

Moorebank Logistics Park West Precinct

Basin 8 (OSD-8)

Autumn Stormwater Network Water Quality
Monitoring Data & Reporting November 2025



Site image: retention basin 8 MPW (Apical image April 2025)

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Consulted Documents / database.

Australia and New Zealand Guidelines for fresh and Marine Water Quality (2000)

[NATIONAL WATER QUALITY MANAGEMENT STRATEGY - Australian and New Zealand Guidelines for Fresh and Marine Water Quality \(2000\) - Volume 2 - Aquatic ecosystems](#)

Bureau of Meteorology – Australian Government [Australia's official weather forecasts & weather radar - Bureau of Meteorology \(bom.gov.au\)](#)

Moorebank Intermodal Precinct West – Stage 3 (SSD 10431) | Assessment Report March 2021

<https://moorebankintermodalprecinct.com.au/wp-content/uploads/2023/04/MPW-S3-DPIE-assessment-report-to-IPC.pdf>

WQM Report Western Precinct _Basin 8_Autumn 2024 – Apical Bushfire and Planning - April 2024

WQM Report Western Precinct _Basin 8_Spring 2024 – Apical Bushfire and Planning - October 2024

Development Consent - Section 4.38 of the Environmental Planning and Assessment Act 1979 - Application

Number: SSD 7709 Applicant: Sydney Intermodal Terminal Alliance (SIMTA) as Qube Holdings Limited Consent

Authority: The Independent Planning Commission Site: Moorebank Avenue, Moorebank Lot 1 DP 1197707 Lot

100 DP 1049508 Lot 101 DP 1049508 Lot 2 DP 1197707 Part Lot 3 DP 1197707 Part Anzac Road and Moorebank

Avenue public road reserves Development: Moorebank Precinct West Stage 2 (MPW Stage 2)

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100 DP 1049508 Lot 101 DP 1049508 Moorebank Precinct West Stage 3 (MPW Stage 3)

Australian Laboratory Services (ALS) Work Order EW2402561 Certificate of Analysis Water Sample Data 09th

April 2025.

Liverpool DCP

[Liverpool's Development Control Plans | Liverpool City Council \(nsw.gov.au\)](#)

DEE 2016. Commonwealth Environmental Management Guidance on Perfluorooctane Sulfonic Acid (PFOS) and Perfluorooctanoic Acid (PFOA). Department of the Environment and Energy.

<https://environment.gov.au/system/files/pages/dfb876c5-581e-48b7-868c-242fe69dad68/files/draft-environmental-mgt-guidance-pfos-pfoa.pdf>

Development Consent SSD 7709 - Section 4.38 of the Environmental Planning and Assessment Act 1979

<https://www.ipcn.nsw.gov.au/resources/pac/media/files/pac/projects/2019/05/moorebank-intermodal-precinct-west-stage-2/referral-from-department-of-planning-and-environment/revised-recommended-conditions/mpw-stage-2-recommended-conditions-inclusive-of-edits-191105.pdf>

Glossary

The following definitions apply to terms used in this report. Many of these definitions are consistent with relevant national literature and cited where appropriate.

Current status trigger value

Concentrations of water quality indicators that reflect existing ecosystem condition, and therefore provide a target for ecosystem maintenance and a benchmark against which future water quality trends may be monitored.

Environmental value

Particular values or uses of the environment important for a healthy ecosystem or for public benefit, welfare, safety or health and requiring protection from the effects of pollution or degradation (Environment Australia 2002).

Indicator

A parameter (biological, physical or chemical) used to provide a measure of the quality of water or the condition of an ecosystem (Environment Australia 2002).

Low-risk trigger value

Concentrations (or loads) of key performance indicators [of water quality] at which if not exceeded, there is a low risk that adverse biological effects will occur (ANZECC 2000a).

Median

The middle reading, or 50th percentile, of all readings taken. i.e. of the readings 10, 13, 9, 16 and 11 (re-ordering these to read 9, 10, 11, 13 and 16), the median is 11. The mean (or average), is the sum of all values divided by the total number of readings (which in this case equals 11.8).

Reference condition

Refers to a site which is unmodified or minimally modified from 'natural' condition. Most commonly, reference sites are subject to limited disturbance from human activity. The reference condition then serves as a standard or target against which environmental change in other similar sites can be assessed.

Trigger value

A concentration that, if exceeded, would indicate a potential environmental problem, and so 'trigger' a management response, such as further investigation and/or remedial actions (ANZECC 2000a).

Water quality guideline

A numerical concentration level (e.g. of a contaminant) or narrative statement (e.g. visual appearance of a water body) recommended to support and maintain a designated water use (ANZECC 2000a)

1.1 Background

The Sydney Intermodal Terminal Alliance (SIMTA) received approval for the construction and operation of Stage 3 (the Project) of Moorebank Precinct West (MPW), which comprises the third stage of development within the Moorebank Precinct West under Development Approval SSD-10431.

The proposal is SSD under clause 19 of Schedule 1 of the State Environmental Planning Policy (State and Regional Development) 2011, as it is development for the purpose of rail and related transport facilities.

The MPW site is located on the western side of Moorebank Avenue and forms the western section of the Moorebank Intermodal Precinct (Map image 1 & 2). The MPW site is approximately 2.5 kilometres (km) from the Liverpool city centre, 27 km south-west of the Sydney Central Business District (CBD) and 26 km west of Port Botany.

The MPW site is irregular in shape, approximately 3 km from north to south and 960 m from east to west at its widest point and covers an area of approximately 220 ha. It is situated between the Georges River to the west (with the SSFL running north-south to the west of the river); and Moorebank Avenue to the east.

Works on the MPW site to date have commenced under two current and active development consents:

- MPW Stage 1 early works, which provides demolition, rehabilitation, remediation of contaminated land, and the establishment of construction facilities and access including site security (as part of the SSD 5066 consent)
- MPW Stage 2, which provides for the construction and 24/7 operation of an intermodal facility and associated warehousing (SSD 7709).

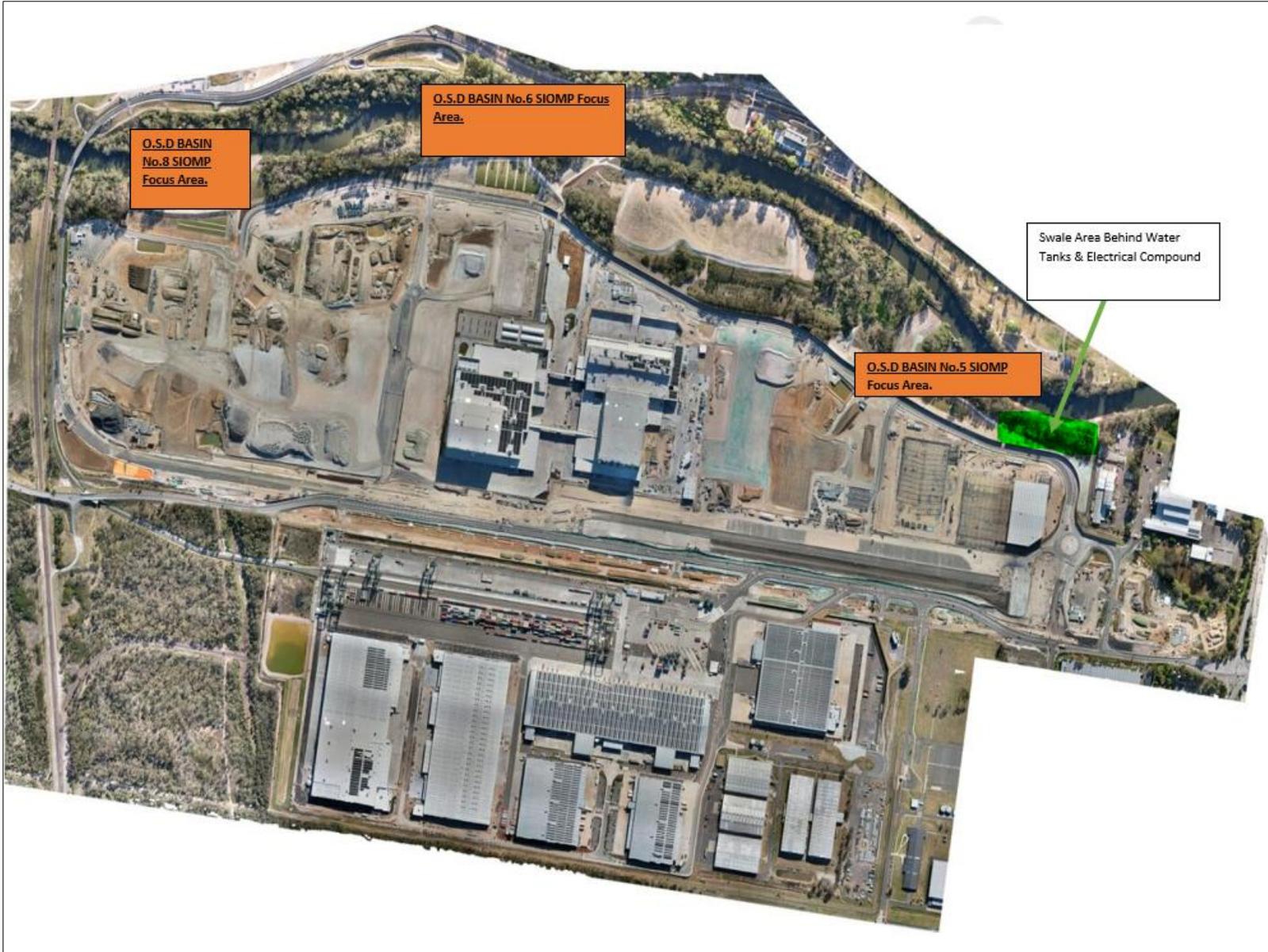
Across the entire precinct there are six onsite detention basins. Bioretention/biofiltration systems also make up the stormwater management infrastructure within the site.

This water quality monitoring program is guided by the Stormwater Infrastructure Operation and Maintenance Plan (SIOPM) and is provided to Qube Holdings Limited (the Applicant) on behalf of MID Plumbing. Three onsite bio-retention basins are present within Moorebank Precinct West. This report is in reference to Basin 8 (MPW – south).

Development Consent - Section 4.38 of the Environmental Planning and Assessment Act 1979 - Application Number: SSD 7709 Moorebank Precinct West Stage 2 (MPW Stage 2)

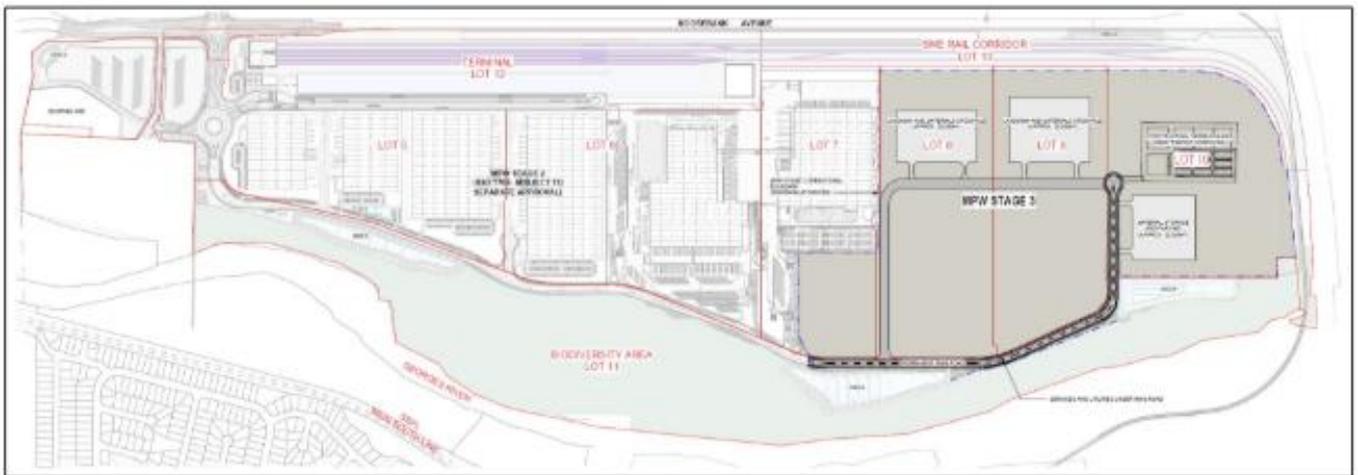
CoC	Requirement
Stormwater Quality Monitoring	
B38.	Stormwater Quality Monitoring Program - Prior to commencement of operation Part of the Operational Environmental Management Plan

Map Image 2. Moorebank Precinct West Detention Basins (provided by MID Plumbing)



Reference information

Map image 4. Moorebank Intermodal Precinct West – Stage 3 State Significant Development Assessment (SSD-10431) March 2021



20. Stormwater Management System or Works

That untreated stormwater is not disposed of into the Georges River or its tributaries.

The likely impact of stormwater disposal on the quality of any receiving waters.

That the levels of nutrients and sediments entering the waterway are not increased by the proposed development.

Whether any proposals to manage stormwater are in accordance with the local council's stormwater management plans and the Managing Urban Stormwater series of documents and meet the local council's stormwater management objectives.

Whether the principles outlined in the *Managing Urban Stormwater Soils and Construction Handbook* (1998) prepared by and available from Landcom and the Department of Housing are followed during each stage of a development (including subdivision).

Detailed stormwater assessments were undertaken as part of MPW Stage 2, and remain applicable to the Stage 3 proposal.

The Department has recommended conditions that would enforce these requirements, by ensuring that appropriate measures are implemented to manage stormwater impacts during construction. In regard to management of stormwater during operation of the MPW site, the MPW Stage 2 proposal incorporates a robust set of conditions to manage the release of stormwater via six onsite detention basins (OSD), a major east-west covered culvert and associated drainage infrastructure.

2. Monitoring Program Methodology

2.1 Monitoring Sites

To support stormwater and drainage management of the facility the MLP West precinct has established a vast stormwater infrastructure system consisting of several Water Sensitive Urban Design (WSUD) functions including raingardens detention basins and bio-swales. These networks are designed to minimise the velocity and peak discharge of stormwater draining from the site and act as onsite detention basins to harvest and sequester potential pollutants generated at the site through designed biological processes.

The stormwater infrastructure system discharges water into the natural drainage system via three outlets:

- Basin 5 detains water from the northern section of MPW before discharging into Georges River
- Basin 6 detains water from the mid-section of MPW before discharging into Georges River
- Basin 8 detains water from the southern section of MPW before discharging into Georges River

Monitoring of the discharge points has been established via our ongoing program with MID Plumbing under the SIOMP program to collect qualitative data and analyse the performance of the WSUD provisions and to establish any potential trends in water quality readings from the stormwater network discharge points prior to release of water into the natural hydrological systems of Anzac Creek and the Georges River.

Table 1. Type of outlet MPW

Discharge Point (see figure 2)	Associated Outlet (see figure 1)	Type of outlet/detention basin
Basin 5	Inlet	Bio retention
	Outlet	Outlet point
	Georges River	River
Basin 6	Inlet	Bio retention
	Outlet	Outlet point
Basin 8	Inlet	Bio retention
	Outlet	Outlet structure

2.2 Water Quality Assessment

Surface water quality data collected at the discharge points is assessed with reference to ANZECC Guidelines (2000) and correlated with baseline Water Quality monitoring results provided by previous condition assessment reports.

By comparing water test data under the program across the testing timeline we can identify and report upon trends, identify exceedances and exclude potential anomalies for datasets.

Table 2. ANZECC Low Risk Trigger Values

Ecosystem type	Turbidity NTU	EC µS/cm	pH*	DO	TN mg/L	NO _x -N mg/L	NH ₄ ⁺ -N mg/L	TP mg/L	DRP-P mg/L
Upland river	2-25	30-350	6.5-7.5	90-110	0.480	0.190	0.013	0.013	0.005
Lowland river	6-50	125-2200	6.5-8.0	85-110	0.500	0.190	0.020	0.050	0.020

Values for Low Land River Systems as insert above are used as the reference guide to water quality parameter values and overall health and safety statements regarding the quality of discharged water from the SIOMP drainage network.

Annual spring and autumn water quality data presented from Anzac Creek and Georges River testing programs by other scientific consultants may also be cross referenced to the data prepared by Apical under the SIOMP program to establish potential trends in results and identify increases in accumulated pollutants from the site under operational condition, which may appear present within adjacent natural waterways.

Site data was collected in the form of water samples and in field data recordings at the prescribed monitoring points, water samples and water probe readings are undertaken following Australia and New Zealand guidelines for fresh and marine water quality – 2000 (ANZECC Guidelines), In situ water quality parameters relevant to stream health and aquatic assessment profiling were collected in field with a multiparameter hand-held water quality monitoring probe (Aquatroll 600).

Water data is collected, analysed and collated under the same methodologies and process under each testing period, the ensure consistency in the process.

Measures tested and samples taken:

- pH
- Dissolved Oxygen
- Electrical Conductivity
- Water Temperature and
- Turbidity

Water samples are collected at inlet and discharge points (Basin 5, Basin 6 & Basin 8) then sent to Australian Laboratory Services (ALS) for quality testing analysis [Surface water \(alsglobal.com\)](http://www.alsglobal.com).

Water analytical suites / testing parameters are provided to obtain overall water condition results and chemical sampling of collected water is undertaken for a range of nutrients, metals, and hydrocarbons relevant to stream health and aquatic assessment protocol, key nutrients, metals, and pollutants included in the assessment to reflect an overall suite of water quality condition guides which are listed below:

- Total phosphorous
- Total Nitrogen
- Kjeldahl Nitrogen
- Dissolved Metals
- PFAS
- Total Suspended Solids
- Total Hydrocarbons

The raw data results from the lab analysis provided to us by ALS Laboratory Services are presented within this report (see Appendix A).

Key water quality data attributes are recorded, tables and compared against; previous condition baseline data, Liverpool Development Control Plan (DCP) water quality targets, Conditions of Consent B40 and ANZECC Guideline (2000) trigger limits under the condition category -(90% protection criteria for freshwater natural systems).

