

Alcoa of Australia Limited

**Native Vegetation Clearing Permit
Application Supporting Document**

**Wagerup Alumina Refinery
Residue Storage Area 10**



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1 Background

Alcoa of Australia Limited (Alcoa) owns and operates the Wagerup Alumina Refinery (the Refinery) located approximately 120km south-east of Perth within the Shire of Waroona. The establishment and operation of an alumina refinery near Wagerup is approved under the *Alumina Refinery (Wagerup) Agreement and Acts Amendment Act 1978* (State Agreement Act).

The Refinery has been issued with a Prescribed Premises Licence (L6217/1983/15) under Part V of *Environmental Protection Act 1986* (EP Act) for Categories 46 (Bauxite refining), 52 (Electric power generation), 64 (Class II or III putrescible landfill site) and 67 (Fuel burning).

The Refinery produces alumina through the Bayer process and generates approximately two (2) dry tonnes of bauxite residue per tonne of alumina produced which is contained within the residue management area. Existing stacking and storage limitations have resulted in a shortfall of approximately 7 ha of storage area per year. To address this shortfall, Alcoa plans to construct a new Residue Storage Area (RSA) on the north-western corner of the existing residue management area.

Construction of RSA 10 requires a suitable clay material which can be sourced from Alcoa's existing borrow pit however due to a shortfall of material, development of a new borrow pit is required. The proposed location of the new borrow pit is approximately 200 metres west of the existing borrow pit. It is located on Alcoa owned agricultural land adjacent to the Refinery residue management area and within the Prescribed Premises Licence boundary.

In August 2024 Alcoa submitted a works approval application for the RSA10 project to the Department of Water and Environmental Regulation (DWER) under Part V of the EP Act. Alcoa met with DWER in November 2023 to discuss the scope of the RSA10 project. DWER confirmed that extraction of clay from borrow pits and associated road upgrades would not be assessed under the works approval application as these activities are not part of the licenced prescribed premises category.

Development of the new borrow pit will require the clearing of 39.83 hectares of historically disturbed agricultural land. Although the vegetation present is primarily associated with grazing farmland, native vegetation has been identified in a 0.305 hectare area within the proposed clearing area, along with scattered native sedge regrowth in the existing farmlands. Therefore, a native vegetation clearing permit application is being submitted to obtain approval to clear the area as required under Part V of the EP Act.

Alcoa understands that the clearing permit will be assessed by the Department of Mines, Petroleum and Exploration (DMPE) under delegated authority as the clearing will be undertaken on land subject to a State Agreement Act.

The location of the proposed clearing area required for the development of the new borrow pit is shown in Figures 1 and 2.

Figure 1: Wagerup Refinery Proposed Clearing Location

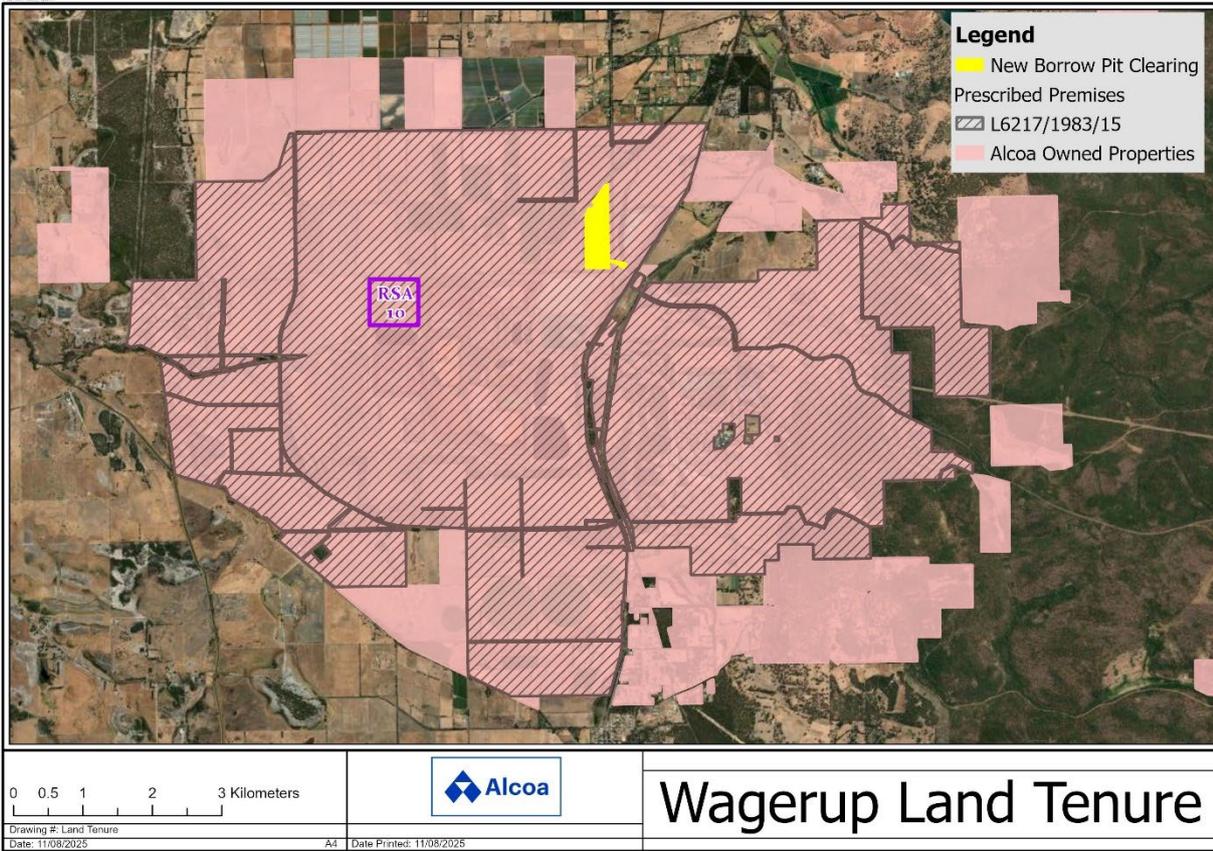


Figure 2: New Borrow Pit Clearing Area



2 Proposed Clearing

2.1 Location

The proposed clearing area will be located wholly on Alcoa freehold land on Lot 206, Deposited Plan 424949, Certificate of Title Volume 4040, Folio 258. An Australian Securities and Investments Commission (ASIC) company summary showing Alcoa as a registered Australian Public company is provided as Appendix A and the Certificate of Title for proof of ownership of the land as Appendix B.

The proposed clearing area is located within the Gnaala Karla Booja (GKB) Indigenous Land Use Agreement area. In 2021, Alcoa consulted with the South West Aboriginal Land and Sea Council who nominated GKB representatives to participate in surveys of areas around the residue management area. An archaeological and ethnographic heritage survey of the RSA10 project and surrounding areas was completed in 2022 (Appendix C), which identified five registered heritage sites and places located outside of the RSA 10 construction footprint and no new heritage sites or places. Development of the new borrow pit will not impact the existing heritage areas.

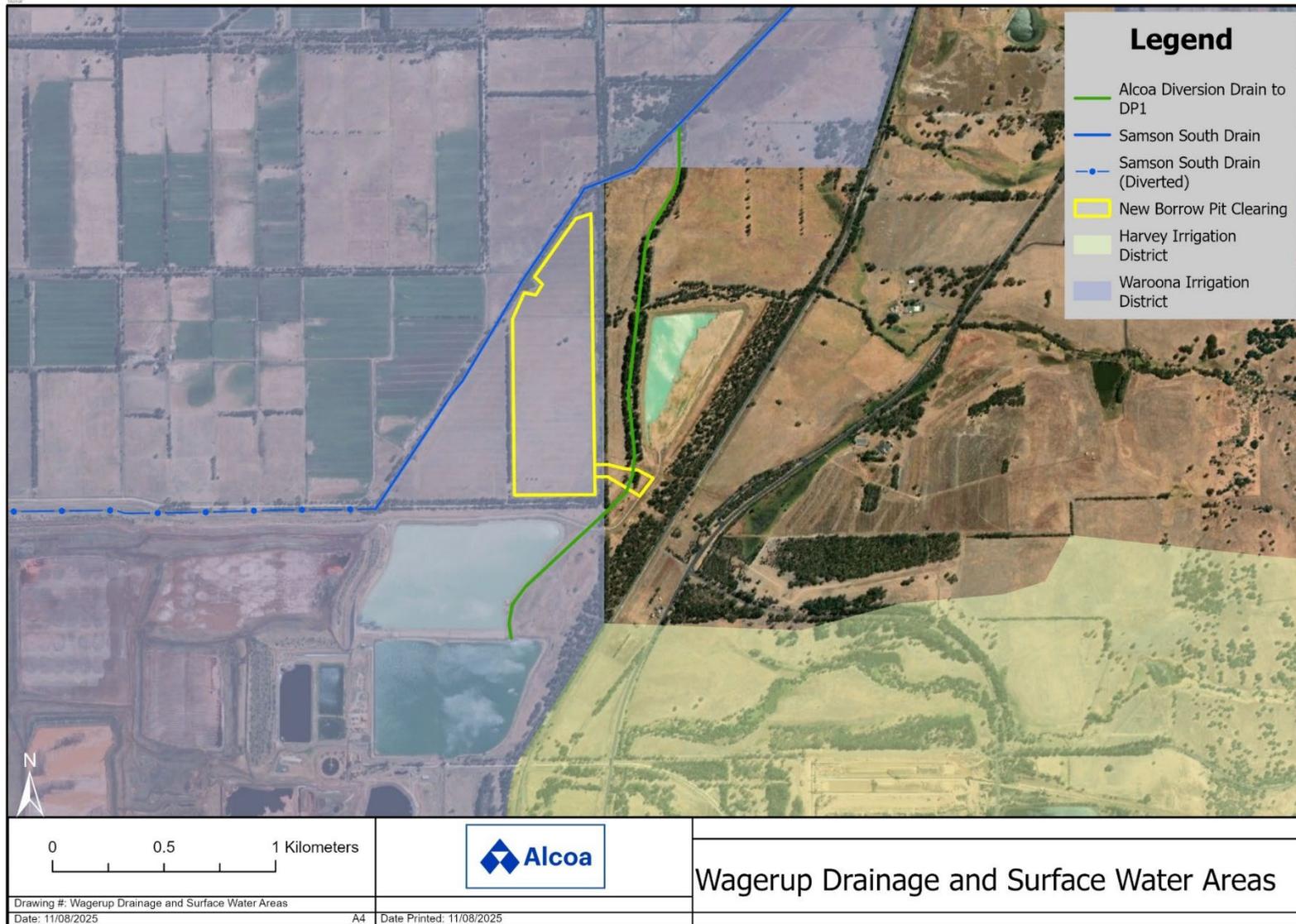
2.2 Proposed Activities

Vegetation clearing of up to 39.83 hectares within Alcoa farmlands is required to enable the extraction of clay material from the proposed new borrow pit and the construction of an access road to the existing borrow pit haul road.

Construction of the new borrow pit access road includes the installation of culverts to establish a crossing over the Alcoa Diversion Drain. The Alcoa Diversion Drain is an artificial watercourse that supplies surface water from the Samson South Diversion Drain and Black Tom Brook to Detention Pond 1 (DP1). Surface water is stored within DP1 is for use by the Refinery in accordance with existing abstraction licences issued under the *Rights in Water and Irrigation Act 1914* (RIWI Act).

A RIWI Act Bed and Banks Permit is not required for the Alcoa diversion drain crossing as it is located outside of the Waroona Irrigation District and Harvey Irrigation District Proclaimed Surface Water Areas (Figure 3).

