoustic modelling to predict noise impacts from the WTP at the NSRs; and
- Assess compliance / non-compliance with the regulatory requirements and recommend any noise control measures required to minimise noise impacts where applicable.

1.3 Proposed Installation

The proposed WTP comprises a series of tanks, pumps, agitators, and control valves. The systems and their associated noise sources are listed in Table 1-1 below. Figure 1-1 shows the layout of WTP inside the RSA and location of noise sources.

Table 1-1 Proposed installation and noise generating equipment

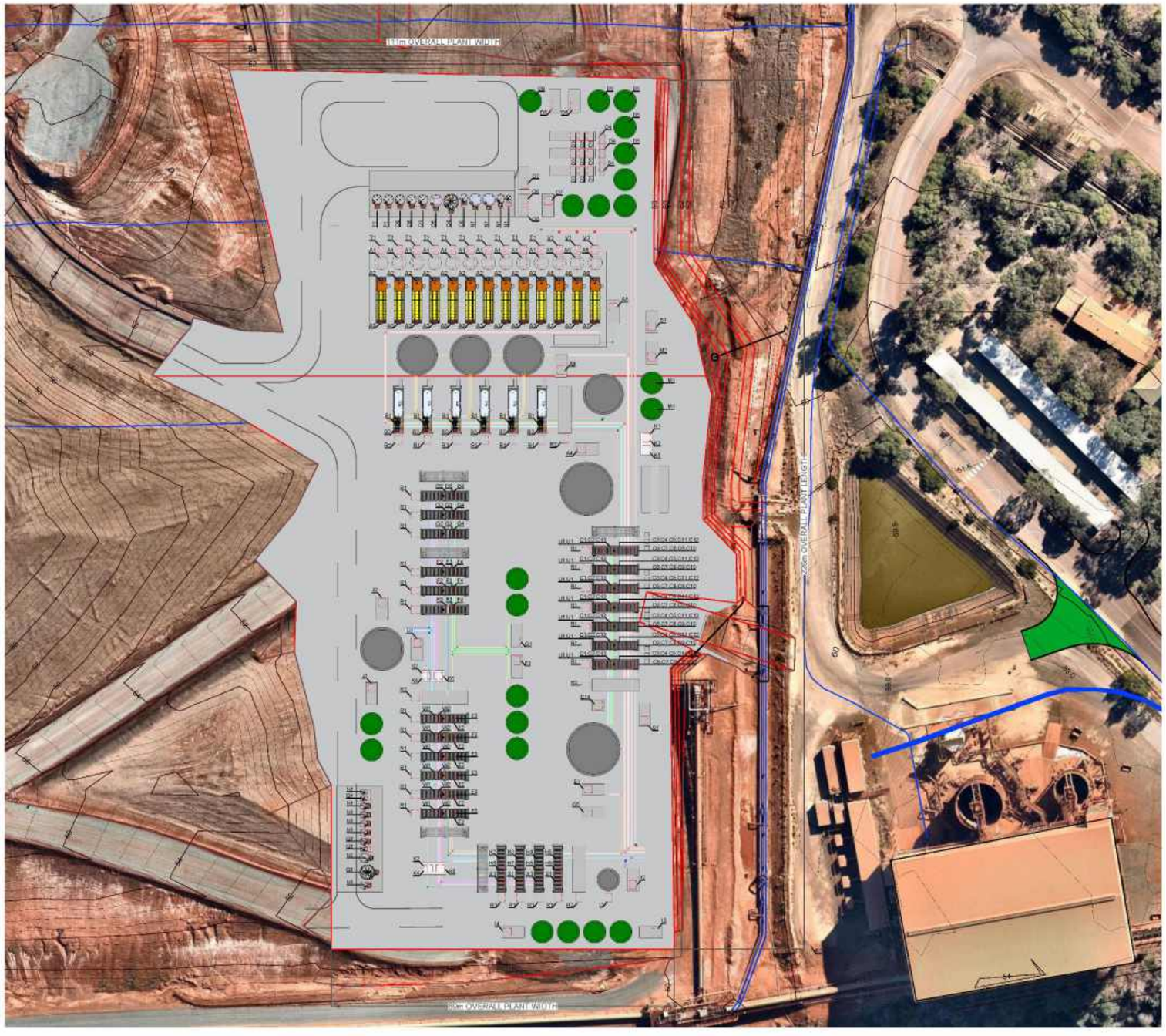
System	Noise Generating Equipment
Neutralisation System	Control valves, agitator, pumps
Backwash Clarifier System	Control valves
Clarifier System	Agitators, pumps, control valves
Media Filter System	Pumps
Ultrafilter System	Blowers, pumps, control valves, compressors, dryers, fans
Centrifuge System	Motors, agitators, pumps
Reverse Osmosis System	Pumps, control valves

System	Noise Generating Equipment
High Pressure Reverse Osmosis System	Pumps, turbo
Ultra High Pressure Reverse Osmosis System	Pumps, turbo
Polishing Reverse Osmosis System	Pumps, control valves
Reverse Osmosis Permeate System	Blower, pumps
Service Water System	Pumps
Clean-In-Place System	Agitator, pumps
Utilities/Plant Compressor System	None
Dosing - CIP	Pumps
Dosing – Coagulant and Flocculant	Agitators, pumps
Dosing – Biocide	Pumps
Dosing – Reverse Osmosis	Pumps
General	Air Conditioners