The water quality guidelines are applied to ensure adjacent natural waterways George River and Anzac creek are not adversely affected by poor water quality discharge from the Moorebank logistics park site and operations.

Trends observed in our datasets are analysed on a temporal scale with any trigger values for specific water quality measures highlighted and presented within the results chapter of each seasonal report. This report provides baseline data and Spring 2025 data for Basin 8 (MPW) from which trend analysis will compound over future reporting periods.

2.3 Data Analysis

The water quality measurements collected are used to assess water quality at each site in terms of health of aquatic ecosystems by comparison with guideline values recommended by the ANZECC and ARMCANZ (2000) guidelines for the protection of lowland streams (i.e. systems at < 150 m altitude) in south-east Australia. This categorisation for stream health is deemed relevant for the description of Anzac Creek, the recipient natural way due to the location in the geomorphic landscape and correlations of expected biophysical health and habitat profiles for similar stream environments.

2.4 Survey dates and personnel

On the 15th December 2025, ecologists from Apical Bushfire and Planning attended Moorebank Precinct West (MPW) to collect water quality data across the testing sites which are located within selected inlet points and discharge points within the stormwater drainage and management system (SIOMP) located within the Moorebank Logistics Park site West (See map image 2).

Inlet and outlet points within the network are representative of variant sites where stormwater will enter a node of the system (as a point source) and then release from the that node of the system at a discharge point. By recording inlet and discharge data water quality can be tracked along the continuum within the system to determine condition changes and overall trends in measured quality at given sites.

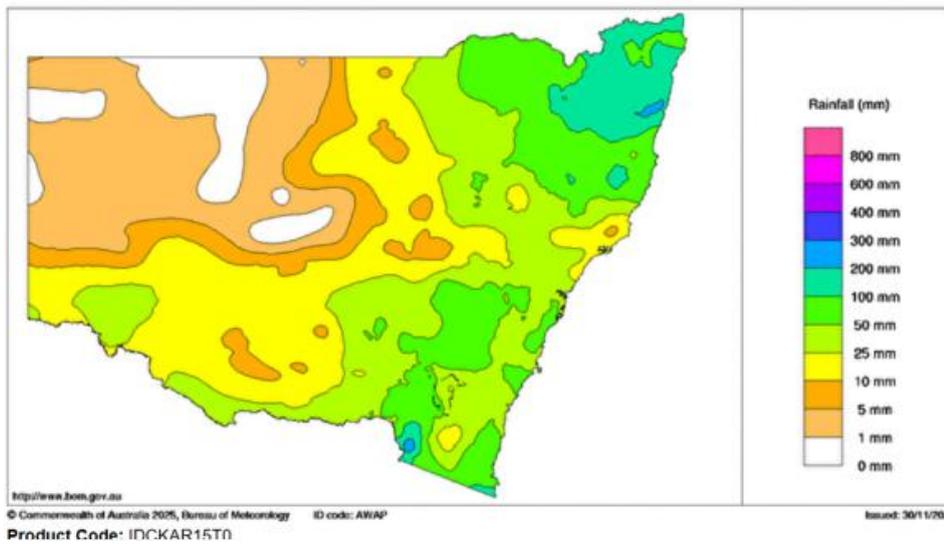
This data was collected on behalf of MID plumbing in accordance with 'The Stormwater Infrastructure Operation and Maintenance Plan Moorebank Logistics Park – West Precinct 2020' and in compliance with Condition of Consent B40 (Liverpool City) for the subject site. The results of such monitoring data collection are presented within this report.

2.5 Rainfall

Between the 1st of November and the 31st of November 2025 Moorebank received 61.6mm of rainfall.

NSW Monthly Rainfall November 2025
61.6 mm for the month in Holsworthy
NSW.

New South Wales Rainfall totals (mm) November 2025
Australian Bureau of Meteorology



3. Results

Data results captured by our water quality sampling are presented herein and are representative of baseline & Spring (2024) water quality results for Moorebank Precinct West Basin 8. Threshold guideline quantitative values for the water quality parameter themes are compared and correlated to ANZECC/ARMCANZ (2000) guidelines under the categorisation thresholds – Waterway benchmark group: ‘The protection of slightly disturbed lowland river ecosystems in southeast Australia’.

As these are the first samples results collected under our scope for the SIOMP-MPW sites, the sampling results presented in this report will be considered for future analysis against subsequent results for use as baseline data for the drainage network SIOMP function.

B) 8 -Inlet (OSD-8)

Measures	Results Nov 25	Results	Results
Date & Time:	26/11/2025 – 9.48am		
Temperature	25.6		
Dissolved Oxygen %	107		
Dissolved Oxygen mg/L	8.7		
Salinity SPC ms/cm	0.906		
Salinity C-ms/cm	916		
TDS mg/L Total Dissolved Solids	589		
pH	7.89		
ORP mV Oxidation reduction potential	193.4		
NTU	440.58		

Collection Site OSD-8 (Basin inlets)



Collection Site (OSD-8) Inlet water source from SIOMP



B) 8 Outlet Results A) (OSD-8)

Measures	Results Nov 25	Results	Results
Date & Time	26/11/2025 – 9.54am		
Temperature	22.9		
Dissolved Oxygen %	101		
Dissolved Oxygen mg/L	8.7		
Salinity SPC ms/cm	0.003		
Salinity C-ms/cm	2.9		
TDS mg/L Total Dissolved Solids	2		
pH	6.3		
ORP mV Oxidation reduction potential	279		
NTU	152.80		

Collection Site (OSD-8) Basin Discharge to Georges River



B) 8 Outlet Results B) (OSD-8)

Measures	Results Nov 25	Results	Results
Date & Time	26/11/2025 – 9.54am		
Temperature	23.2		
Dissolved Oxygen %	101		
Dissolved Oxygen mg/L	8.6		
Salinity SPC ms/cm	0.003		
Salinity C-ms/cm	2.9		
TDS mg/L Total Dissolved Solids	2		
pH	5.91		
ORP mV Oxidation reduction potential	289.7		
NTU	155.34		

Collection Site (OSD-8) Basin Discharge to Georges River



Nitrogen

Reporting period	ANZECC Guideline*	April 2025	Nov 2025
Nitrogen µg/L	350 µg/L	400 µg/L	600 µg/L

* ANZECC 2000 Guidelines 350 µg/L for rivers flowing to the coast

Phosphorus

Reporting period	ANZECC Guideline*	April 2025	Nov 2025
Phosphorous µg/L	50 µg/L	40µg/L	50 µg/L

* ANZECC 2000 Guidelines 50 µg/L for rivers flowing to the coast

Testing period	Trigger Value
Nitrogen µg/L	350 µg/L for rivers
Phosphorous µg/L	25 µg/L - 50 µg/L

Location Basin 8 Outflow

Phosphorous 50 µg/L (Guideline trigger 25 µg/L)

Nitrogen 600 µg/L (Guideline trigger 350)

Both nutrient values exceed the ANZECC guidelines at the OSD-8 discharge culvert.

It must be noted that water outflow volumes are low and highly concentrated at the time of the assessment. Low volume pools will concentrate nutrient particles and sediments and contribute to elevated levels for both N & P under these test / sample conditions.

Metals

Testing period	Trigger value ANZECC	Nov 2025		
Copper mg/L	0.0014 mg/L	0.007		
Zinc mg/L	0.008 mg/L	<0.005		
Arsenic mg/L	0.03 mg/L	<0.001		
Cadmium	0.05 µg/L	<0.0001		
Chromium	5 µg/L	<0.001		
Nickle	0.1 µg/L	<0.001		
Lead	0.005 mg/L	<0.001		

Concentrations for dissolved metals are under the ANZECC guidelines for all listed soluble metals.

Results for these parameters are considered positive for WQM discharges at the outlet and demonstrate that soluble metals are being captured throughout the SIOMP network reducing mobilisation and accretion into the natural waterways.

Total Suspended Solids

The TSS result from OSD-8 is excessively high and is considered an anomaly reading.

The cause for the reading may relate to a low volume and low flow water pool accessible for testing.

Testing period	EPA trigger value	April 2025	Nov 2025	
TSS mg/L	50 mg/L	11mg/L	199 mg/L	

pH

pH value is very low compared to the previous reading at this sample location. The pH should be noted and be prioritised for reviewed again across the next sample period.

Testing	Trigger Value - ANZECC 2000 Guidelines *Lowland rivers	April 2025	Nov 2025		
pH	Min 6.5 Max 8.5	8.08	5.91		

PFAS:

OSD -5 - PFAS – Qube Logistics, Moorebank, NSW			
PFAS Surrogate	Measure µg/L	95% species protection (DEE 2016)	Triggered
13C4-PFOS % Sum of PFAS	83.4 % 0.09 (µg/L)	.13 (µg/L)	N
13C8-PFOA % Sum of PFHxS and PFOS	86.0 % 0.06 (µg/L)	220 (µg/L)	N
<p>Notes:</p> <p>This Guidance focuses on PFOS and PFOA as potential indicators of wider contamination by related PFASs. The reasons for this approach include:</p> <ul style="list-style-type: none"> • Most research undertaken on PFASs internationally and in Australia has focused on PFOS and PFOA due to their frequent occurrence in the environment, persistence, and bioaccumulation. • PFOS and PFOA can also be the breakdown endpoint of other precursor products. • PFOS and PFOA are the most commonly encountered PFAS in the environment and wildlife. • Information on other PFASs, of which there are several hundred known, is more limited. • Effective management of PFOS and PFOA may help address potential contamination where other PFASs may also be present. <p>* DEE 2016. Commonwealth Environmental Management Guidance on Perfluorooctane Sulfonic Acid (PFOS) and Perfluorooctanoic Acid (PFOA). Department of the Environment and Energy.</p>			

PFAS concentrations are within the guidelines by the provided sample readings.

Total Hydrocarbons

OSD-5 - Total hydrocarbons – Qube Logistics, Moorebank, NSW								
Total Hydrocarbons assessed alongside baseline data (2018) and Spring monitoring (2025) for Aquatic Monitoring location 11&12 (AQ11 & AQ12 Anzac Creek).								
Lab results - Total hydrocarbons:	Trigger value ANZECC Guidelines 2000 – slightly disturbed lowland river ecosystem	Triggered	Baseline monitoring April 2018 (presented by Biosis)	November 2025				
Benzene µg/L	1300 µg/L	N	<1	<1				
Toluene µg/L	-	N	<2	<2				
Ethylbenzene µg/L	-	N	<2	<2				
meta- & para-Xylene µg/L	200 µg/L	N	-	<2				
Ortho-Xylene µg/L	470 µg/L	N	<2	<2				
Total Xylenes µg/L	-	N	-	<2				
Sum of BTEX µg/L	-	N	-	<1				
Naphthalene µg/L	85 µg/L	N	-	<5				
		Notes: <ul style="list-style-type: none"> • The data were compared to the default trigger values (DTVs) recommended by ANZECC/ARMCANZ (2000) for the protection of slightly disturbed lowland river ecosystems in southeast Australia. • Moorebank Precinct East Stage 2: Biodiversity Monitoring in Anzac Creek Autumn 2019 Survey - Final Report, Bio-Analysis Pty Ltd (2019) • Moorebank Precinct East - Stage 2 B106 – Baseline Aquatic Ecological Monitoring Report and Biodiversity Monitoring Strategy (SSD 7628) Biosis (2018) • A commonly encountered example of additive toxicity of mixtures is the simple aromatic hydrocarbons commonly associated with contaminated petroleum sites, benzene, toluene, ethyl benzene and xylenes, collectively known as BTEX 						

Total hydrocarbons are recorded within the baseline parameter values and have not changed across this testing period to other prior results.

3.2 Interpreting Results

Phosphorous Values

Phosphorus

Stormwater runoff is a major cause of physical, chemical (i.e. nutrients), and microbial degradation of receiving waters. Nitrogen (N) and phosphorus (P) are of particular concern and interest in urban stormwater runoff due to their role in eutrophication of water bodies, onset of harmful algal blooms, and fish kills. refer (Yun-Ya Yang & Gurpal S. Toor)

The linkages between urbanization and increased N and P export is well established; however, the contributions and dynamics of N and P are often site-specific, the synchronicity between N and P in aquatic environment has been widely used as an ecological indicator of biological growth and nutrient limitation.

Understanding P dynamics in stormwater runoff can help to implement and enhance the effectiveness of strategies to control P loss and transport to receiving waters.

P values from this testing period were slightly raised above the ANZECC guidelines, however are considered reasonable for the testing environment and sample pool.

Nitrogen Values

Nitrogen

A previous spike in Nitrogen has decreased to almost meet the ANZECC trigger value for rivers flowing to the coast at this collection point. This may be due to increased vegetation within the system allowing for uptake of excess nitrogen being mobilised by the stormwater.

Nitrogen values are above the guideline rates, however this is a reduction in concentration when compared to the samples of October 2024, which provides an improvement in nitrogen concentration.

Five (5) Industrial Applications of Nitrogen

While the main industrial use of nitrogen is to create ammonia that is required for fertilizer, explosives, and other materials, it uses go far beyond these applications. From food packaging to pharmaceuticals, nitrogen gas can be found in more places and used for more purposes than you may have realized.

Food Packaging: It is common practice for food processing companies to use compressed nitrogen to displace oxygen in the packaging of perishable foods. Without oxygen, the shelf life of foods such as meats, fruits, vegetables, and various snack foods can be extended. Nitrogen can also add a cushion around food to keep it safe during transport.

Chemical Blanketing: Nitrogen is typically used to prevent fires and explosions in dangerous atmospheres like chemical plants or manufacturing facilities, by lowering the oxygen level below explosive limits.

Electronics: In the process of assembling electronics, nitrogen gas is used when two electronic components are forming a permanent connection, also known as soldering. The gas is used to reduce surface tension so there is a cleaner break away from the site of the electrical bond. Nitrogen gas is also used in a computer's main processing system to prevent it from overheating.

Laboratory: Laboratories require a very specific environment to ensure that tests and results are carried out accurately. Nitrogen gas is used to control oxygen levels, humidity and temperature, and maintain an appropriate atmosphere for highly sensitive procedures and equipment. Additionally, there are various pieces of laboratory equipment that require nitrogen for purging.

Laser Cutting: The application of nitrogen as a purging gas in the steel industry is extremely important. It is used as an assist gas to blow away molten material and achieve a stronger stainless or aluminized steel product that is also more resistant to corrosion.

<https://nigen.com/industries-that-benefit-from-on-site-nitrogen-systems/>

Industries That Benefit from On-Site Nitrogen Systems

Gaseous nitrogen is very useful in large-scale manufacturing and industrial applications. The large volumes of nitrogen gas required for these operations are either sourced from vendors in gas cylinders or generated on-site. In this article, we will highlight critical industrial processes that benefit from on-site nitrogen system

Dissolved Oxygen – Measures:

Dissolved oxygen (DO) is oxygen held (dissolved) in the water and available to aquatic organisms.

The amount of dissolved oxygen in a river or stream can tell us a lot about its water quality.

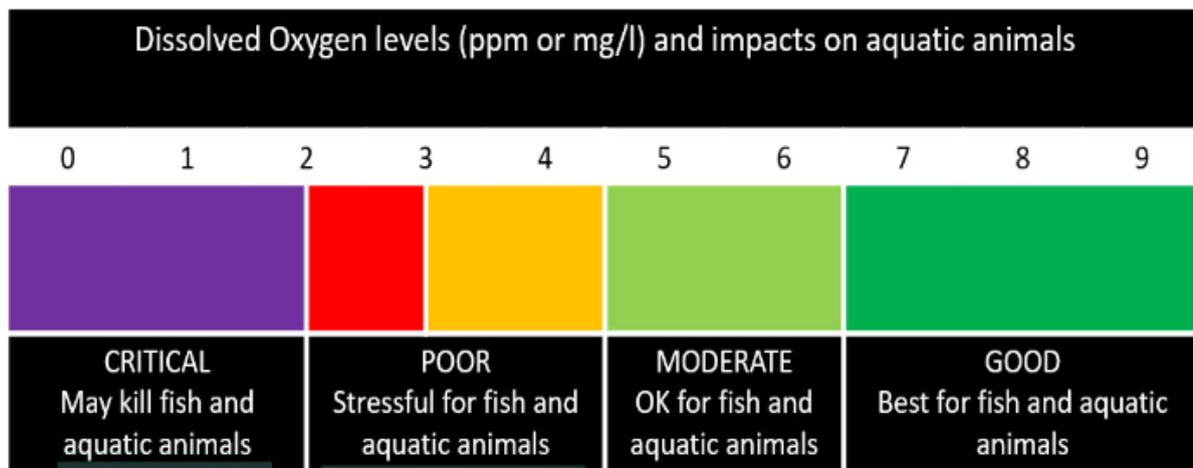
Water will naturally contain a certain amount of dissolved oxygen that is absorbed from the air and produced by plants and algae living in the water.

Temperature has a large effect on the amount of oxygen dissolved in water; cold water can hold higher levels of oxygen than warmer water. Higher water temperatures over summer will cause oxygen levels to drop.

Other factors such as river flow, wind, nutrients and bacterial activity can also affect the amount of dissolved oxygen in waterways.

Dissolved oxygen levels typically range between 5 and 14 mg/L (or ppm).