Figure 3: New Borrow Pit Access Road Drain Crossing



3 Existing Environment

3.1 Regional Context

The proposed clearing area is located on the eastern edge of the Swan Coastal Plain Interim Biogeographic Regionalisation for Australia (IBRA) subregion, which is associated with a belt of heavier alluvial soil constituting the Pinjarra Plain geomorphic system (Beard, 1990).

3.2 Climate

The area experiences a Mediterranean-type climate, with hot dry summers and cool wet winters. On average, rainfall occurs during every month of the year with most falling during winter and spring.

The closest Bureau of Meteorology weather station that records temperatures is located at Wokalup which is approximately 22 km from the Refinery. A summary of monthly and annual temperatures is included in Table 1. The warmest months are January and February, when maximum temperatures average over 30 degrees and can exceed 40 degrees. The coldest months are July and August, when the average maximum temperature is around 17 degrees (Bureau of Meteorology, 2024). Humidity generally peaks in the early mornings then drops during the day, and is higher in winter than summer (Alcoa, 2017).

Table 1: Mean Maximum and Minimum Monthly Temperatures - Wokalup (1991-2020)

Temperature	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Mean maximum (°C)	30.9	30.8	28.2	25.0	21.0	18.0	16.9	17.4	18.6	21.5	24.5	29.1	23.5
Mean minimum (°C)	15.7	15.9	15.0	13.0	10.7	9.2	8.3	8.1	8.6	9.0	11.4	14.0	11.6

Alcoa maintains a weather station on the eastern side of the Refinery that provides data to the Bureau of Meteorology (Station No. 009894). Mean annual rainfall is 841 mm with mean monthly rainfall ranging between 14 mm in February and 160 mm in July. Around 80% of annual rainfall generally occurs in the five-month period between May and September. There is a trend of decreasing annual rainfall since the mid-1990s. The mean annual evaporation rate is 2,059 mm, with monthly average rates ranging between 73 mm in July and 310 mm in January and December. Evaporation exceeds rainfall on average for seven months of each year, between January to April, and October to December (Rockwater 2023).

Winds at the Refinery are controlled by synoptic weather patterns, local features such as topography, and sea and land breezes. The Refinery is located at the base of the Darling Scarp which influences wind patterns through:

- Generation of very strong gully or foothill winds during summer, particularly at night and in the early morning
- Creation of rotors or wind reversals near the foothills during easterly winds
- Channelling or deflection of westerly winds up the escarpment
- Creation of katabatic wind flows down the escarpment.

During the summer months, easterly winds are generated from high pressure systems passing over the southwest corner of Western Australia. In winter, westerly winds are caused by cold fronts and low-pressure systems.

3.3 Landscape

The Refinery is located on the eastern edge of the Swan Coastal Plain and adjacent to the Darling Scarp. Much of the land on the coastal plain has been cleared for agricultural purposes. Topographic elevations decrease gradually towards the west, from 40–50m AHD near the Refinery, to between 15 m AHD and 20 m AHD around the residue management area (Rockwater 2023).

The Swan Coastal Plain comprises five major geomorphological systems that lie parallel to the coast, namely (from west to east) the Quindalup Dunes, Spearwood Dunes, Bassendean Dunes, Pinjarra Plain and Ridge Hill Shelf. Each major system is composed of further subdivisions in the form of detailed geomorphological units (Churchward and McArthur 1980 and Gibson et al. 1994).

The Refinery residue management area is situated on the Pinjarra Plain geomorphic system. The Pinjarra Plain is an alluvial plain, with the older layers having been laterised and stripped and generally consisting of a sandy surface over a poorly structured sub soil clay (Beard, 1981).

The Wagerup farmlands include three main landform and soil units as defined and mapped by Churchward and McArthur (1980):

- Guildford - Flat plain with medium textured deposits; yellow duplex soils.
- Forrestfield - Laterised foothills of the Darling Scarp dominated by gravelly and sandy soils.
- Darling Scarp - Very steep slopes with shallow red and yellow earths and much rock outcrop.

An acid sulfate soils (ASS) assessment was completed for the RSA 10 project in accordance with the DWER Guideline: *Identification and Investigation of Acid Sulfate Soils and Acidic Landscapes* (Department of Environmental Regulation, 2015) (Appendix D). The soils over the RSA 10 footprint and clay borrow pit areas are considered to have slightly acidic soils however most soil samples and all samples below 2 metres depth are assessed as non-sulfidic soils. The results of the investigation indicate the near surface soils at the site are slightly acidic and not Actual ASS (AASS). The soils were assessed for Potential ASS (PASS) using the results of the pH_{FOX} and S_{CR} analysis, with the findings indicating that soils at the site are not considered to be PASS (Hatch, 2024). No AASS or PASS will be disturbed by the RSA 10 project, and therefore no treatment of the soil is required.

3.4 Hydrology

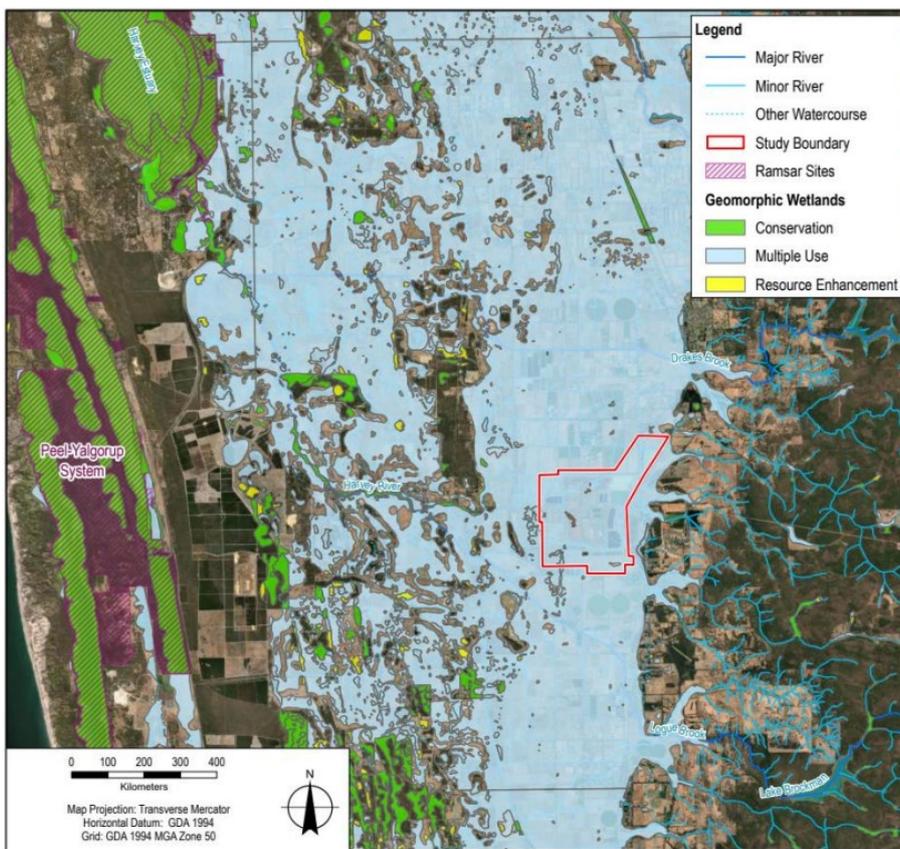
The Refinery is located within the lower Harvey River Catchment in the Harvey Estuary Environmental Protection Policy (1992) area. The purpose of this policy is to protect the Peel-Harvey Estuarine System, maintain environmental quality objectives and to prevent environmental damage, primarily from increased nutrients. The Peel Inlet Management Area, a gazetted Waterways Conservation Act (1976) Management Area, is located to the west of the Refinery.

Two wetland systems of conservation significance are located downstream of the Refinery:

- The Peel Yalgorup System – Ramsar listed wetland included in the Directory of Important Wetlands in Australia. The Samson South Drain discharges into the Harvey River which then discharges into the Peel Yalgorup System located approximately 25 km downstream.
- The Yalgorup Lakes – Ramsar listed wetlands located approximately 14.5 km west. Review of linear hydrography mapping (DWER-031) identifies there is no direct surface water discharge from the proposed clearing area catchment into the Yalgorup Lakes.

A surface water assessment completed for the RSA 10 Project (Appendix E) included mapping of Geomorphic Wetlands of the Swan Coastal Plain (DBCA-019). The Refinery and its surrounds are shown as multiple use wetland, comprising a palusplain (seasonally waterlogged flat) that extends north-south along the Swan Coastal Plain (Figure 4).

Figure 4: Geomorphic Wetlands



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Data source: DBCA, Geomorphic Wetlands, Swan Coastal Plain (DBCA-019) World Imagery: Earthstar Geographics Created by rtbrown3

There are no Environmental Protection Policy (EPP) listed wetlands in the Refinery or residue management area. An EPP listed wetland, commonly referred to as Exelby Wetland, is located on the northern side of Bancell Road, approximately 1 kilometre south of the residue management area. This wetland is part of a low-lying swampland on Bancell creek and was traditionally an ephemeral wetland, however due to the inflow of excess irrigation water from surrounding farmland, it has become a permanent water body.

Downstream of the residue management area, the lower extent of Samson Brook is mapped as conservation wetland (floodplain flat), with two linear resource enhancement sumpland basins occurring over 2 km west. Other nearby wetlands include four small wetlands near Yarloop (located approximately 3.5 kilometres south of the Refinery), and three small wetlands near Hamel (located approximately 4 kilometres north of the Refinery) (Alcoa, 2017).

Existing drainage in the area has been significantly modified. Agricultural drains have been installed to drain low-lying farmlands of the coastal plain section that were winter water-logged, and modified sections of rivers and brooks are also considered drains. Surface water systems are highly regulated with some of the upland forested streams dammed for water supply and surface flows diverted for district irrigation schemes. The Harvey River Main Drain lies approximately 4 km to the west of the residue management area and flows in a north-westerly direction discharging into the Harvey Estuary (GHD, 2024).

Surface water has been diverted around the residue management area by two channels – the Samson South Drain on the north side and the Alcoa Diversion Drain / Yalup Brook Drain (also referred to as South Samson Diversion Drain) on the eastern and southern sides. The confluence of these Drains occurs approximately 2 kilometres west of the residue management area (Figure 5).

Samson South Drain directs surface water from a small catchment north of the Refinery around the northern edge of the existing residue management area, with a section of the drain diverted around the long-term residue management area footprint (Alcoa, 2017).

The Alcoa Diversion Drain directs purchased water from Samson South Drain and surface water from the Black Tom Brook catchment to DP1 located in the residue management area.

The Yalup Brook Drain includes surface water from the catchments of North Yalup Brook, South Yalup Brook, the Refinery, and overflow from DP1 (Rockwater, 2023) (Figure 6).