Figure 1-1 WTP Site Layout

No.	SYSTEM AND EQUIPMENT DESCRIPTION - MOTOR DRIVEN EQUIPMENT	ELEVATION	SPL AT 1M (dB)	FIELD/CONTAINER
A	**CLARIFIER SYSTEM**			
A1	COAGULATION TANK AGITATOR #1 - #10	+6.0M	56	FIELD
A2	FLOCCULATION TANK AGITATOR #1 - #10	+6.0M	67	FIELD
A3	CLARIFIER SLUDGE TRANSFER PUMP #1 - #10	+1.0M	66	FIELD
A4	SW CLARIFIER FEED PUMP #1 - #2	+1.0M	75	FIELD
A5	SW CLARIFIER COAGULATION TANK AGITATOR #1 - #3	+6.0M	56	FIELD
A6	SW CLARIFIER FLOCCULATION TANK AGITATOR #1 - #3	+6.0M	67	FIELD
A7	SW CLARIFIER SLUDGE TRANSFER PUMP #1 - #3	+1.0M	66	FIELD
A8	SW CLARIFIER PRODUCT PUMP #1 - #2	+1.0M	75	FIELD
A9	MF BYPASS TO PRODUCT PUMP #1 - #2	+1.0M	75	FIELD
B	**MEDIA FILTER SYSTEM**			
B1	MEDIA FILTER FEED PUMP #1 - #6	+1.5M	70	CONTAINER
B2	MEDIA FILTER BACKWASH PUMP #1 - #6	+1.5M	75	CONTAINER
C	**ULTRAFILTER SYSTEM**			
C1	ULTRAFILTER FEED BOOSTER #1 - #7	+1.5M	75	CONTAINER
C2	ULTRAFILTER CIP PUMP #1 - #7	+1.5M	66	CONTAINER
C3	ULTRAFILTER CIP HEATER #1 - #7	+1.5M	-	CONTAINER
C4	ULTRAFILTER COMPRESSOR #1 - #7	+1.5M	66	CONTAINER
C5	ULTRAFILTER AIR DRYER #1 - #7	+1.5M	59	CONTAINER
C6	ULTRAFILTER CAUSTIC MC DOSING PUMP #1 - #7	+1.5M	55	CONTAINER
C7	ULTRAFILTER OXIDIANT MC DOSING PUMP #1 - #7	+1.5M	55	CONTAINER
C8	ULTRAFILTER ACID MC DOSING PUMP #1 - #7	+1.5M	55	CONTAINER
C9	ULTRAFILTER HIGH PH MC DOSING PUMP #1 - #7	+1.5M	55	CONTAINER
C10	ULTRAFILTER LOW PH MC DOSING PUMP #1 - #7	+1.5M	55	CONTAINER
C11	ULTRAFILTER AIR SCOUR BLOWER #1 - #7	+1.5M	70	CONTAINER
C12	ULTRAFILTER BLOWER HOOD COOLING FAN #1 - #7	+1.5M	55	CONTAINER
C13	ULTRAFILTER BACKWASH PUMP #1 - #7	+1.5M	75	CONTAINER
C14	ULTRAFILTER DRAIN SUMP PUMP	1.5M	70	FIELD
D	**CENTRIFUGE SYSTEM**			
D1	CENTRIFUGE #1 - #3 MAIN DRIVE	+2.0M	96	FIELD
D2	CENTRIFUGE #1 - #3 BACK DRIVE	+2.0M	74	FIELD
D3	CENTRIFUGE SLUDGE DISCHARGE PUMP #1 - #3	+1.0M	62	FIELD
D4	CENTRIFUGE CENTRATE PUMP #1 - #3	1.5M	63	FIELD
D5	CENTRIFUGE FEED TANK AGITATOR #1 - #4	+5.0M	59	FIELD
D6	CENTRIFUGE #1 - #3 FEED PUMP	+1.0M	75	FIELD
D7	CENTRATE RECYCLE PUMP #1 - #2	+1.0M	77	FIELD
D8	CENTRIFUGE SLUDGE HOLDING TANK DISCHARGE PUMP #1 - #2	+1.0M	66	FIELD
D9	CENTRIFUGE SLUDGE HOLDING TANK AGITATOR	+1.0M	59	FIELD
E	**REVERSE OSMOSIS SYSTEM**			
E1	REVERSE OSMOSIS PASS 1 LOW PRESSURE FEED PUMP #1 - #3	+1.0M	75	FIELD
E2	REVERSE OSMOSIS PASS 1 HIGH PRESSURE FEED PUMP #1 - #6	+1.5M	81	CONTAINER
E3	REVERSE OSMOSIS PASS 1 FLUSHING WATER PUMP #1 - #6	+1.5M	66	CONTAINER
F	**HIGH PRESSURE REVERSE OSMOSIS SYSTEM**			
F1	HIGH PRESSURE REVERSE OSMOSIS LOW PRESSURE FEED PUMP #1 - #2	+1.0M	80	FIELD
F2	HIGH PRESSURE REVERSE OSMOSIS HIGH PRESSURE FEED PUMP #1 - #3	+1.5M	81	CONTAINER
F3	HIGH PRESSURE REVERSE OSMOSIS TURBO #1 - #3	+1.5M	85	CONTAINER
F4	HIGH PRESSURE REVERSE OSMOSIS FLUSHING WATER PUMP #1 - #5	+1.5M	66	CONTAINER
G	**ULTRA HIGH PRESSURE REVERSE OSMOSIS SYSTEM**			
G1	ULTRA HIGH PRESSURE REVERSE OSMOSIS LOW PRESSURE FEED PUMP #1 - #2	+1.0M	75	FIELD
G2	ULTRA HIGH PRESSURE REVERSE OSMOSIS HIGH PRESSURE FEED PUMP #1 - #3	+1.5M	81	CONTAINER
G3	ULTRA HIGH PRESSURE REVERSE OSMOSIS TURBO #1 - #3	+1.5M	85	CONTAINER
G4	ULTRA HIGH PRESSURE REVERSE OSMOSIS FLUSHING WATER PUMP #1 - #3	+1.5M	75	CONTAINER
G5	FINAL BRINE DISCHARGE PUMP #1 - #2	+1.0M	75	FIELD
H	**POLISHING REVERSE OSMOSIS SYSTEM**			
H1	POLISHING REVERSE OSMOSIS LOW PRESSURE FEED PUMP #1 - #2	+1.0M	77	FIELD
H2	POLISHING REVERSE OSMOSIS HIGH PRESSURE FEED PUMP #1 - #2	+1.5M	77	CONTAINER
H3	POLISHING REVERSE OSMOSIS HIGH PRESSURE FEED PUMP #3 - #4	+1.5M	77	CONTAINER
H4	POLISHING REVERSE OSMOSIS HIGH PRESSURE FEED PUMP #5 - #6	+1.5M	77	CONTAINER
H5	POLISHING REVERSE OSMOSIS HIGH PRESSURE FEED PUMP #7 - #8	+1.5M	77	CONTAINER
H6	POLISHING REVERSE OSMOSIS HIGH BOOSTER PUMP #1 - #2	+1.5M	70	CONTAINER
H7	POLISHING REVERSE OSMOSIS HIGH BOOSTER PUMP #3 - #4	+1.5M	70	CONTAINER
H8	POLISHING REVERSE OSMOSIS HIGH BOOSTER PUMP #5 - #6	+1.5M	70	CONTAINER
H9	POLISHING REVERSE OSMOSIS HIGH BOOSTER PUMP #7 - #8	+1.5M	70	CONTAINER
I	**REVERSE OSMOSIS PERMEATE SYSTEM**			
I1	PERMEATE DEGASSER BLOWER	+1.0M	70	FIELD
I2	PRODUCT WATER TRANSFER PUMP #1 - #2	+1.0M	77	FIELD
I3	FINAL PRODUCT TANK DISCHARGE PUMP #1 - #2	+1.0M	85	FIELD
I4	FINAL BRINE TANK DISCHARGE PUMP #1 - #2	+1.0M	85	FIELD
J	**SERVICE WATER SYSTEM**			
J1	UTILITY WATER PUMP	+1.0M	70	CONTAINER
J2	RO FLUSHING WATER PUMP #1 - #2	+1.0M	75	FIELD
K	**CLEAN-IN-PLACE SYSTEM**			
K1	BOC CIP TANK HEATER ELEMENT #1 - #4	+2.0M	-	FIELD
K2	REVERSE OSMOSIS CIP TANK HEATER ELEMENT #1 - #4	+2.0M	-	FIELD
K3	BOC CIP TANK AGITATOR	+4.0M	52	FIELD
K4	REVERSE OSMOSIS CIP TANK AGITATOR #1 - #2	+4.0M	56	FIELD
K5	BOC CIP PUMP	+1.5M	66	FIELD
K6	REVERSE OSMOSIS CIP PUMP #1 - #2	+1.5M	75	FIELD
L	**UTILITIES / PLANT COMPRESSOR SYSTEM**			
L1	NONE			
M	**BOC SYSTEM**			
M1	HIGH TA NEUTRALISATION TANK AGITATOR #1 - #2	+5.0M	59	FIELD
M2	HIGH TA NEUTRALISATION TANK PUMP #1 - #2	+1.0M	77	FIELD
N	**DOSING - CIP**			
N1	VARIOUS CHEMICAL DOSING PUMP TYPE-1 #1 - #11	+1.5M	70	FIELD
O	**DOSING - COAGULANT AND FLOCCULANT**			
O1	COAGULANT DOSING PUMP #1 - #2	+1.5M	70	FIELD
O2	FLOCCULANT BULK STORAGE TANK AGITATOR	+1.5M	64	FIELD
O3	FLOCCULANT DOSING TANK AGITATOR	+1.5M	64	FIELD
O4	FLOCCULANT SOLUTION PUMP #1 - #2	+1.5M	66	FIELD
O5	VARIOUS CHEMICAL DOSING PUMP TYPE-2 #1 - #16	+1.5M	60	FIELD
O6	DEWATERING AID MAKE-UP TANK AGITATOR #1 - #2	+1.5M	64	FIELD
O7	DEWATERING AID POWDER SCREW CONVEYOR	+1.5M	64	FIELD
O8	DEWATERING AID DOSING PUMP #1 - #3	+1.5M	60	FIELD
P	**DOSING - BIOCIDE**			
P1	VARIOUS CHEMICAL DOSING PUMP TYPE-2 #1 - #3	+1.5M	60	FIELD
Q	**DOSING - REVERSE OSMOSIS**			
Q1	VARIOUS CHEMICAL DOSING PUMP TYPE 2 #1 - #6	+1.5M	60	FIELD
R	**GENERAL**			
R1	CONTAINER AIR CONDITIONER(S)	+1.0M	70	FIELD
R2	MCC AIR CONDITIONER(S)	+1.0M	70	FIELD