Example:



Salinity – Measures:

Electrical conductivity is a measure of the saltiness of the water and is measured on a scale from 0 to 50,000 uS/cm. Electrical conductivity is measured in microsiemens per centimeter (uS/cm). Freshwater is usually between 0 and 1,500 uS/cm and typical sea water has a conductivity value of about 50,000 uS/cm. Examples:

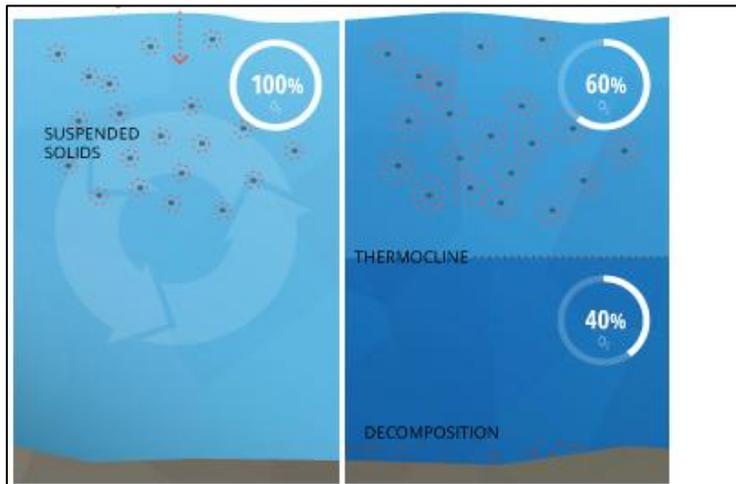
μS/cm	Use
0 - 800	<ul style="list-style-type: none"> • Good drinking water for humans (provided there is no organic pollution and not too much suspended clay material) • Generally good for irrigation, though above 300μS/cm some care must be, particularly with overhead sprinklers, which may cause leaf, scorch on some salt sensitive plants. • Suitable for all livestock
800 - 2500	<ul style="list-style-type: none"> • Can be consumed by humans, although most would prefer water in the lower half of this range if available • When used for irrigation, requires special management including suitable soils, good drainage and consideration of salt tolerance of plants • Suitable for all livestock
2500 -10,000	<ul style="list-style-type: none"> • Not recommended for human consumption, although water up to 3000 μS/cm can be consumed • Not normally suitable for irrigation, although water up to 6000 μS/cm can be used on very salt tolerant crops with very special management techniques. Over 6000 μS/cm, occasional emergency may be possible with care • When used for drinking water by poultry and pigs, the salinity should be limited to about 6000 μS/cm. Most other livestock can use water up to 10000 μS/cm

Total Dissolve Solids (TDS) – Measures

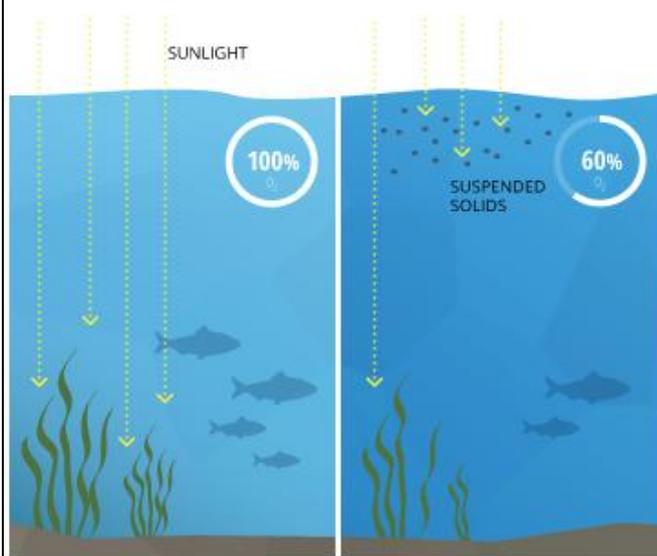
Dissolved solids, smaller than 2 microns, refer to any minerals, salts, metals, in the form of molecules, atoms, cations or anions dissolved in water. Total dissolved solids (TDS) comprise inorganic salts (principally calcium, magnesium, potassium, sodium, bicarbonates, chlorides and sulfates) and some small amounts of organic matter that dissolve in water.

The TDS concentration is the sum of all filterable substances in water that can be determined gravimetrically. However, in most cases, TDS is primarily comprised of ions.

High levels of total suspended solids can affect turbidity, increase water temperatures and decrease dissolved oxygen (DO) levels. This can cause the water to heat up more rapidly because the suspended particles absorb more heat and deplete oxygen, which can adversely affect aquatic life.



Suspended solids can increase the temperature of water as they absorb additional heat from the sun. This can also cause dissolved oxygen levels to drop below the thermocline, creating hypoxic conditions.

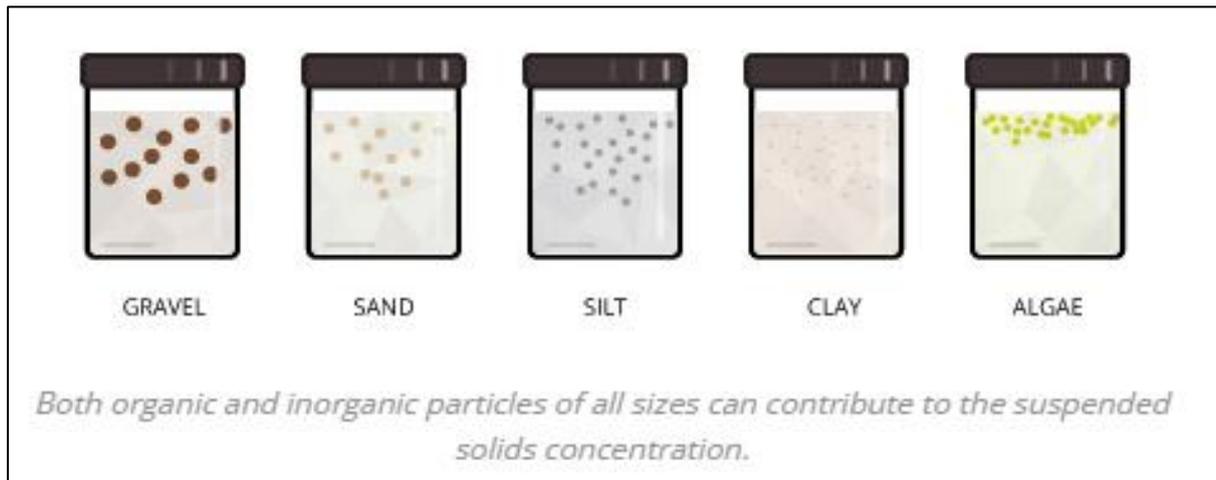


Suspended solids, particularly algae, can block sunlight from reaching submerged plants. This can cause dissolved oxygen levels to drop, as the plants rely on respiration (consuming oxygen) instead of photosynthesis.

Turbidity – Total Suspended Solids (TSS)

Turbidity data are reported in Nephelometric Turbidity Units (NTU). To provide a sense of scale, water with a turbidity of 1 NTU is crystal clear, water at 5 NTU has a tiny trace of discoloration, and water at 100 NTU is brown and opaque. The standard is less than 10 NTU for rural streams and rivers and less than 30 NTU for urban lakes and ponds.

Total suspended solids (TSS) are particles that are larger than 2 microns found in the water column. Anything smaller than 2 microns (average filter size) is considered a dissolved solid. Most suspended solids are made up of inorganic materials, though bacteria and algae can also contribute to the total solids concentration.



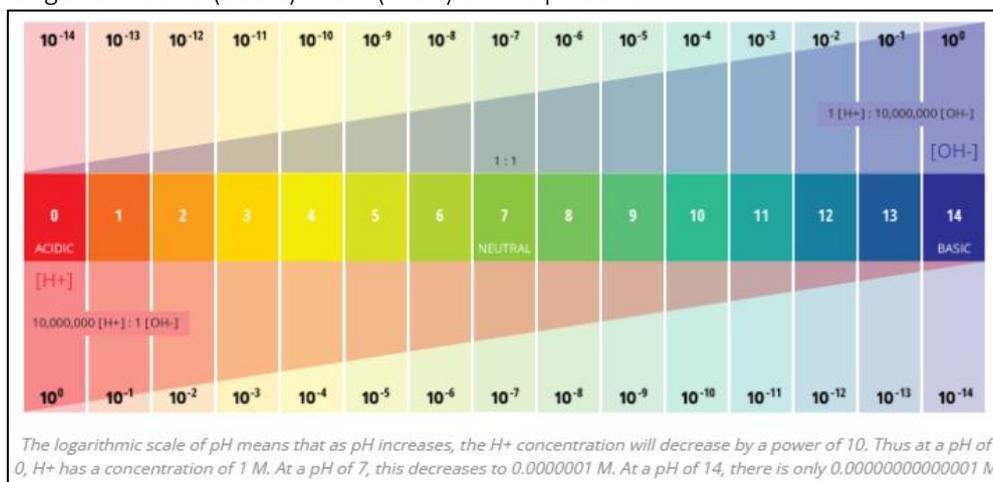
pH – Acidity / Alkalinity – Measures

The pH refers to the degree of acidity or alkalinity of a substance. A pH of 7 is neutral. A value above 7 indicates that the water is more alkaline and a pH below 7 indicates acidic conditions.

A pH of 7 is considered neutral. The logarithmic scale means that each number below 7 is 10 times more acidic than the previous number when counting down. Likewise, when counting up above 7, each number is 10 times more basic than the previous number pH stands for the “power of hydrogen”³. The numerical value of pH is determined by the molar concentration of hydrogen ions (H⁺)³. This is done by taking the negative logarithm of the H⁺ concentration (-log(H⁺)).

Standard values for pH readings are expected, pH 6.5–9 for rural streams and rivers and pH 6–9 for urban lakes and ponds.

In freshwater systems pH sets up the conditions for how easy it is for nutrients to be available and how easily things like heavy metals (toxicity for aquatic life) can dissolve in the water. Rivers and lakes generally range between 5 (acidic) and 9 (basic) on the pH scale.



Summary of Results

Aquatic ecosystems	
Indicator	Numerical criteria (trigger values)
Total phosphorus 50 µg/L	Upland rivers: 20 µg/L Lowland rivers: 25 µg/L for rivers flowing to the coast; Lakes & reservoirs: 10 µg/L Estuaries: 30 µg/L
Total nitrogen 600 µg/L	Upland rivers: 250 µg/L Lowland rivers: 350 µg/L for rivers flowing to the coast; Lakes & reservoirs: 350 µg/L Estuaries: 300µg/L
Chlorophyll-a	Upland rivers: not applicable Lowland rivers: 5 µg/L Lakes & reservoirs: 5 µg/L. Estuaries: 4 µg/L.
Turbidity 152.8 NTU	Upland rivers: 2–25 NTU (see supporting information) Lowland rivers: 6–50 NTU (see supporting information) Lakes & reservoirs: 1–20 NTU Estuaries: 0.5–10 NTU
Salinity (electrical conductivity) SPC 0.003 µS/cm	Upland rivers: 30–350 µS/cm Lowland rivers: 125–2200 µS/cm supporting information
Dissolved oxygen 101%	Upland rivers: 90–110% Lowland rivers: 85–110% Freshwater lakes & reservoirs: 90–110% Estuaries: 80–110% Note: Dissolved oxygen values were derived from daytime measurements. Dissolved oxygen concentrations may vary diurnally and with depth. Monitoring programs should assess this potential variability.
pH 6.3	Upland rivers: 6.5–8.0 Lowland rivers: 6.5–8.5 Freshwater lakes & reservoirs: 6.5–8.0 Estuaries: 7.0–8.5 Changes of more than 0.5 pH units from the natural seasonal maximum or minimum should be investigated.

3.1 Key Summary of Results Spring 2025

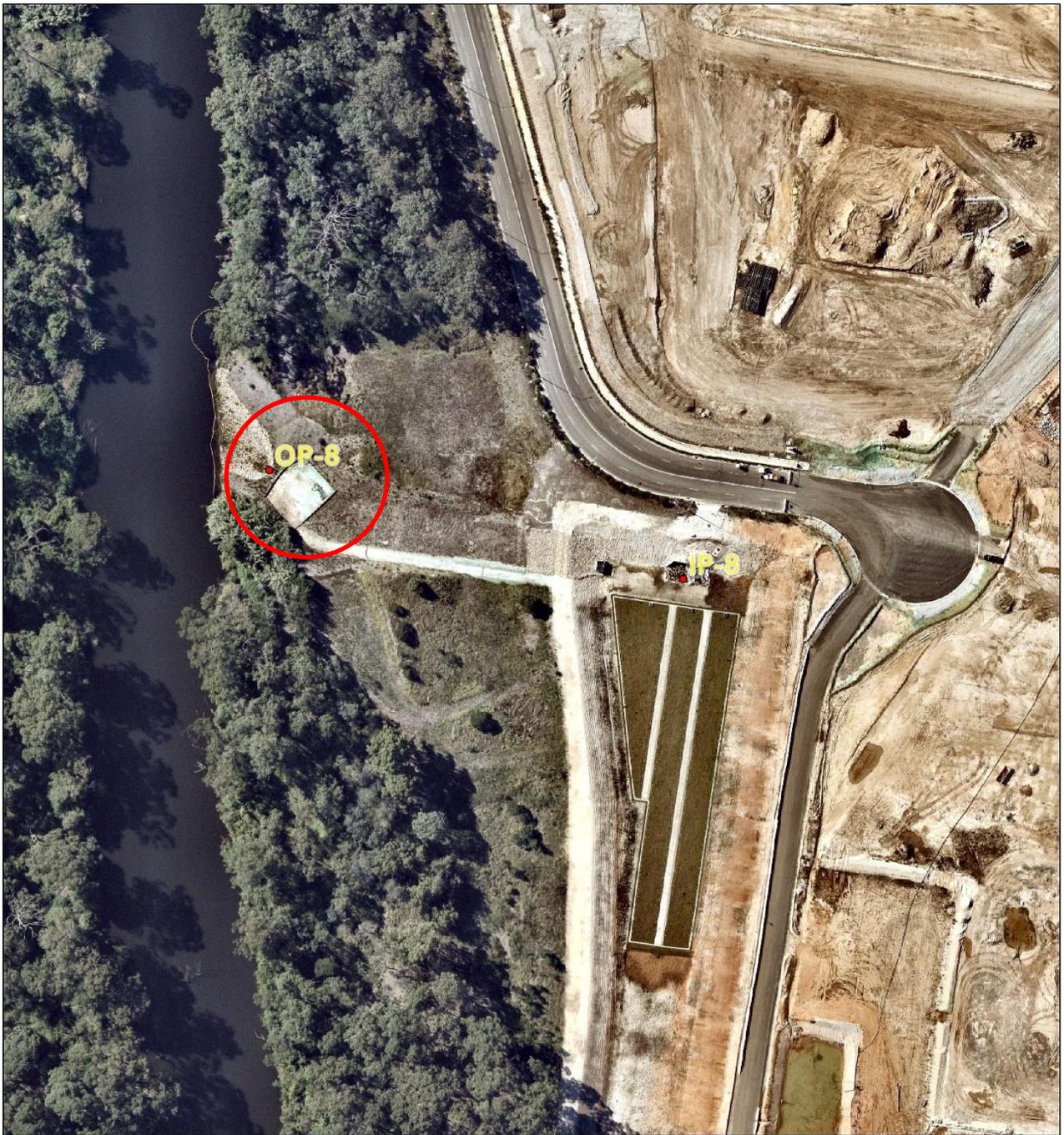
Both Nitrogen and phosphorous trigger the Anzecc guideline within the water samples from basin 8. This may be due to low water flow and low water volumes at the collection points which will contribute to increasing concentrations in samples, particularly for N & P readings.

pH has decreased significantly at basin 8 (8.12 down to 5.91).

This is considered an extreme change and most probable an anomaly in the testing results.

This value will continue to be monitored during future testing periods, to determine a less volatile trend and consistent reading for pH.

Map Image 5. Stormwater Testing Site – Moorebank Logistics Park



Sample Site Map

0 30 60 120 Meters

Client: M.I.D Plumbing	Map Issue: Basin 8 Sample Site Map
Address: BUSHMASTER AVENUE MOOREBANK2170	Time: 10/07/2024 2:25 PM

LGA:
LIVERPOOL CITY
COUNCIL

Lot/DP:
5 to 14/DP
1299137

Units:
Meters

Scale:
1:2,000

Spatial Reference:
WGS 1984 Web
Mercator Auxiliary
Sphere

Marco Perry
Environmental/Bushfire Planner
Bsc EnvSc

Marco@apical-bushfire.com.au

Map image 6.



STORMWATER DISCHARGE TESTING SITE
BASIN 8 – OSD 8 INFLOW

Site image 1. Testing site Basin OSD-8 inflow water from the SIOMP network



Table 3. In-situ data and observations Retention Basin 8 outflow

(a) Total phosphorus

Basin 8. - Total phosphorous – Qube Logistics, Moorebank, NSW		Trigger Trigger Value - ANZECC 2000 Guidelines	Triggered
Lab results - Total phosphorous:	40 µg/L	25 µg/L - 50 µg/L	N
Notes: <ul style="list-style-type: none">• Channel Culvert• Trigger value 50 µg/L for lowland rivers, trigger value 25 µg/L for rivers flowing to the coast Anzecc Guidelines 2000.			

Phosphorus levels at inflow samples are within the ANZECC guidelines

(b) Total Nitrogen as N (TKN + NOx) by Discrete Analyser

Basin 8.1 inflow - Total nitrogen – Qube Logistics, Moorebank, NSW		Trigger Value - ANZECC 2000 Guidelines	Triggered
Lab results -Total nitrogen:	1,900 µg/L	350 µg/L for rivers flowing to the coast	Y
Notes: <ul style="list-style-type: none">• Total Nitrogen as N (TKN + NOx) by Discrete Analyser• Trigger values are based on a low-lying river			

Total nitrogen at the inlet source to OSD-8 is approximately 5 times the ANZECC guidelines rating. Total nitrogen levels leaving the basin at the discharge is however recorded at 600 µg/L or 300% lower than the inlet rating.

(c) Kjeldahl nitrogen Total Kjeldahl Nitrogen as N

Basin 8.1 inflow - Kjeldahl nitrogen – Qube Logistics, Moorebank, NSW		Trigger Value - ANZECC 2000 Guidelines	Triggered
Lab results – kjeldahl nitrogen:	1,700 µg/L	-	-
Notes: <ul style="list-style-type: none">• Total Kjeldahl Nitrogen as N			

Total nitrogen at the inlet source to OSD-8 is approximately 5 times the ANZECC guidelines rating.