Figure 5: Wagerup Refinery Surface Water Features

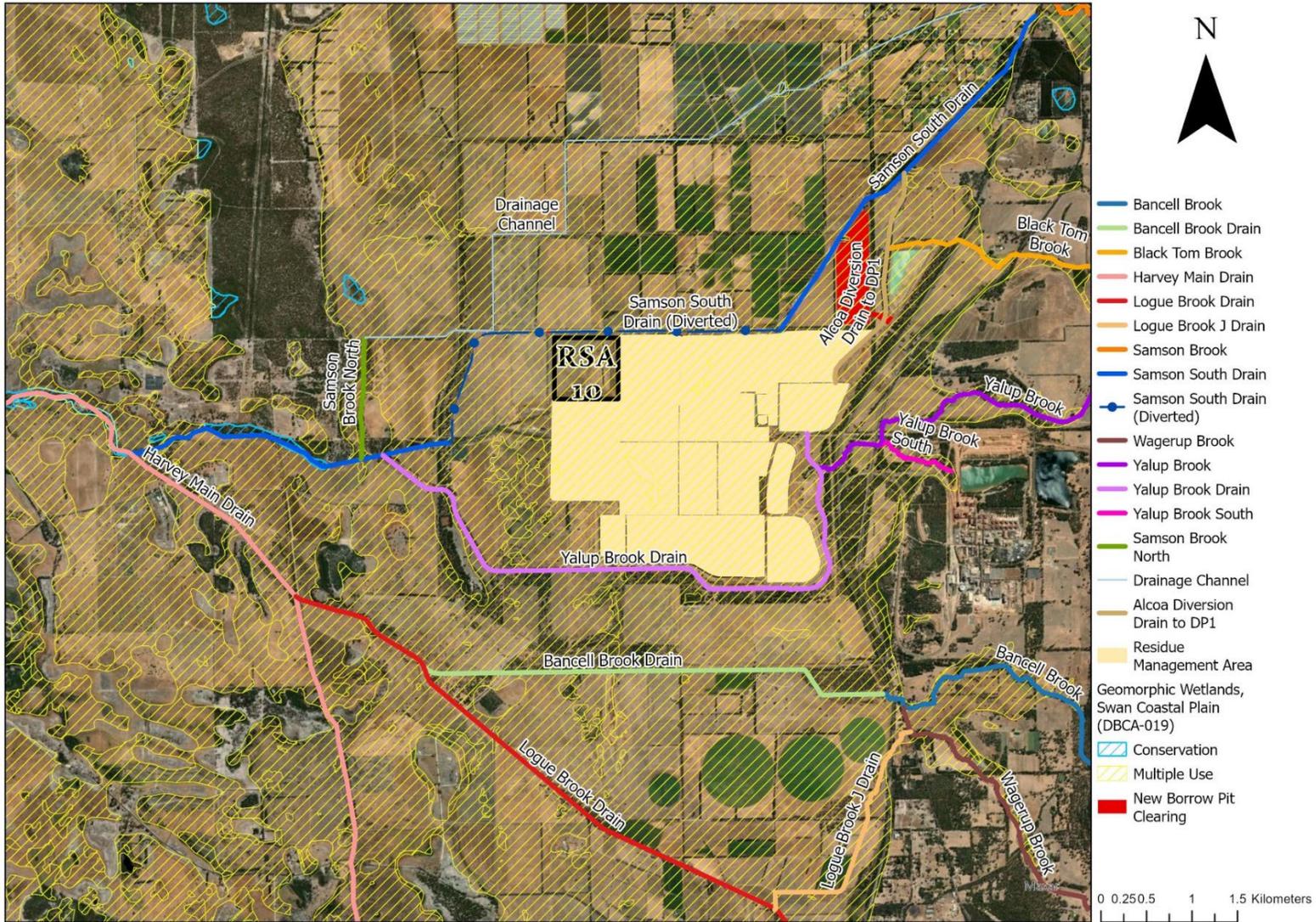
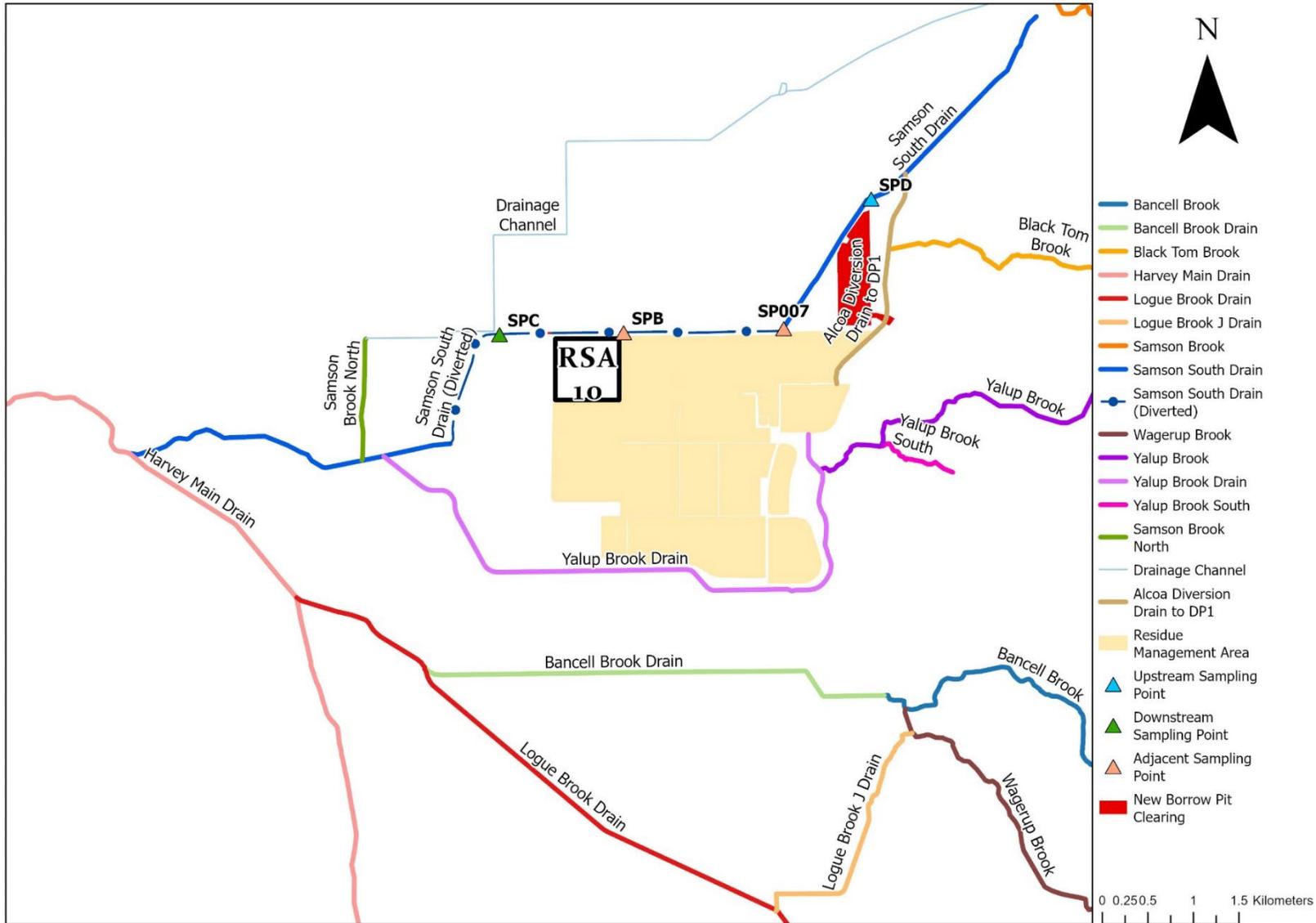


Figure 6: Wagerup Refinery Surface Water Drains



3.5 Hydrogeology

The superficial geological formations in the region are heterogeneous, comprising zones of very permeable clay, sandy clay, laterite and sand. Under the Refinery and residue management area, the superficial formations can generally be divided into an upper layer with low permeability and a lower layer with higher permeability (Alcoa, 2017).

Below the residue management area, the low permeability clays and sandy clays of the Guilford Formation generally restrict vertical groundwater movement in the superficial aquifer. This is underlain by sands and clayey sands of the Yoganup and Ascot Formations. These sandy formations intercept and together form a regionally continuous aquifer, which is the main conduit for horizontal groundwater movement in the superficial formations. This aquifer is confined by the less permeable, overlying clayey materials of the Guildford Formation. The contact between the Leederville and Yoganup formations is generally identifiable due to a layer of carbonaceous or greenish-grey silty clay and shale. This layer restricts the vertical movement of groundwater between the superficial formations and the underlying Leederville Formation (Alcoa, 2017).

Regional groundwater flows are shown in Figure 7 and local geological formations in Figure 8 (Rockwater, 2023).