No.	SYSTEM AND EQUIPMENT DESCRIPTION - CONTROL VALVES	ELEVATION	SPL AT 1M (dB)	FIELD/ CONTAINER
S	**BOC SYSTEM**			
S1	BOC CO2 FEED FLOW CONTROL VALVE #1 - #2	+1.5M	79	FIELD
T	**CLARIFIER SYSTEM**			
T1	CLARIFIER FEED FLOW CONTROL VALVE #1 - #9	+1.5M	79	FIELD
U	**ULTRAFILTER SYSTEM**			
U1	ULTRAFILTER TRAIN #1 - #14 FEED FLOW CONTROL VALVE	+1.5M	79	CONTAINER
V	**BACKWASH CLARIFIER SYSTEM**			
V1	BACKWASH CLARIFIER #1 - #3 FLOW CONTROL VALVE	+1.5M	79	FIELD
W	**REVERSE OSMOSIS SYSTEM**			
W1	REVERSE OSMOSIS TRAIN #1 - #6 FLOW CONTROL VALVE	+1.5M	83	CONTAINER
W2	REVERSE OSMOSIS TRAIN #1 - #6 RECOVERY CONTROL VALVE	+1.5M	83	CONTAINER
X	**POLISHING REVERSE OSMOSIS SYSTEM**			
X1	POLISHING REVERSE OSMOSIS TRAIN #1 - #6 FLOW CONTROL VALVE	+1.5M	79	CONTAINER



1.4 Noise Sensitive Receivers

The nearest NSRs to the site are shown in Figure 1-2 below with their coordinates shown in Table 1-2. The receiver numbering has been maintained to align with historic reports for the site. The receiver at R3 has been demolished and is thus no longer considered as part of the assessment. The receiver at R9 represents the closest residence to the RSA and is consistent with receivers considered in historic assessments. Receivers R10 and R11 have been included to ensure the suburb was adequately represented in the noise modelling.

Figure 1-2 Noise-sensitive receivers

Table 1-2 Nearest noise-sensitive receivers

Receiver	Co-ordinates[1]		Description
	X	Y	
R2	388062.7	6438064.7	A quarry business situated 250 m north of the RSA with associated residence and office.
R4	389286.4	6438160.7	Residential dwelling situated approximately 300 m north of the RSA on Mandogalup Road.

[1] Coordinate Reference System: EPSG:28350 / MGA Zone 50

Receiver	Co-ordinates[1]		Description
	X	Y	
R5	390634.9	6437273	Residential dwelling situated approximately 400 m east of the RSA on Norkett Road.
R6	390580	6436973	Residential dwelling situated approximately 200 m east of the RSA on Norkett Road.
R7	390530.3	6436059.6	Residential dwelling situated approximately 500 m southeast of the RSA on Clement Road.
R8	387387.6	6435910.0	Residential dwelling situated approximately 150 m west of the RSA on Abercrombie Road.
R9	388591.2	6433624.2	Residential dwelling situated approximately 2 km south of the RSA on Nye Way.
R10	389362.8	6433717.2	Residential dwelling situated approximately 2 km south of the RSA on Belvoir Crescent.
R11	387868.8	6433761.0	Residential dwelling situated approximately 2 km south of the RSA on Bingfield Road East.

2 SUMMARY OF ENVIRONMENTAL PROTECTION (NOISE) REGULATIONS 1997

The Environmental Protection (Noise) Regulations 1997 (Regulations) outlines the requirements for the control of environmental noise in Western Australia. The Regulations operate as a prescribed standard under the 'Environmental Protection Act (EPA) 1986' and outline assigned levels which are the maximum permissible noise levels at noise-sensitive receivers.

2.1 Assigned Levels

The assigned levels are dependent upon the time of day and are lower at night when people are more sensitive to noise. Details of different premises and their associated assigned levels are presented in Table 2-1 below.

Table 2-1 Assigned Levels

Type of Premises Receiving Noise	Time of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Noise-sensitive premises: highly sensitive area	0700-1900 hours Monday to Saturday	45+ influencing factor	55+ influencing factor	65+ influencing factor
	0900-1900 hours Sunday and public holidays	40+ influencing factor	50+ influencing factor	65+ influencing factor
	1900-2200 hours all days	40+ influencing factor	50+ influencing factor	55+ influencing factor
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays	35+ influencing factor	45+ influencing factor	55+ influencing factor
Noise sensitive premises: any area other than highly sensitive areas	All hours	60	75	80
Commercial premises	All hours	60	75	80
Industrial and utility premises other than those in the Kwinana Industrial Area	All hours	65	80	90

2.2 Influencing Factor

An influencing factor is incorporated into the assigned level for noise-sensitive premises, such as residential dwellings. This influencing factor depends on land-use zonings within a radius of 100 m (inner circle) and 450 m (outer circle) from the receiver and is determined based upon the presence of major roads, infrastructure, or other industrial developments within these radii. Industrial premises are considered to be Type A under the Regulations and commercial premises are considered as Type B.

Transport factors are included in the influencing factor as follows:

- A major road (with an average daily traffic count of more than 15,000 vehicles per day) where any point inside the road reserve is present within the relevant inner circle corresponds to a transport factor of 6 dB;
- A major road where any point inside the road reserve is present within the relevant outer circle corresponds to a transport factor of 2 dB;
- A secondary road (with an average daily traffic count between 6,000 and 15,000 vehicles per day) where any point inside the road reserve is present in the relevant inner circle corresponds to a transport factor of 2 dB.

The 100 m and 450 m circles adopted for the calculation of the Influencing Factor for each receiver are shown in Figure 2-1 below.

Figure 2-1 Influencing Factor circles

The influencing factors and transport factors have been updated from those calculated for historic reports to reflect the most recent Town Planning District Scheme maps[2] and traffic counts[3]. The relevant maps and traffic counts are provided in Appendix A. Consideration has been given to the receivers with land within the circles which fall under Area A or B of the Kwinana Policy Area where the regulations stipulate:

"*If land within either of the circles –*

(a) Is within Area A or B of the Kwinana Policy Area; and

(b) Is categorized on the land use map as –

i. Land used for industrial or utility purposes that are service industry or light industry purposes; or

ii. Land used for purposes other than for industrial, utility or commercial purposes,

The land is taken to be Type B land for the purposes of subclause (1) …"

The transport factor for receiver R7 is +2 dB to account for the high volume of traffic on Anketell Road. The transport factor at receivers R9 to R11 was calculated to be +6 dB due to the high volume of traffic along Thomas Road.

Details of how each of the assigned levels have been calculated are outlined in Appendix B.

2.3 Assigned Levels for Selected Receivers

The assigned levels for each receiver have been calculated to include the influencing factors and transport factors and are shown in Table 2-2 below. The L_{A1} and L_{Amax} assigned levels are applicable to noise impact assessments of operations which are short in duration. As such, the assigned level relevant to this assessment is the L_{A10} noise index due to the continuous nature of the operations.

The land at receiver R2 is considered to be of industrial use and the associated residence a '*caretaker's and like residences attached to or forming part of [industrial and utility] premises*' referred to in Schedule 1 Part A of the Regulations.

However, since the office building is also situated on the premises, the assigned level for commercial premises in Schedule 1 Part B of the Regulations, outlined above in Table 2-1, has been applied as a conservative approach.

[2] City of Kwinana planning information – last visited 07/10/25

[3] trafficmap - Main Roads WA – last visited 07/10/25

Table 2-2 Assigned Levels at Selected Receivers

Receiver	Influencing Factor (dB)	Transport Factor (dB)	Assigned Level (dB)		
			Day	Evening, Sunday and Public Holiday	Night
R2	-	-	60	60	60
R4	9	0	54	49	44
R5	0	0	45	40	35
R6	2	0	47	42	37
R7	1	2	48	43	38
R8	10	0	55	50	45
R9[4]	0	6	51	46	41
R10	0	6	51	46	41
R11	0	6	51	46	41

2.4 Adjustment for Intrusive or Dominant Noise Characteristics

Predicted noise levels at noise-sensitive receivers are subject to adjustment if the noise is predicted to exhibit any of the following intrusive or dominant acoustic characteristics:

- Impulsivity;
- Tonality; and/or
- Modulation.