(d) Dissolved metals;

Basin 8.1 inflow - Dissolved metals – Qube Logistics, Moorebank, NSW			
Equipment used: - Sample bottles collected from monitoring site ALS Environmental Laboratory Testing Report			
Lab results – Dissolved metals:	Measures mg/L	Trigger value ANZECC Guidelines 2000 95% protection criteria	Triggered
Arsenic	<0.003	0.013 mg/L	N
Cadmium	<0.0001	0.0002 mg/L	N
Chromium	0.002	0.001 mg/L	Y
Copper	0.005	0.0014mg/L	N
Nickel	0.004	0.011 mg/L	N
Lead	<0.001	0.0034 mg/L	N
Zinc	<0.005	0.008 mg/L	N
Mercury	<0.0001	0.0006 mg/L	N
Notes: - ANZECC Guidelines (2000) suggest 0.002 mg/L is considered appropriate for slightly-moderately disturbed systems. - A small spike in cadmium reading is provided by the sample			

(e) PFAS;

Basin 8.1 inflow - PFAS – Qube Logistics, Moorebank, NSW			
PFAS Surrogate	Measure µg/L	95% species protection (DEE 2016)	Triggered
Sum of PFAS 13C4-PFOS	0.18µg/L 84.7%	.13 (µg/L)	Y
Sum of PFHxS and PFOS 13C8-PFOA	0.05µg/L 85.5%	220 (µg/L)	N
Notes: This Guidance focuses on PFOS and PFOA as potential indicators of wider contamination by related PFASs. The reasons for this approach include: <ul style="list-style-type: none">• Most research undertaken on PFASs internationally and in Australia has focused on PFOS and PFOA due to their frequent occurrence in the environment, persistence, and bioaccumulation.• PFOS and PFOA can also be the breakdown endpoint of other precursor products.• PFOS and PFOA are the most commonly encountered PFAS in the environment and wildlife.• Information on other PFASs, of which there are several hundred known, is more limited.• Effective management of PFOS and PFOA may help address potential contamination where other PFASs may also be present. * DEE 2016. Commonwealth Environmental Management Guidance on Perfluorooctane Sulfonic Acid (PFOS) and Perfluorooctanoic Acid (PFOA). Department of the Environment and Energy.			

(f) Total suspended solids.

Basin 8.1 inflow - Total suspended solids – Qube Logistics, Moorebank, NSW		EPA exceedance value	Trigger
Lab results – Total suspended solids: mg/L	6 mg/L	50 mg/L	N
Notes: <ul style="list-style-type: none"> Total Suspended Solids dried at 104 ± 2°C Total Suspended Solids (TSS) 			

(g) Total hydrocarbons

Basin 8.1 inflow - Total hydrocarbons – Qube Logistics, Moorebank, NSW							
Total Hydrocarbons assessed alongside baseline data (2018) and Autumn monitoring (2019) for Aquatic Monitoring location 11&12 (AQ11 & AQ12 Anzac Creek).							
Lab results -Total hydrocarbons:	Trigger value ANZECC Guidelines 2000 – slightly disturbed lowland river ecosystem	Triggered	Monitoring discharge points May 2024 (Apical)	Monitoring discharge points October 2024 (Apical)	Monitoring discharge points April 2025 (Apical)	Nov 2025	Trend
Benzene µg/L	1300 µg/L	N	<1	<1	<1	<1	No Exceedance
Toluene µg/L	-	N	<2	<2	<2	<2	No Exceedance
Ethylbenzene µg/L	-	N	<2	<2	<2	<2	No Exceedance
meta-& para-Xylene µg/L	200 µg/L	N	<2	<2	<2	<2	No Exceedance
Ortho-Xylene µg/L	470 µg/L	N	<2	<2	<2	<2	No Exceedance
Total Xylenes µg/L	-	-	<2	<2	<2	<2	No Exceedance
Sum of BTEX µg/L	-	-	<1	<1	<1	<1	No Exceedance
Naphthalene µg/L	85 µg/L	N	<5	<5	<5	<5	No Exceedance
Notes: <ul style="list-style-type: none"> The data were compared to the default trigger values (DTVs) recommended by ANZECC/ARMCANZ (2000) for the protection of slightly disturbed lowland river ecosystems in southeast Australia. A commonly encountered example of additive toxicity of mixtures is the simple aromatic hydrocarbons commonly associated with contaminated petroleum sites, benzene, toluene, ethyl benzene and xylenes, collectively known as BTEX 							

Water Quality Monitoring Comparative Table (Temporal)

Table 4. Retention Basin 8 MPW. Testing Site OP-8

Testing Site MPW 8.1 Inflow		May 2024	October 2024	April 2025	Nov 2025
pH		8.51	6.44	8.12	6.3
Dissolved Oxygen - %/L		13.07 mg/L	10.5 ppm	9.09 ppm	101%
Actual Electronic Conductivity (SPC -ms/cm)		0.558 SPC -ms/cm	8.3 (C-ms ^{cm})	282.3	0.003 SPC ms/cm
Temperature - °C		15.5	19.3	21.5	23
Turbidity		5.39 NTU	6.80 NTU	28.72 NTU	152.80
Total phosphorous - mg/L					
		0.06 mg/L	0.05 mg/L	0.04 mg/L	0.05mg/L
Total nitrogen - mg/L					
		0.07 mg/L	0.8 mg/L	0.4 mg/L	0.6,mg/L
Kjeldahl nitrogen mg/L					
		0.07 mg/L	0.7 mg/L	0.4 mg/L	1.7mg/L
Dissolved metals					
Arsenic		<0.001	<0.001	<0.001	0.003
Cadmium		<0.0001	<0.0001	<0.0001	<0.0001
Chromium		<0.001	<0.001	<0.001	0.002
Copper		0.002	<0.001	<0.001	0.005
Nickel		0.001	0.001	<0.001	0.004
Lead		<0.001	<0.001	<0.001	<0.001
Zinc		<0.005	<0.005	<0.005	<0.005
Mercury		<0.0001	<0.0001	<0.0001	<0.0001
PFAS					
Lab results – SUM of PFAS Micrograms/L		0.04	0.69	0.01	0.18
SUM of PFHxS & PFOS Microgrms/L		0.04	0.56	0.01	0.05
Total suspended solids mg/L		<5	<5	13	6
Total hydrocarbons					
Benzene	<1	<1	<1	<1	<1
Toluene	<2	<2	<2	<2	<2
Ethylbenzene	<2	<2	<2	<2	<2
meta-& para-Xylene	<2	<2	<2	<2	<2
Ortho-Xylene	<2	<2	<2	<2	<2
Total Xylenes	<2	<2	<2	<2	<2
Sum of BTEX	<1	<1	<1	<1	<1
Naphthalene	<5	<5	<5	<5	<5

Results

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 Client : Apical Bushfire and Planning
 Project : ----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	B6I	B5I	B80	B8I	----
Sampling date / time				26-Nov-2025 00:00	26-Nov-2025 00:00	26-Nov-2025 00:00	26-Nov-2025 00:00	----	
Compound	CAS Number	LOR	Unit	ES2537469-006	ES2537469-007	ES2537469-008	ES2537469-009	----	
				Result	Result	Result	Result	----	
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L	<5	13	199	6	----	
EG020F: Dissolved Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L	<0.001	0.002	<0.001	0.003	----	
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----	
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<u>0.002</u>	----	
Copper	7440-50-8	0.001	mg/L	0.003	<0.001	0.001	<u>0.005</u>	----	
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.001	<u>0.004</u>	----	
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----	
Zinc	7440-66-6	0.005	mg/L	0.012	<0.005	0.006	<0.005	----	
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L	0.05	<u>0.12</u>	0.04	<u>0.16</u>	----	
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.9	1.0	0.6	1.7	----	
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^A Total Nitrogen as N	----	0.1	mg/L	1.0	1.1	0.6	<u>1.9</u>	----	
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L	0.09	<u>0.21</u>	0.05	0.04	----	
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	----	
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	----	
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	----	
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	----	
^A C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	<50	<50	----	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	----	



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 Client : Apical Bushfire and Planning
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Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	B6I	B5I	B80	B8I	---
Sampling date / time				26-Nov-2025 00:00	26-Nov-2025 00:00	26-Nov-2025 00:00	26-Nov-2025 00:00	---	
Compound	CAS Number	LOR	Unit	ES2537469-006	ES2537469-007	ES2537469-008	ES2537469-009	---	
				Result	Result	Result	Result	---	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^A C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	---	
>C10 - C16 Fraction	---	100	µg/L	<100	<100	<100	<100	---	
>C16 - C34 Fraction	---	100	µg/L	<100	<100	<100	<100	---	
>C34 - C40 Fraction	---	100	µg/L	<100	<100	<100	<100	---	
^A >C10 - C40 Fraction (sum)	---	100	µg/L	<100	<100	<100	<100	---	
^A >C10 - C16 Fraction minus Naphthalene (F2)	---	100	µg/L	<100	<100	<100	<100	---	
EP080: BTEXN									
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	---	
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	---	
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	---	
meta- & para-Xylene	109-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	---	
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	---	
^A Total Xylenes	---	2	µg/L	<2	<2	<2	<2	---	
^A Sum of BTEX	---	1	µg/L	<1	<1	<1	<1	---	
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	---	
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluoropropane sulfonic acid (PFPrS)	423-41-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	---	
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	---	
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	---	
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L	<0.01	<0.01	0.03	0.02	---	
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	---	
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.01	0.03	0.03	---	
Perfluorononane sulfonic acid (PFNS)	68259-12-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	---	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	B6I	B5I	B80	B8I	----
Sampling date / time				26-Nov-2025 00:00	26-Nov-2025 00:00	26-Nov-2025 00:00	26-Nov-2025 00:00	----	
Compound	CAS Number	LOR	Unit	ES2537469-006	ES2537469-007	ES2537469-008	ES2537469-009	----	
				Result	Result	Result	Result	----	
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----	
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	----	
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	0.03	----	
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.02	0.07	----	
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----	
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.01	0.01	0.03	----	
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----	
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----	
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----	
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----	
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----	
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----	
Perfluorohexadecanoic acid (PFHxDA)	67905-19-5	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----	
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----	
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----	
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----	
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----	
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----	



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 Client : Apical Bushfire and Planning
 Project : ----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	B6I	B5I	B80	B8I	----
Sampling date / time				26-Nov-2025 00:00	26-Nov-2025 00:00	26-Nov-2025 00:00	26-Nov-2025 00:00	----	
Compound	CAS Number	LOR	Unit	ES2537469-006	ES2537469-007	ES2537469-008	ES2537469-009	-----	
				Result	Result	Result	Result	---	
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	---	
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	---	
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	---	
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	---	
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	---	
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	---	
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L	<0.01	0.02	0.09	<u>0.18</u>	---	
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	0.01	0.06	0.05	---	
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	0.02	0.09	<u>0.18</u>	---	
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	2	%	79.7	106	81.4	80.5	---	
Toluene-D8	2037-28-5	2	%	100	81.9	98.5	99.2	---	
4-Bromofluorobenzene	460-00-4	2	%	<u>113</u>	106	111	104	---	
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%	83.2	84.6	83.4	84.7	---	
13C8-PFOA	----	0.02	%	86.6	87.2	86.0	85.5	---	

Chemical	Trigger values for freshwater (μgL^{-1})				Trigger values for marine water (μgL^{-1})			
	Level of protection (% species)				Level of protection (% species)			
	99%	95%	90%	80%	99%	95%	90%	80%
Hexazinone	ID	ID	ID	ID	ID	ID	ID	ID
Simazine	0.2	3.2	11	35	ID	ID	ID	ID
Urea herbicides								
Diuron	ID	ID	ID	ID	ID	ID	ID	ID
Tebuthiuron	0.02	2.2	20	160 ^C	ID	ID	ID	ID
Miscellaneous herbicides								
Acrolein	ID	ID	ID	ID	ID	ID	ID	ID
Bromacil	ID	ID	ID	ID	ID	ID	ID	ID
Glyphosate	370	1200	2000	3600 ^A	ID	ID	ID	ID
Imazethapyr	ID	ID	ID	ID	ID	ID	ID	ID
Ioxynil	ID	ID	ID	ID	ID	ID	ID	ID
Metolachlor	ID	ID	ID	ID	ID	ID	ID	ID
Sethoxydim	ID	ID	ID	ID	ID	ID	ID	ID
Trifluralin	B	2.6	4.4	6	9 ^A	ID	ID	ID
GENERIC GROUPS OF CHEMICALS								
Surfactants								
Linear alkylbenzene sulfonates (LAS)	65	280	520 ^C	1000 ^C	ID	ID	ID	ID
Alcohol ethoxylated sulfate (AES)	340	650	850 ^C	1100 ^C	ID	ID	ID	ID
Alcohol ethoxylated surfactants (AE)	50	140	220	360 ^C	ID	ID	ID	ID
Oils & Petroleum Hydrocarbons								
Oil Spill Dispersants								
BP 1100X	ID	ID	ID	ID	ID	ID	ID	ID
Corexit 7664	ID	ID	ID	ID	ID	ID	ID	ID
Corexit 8667		ID	ID	ID	ID	ID	ID	ID
Corexit 9527	ID	ID	ID	ID	230	1100	2200	4400 ^A
Corexit 9550	ID	ID	ID	ID	ID	ID	ID	ID

Notes: Where the final water quality guideline to be applied to a site is below current analytical practical quantitation limits, see Section 3.4.3.3 for guidance.

Most trigger values listed here for metals and metalloids are *High reliability* figures, derived from field or chronic NOEC data (see 3.4.2.3 for reference to Volume 2). The exceptions are *Moderate reliability* for freshwater aluminium (pH >6.5), manganese and marine chromium (III).

Most trigger values listed here for non-metallic inorganics and organic chemicals are *Moderate reliability* figures, derived from acute LC_{50} data (see 3.4.2.3 for reference to Volume 2). The exceptions are *High reliability* for freshwater ammonia, 3,4-DCA, endosulfan, chlorpyrifos, esfenvalerate, tebuthiuron, three surfactants and marine for 1,1,2-TCE and chlorpyrifos.

* = *High reliability* figure for esfenvalerate derived from mesocosm NOEC data (no alternative protection levels available).

A = Figure may not protect key test species from acute toxicity (and chronic) — check Section 8.3.7 for spread of data and its significance. 'A' indicates that trigger value > acute toxicity figure; note that trigger value should be <1/3 of acute figure (Section 8.3.4.4).

B = Chemicals for which possible bioaccumulation and secondary poisoning effects should be considered (see Sections 8.3.3.4 and 8.3.5.7).

C = Figure may not protect key test species from chronic toxicity (this refers to experimental chronic figures or geometric mean for species) — check Section 8.3.7 for spread of data and its significance. Where grey shading and 'C' coincide, refer to text in Section 8.3.7.

D = Ammonia as TOTAL ammonia as $[\text{NH}_3\text{-N}]$ at pH 8. For changes in trigger value with pH refer to Section 8.3.7.2.

E = Chlorine as total chlorine, as $[\text{Cl}]$; see Section 8.3.7.2.

F = Cyanide as un-ionised HCN, measured as $[\text{CN}]$; see Section 8.3.7.2.

G = Sulfide as un-ionised H_2S , measured as $[\text{S}]$; see Section 8.3.7.2.

H = Chemicals for which algorithms have been provided in table 3.4.3 to account for the effects of hardness. The values have been calculated using a hardness of 30 mg/L CaCO_3 . These should be adjusted to the site-specific hardness (see Section 3.4.3).

J = Figures protect against toxicity and do not relate to eutrophication issues. Refer to Section 3.3 if eutrophication is the issue of concern.

ID = Insufficient data to derive a reliable trigger value. Users advised to check if a low reliability value or an ECL is given in Section 8.3.7.

T = Tainting or flavour impairment of fish flesh may possibly occur at concentrations below the trigger value. See Sections 4.4.5.3/3 and 8.3.7.