Figure 7: Regional Groundwater Flow

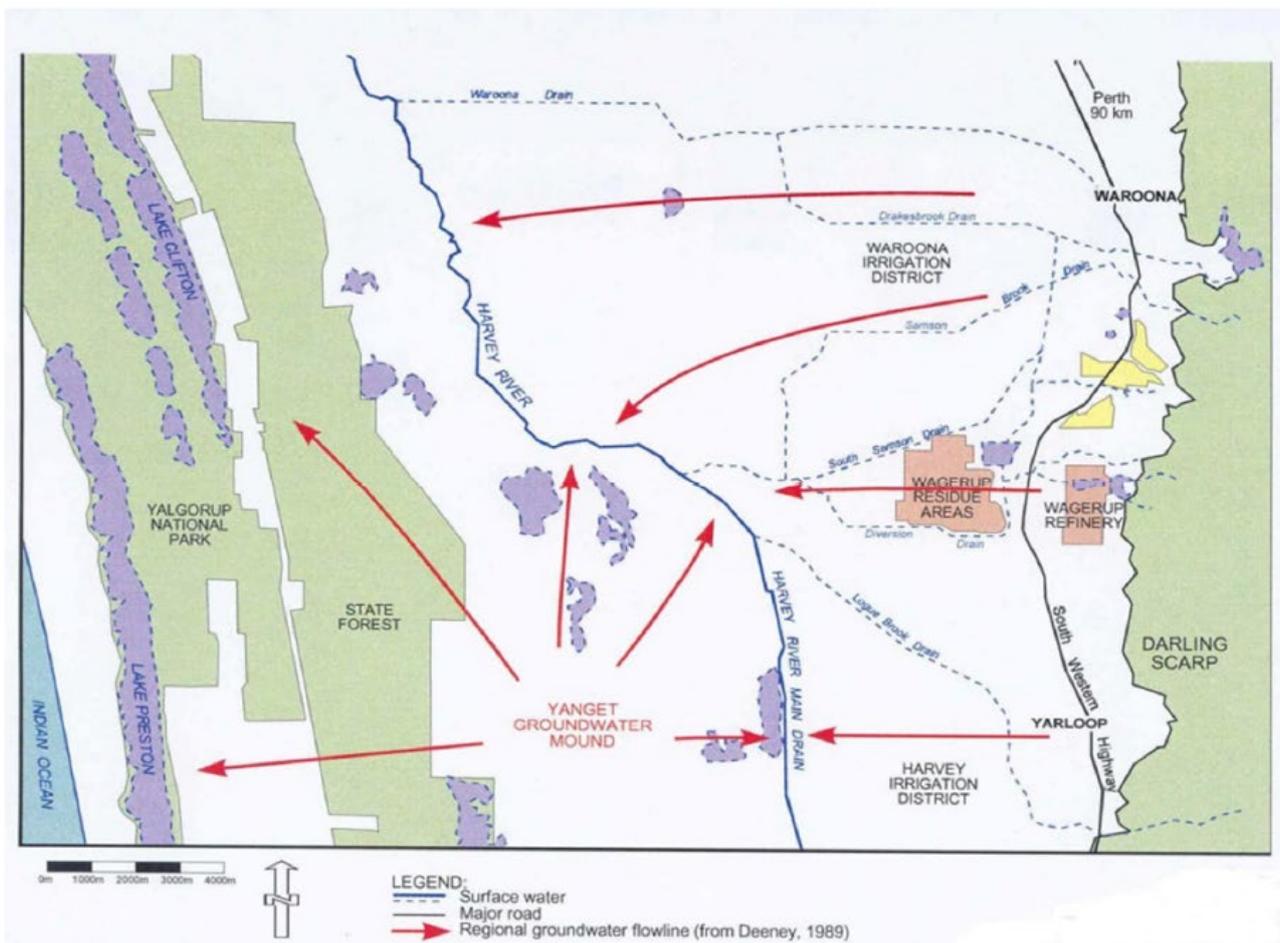
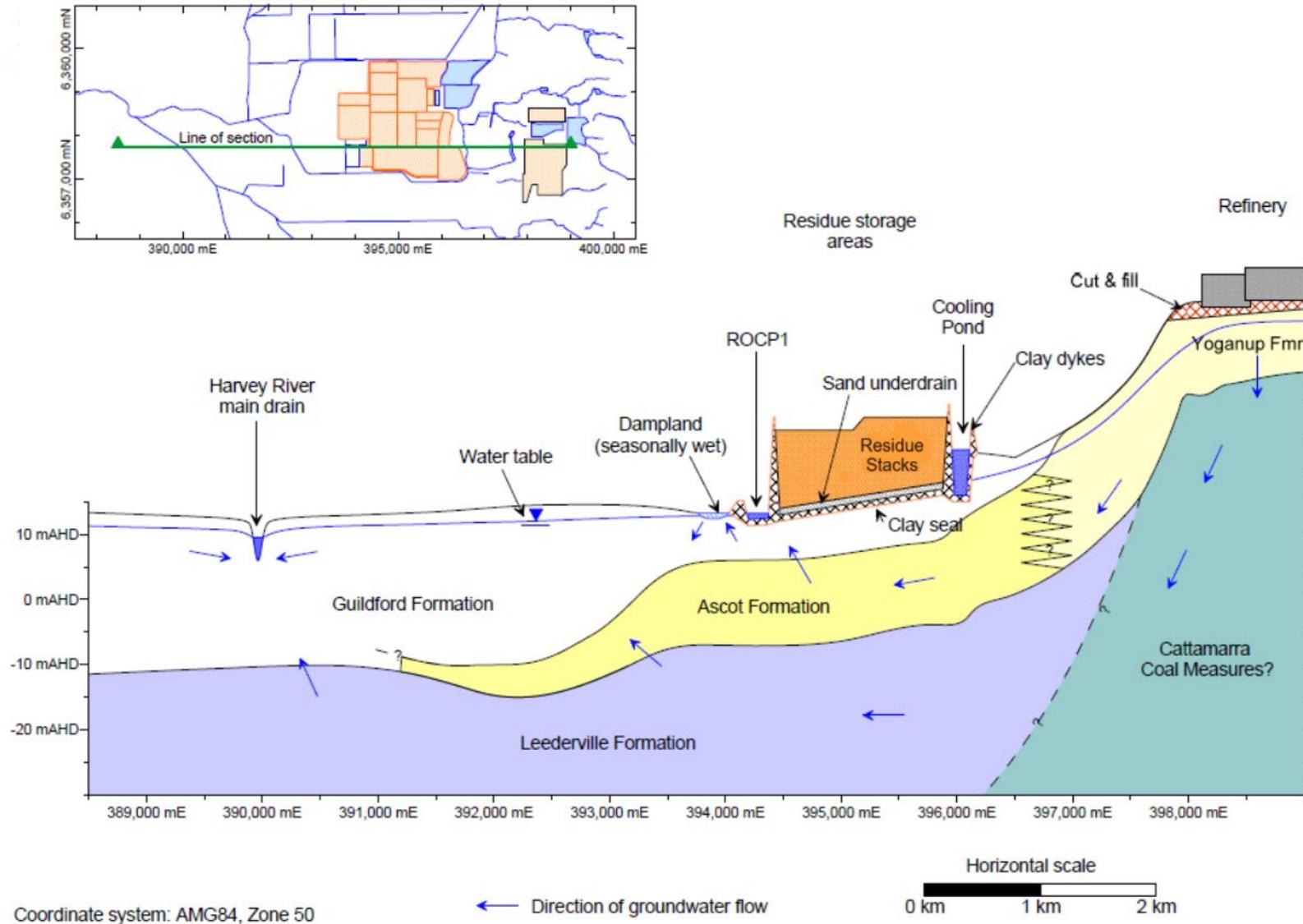


Figure 8: Wagerup Refinery Geological Formations



3.6 Groundwater

The Refinery is located in the Murray Groundwater Area which is a proclaimed groundwater area under the *Rights in Water and Irrigation Act 1914* (GHD, 2024). Alcoa conducts groundwater extraction in accordance with its water abstraction licences and prescribed premises licence conditions and has implemented a comprehensive surface and groundwater monitoring program to assess water quality and quantity.

Residue management area groundwater pH in the superficial formations tends to be slightly acidic to circumneutral, ranging from 5.2 – 7.5 and generally increases from east to west in the lower superficial formations. The groundwater pH in the underlying Mesozoic formations tends to be circum-neutral to slightly alkaline, ranging from about 7.0 – 7.6. The values are consistent with the regional variation of groundwater pH in these units in the Wagerup area.

Groundwater salinity in the superficial formations of the residue management area generally ranges from fresh (<1,000 $\mu\text{S}/\text{cm}$) along the eastern edge, to brackish (2,000 $\mu\text{S}/\text{cm}$ to 5,000 $\mu\text{S}/\text{cm}$) in the remaining area. There are some areas of elevated salinity (>5,000 $\mu\text{S}/\text{cm}$), particularly in the upper superficial formations along the northern perimeter. Another area of elevated salinity occurs immediately west in the upper superficial formations in an area subject to seasonal waterlogging. Groundwater salinity in the underlying Mesozoic formation tends to be slightly brackish (about 2,000– 4,000 $\mu\text{S}/\text{cm}$).

Alkalinity values within the residue management area are generally between 20–250 mg/L, although higher alkalinity values (up to about 500 mg/L) occur to the south-west and the north-east. There are some localised areas of significantly elevated alkalinity (>500 mg/L) in the upper superficial formations in bores around the Sand Lake. Higher-alkalinity groundwater immediately west of the residue management area tends to have alkalinity increasing with depth likely due to the presence of older groundwater within the calcareous Ascot Formation. Groundwater alkalinity in the underlying Mesozoic Formation tends to range from about 180–250 mg/L.

Elevated salinity occurs to the north and north-west of the residue management area, however there is no corresponding increase in alkalinity, suggesting the RSAs are not the source of the salinity. Localised areas of elevated salinity and possibly alkalinity occur to the south-west and west of the residue management area. (Rockwater, 2023).

3.7 Terrestrial Fauna

A terrestrial fauna assessment completed for the RSA 10 project included a survey of fauna habitats and targeted searches for conservation significant species (Appendix F). The targeted searches included:

- Identification of black cockatoo actual and potential foraging, breeding, nesting and roosting trees
- Deployment of motion-sensitive cameras to detect nocturnal animals
- Deployment of audio recorders to detect bats
- Daytime searches of preferred habitats for conservation significant species
- Opportunistic fauna observations.

No threatened or priority fauna species were recorded within the survey footprint as there is limited vegetation present and it does not provide appropriate habitat for conservation significant species.

Thirty-four threatened and priority terrestrial fauna species have the potential to occur within Alcoa's Wagerup landholdings. Most are likely to be irregular visitors or vagrants, and eight species are expected to be residents or regular visitors:

- Coastal Plains Skink *Ctenotus ora* – Priority 3 species according to the Department of Biodiversity, Conservation and Attractions (DBCA)
- Carnaby's Cockatoo *Calyptorhynchus latirostris* - Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and Endangered under the BC Act
- Baudin's Cockatoo *Calyptorhynchus baudinii* - Vulnerable under the EPBC Act and Endangered under the BC Act
- Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii naso* - Vulnerable under the EPBC Act and Endangered under the BC Act
- Peregrine Falcon *Falco peregrinus* - Schedule 7 listing (other specially protected fauna) under the BC Act
- Brush-tailed Phascogale *Phascogale tapoatafa* – Schedule 6 listing (conservation dependent fauna) under the BC Act
- Quenda *Isodoodon fusciventer* – Priority 4 species according to DBCA
- Rakali *Hydromys chrysogaster* - Priority 4 species according to DBCA.

Several black cockatoo potential nesting and breeding trees were identified along the existing access road and waterways. No potential nesting or breeding trees were identified within the clearing permit application area. A 50m buffer will be applied to black cockatoo nesting trees.

Quenda and Brush-tailed Phascogale may inhabit vegetation associated with waterways.

There is a possibility that the Peregrine Falcon *Falco peregrinus* breeds in the survey area. A single bird was observed perched in a large tree on the northern edge of the RSA 10 footprint during the fauna assessment in 2022. Records indicate a pair of Peregrine Falcons were observed in 2016 near the southwestern corner of the residue management area. It is possible these 2016 and 2022 observations represent a resident pair which may breed in the general area.

3.8 Aquatic Fauna

An aquatic fauna assessment completed for the RSA 10 project included a survey of aquatic fauna in Samson South Drain, the Alcoa Diversion Drain and other waterways downstream of the Refinery (Appendix G). The assessment included:

- Water quality sampling
- Survey for aquatic fauna including microinvertebrates, macroinvertebrates, fish and crayfish
- Targeted survey for conservation significant aquatic/semi-aquatic fauna species including:
 - Carter's Freshwater Mussel *Westralunio carteri* - Vulnerable under the EPBC Act
 - Black-striped minnow *Galaxiella nigrostriata* – Endangered under the EPBC Act.

The assessment identified a conservation-significant aquatic fauna species, being a large population of Carter's Freshwater Mussels, in Samson South Drain approximately 6km downstream of the proposed clearing area near surface water sampling site SP012.