Noise emissions assessed to contain any of the above characteristics are subject to the adjustments detailed in Table 2-3 below to a maximum cumulative adjustment of 15 dB.

Table 2-3 Adjustments for intrusive or dominant noise characteristics

Acoustic Characteristic	Adjustment (dB)
Tonality	+5
Impulsivity	+5
Modulation	+10

[4] The area to the north of R9 is zoned as 'Special Use'. It is not clear whether the 'special use' can be considered to be Type A or B and thus no influencing factor has been considered.

3 NOISE MODELLING METHODOLOGY

3.1 Existing Noise Model

Predictive noise modelling was undertaken using the existing Kwinana and RSA facility noise model originally developed by Wood for Alcoa. The model has been used for the following assessments:

- Residue Filtration Project 2016[5];
- Area H Project 2019[6]; and
- Minetek Evaporator Noise Assessment 2025[7].

The acoustic model used in this assessment focuses exclusively on noise emissions from the proposed Water Treatment Plant (WTP) equipment. It does not include contributions from other industrial sources, road traffic, aircraft, animals, or domestic activities. However, noise from other noise sources associated with the Kwinana RSA facility has been considered when determining cumulative noise levels.

Cumulative noise levels associated with the evaporators and Transitional Operating Phase (TOP) equipment have been determined separately as part of report *AU02767 - FN03 - Alcoa KWI Minetek Evaporators - Rev0*. Notably, different evaporator banks operate depending on prevailing wind conditions, which can influence the direction and propagation of noise.

The evaporators will be fitted with noise attenuation kits to mitigate potential noise impacts. Additionally, specific shutdown conditions have been prescribed to ensure compliance with assigned levels under all wind direction scenarios for the evaporators. Worst-case weather conditions for the WTP modelling is assumed to be downwind propagation toward all receivers which is an unrealistic operating condition for the evaporators.

Given that appropriate evaporator shutdown protocols will be implemented to maintain noise emissions at or below the assigned levels, it has been assumed that the cumulative('existing') noise level at the NSRs is equivalent to the assigned level for the purpose of this assessment.

3.2 Noise Model Software

The most recent 3D acoustic model has been constructed using SoundPLAN v 8.2. This program calculates sound pressure levels at nominated receiver locations and produces noise contours

[5] SVT Noise Impact Assessment of Kwinana Residue Filtration Project Commissioning. Report: RPT01-1401421-Rev0 Nov 2016

[6] Wood Area H Project Environmental Noise Assessment. Report: 1403701-1-100 Feb 2019

[7] Wood Alcoa Kwinana Minetek Evaporators Noise Assessment. Report: AU02767 – FN02 – Rev1 Jul 2025

over a defined area of interest around the noise sources. SoundPLAN can be used to model different types of noise, such as industrial noise, traffic noise and aircraft noise, and it is professionally recognised in Australia and internationally. The software is also recommended in the WA DWER Draft Guidelines[8].

The inputs required in SoundPLAN are noise source data, barriers/screens, ground topographical and absorption type data, meteorological conditions, and receiver point locations.

3.3 Noise Model Algorithm

SoundPLAN provides a range of prediction algorithms that can be selected by the user. The CONCAWE prediction algorithms were selected for this assessment[9,10] and is also recommended by the WA DWER Draft Guidelines. The acoustic model has been used to generate a noise contour for the area surrounding the Kwinana facility and predict noise levels at the NSRs.

3.4 Meteorological Conditions

SoundPLAN predicts noise levels for defined meteorological conditions. The day/night-time meteorological conditions used in the model are those suggested by the WA DWER Draft Guideline. This was used to determine the worst-case predicted noise levels at each noise-sensitive location. The meteorological conditions used within the modelling scenarios are summarised in Table 3-1.

Table 3-1 Meteorological Model Inputs for Adverse Conditions

Input	Adverse Conditions	
	Day / Evening	Night
Wind Speed (m/s)	4	3
Wind Direction	Source to Receiver	
Pasquill-Gifford stability class (Atmospheric Stability)	E	F
Humidity (%)	50	
Temperature (degrees Celsius)	20	15

[8] Draft Guideline on Environmental Noise for Prescribed Premises, May 2016, DER2015/001319, Department of Water and Environmental Regulation.

[9] CONCAWE (Conservation of Clean Air and Water in Europe) was established in 1963 by a group of oil companies to carry out research on environmental issues relevant to the oil industry.

[10] The propagation of noise from petroleum and petrochemical complexes to neighbouring communities, CONCAWE Report 4/81, 1981

3.5 Ground Topography, Buildings and Barriers

Surface elevation data (topography) for the area surrounding the WTP and Kwinana RSA was provided by Alcoa.

3.6 Reflections and Barriers

Structures that have the potential to create reflections and barrier effects (e.g. buildings, large tanks) have been included in the model where their influence on predicted noise levels is potentially significant.

3.7 Ground Absorption

The following ground absorption factors were used in the model:

- A ground factor of 0.3 has been used for most of the flat ground surrounding the Refinery;
- Areas outside the Refinery have been modelled as at a factor of 0.6; and
- Residue ponds and other water bodies have been conservatively modelled with a ground absorption factor of 0.

3.8 Noise Modelling Scenarios

The noise model considers the operational scenario during day, evening and night periods.

3.9 Equipment

The list of proposed equipment for the WTP included in the noise model can be found in Appendix C. SPL at 1 m were provided by Alcoa for each equipment item and corresponding sound power levels were calculated using empirically derived formulae. Relative heights of the noise sources were also provided by Alcoa and input into the noise model.

4 RESULTS

Table 4-1 below presents the predicted noise levels at the identified nearby receivers for each scenario considered. Whole octave band SPLs are shown in Appendix D and predictive noise contours are shown in Appendix E.

Table 4-1 Predicted Noise Levels

Name	Predicted SPL, dB(A)		
	Day	Evening/Sundays/Public Holidays	Night
R2	23	23	23
R4	20	20	20
R5	20	20	20
R6	14	14	14
R7	22	22	22
R8	28	28	28
R9	30	30	31
R10	31	31	32
R11	31	31	31

5 DISCUSSION

5.1 Noise Criteria Compliance

Table 5-1 below outlines the predicted cumulative noise levels for each identified NSR with respect to the operation of the WTP and other Kwinana RSA equipment expected to operate concurrently. As outlined in section 3.1 above, noise levels from other equipment in the Kwinana RSA have been assumed to be compliant with the assigned level and conservatively assumed to be equal to the assigned level.

Noise emissions from the WTP are predicted to be significantly below the assigned level and thus will contribute negligibly to cumulative noise levels at the NSRs. As such, the operational noise levels due to the WTP are predicted to comply with the assigned levels at all receivers.

Table 5-1 Cumulative Noise Levels

Name	Day			Evening/Sundays/Public Holidays			Night		
	Assigned Level	WTP Noise Level, dB(A)	WTP Noise Level + Existing , dB(A)	Assigned Level	WTP Noise Level, dB(A)	WTP Noise Level + Existing, dB(A)	Assigned Level	WTP Noise Level, dB(A)	WTP Noise Level + Existing, dB(A)
R2	60	23	**60**	60	23	**60**	60	23	**60**
R4	54	20	**54**	49	20	**49**	44	20	**44**
R5	45	20	**45**	40	20	**40**	35	20	**35**
R6	47	14	**47**	42	14	**42**	37	14	**37**
R7	48	22	**48**	43	22	**43**	38	22	**38**
R8	55	28	**55**	50	28	**50**	45	28	**45**
R9	51	30	**51**	46	30	**46**	41	31	**41**
R10	51	31	**51**	46	31	**46**	41	32	**41**
R11	51	31	**51**	46	31	**46**	41	31	**41**

5.2 Risk of Tonality

Noise contribution from the WTP is anticipated to be at least 9 dB below existing the noise levels at receivers. Therefore, it is unlikely that any intrusive or dominant characteristics from the WTP will be perceptible at the NSRs.

6 CONCLUSION

An assessment of noise emissions from the WTP at the Alcoa Kwinana RSA has been undertaken to assess compliance with the regulatory noise criteria at nearby NSRs.