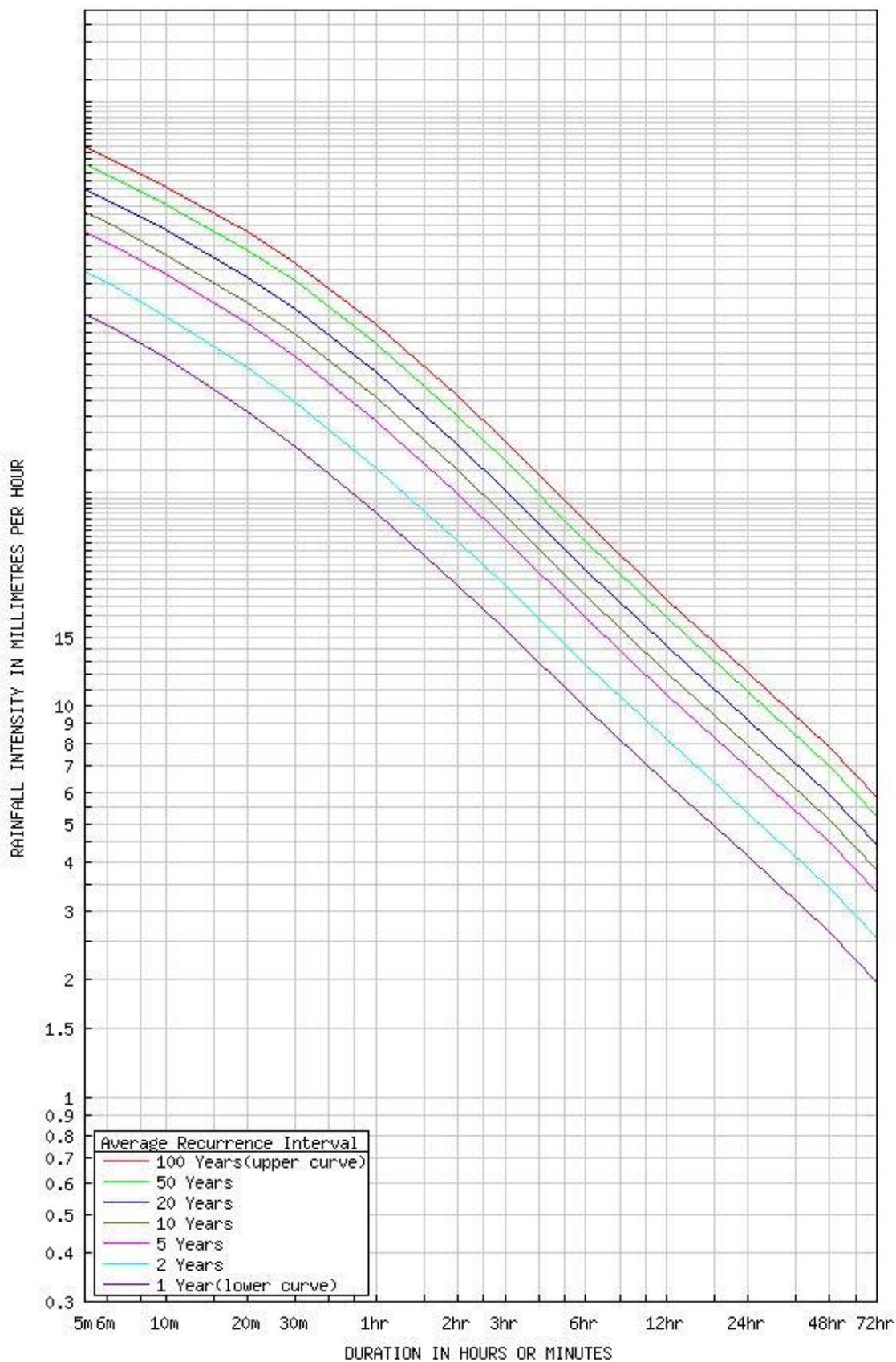
Table 5. Ecological water quality guideline values developed by water regulators

Exposure scenario	PFOS	PFOA	Exposure scenario	Comments and source
Freshwater	0.00023 µg/L	19 µg/L	99% species protection - high conservation value systems	Australian and New Zealand Guidelines for Fresh and Marine Water Quality - technical draft default guideline values for PFOS and PFOA.
	0.13 µg/L	220 µg/L	95% species protection - slightly to moderately disturbed systems	Note 1: The 99% species protection level for PFOS is close to the level of detection. Agencies may wish to apply a 'detect' threshold in such circumstances rather than a quantified measurement.
	2 µg/L	632 µg/L	90% species protection - highly disturbed systems	Note 2: The draft guidelines do not account for effects which result from the biomagnification of toxicants in air-breathing animals or in animals which prey on aquatic organisms.
	31 µg/L	1824 µg/L	80% species protection - highly disturbed systems	Note 3: The WQGs advise ⁴¹ that the 99% level of protection be used for slightly to moderately disturbed systems. This approach is generally adopted for chemicals that bioaccumulate and biomagnify in wildlife. Regulators may specify or environmental legislation may prescribe the level of species protection required, rather than allowing for case-by-case assessments.
Interim marine	0.00023 µg/L	19 µg/L	99% species protection - high conservation value systems	As above. Freshwater values are to be used on an interim basis until final marine guideline values can be set using the nationally-agreed process under the Australian and New Zealand Guidelines for Fresh and Marine Water Quality.
	0.13 µg/L	220 µg/L	95% species protection - slightly to moderately disturbed systems	Note 1: The WQG advise that in the case of estuaries, the most stringent of freshwater and marine criteria apply, taking account of any available salinity correction.
	2 µg/L	632 µg/L	90% species protection - highly disturbed systems	Note 2: Marine guideline values developed by CRC CARE are under consideration through the nationally-agreed water quality guideline development process.
	31 µg/L	1824 µg/L	80% species protection - highly disturbed systems	

Australian Water Quality Guidelines for Fresh and Marine Waters

Type of indicator	Indicator	Units	Fresh waters	Marine waters
	Dissolved oxygen ²	mg/L	> 6 (> 80–90% saturation)	> 6 (> 80–90% saturation)
	Nutrients/nuisance growths	–	(Section 2.3.3)	(Section 2.3.3)
	pH	–	6.5–9.0	< 0.2 pH unit change
	Salinity	mg/L	< 1000 (about 1,500 µS/cm)	–
	Suspended particulate matter/turbidity	–	< 10% change seasonal mean concentration (see also colour & clarity)	< 10% change seasonal mean concentration (see also colour & clarity)
	Temperature ³	–	< 2°C increase	< 2°C increase
Toxicants				
Inorganic toxicants	Aluminium	µg/L	< 5.0 (if pH ≤ 6.5)	NR
	Aluminium	µg/L	< 100.0 (if pH > 6.5)	–
	Ammonia	µg/L	20.0–30.0 (Table 2.3)	NR
	Antimony	µg/L	30.0	500.0
	Arsenic	µg/L	50.0	50.0
	Beryllium	µg/L	4.0 ⁴	NR
	Cadmium	µg/L	0.2–2.0 ⁵	2.0
	Chromium	µg/L	10.0	50.0
	Copper	µg/L	2.0–5.0 ⁵	5.0
	Cyanide	µg/L	5.0	5.0
	Iron	µg/L	1,000.0 ⁶	NR
	Lead	µg/L	1.0–5.0 ⁵	5.0
	Mercury	µg/L	0.1	0.1
	Nickel	µg/L	15.0–150.0 ⁵	15.0
	Selenium	µg/L	5.0	70.0
	Silver	µg/L	0.1	1.0
	Sulfide	µg/L	2.0	2.0
	Thallium	µg/L	4.0	20.0
Tin (tributyltin)	µg/L	0.008	0.002	
Zinc	µg/L	5.0–50.0 ⁶	50.0	
Organic toxicants	Acrylonitrile	µg/L	NR	NR
	Benzidine	µg/L	NR	NR
	Dichlorobenzidine	µg/L	NR	NR
	Diphenylhydrazine	µg/L	NR	NR
Halogenated aliphatic compounds	Hexachlorobutadiene	µg/L	0.1	0.3
	Halogenated ethers	µg/L	NR	NR
	Isophorone	µg/L	NR	NR
Monocyclic aromatic compounds	Benzene	µg/L	300.0	300.0
	Chlorinated benzenes	µg/L	(Table 2.8)	NR

Appendix C. Intensity Frequency Duration – Average Recurrence Interval Indicator
[Intensity-Frequency-Duration \(bom.gov.au\)](http://Intensity-Frequency-Duration (bom.gov.au))



APPENDIX G – COMPLAINTS REGISTER

Moorebank Intermodal Precinct Complaints Register – 2 December 2025

Date received	Complainant	Nature of complaint	Location (MIP/MARW)	Status
01/12/2025	Community member	<p><i>Complaint:</i> Community member is concerned that the Moorebank Intermodal By-pass and Cambridge Avenue upgrade fail to address the precinct's future traffic needs. Concerned that by building the by-pass as one lane each way will create a choke point between two-lane sections and leading to costly duplication later.</p> <p><i>Response:</i> It was noted that the information recently published by Transport for NSW regarding the Cambridge Avenue Upgrade in relation to Moorebank Intermodal Precinct (MIP), the Department's statement that the upgrade is intended to provide secondary access to MIP is incorrect. Under the existing conditions of consent for MIP, no vehicles associated with the Precinct are permitted to access Cambridge Avenue. All freight traffic must enter and exit the precinct to the north, in accordance with the approved Construction Traffic and Access Management Plan (CTAMP) and Operational Traffic and Access Management Plan (OTAMP). To avoid confusion within the community and among our stakeholders, we have asked Transport for NSW to update its communications to reflect this.</p>	MIP	CLOSED
30/11/2025	Community member	<p><i>Complaint:</i> Community member raised concern with lights from the MIP site that shine directly into their main bedroom, making it difficult to sleep. Request that these lights be turned off by 9:00 PM nightly to reduce disruption for themselves and neighbouring properties.</p> <p><i>Response:</i> The project team will visit the community members' home to identify the light source. Further investigation will be undertaken once the source is confirmed.</p>	MIP	OPEN
26/11/2025	Community member	<p><i>Complaint:</i> Community member raised issue with two large bins obstructing view of traffic at intersection Delfin Drive and Anzac Rd (near the fire station). Request for these to be removed to mitigate risk of traffic hazard.</p> <p><i>Response:</i> After investigating, it was confirmed that these blue bins are not associated with MIP and do not belong to the Fire Station. The community member was alerted to the fact that these bins may belong to TFNSW or Liverpool Council, possibly related to recent road works on Anzac Road and to contact them.</p>	Other	CLOSED
25/11/2025	Community member	<p><i>Complaint:</i> Community member reported issue with container dropping on hardstand in the early hours of the morning.</p> <p><i>Response:</i> An email was issued to the community member referring to them where all information about the planning and approval related to the operation of MIP. The complaint was escalated to QUBE operations team for investigate the date and time of the incident.</p>	MIP (Qube)	OPEN

Moorebank Intermodal Precinct Complaints Register – 2 December 2025

Date received	Complainant	Nature of complaint	Location (MIP/MARW)	Status
11/11/2025	Community member	<p><u>Query:</u> Community member following up on damage to a private vehicle which took place occurred in September 2025 on Anzac Road in Moorebank due to ongoing roadworks.</p> <p><u>Response:</u> Roadworks assessed and found to meet the required Transport for NSW standards. Issue has been discussed with the community member and the matter has been escalated within ESR.</p>	MIP	CLOSED
28/10/2025	Community Member	<p><u>Query:</u> Trees growing through site fence in bushland located to the west of Wattle Grove is almost reaching a neighbouring boundary fence. Request that these trees be pruned back due to perceived fire hazard.</p> <p><u>Response:</u> Message has been left with Community member on 18 November 2025. Overhanging tree removal has also been undertaken recently in this location.</p>	MIP	CLOSED
20/10/2025	Community Member	<p><u>Query:</u> A community member asked about fire prevention management in the former ADF boot land at Wattle Grove West (from Moorebank Avenue to the Wattle Grove residential boundary).</p> <p><u>Response:</u> The community member was provided with the following information: the bushland to the west of Wattle Grove is managed under Biodiversity Agreement BA 341, which permits specific bushfire management activities. These include maintaining the Asset Protection Zone and fire access tracks, providing gate access to the RFS, and undertaking ongoing weed reduction to minimise fuel loads.</p>	MIP	Closed
9/10/2025	Community Member	<p><u>Noise:</u> Liverpool City Council informed the project team of a complaint regarding noisy night works along Anzac Road and Delfin Drive, which continued until 2am. Upon investigation, it was determined that the works were related to horizontal directional drilling (HDD) activities by ROC Communications for telecommunications infrastructure.</p> <p><u>Response:</u> The matter was referred to the ROC Communications project manager for appropriate resolution.</p>	MIP	Closed
30/09/2025	MIP tenants	<p><u>Dust management:</u> Management company for the warehouse complex located next to the project advised that tenants in both north and south locations of the east precinct had raised a complaint regarding dust coming from the project. They requested more effective dust suppression measures and controls.</p> <p><u>Response:</u> Measures taken include:</p> <ul style="list-style-type: none"> - Increased watercarts onsite and allocated one to specifically the work zone nearest the warehouses. 	MAR	Closed

Moorebank Intermodal Precinct Complaints Register – 2 December 2025

Date received	Complainant	Nature of complaint	Location (MIP/MARW)	Status
		<ul style="list-style-type: none"> - Increased dust monitoring during inspections. - Commenced proposed scheduled application in the work zone - Dust management including speed reductions discussed at prestart with staff and contractors. - Dust management scheduled as the next environmental toolbox topic 		
26/09/2025	Community Member	<p><i>Noise:</i> Community member contacted the project information line reporting noisy activities off/around Anzac Road observed Thurs 25/9 and Fri 26/9, describing them as ‘jet plane’ sounding/earthworks moving and warehousing noises.</p> <p><i>Response:</i> The project team investigated precinct activities and eliminated the noise being made from precinct contractors related to transmission line infrastructure, Moorebank/Anzac Rd intersection upgrade or MAR works. A detailed response was provided with the suggestion to contact Liverpool City Council for an understanding of other activities occurring in the area.</p>	MIP	Closed
16/09/2025	Community Member	<p><i>Traffic congestion:</i> Community member emailed to report that he experienced a 2-hour delay travelling to Liverpool via Moorebank Avenue and missed his specialist appointment. He noted that the traffic lights are not synchronized to facilitate traffic flow and large trucks were blocking the intersections illegally.</p> <p><i>Response:</i> The team investigated and found that unfortunately there was a traffic signal timer glitch which caused the lights to change too quickly and this coincided with the lane closure as part of pavement works on Bapume Road, Moorebank Ave and the intersection of Anzac Road. We advised the community member that we notified Net Ops as part of TfNSW as the responsibility authority and subsequently reopened the lane to improve traffic flow. The project team also provided contact information for the relevant SCAT dept in TfNSW should the complainant wish to follow up further.</p>	MIP	Closed
16/09/2025	Community Member	<p><i>Traffic congestion:</i> Community member contacted the project information line to report issues with the traffic light at the intersection of Anzac Road (and Moorebank Ave) and that traffic was banked up all the way to the Army Barracks with only approximately three vehicles or one truck passing through at a time.</p> <p><i>Response:</i> Spoke to community member to ascertain further information and found that in his perspective, a lane closure was the problem causing the heavy congestion. Followed up with the project team and contractor and upon further investigation, found that there was a traffic signal timer glitch that occurred during the off-peak lane closure which significantly impacted traffic flow. Offered the caller the contact information for the relevant SCAT dept in TfNSW should they wish to follow up directly with that authority responsible for traffic light sequencing. The caller was satisfied at providing the feedback and reporting the heavy traffic impacts, emphasizing that the area requires ‘common sense’ with traffic management.</p>	MIP	Closed

Moorebank Intermodal Precinct Complaints Register – 2 December 2025

Date received	Complainant	Nature of complaint	Location (MIP/MARW)	Status
12/09/2025	Community Member	<p><u>Blocked pedestrian access:</u> A MIP employee’s family member contacted the project information line to report blocked pedestrian access to the Moorebank Intermodal Precinct. They expressed frustration after being passed between several parties-without receiving a satisfactory resolution.</p> <p><u>Response:</u> The employee’s family member explained that their family member relies on pedestrian access to catch a bus to work and for the past three days the access had been blocked without alternative arrangements. ESR and National Intermodal were contacted for assistance with the matter and begun to explore solutions. National Intermodal and ESR treated the issue as a priority, working together to explore short-term and long-term solutions. A call was made back to the caller on Monday evening (15/9/25) with an initial estimated timeframe of 48 hours for commencement of the reinstated access but the family member was dissatisfied with the response and requested escalation with a callback from management. National Intermodal and ESR transitioned as the point of contact and resolved to provide a driver for the employee each weekday to and from work until the footpath became accessible. The footpath was reopened on 22/09/25.</p>	MIP	Closed
2/09/2025	Community Member	<p><u>Traffic management/road condition:</u> A community member reported unsafe road conditions along Anzac Avenue, including exposed metal plates and insufficient caution signage.</p> <p><u>Response:</u> The issue was referred to Vaughan Civil for immediate attention. Due to multiple recent complaints, the matter was escalated to their Project Manager. Liverpool City Council was also informed and asked to assist in monitoring the site to ensure public safety and compliance with roadwork standards.</p>	MIP	Closed
2/09/2025	Community Member	<p><u>Traffic management:</u> A community member reported a near-miss incident while turning right from Moorebank Avenue onto Anzac Road (northbound), due to two lanes merging into one without adequate signage or sufficient space to safely accommodate turning vehicles.</p> <p><u>Response:</u> The project team investigated and confirmed that the traffic management setup in question is not associated with the current project works but is being managed by Vaughan Civil. The matter was referred to Vaughan Civil for review, with a request to address the safety concerns and implement any necessary rectifications.</p>	MIP	Closed
1/09/2025	Community Member	<p><u>Property damage:</u> A community member reported that recent roadworks caused damage to their vehicle due to uneven steel road plates and insufficient signage.</p> <p><u>Response:</u> The project team contacted the caller to confirm the location, which was identified as Anzac Avenue. As the current project does not have any steel plates in use, the matter was referred to Vaughan Civil. Vaughan Civil is undertaking works in the area on behalf of Endeavour Energy’s 33kV transmission infrastructure project and were asked to address the issue and contact the community member.</p>	MIP	Closed
31/08/2025	Community Member	<p><u>Noise:</u> A community member called the project hotline at 11:30pm to report excessive truck, forklift and banging noises occurring since 10pm.</p>	MIP	Closed

Moorebank Intermodal Precinct Complaints Register – 2 December 2025

Date received	Complainant	Nature of complaint	Location (MIP/MARW)	Status
		<p><i>Response:</i> The project team investigated and confirmed there were no overnight activities taking place at the ITS site. The matter was referred to Qube for follow-up regarding any IMEX-related activities that may have contributed to the noise. As a precautionary measure, the project contractor installed noise curtains around localised intersection works and conducted a toolbox talk to address noise-generating behaviours with staff.</p>		
12/08/2025	Community Member	<p><i>Traffic congestion:</i> A community member responded to an email correspondence from March 2025 regarding traffic congestion on Moorebank Avenue, Cambridge Avenue and Canterbury Road. They reported only slight improvements since adjustments were previously made to the SCATS (traffic light phase timing to improve northbound flows). They advised they are still experiencing significant delays particularly during school drop-off hours and suggested that traffic lights were not coordinated.</p> <p><i>Response:</i> Feedback was shared with the project team and the community member was advised that the current Moorebank Avenue is temporary and will be replaced as part of the realignment project designed to streamline traffic flows around the precinct. They were also informed that Transport for NSW is responsible for sequencing of traffic lights however we could raise the matter on their behalf.</p>	MIP	Closed
1/08/2025	Community Member	<p><i>Traffic management:</i> A community member phoned the project hotline to report an incident involving traffic management and a traffic controller’s behaviour with managing contraflow along Anzac Avenue near the intersection about 7pm on Sunday. Discussed the incident with the caller for further details and passed this on to the project team and contractor to look into further.</p> <p><i>Response:</i> The contractor followed up with their traffic management company, which conducted an investigation and provided a response report. The contractor then contacted the caller to emphasize their commitment to safety and adherence to protocols. Although there were differing accounts of the event from the caller and the traffic controller, the company has implemented reinforcement measures, including additional staff briefings. It is also suspected the incident occurred during a shift change and a brief period when the boom gates were relocated from the intersection. The caller was satisfied with the information provided and action taken.</p>	MIP	Closed
1/08/2025	Community Member	<p><i>Property damage:</i> A community member submitted a claim for a punctured tyre to Liverpool City Council, alleging it was sustained 22 July 2025 from metal debris left on the road from works at Moorebank Avenue near Anzac Road and Bushmaster Avenue.</p> <p><i>Response:</i> The project team investigated with our contractor who reviewed the provided information and video footage. There was no evidence of debris found on the road and additionally the contractor did not have any works occurring in that vicinity nor for a period before, so it is unlikely to be related to project works. A response was provided on 6 August</p>	MIP	Closed