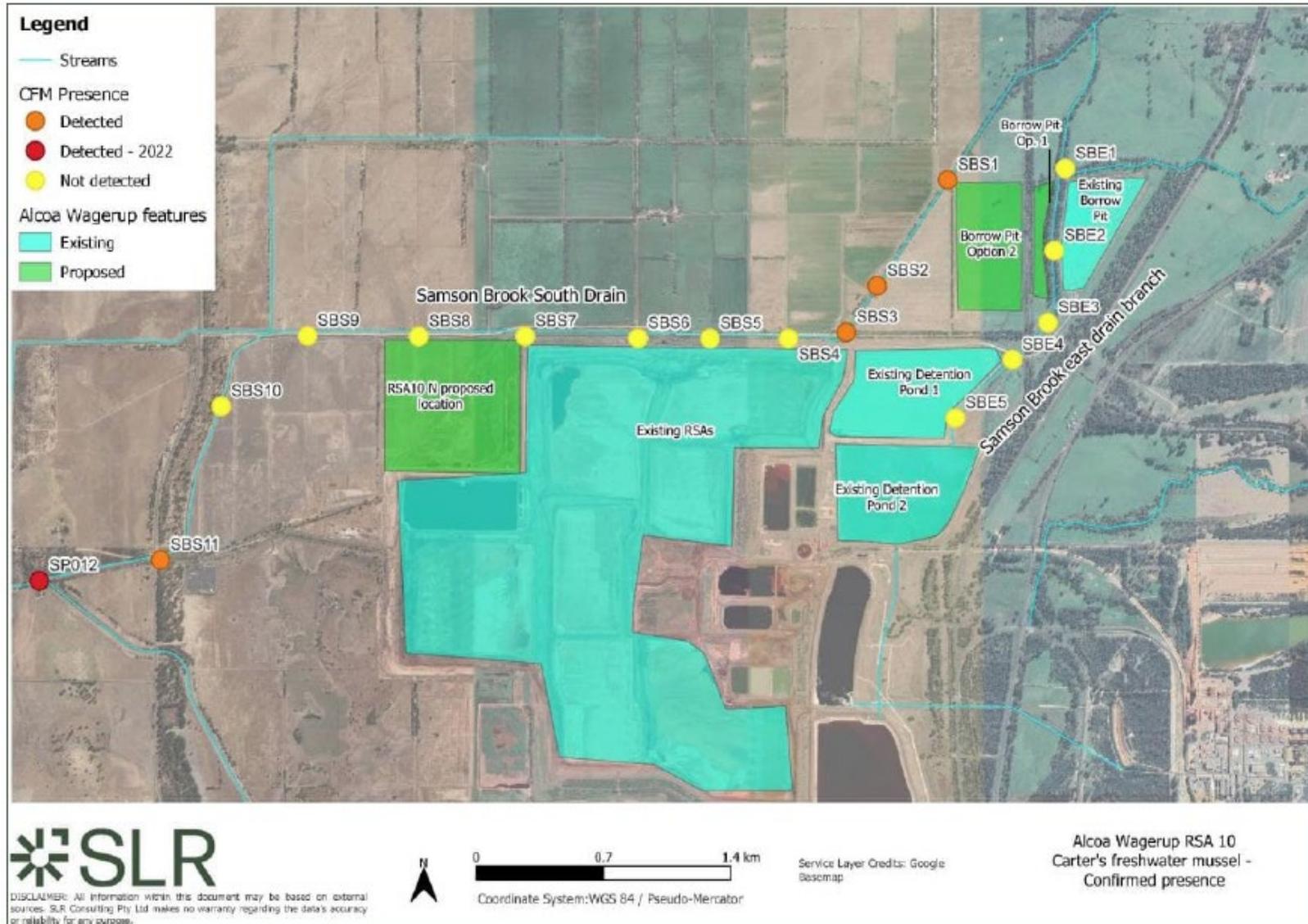
A follow-up Carter's Freshwater Mussel targeted survey was completed in areas that were not intensively sampled for aquatic fauna during the initial assessment to determine the possible extent and density of populations in drains near to construction areas, including the proposed clearing area (Appendix H).

The targeted survey identified very low-density populations of Carter's Freshwater Mussels in the section of Samson South Drain flowing south-west from the proposed clearing area. It is unlikely that these populations would be considered a key source population for breeding and dispersal in Samson Brook under the EPBC Act. Most mussels found would be considered as in the adult life-stage which indicates recruitment rate in the area is low.

No Carter's Freshwater Mussels were identified in the Alcoa Diversion Drain from the confluence with Black Tom Brook near the existing borrow pit to the Refinery DP1 (referred to as the eastern branch of Samson Brook in the assessment), or in the section of Samson South Drain flowing west along the northern perimeter of the existing residue management area (Figure 9).

The targeted survey also included a review of previous desktop and field studies and determined that the ecological values of aquatic habitats adjacent to, and downstream of, the RSA10 Project area have been adequately characterised, with surveys completed appropriately addressing the gaps in knowledge identified in the initial desktop literature review (SLR 2023).

Figure 9: Carter's Freshwater Mussel Detection Sites



3.9 Flora and Vegetation

A flora and vegetation assessment of the land surrounding the residue management area has been completed for the RSA 10 project (Appendix I).

The vegetation can be described broadly as cleared paddocks with pasture species intersected by remnant corridors of *Corymbia calophylla*, *Eucalyptus marginata*, *Melaleuca raphiophylla* and *Melaleuca preissiana* woodlands, and planted corridors of *Eucalyptus camaldulensis* (native to WA but not on the Swan Coastal Plain) and *Eucalyptus botryoides* (alien to WA).

The assessment recorded identified the following flora and vegetation characteristics within the survey area:

- A total of 107 vascular plant taxa, representative of 63 genera and 35 families. The majority of taxa were representative of the Poaceae (24 taxa), Myrtaceae (18 taxa) and Fabaceae (11 taxa) families.
- A total of 59 introduced (weed) species were recorded within the survey area, many of which are short lived annuals and form part of the farmland pasture. *Callistemon phoeniceus*, *Eucalyptus botryoides*, and *Eucalyptus camaldulensis* were planted to give visual amenity to the farmland.
- Most weeds recorded within the survey area were common species of agricultural lands and were expected within an agricultural operation on the Swan Coastal Plain. Some weeds including *Lolium perenne*, form part of the pasture grazed by cattle.
- No threatened flora species pursuant to pursuant to Part 2, Division 1, Subdivision 2 of the *Biodiversity Conservation Act 2016* (BC Act) and as listed by DBCA (2018), or pursuant to section 179 of the EPBC Act or listed by DAWE (2022), were recorded within the survey area.
- No priority flora species, as listed by DBCA (2018) were recorded within the survey area.
- Two Threatened Ecological Communities (TECs) - *Corymbia calophylla* – *Kingia australis* woodlands on heavy soils of the Swan Coastal Plain, listed as endangered under the EPBC Act and threatened under the Biodiversity Conservation Act 2016 (BC Act). *Corymbia calophylla* – *Eucalyptus marginata* woodlands on sandy clay soils of the southern Swan Coastal Plain, listed as vulnerable under the EPBC Act and threatened under BC Act (Mattiske Consulting, 2022).

Buller Nature reserve is located approximately 5.5km west of the proposed new borrow pit. No Environmentally Sensitive Areas (DWER-046) are located within the proposed clearing area (Figure 10).

The flora and vegetation assessment delineated and mapped fifteen vegetation communities across the survey area. The proposed clearing area contains mostly completed degraded vegetation (Figure 11) and includes the following vegetation classifications:

- P1 - *Juncus pallidus* low sparse sedgeland over**Lotus angustissimus*, **Lolium perenne*, **Cynodon dactylon* low grassland on sandy-loam on flats.
- P2- Planted *Eucalyptus camaldulensis* and **Eucalyptus botryoides* over mixed weed and pasture species on sandy-loam on flats

* *Introduced species*

Development of the new borrow pit will require the clearing of 39.83 hectares of historically disturbed agricultural land. Although the vegetation present is primarily associated with grazing farmland, native vegetation has been identified in a 0.305 hectare area (Area 1) within the proposed clearing footprint, along with scattered native sedge regrowth in the existing farmlands.

The vegetation communities relevant to the new borrow pit development are shown in Figures 12 and 13.