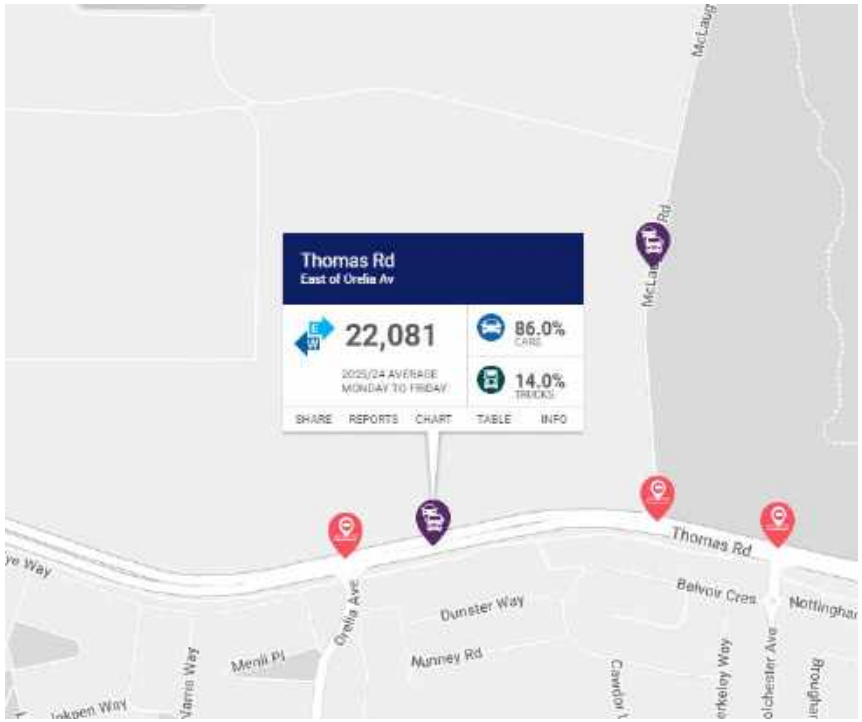
Predictive noise modelling results show that the equipment associated with the WTP is significantly below the assigned level for each receiver.

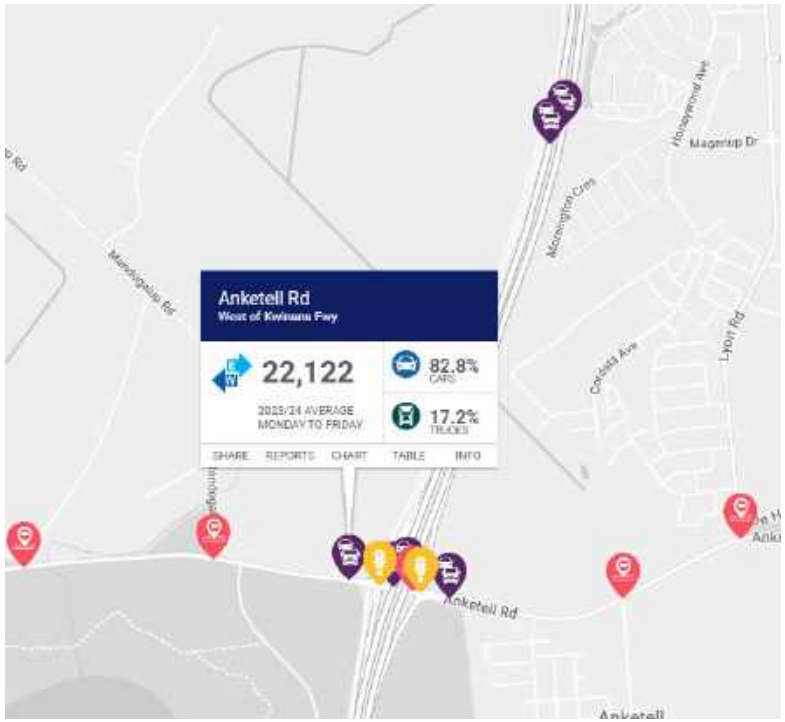
Cumulative noise levels were then determined by considering other operational equipment from the RSA facility. Noise levels from other equipment have been assumed to be compliant with assigned levels and conservatively assumed to be operating at a level equal the assigned level at each NSR. The WTP was found to have negligible impact to the cumulative noise levels at the receivers. As a result, noise emissions from the WTP operations are predicted to be compliant with assigned levels.

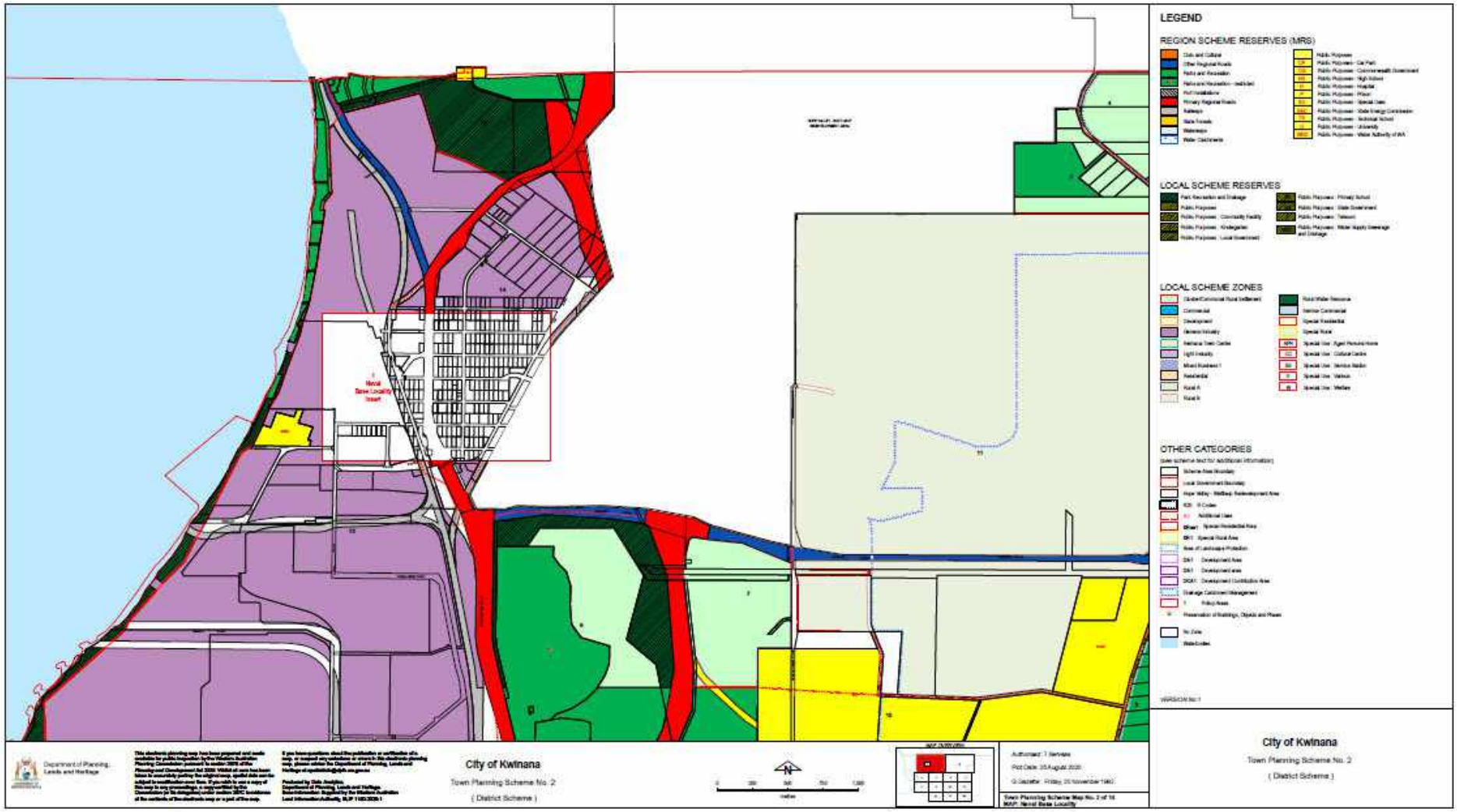
7 RECOMMENDATIONS

Noise levels from the WTP at its current state is found to be compliant with assigned levels at nearby NSRs. Where noise levels from the WTP equipment are found to differ significantly to that used in the noise model and / or the WTP site footprint move closer to the receivers, it is recommended that the noise assessment be updated.