Moorebank Intermodal Precinct Complaints Register – 2 December 2025

Date received	Complainant	Nature of complaint	Location (MIP/MARW)	Status
		to Liverpool City Council to advise of our findings.		
15/07/2025	Community Member	<p><u>Road works:</u> Phone enquiry received from nearby community member in Lurnea who complained about the extended length of time to complete for works occurring on Moorebank Avenue (specifically the 200m stretch up to the Anzac Road intersection). Caller complained of heavy traffic congestion in the area and sought more information about project works and when it will all finish.</p> <p><u>Response:</u> Spoke to caller, explaining the unforeseen delays associated with weather conditions and the Endeavour Energy project, and advised caller about upcoming traffic switch for MAAI (25-28 July). Added him to the project subscriber list and followed up with emails providing a copy of the upcoming OOH notification and website link, advised him MAAI is expected to be fully completed by the end of 2025 and that MAR is scheduled to be ongoing for approximately 18m (although mostly being undertaken offline).</p>	MIP	Closed
5/07/2025	Community Member	<p><u>Truck movements:</u> An enquiry was received regarding the Cambridge Avenue upgrade, truck movements at the Moorebank Intermodal Precinct (MIP), and whether these movements can be restricted during peak traffic hours. The enquirer also raised general concerns about the need for greater coordination with other government departments to minimise traffic impacts.</p> <p><u>Response:</u> The enquirer was informed of the essential role that truck movements play in supporting the multiple warehousing and logistics operations within the precinct. They were reassured that the project is committed to managing and mitigating traffic impacts including through two key initiatives underway with the delivery of the MAR project and the Moorebank Intermodal Terminal Road Access (MITRA) Strategy in collaboration with Transport for NSW. The enquirer was also referred to Transport for NSW as the appropriate authority for further information regarding the Cambridge Avenue upgrade.</p>	MIP	Closed
4/06/2025	Community Member	<p><u>Road works:</u> Caller enquired about works along Anzac Road from the Moorebank Avenue intersection up to the Fire Station as it seems constantly being dug up and the road is not holding up in the rain. Upon investigation, activities relate to the installation of the 33kw transmission line as part of Endeavour Energy’s separate project.</p> <p><u>Response:</u> Caller was contacted by the project team and advised that MAAI works with final reinstatement is due end-July around the intersection. Remainder works are being undertaken by Vaughan Civil. Feedback was passed on to Vaughan Civil who also phoned caller to advise that works are continuing and explain that reinstatement is temporary after each shift and permanent road reinstatement will be carried out once works are complete.</p>	MIP	Closed
23/05/2025	Community Member	<p><u>Property damage:</u> Stakeholder’s vehicle tyre was damaged from driving over a significant pothole along Moorebank Avenue and requested reimbursement/support to rectify the damage. Council was also contacted for assistance by stakeholder and contacted the</p>	MIP	Closed

Moorebank Intermodal Precinct Complaints Register – 2 December 2025

Date received	Complainant	Nature of complaint	Location (MIP/MARW)	Status
		<p>project team due to receiving a few community complaints. <u>Response:</u> Pothole was investigated and location confirmed belonging to Defence. Stakeholder and Council was referred to a Defence contact for follow up.</p>		
22/05/2025	Community Member	<p><u>Noise:</u> Resident phoned the project number around midnight to report loud container noises over the last few nights and requested contact details to complain to Government agencies. <u>Response:</u> Project team investigated and eliminated any contractor works relating to MAAI or MAR and known precinct activities. On closer review it appears potentially related to Qube and information has been passed on to their Director of Communications – awaiting response.</p>	MIP	Open
18/05/2025	Community and CCC Member	<p><u>Environmental reporting:</u> Stakeholder emailed to lodge a complaint regarding environmental reporting with respect to specific emissions information and more detailed data that they have requested for some time. <u>Response:</u> There has been ongoing correspondence and attempts to provide the requested information. This is currently being reviewed again to confirm that the project team has provided the requested information as best as they are able. Additional information has subsequently been provided, and a member of project team will follow up with stakeholder.</p>	MIP	Closed
24/04/2025	Community Member	<p><u>Noise:</u> Caller phoned the project hotline in the evening, reporting incessant banging and vibrations through the house. <u>Response:</u> Caller was phoned back for more information but could not be reached.</p>	MIP	Closed
24/04/2025	Community Member	<p><u>Noise:</u> Resident phoned the project hotline to make a complaint about overnight works being very disruptive into the early morning affecting sleep. Resident reported smashing and banging, reversing beepers and seeing tippers and lights. Resident called back the following night reporting the same. <u>Response:</u> Resident was phoned to discuss. The project team investigated, confirming there were no overnight works at either location. Resident was sent follow up email advising of no night work activities from MIP, provided a copy of recent OOH letter notification for periodic works until June (although nothing expected for a few weeks) and suggestion to contact Council or Sydney Trains in case of any related activities.</p>	MIP	Closed
5/04/2025	Community Member	<p><u>Noise:</u> Ongoing concerns about the long-term potential of noise and potential for increased bushfire risk due to an increase in traffic accessing the intermodal terminal, cranes movements and handling of containers, once works are completed. <u>Status:</u> Stakeholder acknowledged; no response required. Note not a construction-based comment.</p>		Closed
27/03/2025	Community Member	<p><u>Noise:</u> Concerned the upcoming night works required for the Moorebank Avenue upgrade will impact residents on the Western side of Wattle Grove. <u>Response:</u> sent to stakeholder on 4/4</p>		Closed

Moorebank Intermodal Precinct Complaints Register – 2 December 2025

Date received	Complainant	Nature of complaint	Location (MIP/MARW)	Status
24/03/2025	Community Member	Traffic and disruptions: Concerns raised around ongoing roadworks including the recent Anzac Road closure between Moorebank Ave and Delfin Dr. Additionally, concerns raised around interruptions from the upgrade of underground electrical supply continuing to September 2025. Response sent to stakeholder 7 April.		Closed
17/03/2025	Community Member	MAR Construction: Complaint in agreement with prior complaint. Concern about location of Moorebank Avenue Realignment and the risks of increased noise from the precinct. Stated that noise walls were necessary for project. Response sent to stakeholder on 4/4.		Closed
17/03/2025	Community Member	MAR Construction: Concern about location of Moorebank Avenue Realignment and the risks of increased noise from the precinct. Stated that noise walls were necessary for project. Stakeholder contacted, and complaint receipt acknowledged.		Closed
9/03/2025	Community Member	MAR Construction: Concern about location of Moorebank Avenue Realignment and the risks of increased noise and bushfires from road moving to the east of the precinct. Suggested noise wall the duration of the road. Response sent to stakeholder on 11/3.		Closed
8/03/2025	Community Member	Traffic Impacts: Excessive traffic congestion on Moorebank Avenue in mornings heading north towards Liverpool. Response sent to Stakeholder on 27/3		Closed
8/03/2025	Community Member	Traffic Impacts: Excessive traffic congestion on Moorebank Avenue, Cambridge Avenue, and Canterbury Road. Two traffic light sets within MIP holding traffic. Response sent to Stakeholder on 27/3		Closed
2024 Complaints				
18/12/2024	Community Member	Building design and Visual Impact: Stakeholder from Glenfield voiced dissatisfaction with the buildings and loss of city views due to Moorebank Development. Complaint acknowledged and plantings to reduce visual impact discussed with stakeholder and complaint closed.		Closed
17/12/2024	Community Member	Vegetation management: Statement of disapproval in relation to the revegetation approach from a community member. Complaint acknowledged and possible options for improvements discussed with stakeholder		Closed
2/12/2024	Community Member	Dust: Complaint regarding airborne dust from precinct reaching property in Wattle Grove. This has required an increase in the number of times the pool needs to be cleaned. Requested improvements to dust management on site. Investigation undertaken, and property 1.76kms away from earthworks. Complaint passed to teams to ensure dust management remains a focus. Stakeholder satisfied.		Closed

Moorebank Intermodal Precinct Complaints Register – 2 December 2025

Date received	Complainant	Nature of complaint	Location (MIP/MARW)	Status
29/10/2024	Community Member	Noise: Complaint regarding noise at ABB Site. Noise linked to sandblasting at ABB site. Stakeholder provided update and link to complaint line for ABB.		Closed
28/10/2024	Community Member	Traffic: Complaint received regarding traffic stationary on Moorebank Avenue. Contractor has struck overhead wires and traffic is stopped while area made safe. Stakeholder advised of incident.		Closed
24/10/2024	Community Member	Traffic: Concerned with traffic layout of Anzac Road causing traffic build up. Request for an additional right turn lane. Stakeholder advised there is insufficient width to have two right turn lanes.		Closed
12/10/2024	Community Member	Vegetation management: Dissatisfied with quality of cut of reeds at Woolmers Court. Concern about reeds being left on ground being a fire risk. Contractors returned to site and mulched reeds. Stakeholder updated.		Closed
11/10/2024	Community Member	Vegetation management: Quality of cut of reeds at Woolmers Court. Dissatisfied with quality of cut. Concern about reeds being left on ground being a fire risk. Contractors returned to site and mulched reeds. Stakeholder updated.		Closed
19/09/2024	Community Member	Traffic: Concerned with traffic backing up on the M5 when turning onto Moorebank Avenue, wondered if there was a change to traffic conditions to cause the congestion. Investigation conducted, no change to traffic conditions on Moorebank Avenue, issue present at other M5 offramps during morning peak. Likely issue relating to wider network. Stakeholder informed and satisfied.		Closed
13/09/2024	Community Member	Follow up and dissatisfaction with outcome of pushbike accident complaint resolution. Concern with safety of designated bike route. Update sent to stakeholder regarding outcome of investigation. Work completed to standard and no claim. Item closed.		Closed
29/08/2024	Community Member	Concern surrounding extent of work, and if road construction will reach Glenfield Road roundabout. Concerns about biodiversity losses through project. Response provided with links to additional information on projects.		Closed
27/08/2024	Community Member	Question relating to how many trucks are taken off roads and how many containers have been handled each quarter. General complaint against time for Moorebank Ave project to be finished. BMD and MIP provided responses		Closed
14/08/2024	Community Member	Caller advised excessive noise from smashing containers. Requesting for the noise to stop. Does not want to speak with someone and wanting complaint to be passed on. Stakeholder contacted and acknowledged the receipt of the complaint		Closed
23/07/2024	Community member	Traffic: Community member lodged complaint about conditions of road upgrade of Moorebank Avenue, poor signage on the road, and workers on the phone not directing traffic. Stakeholder contacted and informed of investigation into traffic management and signage. Stakeholder provided update that project is inline with TfNSW approved traffic Management Plan		Closed



APPENDIX H – WEED MONITORING REPORTS

MIP BI-MONTHLY WEED MONITORING REPORT – JUNE 2025

Introduction

Arcadis has been commissioned to conduct bi-monthly weed monitoring surveys within the operational areas of Moorebank Precinct East (MPE) and Moorebank Precinct West (MPW). These areas together are known as the Moorebank Intermodal Precinct (MIP).

The MPE operational facility includes the Import and Export Terminal (IMEX), Rail Access Land Package (RALP), warehouses, distribution facilities and freight village, and stormwater trunk drainage infrastructure and landscaping areas. The MPW operational facility includes the landscaped vegetation along Bushmasters Avenue (Figure 1).

Regular monitoring of the MIP operational facilities will inform the land manager of weed cover, and the presence of any weeds listed as 'priority' for the Greater Sydney Local Land Services region under the *Biosecurity Act 2015*.

The schedule for the bi-monthly weed monitoring inspections for the 2025-26 monitoring year are detailed in Table 1. This document will be treated as live throughout the monitoring year and will be updated at the end of each inspection.

Table 1 Schedule for bi-monthly weed inspections

Inspection month	Date completed
June 2025	25/06/2025
August 2025	TBC
October 2025	TBC
December 2026	TBC
February 2026	TBC
April 2026	TBC

Background

Arcadis has been monitoring the MPE operational facility for weed occurrence since April 2020. The RALP, which includes the MPE operational RALP, has seen significant change and works over the time Arcadis has conducted weed monitoring. Additionally, works conducted in MPW in 2023/24 have changed the layout and vegetation spread in the RALP. Several weed remediation events have occurred since the inception of weed monitoring, detailed below in Table 2.

Table 2 Summary of weed events throughout monitoring history

Timing	Summary of events	Weed contractor
Spring 2020	<ul style="list-style-type: none"> Weeds removed from batters and revegetated with native species, as per the Urban Design and Landscaping Plan (UDLP) for MPE 	Spray Grass Solutions

Timing	Summary of events	Weed contractor
	<ul style="list-style-type: none"> Cumberland Plain Seeds were procured to provide technical oversight of revegetation effort 	
December 2021	<ul style="list-style-type: none"> As per recommendations from Spray Grass Solutions and Cumberland Plain Seeds, the monitoring methodology was changed Changes included reporting on cover on 'priority' weeds species and key weeds specific to the project. 	
December 2022 to June 2023	<ul style="list-style-type: none"> Weed remediation works commenced Priority weed species were targeted Native species were identified throughout the RALP to avoid accidental removal. 	P&E Services
December 2023 to present	<ul style="list-style-type: none"> Weed remediation works continued Regular maintenance of priority weed species via slashing, hand removal and herbicide spraying 	Toolijooa Environmental Restoration

Methodology

Arcadis ecologist Kate Mauger attended the MIP operational area on 25 June 2025. Monitoring involved traversing the MIP operational facility on foot, surveying landscaped areas, stormwater infrastructure and soft batters adjoining the RALP for increases in weed abundance of the identified species in Appendix A and Appendix B. The areas surveyed are presented in Figure 1.

The weather on the 25 June was windy, with a maximum temperature of 16.2°C, and the weather recorded at Holsworthy Aerodrome (station 066161) (BOM 2025).

Study Limitations

The data presented within this report is restricted to what was observed and recorded by the attending Arcadis ecologists during the site assessment on 25 June 2025.

Monitoring of weeds was restricted to the operational facility; weeds were not assessed within the bounds of the active construction areas surrounding new warehouses.

Surveys were not undertaken in areas extending beyond the junction between the QUBE RALP and the Southern Sydney Freight Line (SSFL).



- Legend
- MPW operational boundary
 - MPE operational boundary
 - Weed monitoring survey extent

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 GDA2020 MGA Zone 56
 Date issued: July 3, 2025
 Imagery: Esri

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Figure 1. Survey extent within the MPI operational facility

Results

Results of the weed monitoring surveys during the June 2025 survey are summarised below in Table 3. Weed records, previously recorded threatened flora species records, and instances of native species within the survey extent are shown in Figure 2.

Progress photographs of monitoring locations are provided in Appendix E and a complete flora species inventory in Appendix F.

Table 3 Summary of weed abundances across all inspection areas in MPI, for the current survey

Inspection area	Weed abundances for current survey	Photo of inspection area
Moorebank Precinct East (MPE)		
Rail Access Land Package (RALP)	<ul style="list-style-type: none"> • <i>Chloris gayana</i> (Rhodes Grass) and small amounts of <i>Themeda quadrivalvis</i> (Grader Grass) were removed during this inspection • Some areas of <i>Lantana camara</i> (Lantana) were slashed along the fences adjacent to the Georges River BioBank site • The southern section of the RALP, in areas that have previously experienced significant batter erosion, were being colonised intensely by <i>Tagetes minuta</i> (Stinking Roger), and were slashed during this inspection (see adjacent photo). 	

Inspection area	Weed abundances for current survey	Photo of inspection area
<p>IMEX building and adjacent drainage infrastructure</p>	<ul style="list-style-type: none">• <i>Acacia falcata</i> (Hickory Wattle) continue to grow unimpeded by weeds.	 A photograph showing an outdoor inspection area. On the left is a long, dark-colored building with a corrugated metal roof. A concrete path runs alongside the building. To the right of the path is a chain-link fence. Behind the fence, there is a small, bushy tree with yellowish-green leaves, identified in the text as Acacia falcata. The ground behind the fence appears to be a mix of dirt and sparse vegetation. The sky is clear and blue. A street light pole is visible in the distance.

Inspection area	Weed abundances for current survey	Photo of inspection area
Warehouse areas	<ul style="list-style-type: none"> • Large areas of the native <i>Cynodon dactylon</i> (Couch Grass) are present across most of these areas and is generally outcompeting weed species. • Occurrences of weeds in the warehouse area and the adjacent drainage infrastructure is restricted to scattered individuals of <i>Senecio madagascariensis</i> (Fireweed), <i>Plantago lanceolata</i> (Plantain), <i>Trifolium arvense</i> (Clover) and exotic grasses like <i>Chloris gayana</i> (Rhodes Grass), <i>Sporobolus africanus</i> (Parramatta Grass), <i>Paspalum urvillei</i> (Giant Paspalum) and <i>Ehrharta erect</i> (Panic Veldtgrass) • Majority of this area has now been claimed by the Moorebank Avenue Upgrade project. 	