Figure 10: Environmentally Sensitive Areas

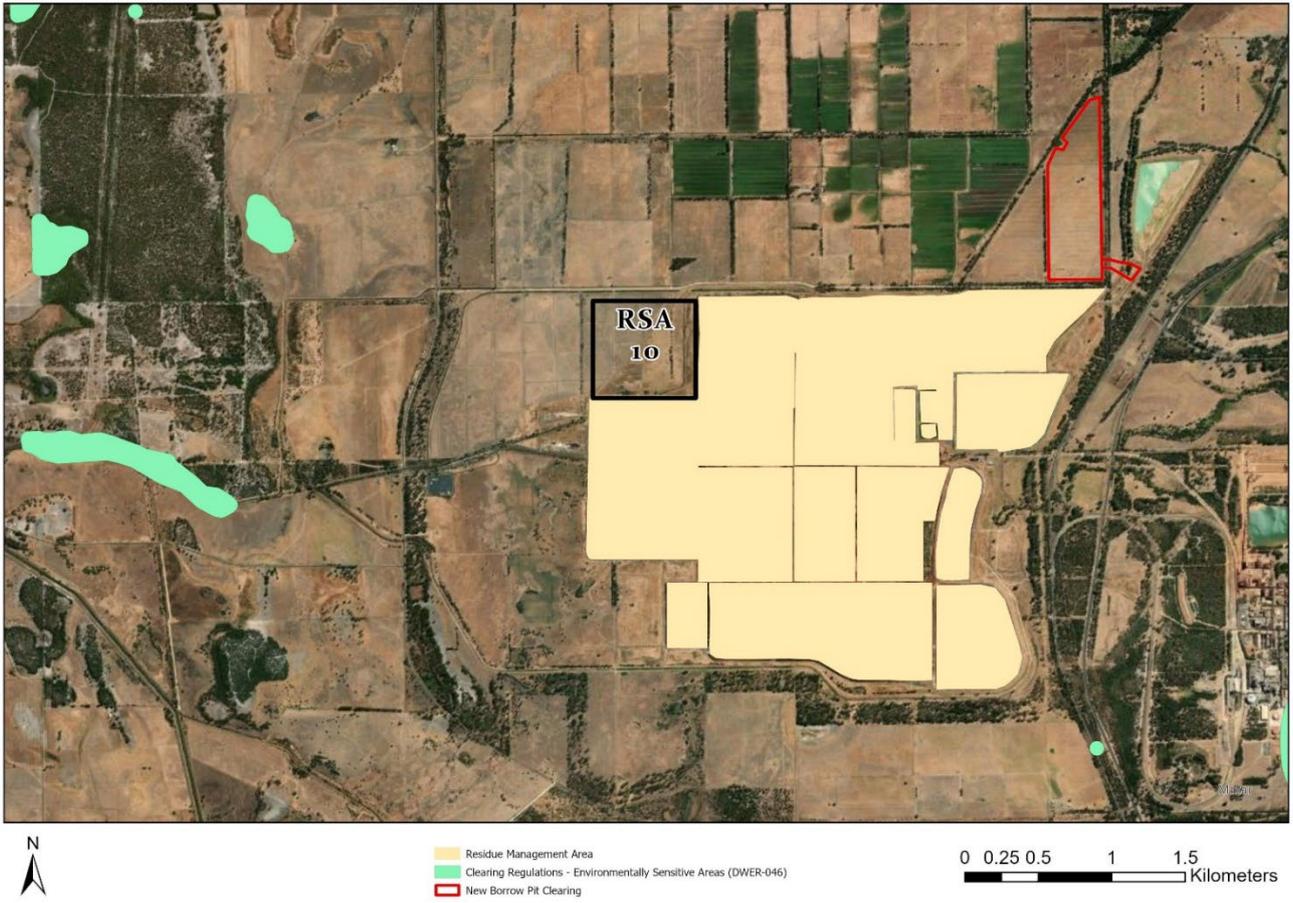


Figure 11: Vegetation Condition

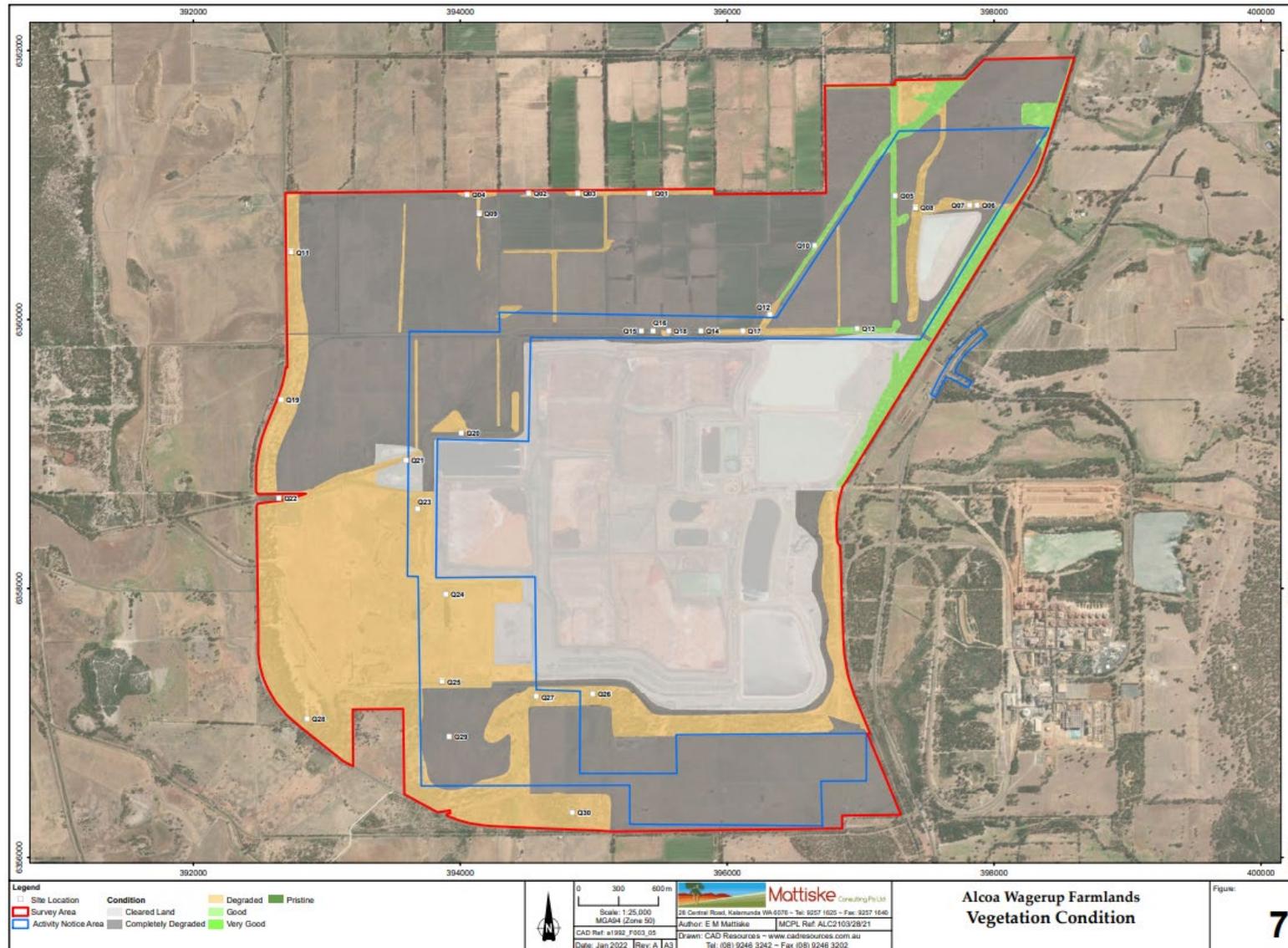


Figure 12: New Borrow Pit Development Area Vegetation

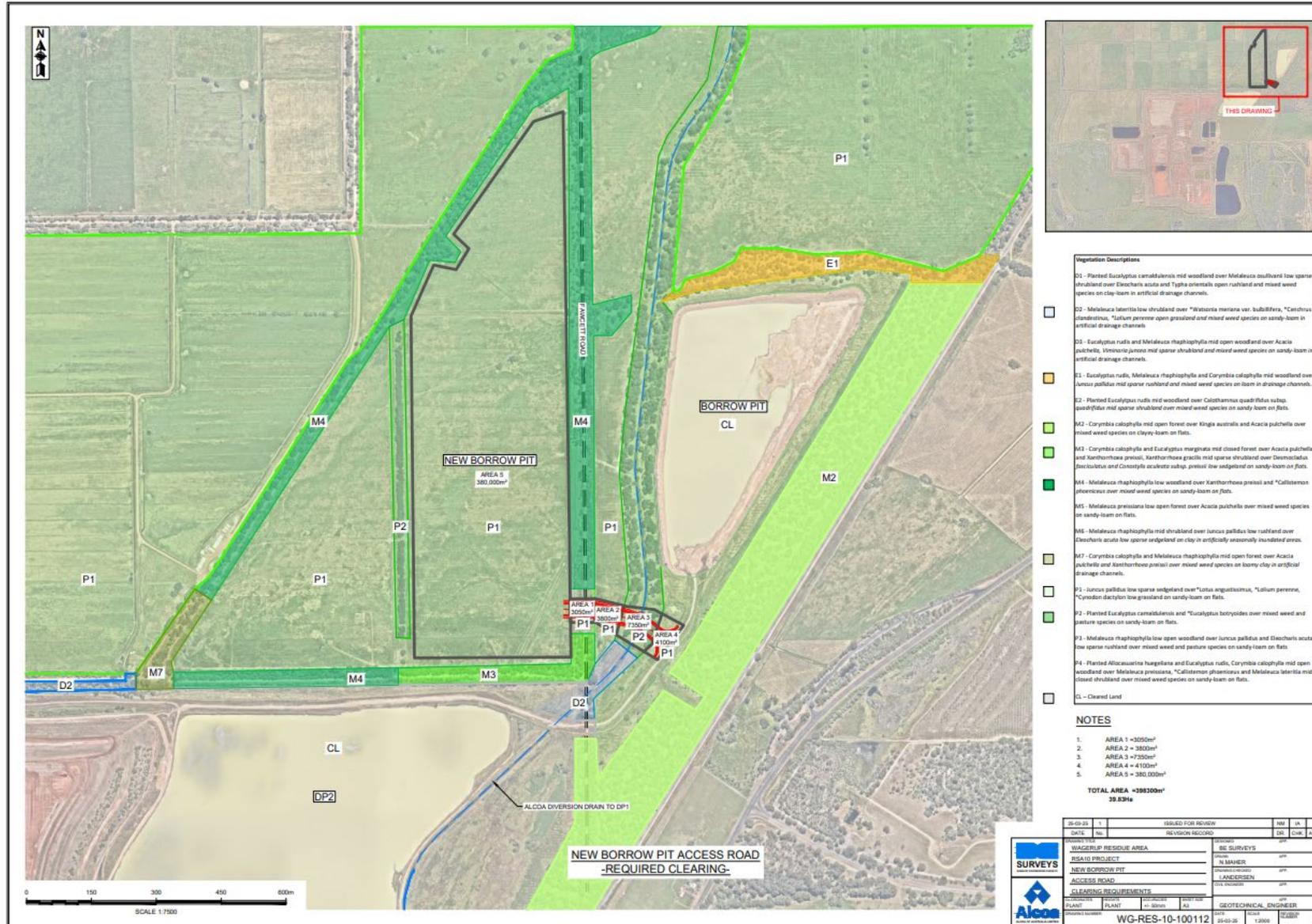
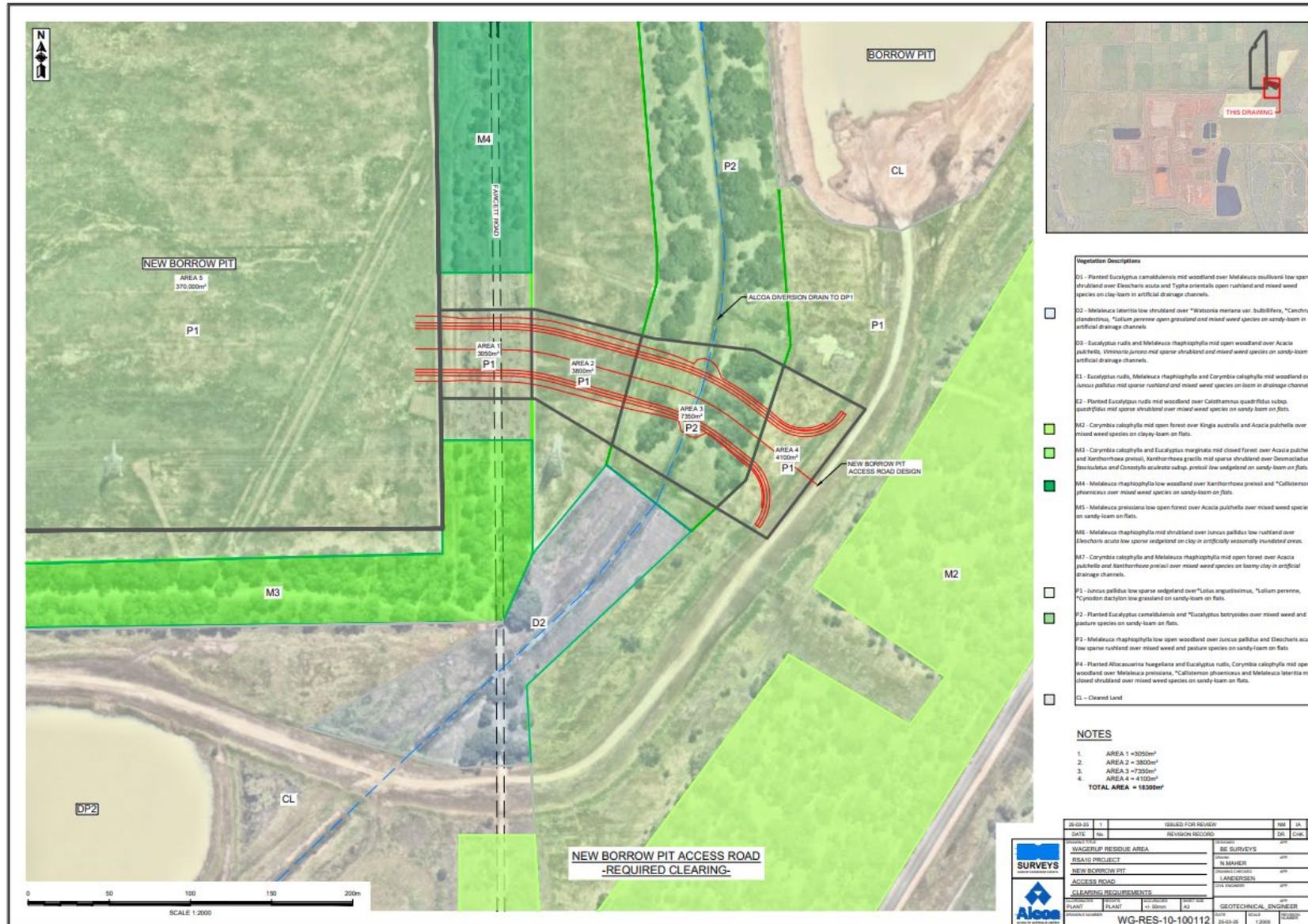