Appendix A ZONING MAPS AND TRAFFIC COUNTS



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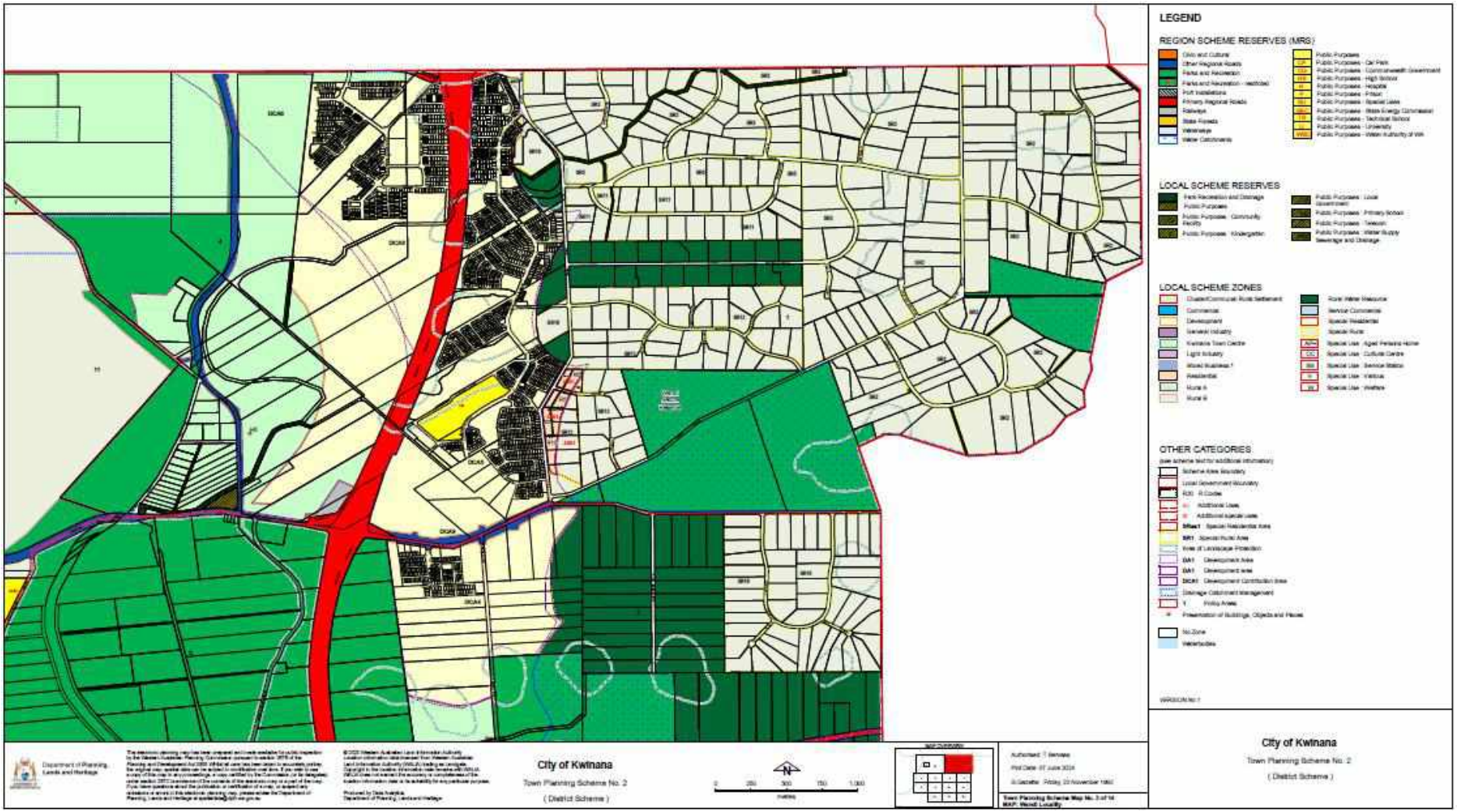
LOCAL SCHEME RESERVES
LOCAL SCHEME ZONES
OTHER CATEGORIES
City of Kwinana
Town Planning Scheme No. 2
(District Scheme)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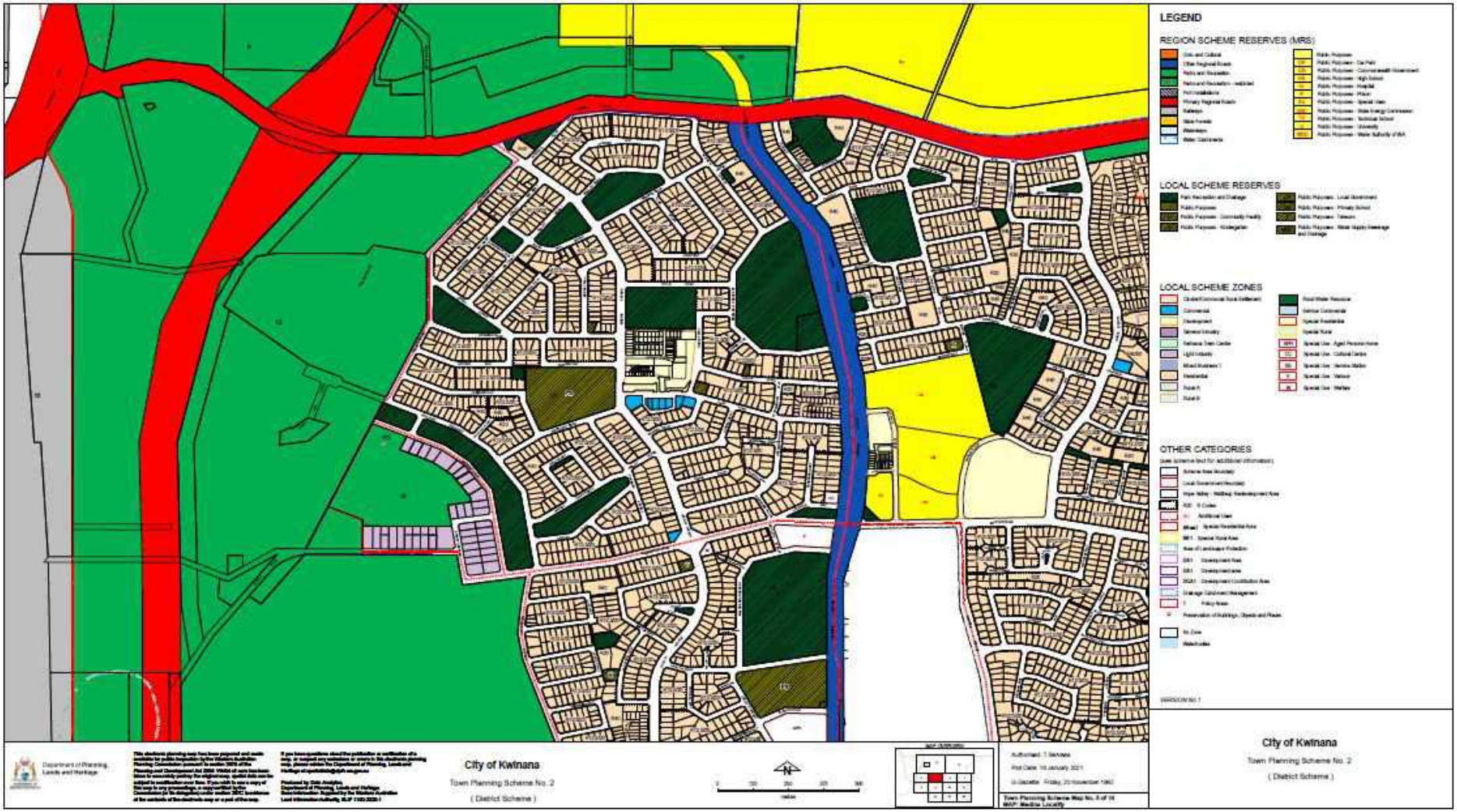
(District Scheme)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REGION SCHEME RESERVES (MRS)
LOCAL SCHEME RESERVES
LOCAL SCHEME ZONES
OTHER CATEGORIES
City of Kwinana
Town Planning Scheme No. 2
(District Scheme)
City of Kwinana
Town Planning Scheme No. 2
(District Scheme)

Appendix B INFLUENCING FACTORS

Industrial and commercial noise in Western Australia is managed under the Western Australia Environmental Protection (Noise) Regulations 1997 which operate under the Environmental Protection Act 1986. The regulations specify maximum permissible noise levels at noise-sensitive (residential), commercial, and industrial premises.