Inspection area	Weed abundances for current survey	Photo of inspection area
<p>Eastern boundary drainage infrastructure</p>	<ul style="list-style-type: none"> • Drainage infrastructure dominated by <i>Bulboschoenus fluviatilis</i> (Marsh club-rush) whilst other are dominated by <i>Typha orientalis</i> (Bulrush). Where space is present between stands of these native emergent species small clumps of <i>Pericaria decipiens</i> (Slender Knotweed), <i>Daviesia ulicifolia</i>, <i>Ficinia nodosa</i> (Knotted Club-rush), <i>Carex tereticaulis</i> and <i>Juncus usitatus</i> are present. Other native species such as <i>Imperata cylindrica</i> and <i>Lomandra longifolia</i> were observed in the drainage channels. • Areas of erosion still present. 	 <p>The photograph shows an outdoor drainage area. In the foreground, there is a concrete base for a utility pole. A metal fence runs across the middle ground, with a green safety netting attached to its base. The ground is covered with dry grass and some weeds. In the background, there are trees, a utility tower, and a cloudy sky.</p>

Inspection area	Weed abundances for current survey	Photo of inspection area
Moorebank Precinct West (MPW)		
<p>Landscaped areas along Bushmasters Avenue</p>	<ul style="list-style-type: none"> • Landscapes vegetation is in good condition, with minor weed incursions • Weed species present include <i>Sonchus oleraceus</i> (Common Sowthistle), <i>Chloris virgata</i> (Rhodes Grass), <i>Bidens pilosa</i>, <i>Conyza bonariensis</i> (Fleabane), <i>Cyclosporum leptophyllum</i> (Slender Celery), and <i>Tagetes minuta</i> (Stinking Roger). • Areas with limited to no landscaped vegetation are particularly susceptible to weed incursion from cleared areas (see adjacent photo) 	



LEGEND

MPE operational boundary	Damage to native veg	Fireweed
Survey extent	Weed cover (outside Rail Link)	Golden Wreath Wattle
Areas targeted in weed remediation works in Dec 2022 & Feb 2023	Low	Paterson's Curse
None	Priority & key weeds	Red Natal Grass
Management issue	African Lovegrass	Rhodes Grass
Erosion		Fireweed
		Large-leaf Pennywort

Page 1 of 8
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 Coord System: GDA2020 MGA Zone 56
 Date issued: March 20, 2023
 Imagery: Nearmap

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Figure 2 Instances of weeds, native species and threatened flora records in the survey extent and MIP operational boundary (1 of 8)

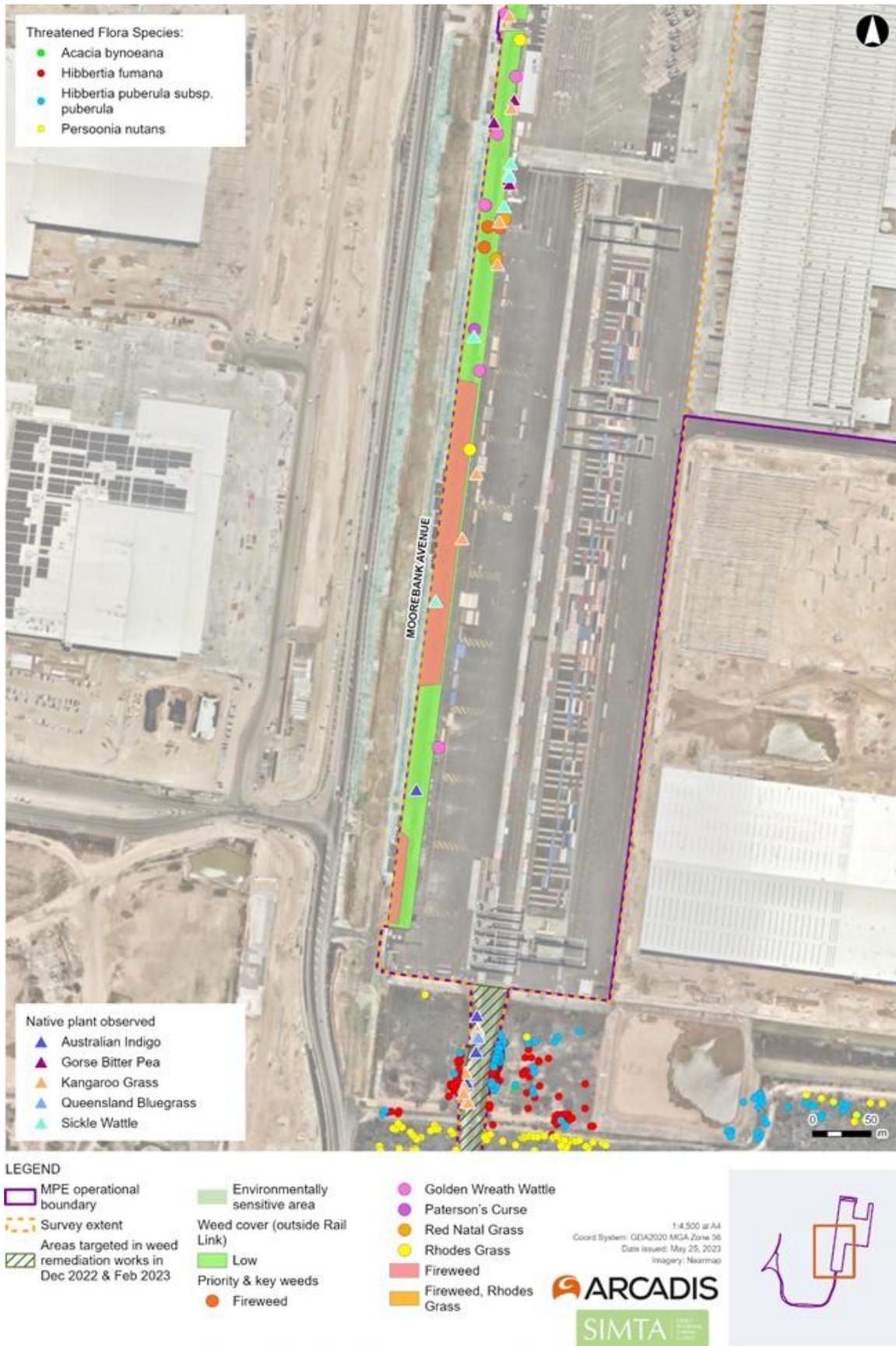


Figure 2 Instances of weeds, native species and threatened flora records in the survey extent and MIP operational boundary (2 of 8)

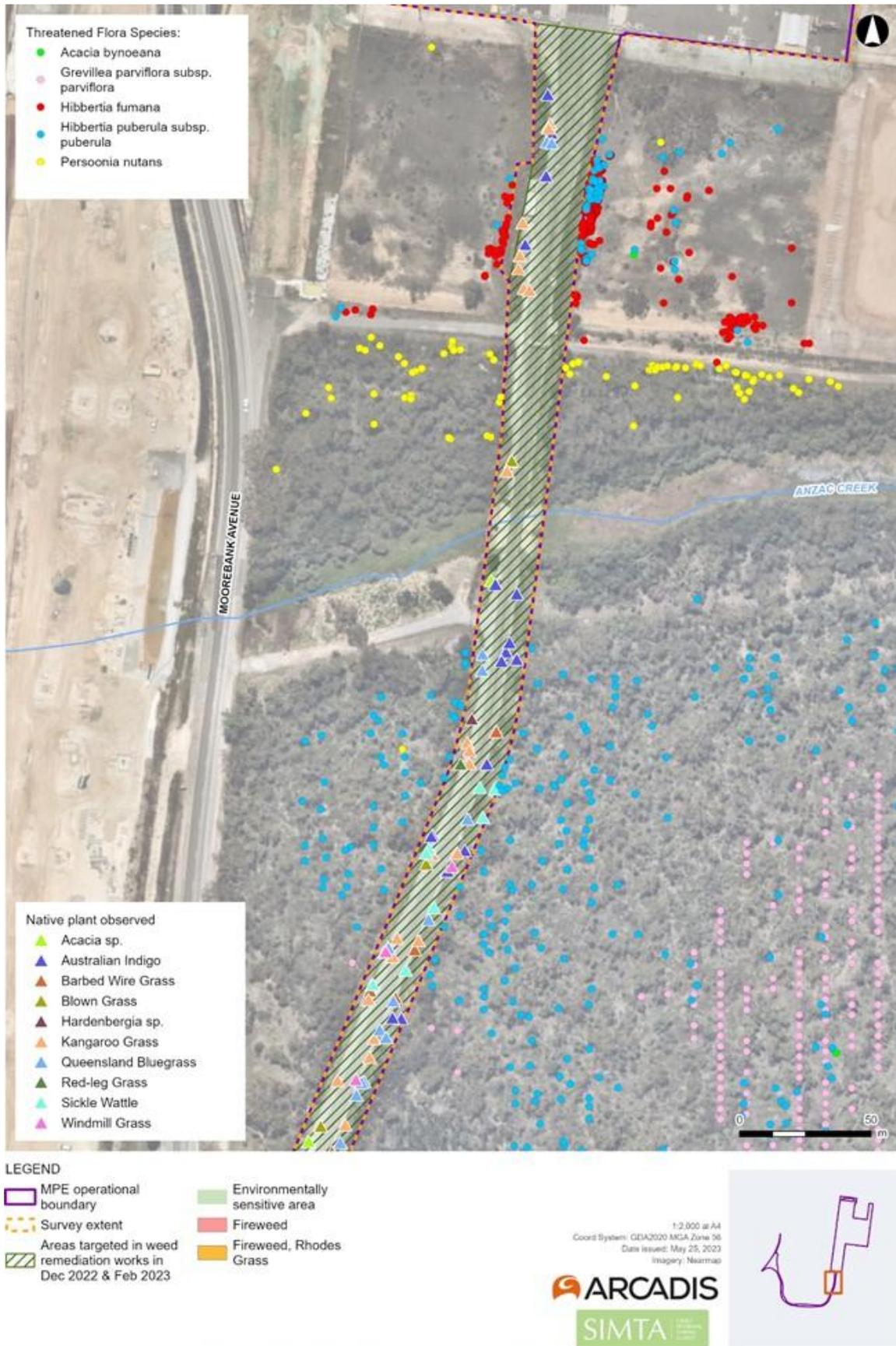


Figure 2 Instances of weeds, native species and threatened flora records in the survey extent and MIP operational boundary (3 of 8)

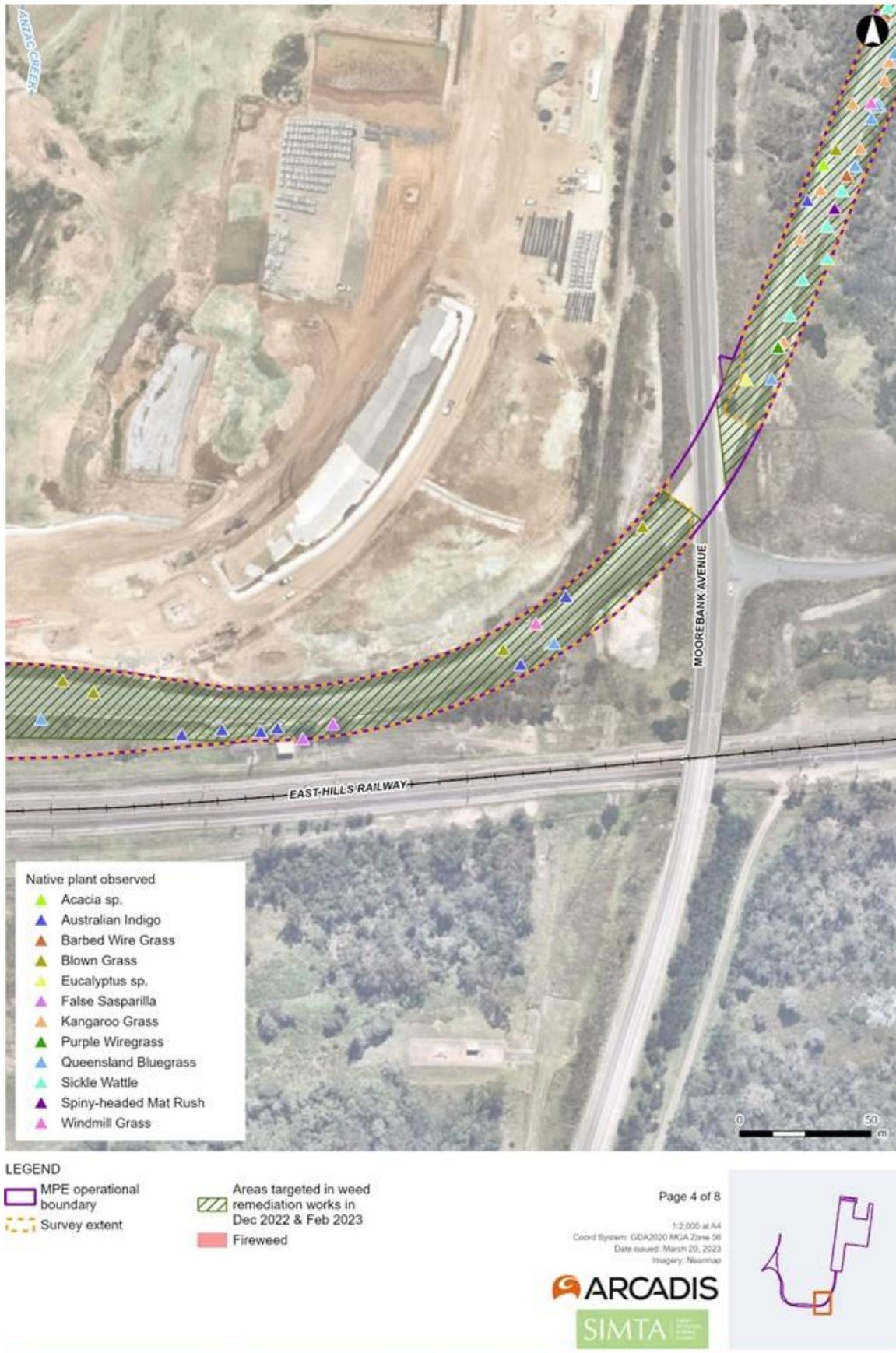
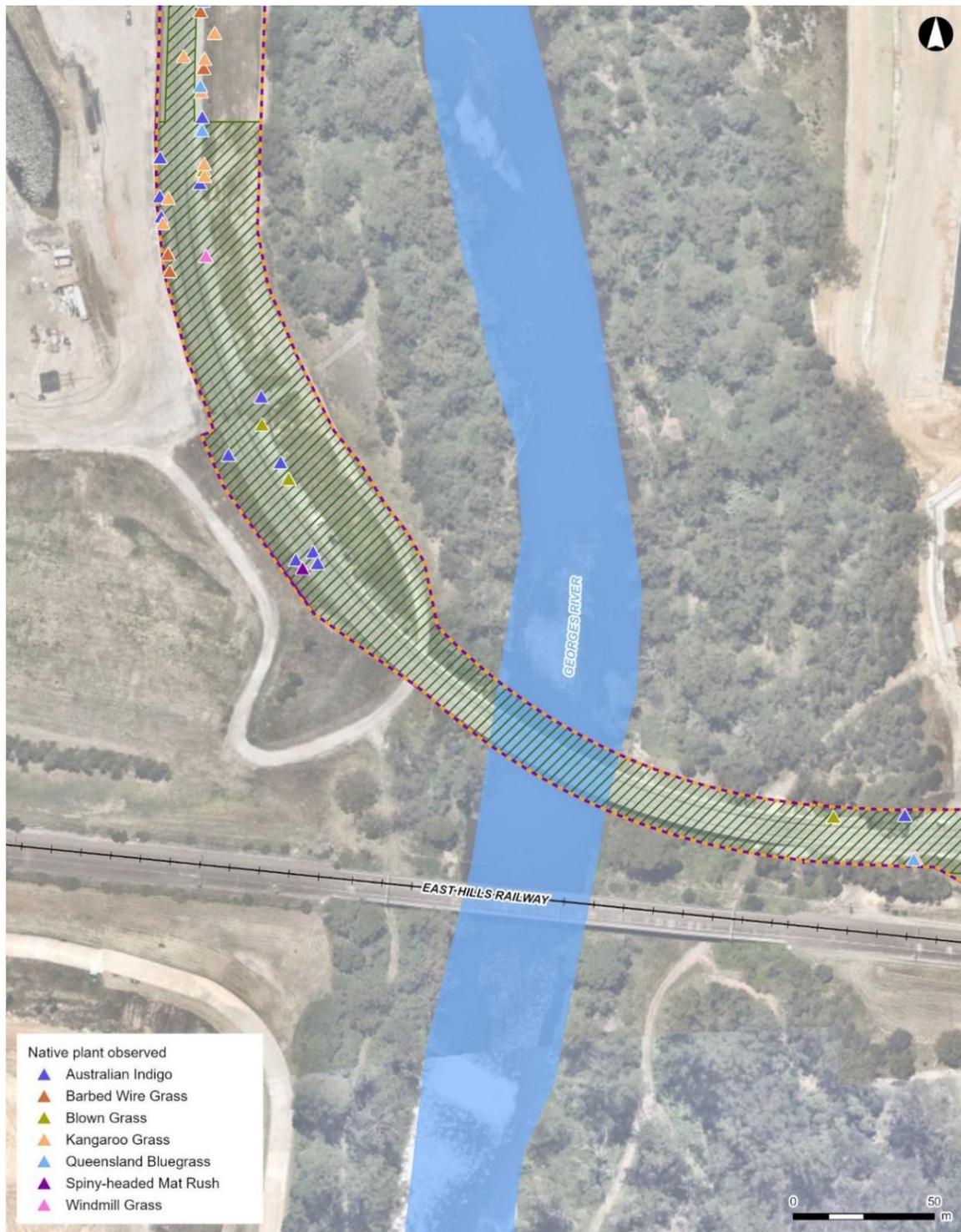


Figure 2 Instances of weeds, native species and threatened flora records in the survey extent and MIP operational boundary (4 of 8)



Figure 2 Instances of weeds, native species and threatened flora records in the survey monitoring extent and MIP operational boundary (5 of 8)



- Native plant observed**
- ▲ Australian Indigo
 - ▲ Barbed Wire Grass
 - ▲ Blown Grass
 - ▲ Kangaroo Grass
 - ▲ Queensland Bluegrass
 - ▲ Spiny-headed Mat Rush
 - ▲ Windmill Grass
- LEGEND**
- ▭ MPE operational boundary
 - ▭ Areas targeted in weed remediation works in Dec 2022 & Feb 2023
 - ▭ Survey extent