Figure 13: New Borrow Pit Access Road Vegetation



- Vegetation Descriptions**
- D1 - Planted *Eucalyptus camaldulensis* mid woodland over *Melaleuca osullivanii* low sparse shrubland over *Eaccharis acuta* and *Typha orientalis* open rushland and mixed weed species on clay loam in artificial drainage channels.
 - D2 - *Melaleuca lateralis* low shrubland over *Platanus mariana* var. *hullifera*, *Casuarina glaucescens*, *Litsea persea* open grassland and mixed weed species on sandy loam in artificial drainage channels.
 - D3 - *Eucalyptus rudis* and *Melaleuca rhaphiophylla* mid open woodland over *Acacia pulchella*, *Urosalpinx juncea* mid sparse shrubland and mixed weed species on sandy loam in artificial drainage channels.
 - D4 - *Eucalyptus rudis*, *Melaleuca rhaphiophylla* and *Corymbia calophylla* mid woodland over *Juncus pallidus* mid sparse rushland and mixed weed species on loam in drainage channels.
 - M1 - Planted *Eucalyptus rudis* mid woodland over *Calothamus quadrifidus* subsp. *australis* mid sparse shrubland over mixed weed species on sandy loam on flats.
 - M2 - *Corymbia calophylla* mid open forest over *Kingia australis* and *Acacia pulchella* over mixed weed species on clay loam on flats.
 - M3 - *Corymbia calophylla* and *Eucalyptus marginata* mid closed forest over *Acacia pulchella* and *Xanthorrhoea prelexis*, *Xanthorrhoea gracilis* mid sparse shrubland over *Drosera sp.* *baicabutus* and *Conostyle aculeata* subsp. *prelexis* low sedge/land on sandy loam on flats.
 - M4 - *Melaleuca rhaphiophylla* low woodland over *Xanthorrhoea prelexis* and *Callistemon phoeniceus* over mixed weed species on sandy loam on flats.
 - M5 - *Melaleuca preissiana* low open forest over *Acacia pulchella* over mixed weed species on sandy loam on flats.
 - M6 - *Melaleuca rhaphiophylla* mid shrubland over *Juncus pallidus* low rushland over *Eleocharis acuta* low sparse sedge/land on clay in artificially seasonally inundated areas.
 - M7 - *Corymbia calophylla* and *Melaleuca rhaphiophylla* mid open forest over *Acacia pulchella* and *Xanthorrhoea prelexis* over mixed weed species on loamy clay in artificial drainage channels.
 - P1 - *Juncus pallidus* low sparse sedge/land over *Lotus angustissimus*, *Litsea persea*, *Cyperoides decipiens* low grassland on sandy loam on flats.
 - P2 - Planted *Eucalyptus camaldulensis* and *Eucalyptus botryoides* over mixed weed and pasture species on sandy loam on flats.
 - P3 - *Melaleuca rhaphiophylla* low open woodland over *Juncus pallidus* and *Eleocharis acuta* low sparse rushland over mixed weed and pasture species on sandy loam on flats.
 - P4 - Planted *Allocasuarina hageniana* and *Eucalyptus rudis*, *Corymbia calophylla* mid open woodland over *Melaleuca preissiana*, *Callistemon phoeniceus* and *Melaleuca lateralis* mid closed shrubland over mixed weed species on sandy loam on flats.
 - CL - Cleared Land

- NOTES**
1. AREA 1 = 3050m²
 2. AREA 2 = 3850m²
 3. AREA 3 = 7350m²
 4. AREA 4 = 4100m²
 - TOTAL AREA = 18350m²**

25-03-25	1	ISSUED FOR REVIEW	NM	UK	
DATE	NO.	REVISION RECORD	DR	CHK	APP.
WAGERUP RESERVE AREA WAGERUP PROJECT NEW BORROW PIT ACCESS ROAD CLEARING REQUIREMENTS			SURVEYS N. MAHER J. ANDERSON GEOTECHNICAL ENGINEER		
PLANT	PLANT	NO.	DATE	SCALE	STATUS
		1:100m	25-03-25	1:2000	ISSUED
PROJECT NUMBER: WG-RES-10-100112					

4 Mitigation Hierarchy

The selection of the proposed area to be cleared for the new borrow pit and access road is based on the mitigation hierarchy and is designed to avoid and minimise the clearing of native vegetation. Areas to be cleared are classified as planted vegetation communities that are predominately completely degraded.

The proposed location for the new borrow pit is within existing cleared agricultural land (P1) and the site of the access road (P1 and P2) was selected to avoid clearing of native vegetation in the corridors identified to the south (M3) and north (M4):

- M3 - *Corymbia calophylla* and *Eucalyptus marginata* mid closed forest over *Acacia pulchella* and *Xanthorrhoea preissii*, *Xanthorrhoea gracilis* mid sparse shrubland over *Desmocladius fasciculatus* and *Conostylis aculeata* subsp. *preissii* low sedgeland on sandy-loam on flats (TEC).
- M4 - *Melaleuca raphiophylla* low woodland over *Xanthorrhoea preissii* and **Callistemon phoeniceus* over mixed weed species on sandy-loam on flats.

* *Introduced species*

Although some individual native vegetation species may be present in P1 vegetation communities, the area to be cleared represents the best option to minimise the extent and impact of potential native vegetation clearing.

The P2 vegetation proposed to be cleared on both sides of the Alcoa Diversion Drain for construction of the access road and crossing contains eucalyptus trees planted by Alcoa. Historical aerial images from 2004 and 2012 show the vegetation planted in rows adjacent to the drain (Figures 14 and 15).

A high voltage electricity transmission line corridor is also situated directly south of the proposed access road.

The drone photographs included below were taken in early 2025 and highlight the main areas of vegetation proposed to be cleared for the new borrow pit:

- Figure 16 shows the new borrow pit and access road existing vegetation to be cleared looking southwest with DP1 in the background.
- Figure 17 shows the new borrow pit and access road existing vegetation to be cleared looking east, with existing borrow pit located to the north.
- Figure 18 shows the new borrow pit access road existing vegetation to be cleared for the Alcoa Diversion Drain Crossing looking east with the existing borrow pit haul road located directly east.

Additional ground level photographs of the vegetation are provided in Appendix J.

Figure 14: Historical Aerial Image 2004 - Planted Vegetation

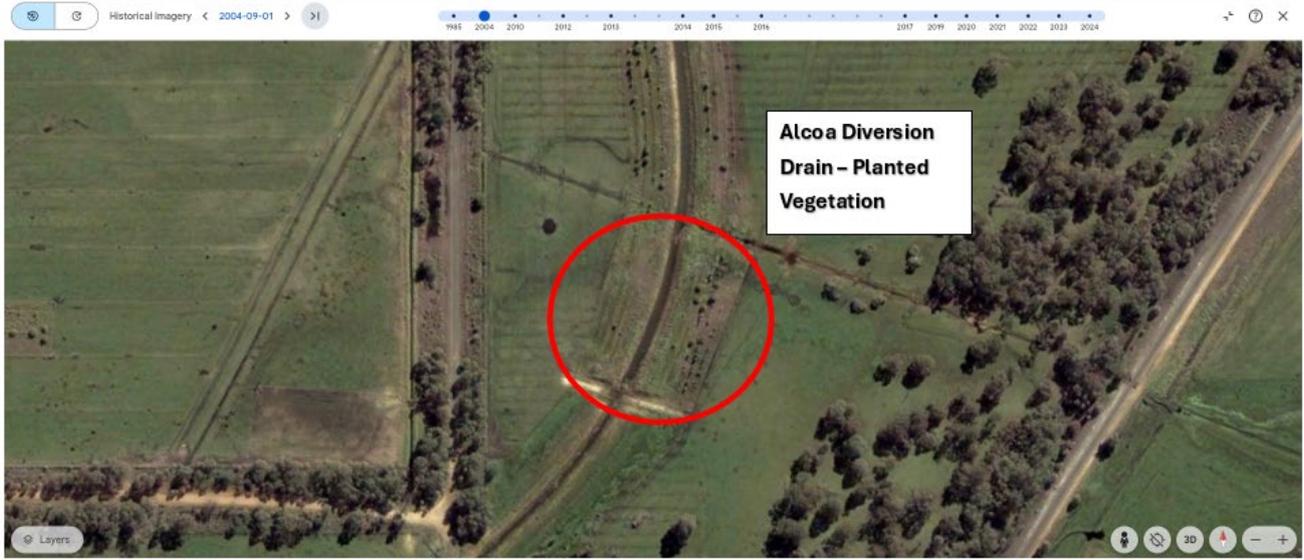


Figure 15: Historical Aerial Image 2012 - Planted Vegetation

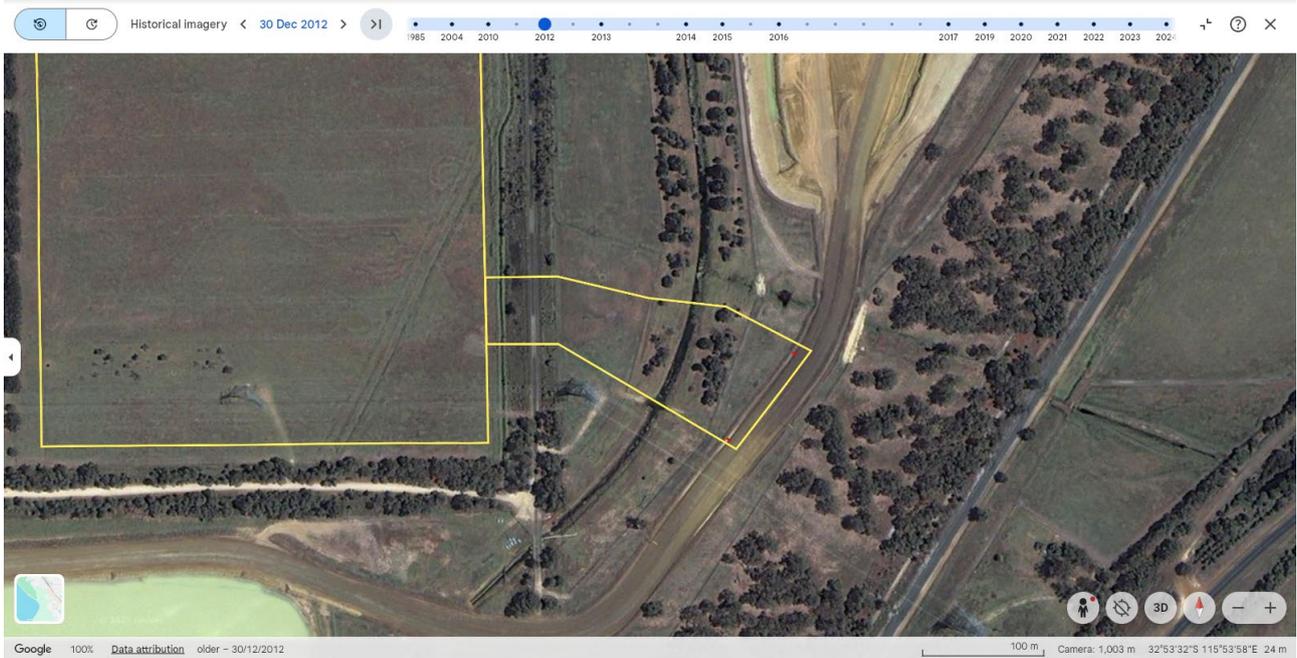


Figure 16: New Borrow Pit and Access Road Vegetation (Looking South-West)



Figure 17: New Borrow Pit and Access Road Vegetation (Looking East)



Figure 18: New Borrow Pit and Access Road Vegetation – Alcoa Diversion Drain Crossing (Looking East)



5 Environmental Impacts and Management

The potential environmental impacts associated with the proposed clearing for the new borrow pit and access road are summarised in Table 2. The risk of environmental impact is considered low based on:

- Minimal native vegetation present
- Vegetation to be cleared is in a highly disturbed condition having been modified by agricultural activities
- Location of clearing on Alcoa owned farmlands adjacent to the Refinery residue management area and associated with a major industrial facility.

Table 2: Environmental Risk Summary

Aspect	Assessment	Risk Management
Groundwater	<ul style="list-style-type: none"> • Minimal vegetation clearing associated with agricultural land has a low risk of impacting groundwater. • No groundwater abstraction proposed for the development of the new borrow pit. 	<ul style="list-style-type: none"> • Groundwater is managed in accordance with the existing DWER groundwater Licences and the Wagerup Alumina Refinery Ground Water and Surface Water Licences Operating Strategy (Alcoa, 2020). • Water licences will be amended/obtained for future groundwater abstraction related to the development of the new borrow pit if required.
Surface water	<ul style="list-style-type: none"> • The nearest Public Drinking Water Source Area (PDWSA) is the Samson Brook Catchment Area which is upgradient from the new borrow pit. • The area to be cleared is located within agricultural land mapped as a multiple use wetland. • RSA 10 Project design includes surface water management controls that contain surface water within construction areas for reuse by Refinery operations (no direct discharge to Samson South Drain). 	<ul style="list-style-type: none"> • Surface water managed in accordance with the existing DWER surface water Licences and the Wagerup Alumina Refinery Ground Water and Surface Water Licences Operating Strategy (Alcoa, 2020). • RSA10 Project construction surface water management applies to the development of the new borrow pit to prevent release of stormwater outside of construction areas and any potential water quality impacts. • Temporary and permanent drainage controls will be installed to minimise flood risk. • The proposed clearing will not involve any temporary or permanent obstruction of the South Samson Drain.