An Influencing Factor is incorporated into the Assigned Levels for noise-sensitive premises. The influencing factor depends on the land-use zonings within circles 100 m and 450 m radius from the noise-sensitive receiver including:

- The proportion of industrial land-use zoning (Type A);
- The proportion of commercial zoning (Type B); and
- The presence of major roads.

The land use is to be determined from appropriate land-use maps (see Appendix A) with the area of each type of premises calculated as a percentage of the full area of each circle. The influencing factor may then be calculated from the following equation:

$$IF\ (dB) = \frac{1}{10}\left(\sum C_{A,1}\%\,, C_{A,2}\%\right) + \frac{1}{20}\left(\sum C_{B,1}\%\,, C_{B,2}\%\right)\ +\ TF$$

where:

- IF is the influencing factor
- $C_{A,1}\%$ is the percentage of Type A inner circle (100 m)
- $C_{A,2}\%$ is the percentage of Type A outer circle (450 m)
- $C_{B,1}\%$ is the percentage of Type B inner circle (100 m)
- $C_{B,2}\%$ is the percentage of Type B outer circle (450 m)
- TF is the transport factor

The transport factor is determined by the following. A major road is one with an average daily traffic count of more than 15,000 vehicles and a secondary road is one with between 6,000 and 15,000 vehicles.

- 6 dB for a major road where any point inside the road reserve is present in the relevant inner circle;

- 2 dB for a major road where any point inside the road reserve is present in the relevant outer circle; and
- 2 dB for a secondary road where any point inside the road reserve is present in the inner circle.

The relevant maps and traffic counts are provided in Appendix A. Consideration has been given to the receivers with land within the circles which falls under Area A or B of the Kwinana Policy Area where the regulations stipulate:

"If land within either of the circles –

(a) Is within Area A or B of the Kwinana Policy Area; and

(b) Is categorized on the land use map as –

i. Land used for industrial or utility purposes that are service industry or light industry purposes; or

ii. Land used for purposes other than for industrial, utility or commercial purposes,

The land is taken to be Type B land for the purposes of subclause (1) ..."

The calculation of the relevant influencing factors for noise-sensitive receivers are presented in the table below.

Receiver	Commercial Area		Percentage of Area		Major Road		Secondary Road	IF (dB)	TF (dB)
	Inner Circle (m^2)	Outer Circle (m^2)	Inner Circle (%)	Outer Circle (%)	Inner Circle	Outer Circle	Inner Circle		
R4	31,416	477,129	100	75	N	N	N	9	0
R5	0	45,449	0	7	N	N	N	0	0
R6	1,575	159,324	5	25	N	N	N	2	0
R7	0	78,952	0	12	N	Y	N	1	2
R8	31,416	636,173	100	100	N	N	N	10	0
R9	0	0	0	0	Y	N	N	0	6
R10	0	0	0	0	Y	N	N	0	6
R11	0	0	0	0	Y	N	N	0	6

Appendix C WTP EQUIPMENT LIST

Equipment	Sound Power Level (dB) at 1/1-Octave Band Centre Frequency (Hz)									Overall Sound Power Level dB(A)
	31.5	63	125	250	500	1k	2k	4k	8k	
Clarifier System										
Coagulation Tank Agitator #1 To #10	51	51	54	56	59	59	58	53	45	64
Flocculation Tank Agitator #1 To #10	42	42	45	47	50	50	49	44	36	55
Clarifier Sludge Transfer Pump #1 To #10	63	64	65	67	67	70	67	63	57	74
BW Clarifier Feed Pump #1 To #2	73	74	75	77	77	80	77	73	67	83
BW Clarifier Coagulation Tank Agitator #1 To #3	51	51	54	56	59	59	58	53	45	64
BW Clarifier Flocculation Tank Agitator #1 To #3	42	42	45	47	50	50	49	44	36	55
BW Clarifier Sludge Transfer Pump #1 To #3	63	64	65	67	67	70	67	63	57	74
BW Clarifier Product Pump #1 And #2	72	73	74	76	76	79	76	72	66	83
MF Bypass to Product Pump #1 And #2	72	73	74	76	76	79	76	72	66	83
Media Filter System										
Media Filter Feed Pump #1 To #6	67	68	69	71	71	74	71	67	61	78
Media Filter Backwash Pump #1 To #6	72	73	74	76	76	79	76	72	66	83
Ultrafilter System										
Ultrafilter Feed Booster Pump #1 To #7	73	74	75	77	77	80	77	73	67	83

Equipment	Sound Power Level (dB) at 1/1-Octave Band Centre Frequency (Hz)									Overall Sound Power Level dB(A)
	31.5	63	125	250	500	1k	2k	4k	8k	
Ultrafilter Feed CIP Pump #1 To #7	63	64	65	67	67	70	67	63	57	74
Ultrafilter CIP Heater #1 To #7	63	64	65	67	67	70	67	63	57	74
Ultrafilter Compressor #1 To #7	66	63	63	62	65	68	68	66	63	74
Ultrafilter Air Dryer #1 To #7	55	52	52	51	54	57	57	55	52	63
Ultrafilter Caustic MC Dosing Pump #1 To #7	52	53	54	56	56	59	56	52	46	63
Ultrafilter Oxidant MC Dosing Pump #1 To #7	52	53	54	56	56	59	56	52	46	63
Ultrafilter Acid MC Dosing Pump #1 To #7	52	53	54	56	56	59	56	52	46	63
Ultrafilter High Ph MC Dosing Pump #1 To #7	52	53	54	56	56	59	56	52	46	63
Ultrafilter Low Ph MC Dosing Pump #1 To #7	52	53	54	56	56	59	56	52	46	63
Ultrafilter Air Scour Blower #1 To #7	65	65	68	70	73	73	72	67	59	78
Ultrafilter Blower Hood Cooling Fan #1 To #7	-	52	52	51	54	57	57	55	52	63
Ultrafilter Backwash Pump #1 To #7	70	71	72	74	74	77	74	70	64	81
Ultrafilter Drain Sump Pump	67	68	69	71	71	74	71	67	61	78
Centrifuge System										
Centrifuge Main Drive #1 To #3	71	71	74	76	79	79	78	73	65	84
Centrifuge Back Drive #1 To #3	69	69	72	74	77	77	76	71	63	82
Centrifuge Sludge Discharge Pump #1 To #3	59	60	61	63	63	66	63	59	53	70
Centrifuge Centrate Pump #1 To #3	59	60	61	63	63	66	63	59	53	70

Equipment	Sound Power Level (dB) at 1/1-Octave Band Centre Frequency (Hz)									Overall Sound Power Level dB(A)
	31.5	63	125	250	500	1k	2k	4k	8k	
Centrifuge Feed Tank Agitator #1 To #4	54	54	57	59	62	62	61	56	48	67
Centrifuge #1 - #3 Feed Pump	72	73	74	76	76	79	76	72	66	83
Centrate Recycle Pump #1-#2	74	75	76	78	78	81	78	74	68	85
Centrifuge Sludge Holding Tank Discharge Pump #1	82	83	84	86	86	89	86	82	76	93
Centrifuge Sludge Holding Tank Discharge Pump #2	82	83	84	86	86	89	86	82	76	93
Centrifuge Sludge Holding Tank Agitator	54	54	57	59	62	62	61	56	48	67
Reverse Osmosis System										
Reverse Osmosis Pass 1 Low Pressure Feed Pump #1-#3	72	73	74	76	76	79	76	72	66	83
Reverse Osmosis Pass 1 Stage 1 High Pressure Feed Pump #1-#6	78	79	80	82	82	85	82	78	72	89
Reverse Osmosis Pass 1 Flushing Water Pump #1-#6	63	64	65	67	67	70	67	63	57	74
High Pressure Reverse Osmosis System										
High Pressure Reverse Osmosis Low Pressure Feed Pump #1-#2	77	78	79	81	81	84	81	77	71	88
High Pressure Reverse Osmosis High Pressure Feed Pump #1-#3	78	79	80	82	82	85	82	78	72	89
High Pressure Reverse Osmosis Turbo #1-#3	82	83	84	86	86	89	86	82	76	93
High Pressure Reverse Osmosis Flushing Water Pump #1-#3	63	64	65	67	67	70	67	63	57	74
Ultra High Pressure Reverse Osmosis System										
Ultra High Pressure Reverse Osmosis Low Pressure Feed Pump #1-#2	72	73	74	76	76	79	76	72	66	83

Equipment	Sound Power Level (dB) at 1/1-Octave Band Centre Frequency (Hz)									Overall Sound Power Level dB(A)
	31.5	63	125	250	500	1k	2k	4k	8k	
Ultra High Pressure Reverse Osmosis High Pressure Feed Pump #1-#3	78	79	80	82	82	85	82	78	72	89
Ultra High Pressure Reverse Osmosis Turbo #1-#3	82	83	84	86	86	89	86	82	76	93
Ultra High Pressure Reverse Osmosis Flushing Water Pump #1-#3	72	73	74	76	76	79	76	72	66	83
Final Brine Discharge Pump #1-#2	72	73	74	76	76	79	76	72	66	83
Polishing Reverse Osmosis System										
Polishing Reverse Osmosis Low Pressure Feed Pump #1-#8	74	75	76	78	78	81	78	74	68	85
Polishing Reverse Osmosis High Booster Pump #1-#8	67	68	69	71	71	74	71	67	61	78
Reverse Osmosis Permeate System										
Permeate Degasser Blower	65	65	68	70	73	73	72	67	59	78
Product Water Transfer Pump #1 - #2	74	75	76	78	78	81	78	74	68	85
Final Product Tank Discharge Pump #1- #2	82	83	84	86	86	89	86	82	76	93
Final Brine Tank Discharge Pump #1 - #2	82	83	84	86	86	89	86	82	76	93
Service Water System										
Utility Water Pump	67	68	69	71	71	74	71	67	61	78
Ro Flushing Water Pump #1-#2	72	73	74	76	76	79	76	72	66	83
Clean-In-Place System										
BOC CIP Tank Heater Element #1-#4	-	-	-	-	-	-	-	-	-	-

Equipment	Sound Power Level (dB) at 1/1-Octave Band Centre Frequency (Hz)									Overall Sound Power Level dB(A)
	31.5	63	125	250	500	1k	2k	4k	8k	
Reverse Osmosis CIP Tank Heater Element #1-#4	-	-	-	-	-	-	-	-	-	-
BOC CIP Tank Agitator										
Reverse Osmosis CIP Tank Agitator #1-#2	51	51	54	56	59	59	58	53	45	64
BOC CIP Pump	77	78	79	81	81	84	81	77	71	88
Reverse Osmosis CIP Pump #1-#2	72	73	74	76	76	79	76	72	66	83
Utilities / Plant Compressor System										
None										
Neutralisation System										
High TA Neutralisation Tank Agitator #1-#2	54	54	57	59	62	62	61	56	48	67
High TA Neutralisation Tank Pump #1-#2	74	75	76	78	78	81	78	74	68	85
Dosing - CIP										
Various Chemical Dosing Pump Type-1 #1-#11	67	68	69	71	71	74	71	67	61	78
Dosing - Coagulant and Flocculant										
Coagulant Dosing Pump #1 - #2	67	68	69	71	71	74	71	67	61	78
Flocculant Bulk Storage Tank Agitator	39	39	42	44	47	47	46	41	33	52
Flocculant Dosing Tank Agitator	40	40	43	45	48	48	47	42	34	52
Flocculant Solution Pump #1 - #2	57	58	59	61	61	64	61	57	51	68
Various Chemical Dosing Pump Type-2 #1 -#18	57	58	59	61	61	64	61	57	51	68

Equipment	Sound Power Level (dB) at 1/1-Octave Band Centre Frequency (Hz)									Overall Sound Power Level dB(A)
	31.5	63	125	250	500	1k	2k	4k	8k	
Dewatering Aid Make-Up Tank Agitator #1 -#2	39	39	42	44	47	47	46	41	33	52
Dewatering Aid Powder Screw Conveyor										
Dewatering Aid Dosing Pump #1 -#3	57	58	59	61	61	64	61	57	51	68
Dosing - Biocide										
Various Chemical Dosing Pump Type-2 #1-#3	57	58	59	61	61	64	61	57	51	68
Dosing - Reverse Osmosis										
Various Chemical Dosing Pump Type-2 #1-#6	57	58	59	61	61	64	61	57	51	68
General										
Container Air Conditioner(s)	65	65	68	70	73	73	72	67	59	78
MCC Air Conditioner(s)	65	65	68	70	73	73	72	67	59	78
Neutralisation System										
BOC Co2 Feed Flow Control Valve #1-#2	117	111	106	99	93	88	85	84	74	97
Clarifier System										
Clarifier Feed Flow Control Valve #1 - #9	117	111	106	99	93	88	85	84	74	97
Backwash Clarifier System										
Backwash Clarifier #1 - #3 Flow Control Valve	117	111	106	99	93	88	85	84	74	97
Ultrafilter System										
Ultrafilter Train #1 - #14 Feed Flow Control Valve	117	111	106	99	93	88	85	84	74	97

Equipment	Sound Power Level (dB) at 1/1-Octave Band Centre Frequency (Hz)									Overall Sound Power Level dB(A)
	31.5	63	125	250	500	1k	2k	4k	8k	
Reverse Osmosis Train #1 - #6 Flow Control Valve	121	115	110	103	97	92	89	88	78	101
Reverse Osmosis Train #1 - #6 Recovery Control Valve	121	115	110	103	97	92	89	88	78	101
Polishing Reverse Osmosis System										
Polishing Reverse Osmosis Train #1 - #6 Flow Control Valve	117	111	106	99	93	88	85	84	74	97

Appendix D PREDICTIVE SOUND PRESSURE LEVELS

D.1 Day / Evening

Name	Overall Noise Level, dB(A)	Sound Pressure Level (dB) at 1/1 Octave Band Centre Frequency (Hz)								
		31.5	63	125	250	500	1k	2k	4k	8k
R2	23	51	43	35	25	18	7	-	-	-
R3	25	53	44	36	26	19	9	-	-	-
R4	20	49	41	32	21	15	4	-	-	-
R5	20	48	40	31	20	14	6	-	-	-
R6	14	43	33	23	14	11	3	-	-	-
R7	22	51	42	33	21	16	9	-	-	-
R8	28	55	47	40	30	23	14	2	-	-
R9	30	55	47	40	32	28	21	6	-	-
R10	31	56	48	41	33	30	21	7	-	-
R11	31	55	47	40	32	29	21	6	-	-

D.2 Night Time

Name	Overall Noise Level, dB(A)	Sound Pressure Level (dB) at 1/1 Octave Band Centre Frequency (Hz)								
		31.5	63	125	250	500	1k	2k	4k	8k
R2	23	51	43	35	25	18	8	-	-	-
R3	25	53	45	36	27	19	9	-	-	-
R4	20	49	41	32	21	15	5	-	-	-
R5	20	48	40	31	20	15	7	-	-	-
R6	14	43	33	23	15	11	4	-	-	-
R7	22	51	42	33	22	16	10	-	-	-
R8	28	55	47	40	30	23	14	2	-	-
R9	31	55	47	40	32	29	21	6	-	-
R10	32	56	49	42	33	30	22	7	-	-
R11	31	55	48	41	32	29	22	6	-	-

Appendix E PREDICTIVE NOISE CONTOURS

E.1 Day / Evening

E.2 Night Time