Aspect	Assessment	Risk Management
Vegetation	<ul style="list-style-type: none"> No Threatened Ecological Communities (TEC) and Priority Ecological Communities (PECs). No Threatened or priority flora species. No Groundwater Dependent Ecosystems (GDEs). Alcoa diversion drain is an artificially constructed channel located downstream of the Black Tom Brook natural streambed. Minimal vegetation to be removed, predominately planted species including Eucalyptus species for visual amenity and pasture species associated with historically cleared agricultural land. Potential for some individual native vegetation species to be present and impacted by proposed clearing. Negligible impact to nearby vegetation communities. 	<ul style="list-style-type: none"> Dust emissions managed in accordance with the existing DWER EP Act licence. RSA10 Project specific construction dust management applies to activities related to the development of the new borrow pit. This involves implementation of controls and monitoring for dust emissions, including the use of temporary real-time dust monitors to trigger response actions if required. Survey and demarcation of area to be cleared.
Fauna	<ul style="list-style-type: none"> Area to be cleared has negligible fauna habitat value being completely degraded agricultural land. No foraging, nesting, or breeding trees suitable for black cockatoo species or suitable habitat for Quenda or Brush-tailed Phascogale identified within the area to be cleared. Carter's Freshwater Mussel (CFM) populations have been identified within Samson South Drain at locations adjacent to and downstream of the proposed area to be cleared. No CFM identified in the Alcoa Diversion Drain to DP1. 	<ul style="list-style-type: none"> Surface water managed in accordance with the existing DWER surface water Licences and the Wagerup Alumina Refinery Ground Water and Surface Water Licences Operating Strategy (Alcoa, 2020). RSA10 Project construction surface water management applies to the development of the new borrow pit to prevent release of stormwater outside of construction areas and any potential water quality impacts. The proposed clearing will not involve any temporary or permanent obstruction of the South Samson Drain. RSA10 Project surface water quality monitoring program focused on CFM informed by baseline surface water quality assessment completed as part of the aquatic fauna assessment. A 50m buffer will be applied to black cockatoo nesting trees.
Aboriginal and other heritage sites	<ul style="list-style-type: none"> No sites of heritage significance identified within the area to be cleared. 	<ul style="list-style-type: none"> Alcoa chance finds response for Aboriginal Cultural Heritage objects or materials encountered during ground disturbing activities applies to RSA10 Project including activities related to the development of the new borrow pit.

6 Clearing Principles

The potential impacts of clearing native vegetation for the development of the new borrow pit have been assessed against the DWER clearing principles listed under Schedule 5 of the EP Act and are summarised in Table 3.

The proposed clearing is deemed to meet the Ten Clearing Principles and is unlikely to have a significant effect on the environment based on the development area being significantly degraded through agricultural land use practices that have resulted in limited native vegetation being present.

Table 3: Assessment of proposal against the Ten Clearing Principles

Principle No.	Principle	Assessment
1	<p>Native vegetation should not be cleared if it comprises a high level of biological diversity.</p> <p>The area to be cleared consists largely of cleared agricultural pasture and planted trees with some native flora regrowth.</p> <p>The proposed clearing does not include vegetation which comprises a high level of biological diversity.</p>	The proposal is not at variance with this principle.
2	<p>Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.</p> <p>Detailed flora and fauna surveys have been completed of the proposed clearing area. No threatened or priority fauna species were recorded within the proposed clearing area as the vegetation communities are in highly degraded condition and consist of predominately planted vegetation associated with existing cleared agricultural land and planted Eucalyptus trees.</p> <p>Potential black cockatoo nesting and breeding trees identified during the fauna survey will not be cleared. A 50m buffer will be applied to black cockatoo nesting trees. The fauna survey noted that quenda and brush-tailed phascogale may inhabit vegetation associated with waterways. The proposed clearing area includes the vegetation within a 90m section of the artificial drain. The vegetation to be cleared in the vicinity of the drain is relatively sparse, consisting of planted eucalyptus species with limited understory for fauna habitat.</p> <p>The proposed clearing does not include significant habitat for native fauna.</p>	The proposal is not at variance with this principle.
3	<p>Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.</p> <p>The flora and vegetation assessment found no threatened flora species pursuant to Part 2, Division 1, Subdivision 2 of the BC Act and as listed by DBCA, or pursuant to section 179 of the EPBC Act or listed by DAWE, and no priority flora species, as listed by DBCA.</p>	The proposal is not at variance with this principle.

Principle No.	Principle	Assessment
4	<p>Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community.</p> <p>The flora and vegetation assessment identified two TECs (M2 and M3 vegetation communities). Both TECs are confined to road verges and are heavily impacted by weed species with their condition ranging from Good to Degraded. No M2 or M3 TEC vegetation will be cleared for the development of the new borrow pit.</p> <p>The proposed clearing does not include any threatened ecological communities or vegetation considered necessary for the maintenance of any threatened ecological communities.</p>	The proposal is not at variance with this principle.
5	<p>Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.</p> <p>The Refinery and surrounding Alcoa farmlands have been extensively cleared and the proposed clearing area has previously been cleared. The proposed clearing area does not include vegetation communities that have been identified as M2 or M3 remnant vegetation.</p> <p>The proposed clearing is not significant as a remnant of native vegetation in an area that has been extensively cleared.</p>	The proposal is not at variance with this principle.
6	<p>Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.</p> <p>The proposed clearing is adjacent to the Alcoa Diversion Drain constructed by Alcoa to supply water from Samson South Drain and Black Tom Brook to the Refinery DP1. This is an artificial drain and is dominated by introduced (exotic) species and fringed by planted riparian vegetation of low ecological value with little native understorey.</p> <p>The proposed clearing area includes planted and naturally recruited native vegetation growing in association with an artificial watercourse which provides a low level of ecological value.</p>	The proposal may be at variance with this principle.
7	<p>Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.</p> <p>Most of the area to be cleared is completely degraded pasture, with a small area of planted vegetation along the Alcoa Diversion Dam. The proposed clearing area will include a small number of individual native vegetation species that have persisted in the area. Following clearing, Alcoa will install appropriate controls to prevent erosion, for example replanting of native flora species, jute matting or blue metal application.</p> <p>The proposed clearing is unlikely to cause appreciable land degradation.</p>	The proposal is not at variance with this principle.
8	<p>Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.</p> <p>The closest conservation area is Buller Nature Reserve located approximately 5.5 km west of the proposed clearing area. Buller Nature Reserve is surrounded by Degraded or Completely Degraded pasture, therefore the proposed clearing area is unlikely to impact Buller Nature Reserve.</p> <p>The proposed clearing is not likely to impact the environmental values of any nearby conservation area.</p>	The proposal is not at variance with this principle.

Principle No.	Principle	Assessment
9	<p>Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.</p> <p>Alcoa will install erosion and drainage controls to prevent stormwater from the new borrow pit entering Samson South Drain. Surface water and groundwater abstraction will be undertaken in accordance with existing abstraction licences issued under the RIWI Act. Alcoa has a comprehensive surface and groundwater monitoring program in place to detect any changes to surface or groundwater quality, including during development of the new borrow pit.</p> <p>The proposed clearing is unlikely to cause deterioration in the quality of surface and underground water.</p>	The proposal is not at variance with this principle.
10	<p>Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.</p> <p>Alcoa will install temporary and permanent drainage controls to minimise the risk of flooding. The proposed clearing will not involve any temporary or permanent obstruction of the Samson South Drain.</p> <p>The proposed clearing is unlikely to cause, or exacerbate, the incidence or intensity of flooding.</p>	The proposal is not at variance with this principle.

7 References

- Alcoa of Australia (Alcoa) (2017). *Wagerup Alumina Refinery Long Term Residue Management Strategy*.
- Alcoa of Australia (Alcoa) (2020). *Alcoa World Alumina – Australia Wagerup Refinery Groundwater and Surface Water Licences Operating Strategy*. Documented agreement between Department of Water and Alcoa of Australia, dated 28 August 2020.
- Beard, J.S. (1981). *Vegetation Survey of Western Australia, Sheet 7, Swan, 1:1,000,000 Vegetation Series. Map and Explanatory Notes*. University of Western Australia Press, Perth.
- Beard, JS (1990). *Plant life of Western Australia*, Kangaroo Press, Kenthurst, NSW.
- Bureau of Meteorology (2024). Bureau of Meteorology 2017, 'Climate Statistics for Australian Locations – Wokalup', Viewed 5 August 2024
http://www.bom.gov.au/jsp/ncc/cdio/cvg/av?p_stn_num=009642&p_prim_element_index=0&p_comp_element_index=0&redraw=null&p_display_type=statistics_summary&normals_years=1991-2020&tablesizebutt=normal
- Churchward, H.M. and McArthur, W.M. (1980). *Landforms and Soils of the Darling System. In: Atlas of Natural Resources, Darling System, Western Australia*. Department of Conservation and Environment, Western Australia.
- Department of Agriculture, Water and the Environment (DAWE) (2022). EPBC Act list of threatened flora. Available from: <https://www.environment.gov.au/cgi-bin/sprat/public/publicthreatenedlist.pl?wanted=flora>, 14th January 2022.
- Department of Biodiversity, Conservation and Attractions (DBCA) (2018). Threatened and Priority Flora List. Available from: https://www.dpaw.wa.gov.au/images/documentsDAWE/plants-animals/threatenedspecies/Listings/flora_notice.pdf, 14th January 2022.
- Department of Environmental Regulation (DER) (2015). *Identification and Investigation of Acid Sulfate Soils and Acidic Landscapes*. Perth: Department of Water and Environmental Regulation.
- GHD (2024). *Surface Water Study Alcoa Wagerup RSA10*. Report for Alcoa of Australia Ltd.
- Gibson N., B.J. Keighery, G.J. Keighery, A.H. Burbidge, and M.N. Lyons (1994) *A Floristic Survey of the southern Swan Coastal Plain*. Unpublished Report for the Australian Heritage Commission prepared by Department of Conservation and Land Management and the Conservation Council of Western Australia (Inc.).
- Hatch (2024). *Wagerup RSA10N Acid Sulfate Soils Report*. Report for Alcoa of Australia Ltd.
- Mattiske Consulting (2022). *Flora and Vegetation Assessment Alcoa Wagerup Farmlands*. Report for Alcoa of Australia Ltd
- Rockwater (2023). *Wagerup Refinery and Bunbury Caustic Loading Facility Groundwater and Surface water Management Review 2020-2022*. Report for Alcoa of Australia Ltd.
- SLR (2023). *Samson Brook Carter's Freshwater Mussel Targeted Survey July 2023*. Report for Alcoa of Australia Ltd.

Appendix A: ASIC Company Summary

Appendix B: Proof of Occupier Status

Appendix C: Aboriginal Heritage Assessment

Appendix D: Acid Sulfate Soils Assessment

Appendix E: Surface Water Assessment

Appendix F: Terrestrial Fauna Assessment

Appendix G: Aquatic Fauna Assessment

Appendix H: Carter's Freshwater Mussel Survey

Appendix I: Flora and Vegetation Assessment

Appendix J: Vegetation Photographs