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 Date issued: March 20, 2023
 Imagery: Nearmap



Figure 2 Instances of weeds, native species and threatened flora records in the survey extent and MIP operational boundary (6 of 8)

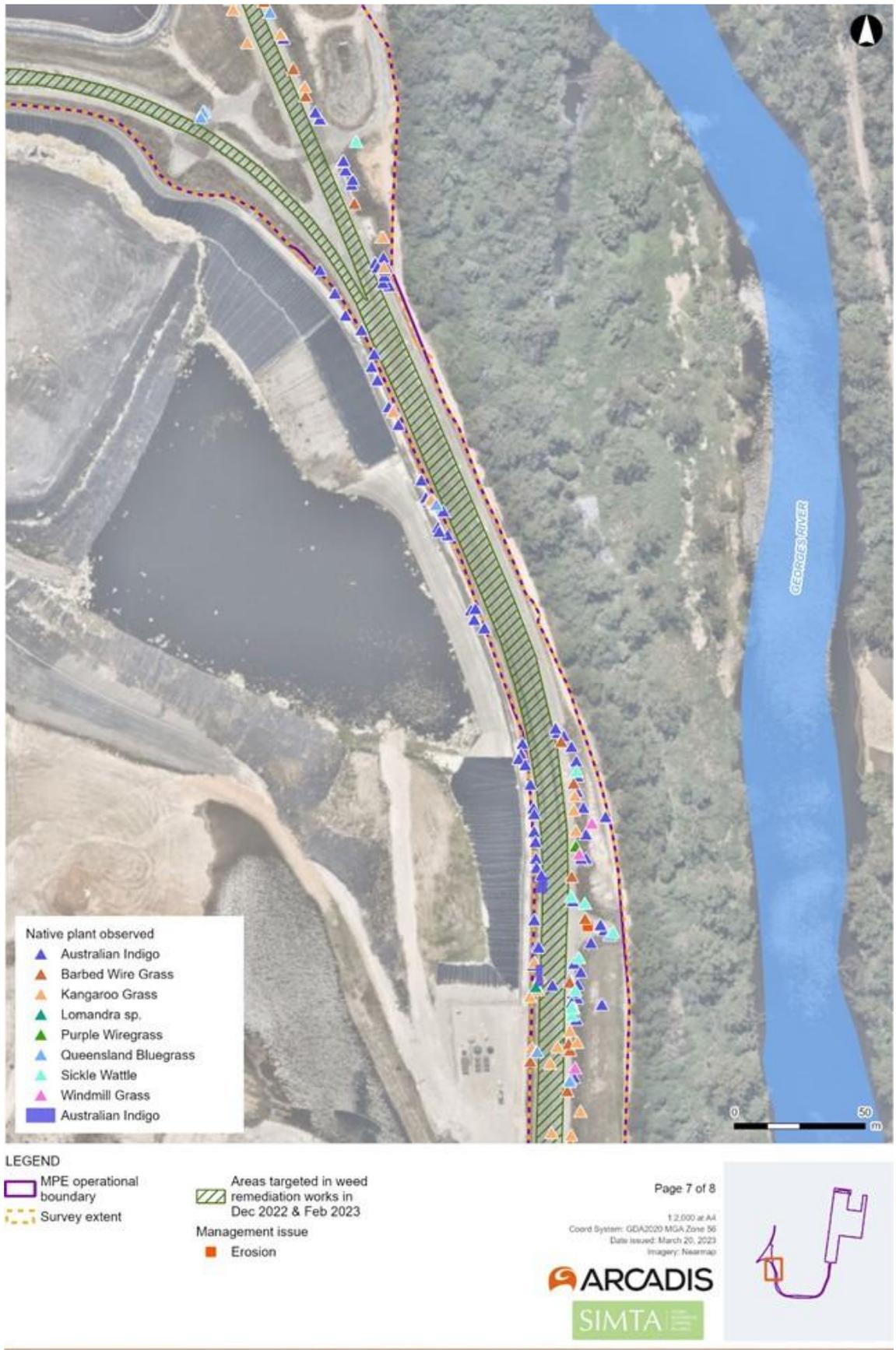
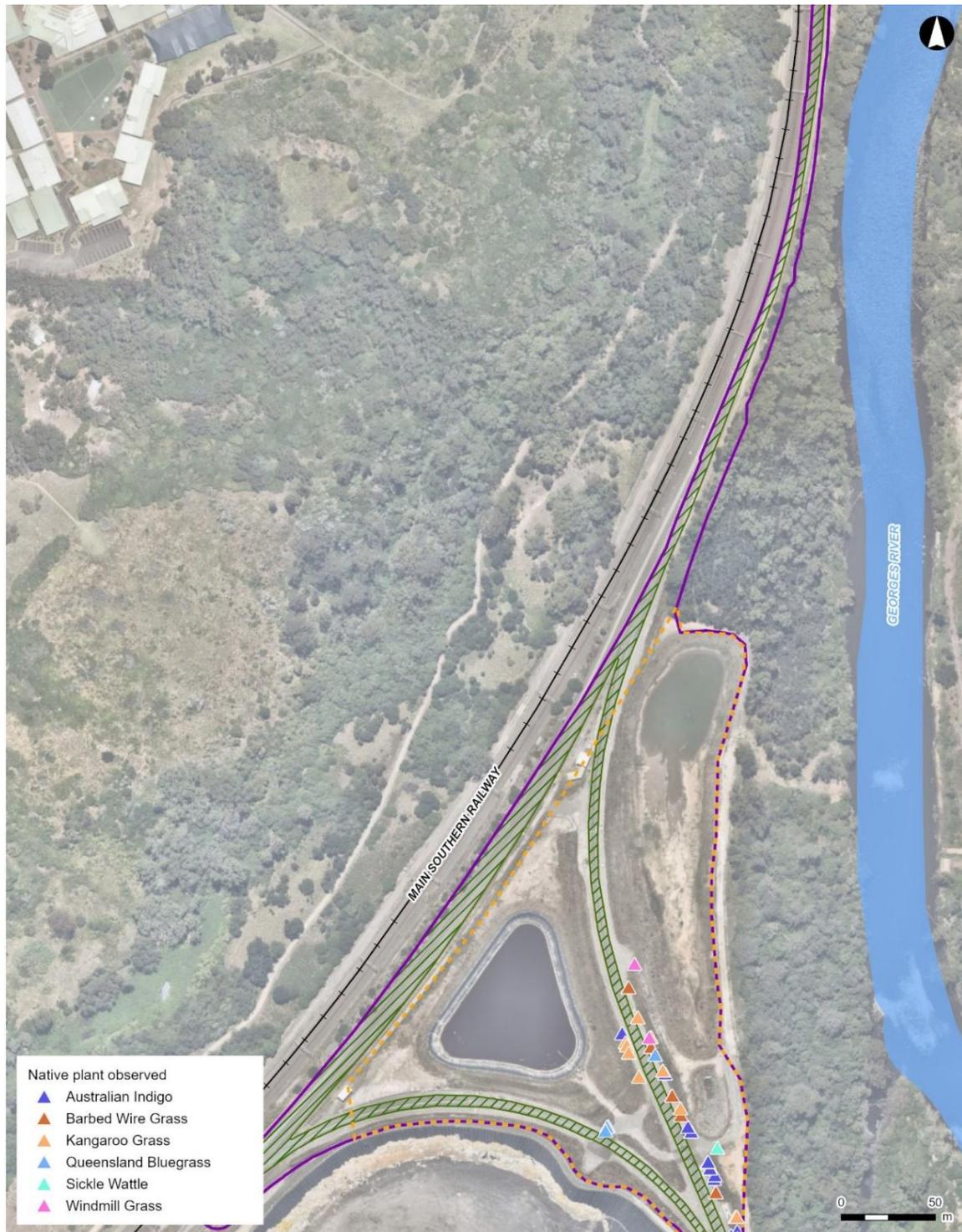


Figure 2 Instances of weeds, native species and threatened flora records in the survey extent and MIP operational boundary (7 of 8)



- Native plant observed
- ▲ Australian Indigo
 - ▲ Barbed Wire Grass
 - ▲ Kangaroo Grass
 - ▲ Queensland Bluegrass
 - ▲ Sickle Wattle
 - ▲ Windmill Grass

LEGEND

- ▭ MPE operational boundary
- ▭ Areas targeted in weed remediation works in Dec 2022 & Feb 2023
- ▭ Survey extent

Page 8 of 8

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 Coord System: GDA2020 MGA Zone 56
 Date issued: March 20, 2023
 Imagery: Nearmap



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Figure 2 Instances of weeds, native species and threatened flora records in the survey extent and MIP operational boundary (8 of 8)

Recommendations

Weed monitoring and weed remediation works should continue throughout the 2025/26 monitoring year. Table 4 summarises the recommendations for weed remediation within the MIP. Additionally, the weed remediation works being conducted by Toolijooa in the RALP have been compared against the criteria in Appendix C and are considered to be consistent.

Recommended actions documented in previous weed monitoring reports are included in Appendix D. The catalogue has been reviewed and updated to reflect works which have been completed and is considerate of the revegetation methodology proposed by Spray Grass Solutions and Cumberland Plain Seeds.

Table 4 Recommended actions for weed remediation in the MIP

Area	Recommendation
All areas	<ul style="list-style-type: none"> Targeted weed remediation to continue during the 2025/26 monitoring year and is to be conducted using the same methods and at the same locations as previously conducted
Rail Access Land Package (RALP)	<ul style="list-style-type: none"> Weed remediation works will focus on controlling priority and key weed species (Appendix A and Appendix B)
	<ul style="list-style-type: none"> Suppression of environmental weeds and encroachment into areas of bushland should occur where possible
	<ul style="list-style-type: none"> Hand weeding should be conducted for individuals, whereas slashing and herbicide spraying should be adopted to target larger patches of weeds. However, extreme care must be taken when conducting any weed management within the RALP, as many native grasses have become established Hand weeding is only feasible on annual species such as <i>Themeda quadrivalvis</i> (Grader Grass) and <i>Senecio madagascariensis</i> (Fireweed) due to their relatively small root system
	<ul style="list-style-type: none"> Contractors should identify the extent of the works zone and discuss 'No Go' zones with all involved in the works. Weeding must be restricted to identified weeds and native species to be retained should be identified prior to works commencing
	<ul style="list-style-type: none"> Priority and aggressive weed species outside revegetated RALP areas should be removed. Weeds that should be targeted include <i>Senecio madagascariensis</i> (Fireweed)
	<ul style="list-style-type: none"> Large patches of <i>Eragrostis curvula</i> (African Lovegrass), <i>Chloris gayana</i> (Rhodes Grass) and <i>Themeda quadrivalvis</i> (Grader Grass) between the RALP and the East Hills train line should be slashed regularly to prevent seeding events (Figure 2 (5 of 8)). This will reduce the colonisation of these grasses into revegetation areas Slashing should only occur when plants are not seeding to prevent further spread. As more native species become established in these areas, slashing may impact their growth; therefore, non-targeted slashing should be avoided Application of herbicide within the RALP and in areas adjacent to the Moorebank biobank site should be conducted to prevent overspray (off-target poisoning). If herbicide application occurs, recommended herbicides for tussock grass, <i>Chloris gayana</i> (Rhodes Grass) and <i>Eragrostis curvula</i> (African Lovegrass), include glyphosate or flupropanate, while plants are actively growing during summer and spring. Native vegetation outside the

Area	Recommendation
	<p>RALP fence must not be impacted by herbicide during weed remediation works</p> <ul style="list-style-type: none"> • No herbicide spraying should be conducted outside the RALP, specifically adjacent to ecologically sensitive areas south of the MPE Operational facility (Figure 2). Manual weed remediation works in ecologically sensitive areas should not extend beyond the construction envelope of the RALP. If further clarification is necessary, the project ecologist should be consulted <hr/> <ul style="list-style-type: none"> • Batters that currently have limited vegetation cover should be colonised by a native seed mix as soon as practical. This will ensure that these areas are not colonised by weed species and will further reduce erosion during heavy rainfall events <hr/> <ul style="list-style-type: none"> • Continue to collect litter from within the RALP and in adjacent areas
IMEX building and adjacent drainage infrastructure	<ul style="list-style-type: none"> • Soft batters within the trunk drainage system and retention basin/swale at the north-eastern extent of the facility should be inspected for weed growth. Weed levels should be controlled through herbicide application, slashing and hand weeding. Weed remediation works should be conducted in accordance with the approved Weed Management Plan
Warehouse areas	<ul style="list-style-type: none"> • Weed levels should be controlled through herbicide application, slashing and hand weeding. Weed remediation works should be conducted in accordance with the approved Weed Management Plan
Eastern boundary drainage infrastructure	<ul style="list-style-type: none"> • Weed levels should be controlled through herbicide application, slashing and hand weeding. Weed remediation works should be conducted in accordance with the approved Weed Management Plan • Erosion in the drainage infrastructure should be controlled by planting additional native ground cover species to maintain batters during heavy rainfall events
Landscaped areas along Bushmasters Avenue	<ul style="list-style-type: none"> • Continued maintenance of these landscaped areas should be maintained at a frequency that does not increase the current abundance of identified weed species. This is pertinent for areas where landscaped species have died back, and bare ground is more abundant • Areas adjacent to cleared areas in the MPW operational area should be sprayed for weeds to limited the potential for spreading

References

Arcadis (2019a) Urban Design and Landscape Plan. Moorebank Precinct East Stage 1

Arcadis (2019b) Operational Flora and Fauna Management Plan. Moorebank Logistics Park – East Precinct

Arcadis (2019c) Landscape Vegetation Management Sub Plan. Moorebank Precinct East Stage 2

Arcadis (2020) MPE Operational – Weed Monitoring Report December 2020

Arcadis (2020) Urban Design and Landscape Plan. Moorebank Precinct East Stage 2

Bureau of Meteorology (BOM) (2021) Climate Data Online. Weather and Climate: Holsworthy Aerodrome NSW (station 066161) <http://www.bom.gov.au/climate/dwo/IDCJDW2161.latest.shtml>

NSW Department of Primary Industries (DPI) (accessed 2021) NSW WeedWise. priority weeds for the Greater Sydney. <https://weeds.dpi.nsw.gov.au/WeedBiosecurities?AreaId=3>

APPENDIX A PRIORITY WEED PROFILES



Lantana (*Lantana camara*)



Fireweed (*Senecio madagarsensis*)



Alligator Weed (*Alternanthera philoxeroides*)



African Olive (*Olea europea* subsp. *cuspidata*)



Lantana (*Lantana camara*)



Fireweed (*Senecio madagarsensis*)



Bridal Creeper (*Asparagus asparagoides*)



Peruvian Primrose (*Ludwigia peruviana*)

APPENDIX B KEY WEED PROFILES



Rhodes Grass (*Chloris gayana*)



African Love Grass (*Eragrostis curvula*)



Patterson's Curse (*Echium planteganium*)



Coolatai Grass (*Hyparrhenia hirta*)



Grader Grass (*Themeda quadrivalvis*)



Red Natal Grass (*Melinis repens*)

APPENDIX C WEED REMEDIATION WORKS TRACKING

Priority	Action	Action description	Current performance assessment
1	Eradicate 'priority' weeds	Target 'priority' weed species through manual removal and herbicide treatment. Herbicide application should consider timing (i.e., applying herbicide when weeds are actively growing) and best practice methodologies. Areas outlined by coloured polygons in Figure 2 should be prioritised.	One priority weed species are present within the RALP: <i>Senecio madagascariensis</i> (Fireweed). These should be removed as a priority. Progress has been made through remediation works within the RALP. Continued management must be undertaken to work towards eradication.
2	Removal of key and aggressive weed species	Key weed species, including African Lovegrass, Rhodes Grass, Paterson's Curse, Coolatai Grass and Grader Grass, should be removed from revegetated areas of soft batter. Aggressive weed species, including Moth Vine and Castor Oil Plant, should be removed from all operational areas using a combination of manual and herbicide control. Areas outlined by coloured polygons in Figure 2 should be prioritised.	Key weed species, including Rhodes Grass, African Lovegrass, Coolatai Grass, Paterson's Curse, and Grader Grass, are colonising soft batters in the RALP. These weeds should be removed. Progress has been made through remediation works within the RALP. Continued management must be undertaken to work towards eradication.
3	Suppress further colonisation of environmental weeds and encroachment into areas of bushland	Control of exotic species adjacent to the biobank site and ecologically sensitive areas. Manual removal should be adopted in areas adjacent to threatened flora locations. Areas outlined by coloured polygons in Figure 2 should be prioritised.	Weed growth is stabilising through continued weed management on soft batters adjacent to the biobank site and ecologically sensitive areas. Manual removal, including routine slashing, is being used to prevent present weeds from reaching seeding maturity and further encroaching on adjacent high-value areas (biobank site and ecologically sensitive areas containing threatened plant species). All works should be restricted to the operational area and not extend into the biobank site or identified ecologically sensitive areas. Slashing should only be conducted when weed species are not in flower to prevent further spread. Appropriate slashing time is during winter for most species.

Priority	Action	Action description	Current performance assessment
4	Slashing of invasive grasses to prevent seeding.	Management of invasive grasses such as Rhodes Grass and African Love Grass through regular mowing or slashing. Areas outlined by coloured polygons in Figure 2 should be prioritised.	<p>Slashing has been adopted to manage the regrowth of invasive grasses (African Lovegrass, Grader Grass) within the RALP in ballast and gravel areas. Some areas beyond the Georges River bridge are yet to be managed.</p> <p>Slashing should be used to manage large expanses of exotic grassland to prevent seeding events. However, as native grasses become established, extreme care must be taken, and indiscriminate slashing must be avoided. A contractor with knowledge of native species should be employed to carry out this task, in failing that, an ecologist should be on site to monitor weed remediation.</p>
5	Reduce cover of weeds within the RALP	Reduction of weed cover by applying control methods commensurate with the Operational Flora and Fauna Management Plan (Arcadis 2019).	<p>Works should involve targeted slashing of mature plants and removing flowering and seed heads to minimise seeding. Targeted slashing has been previously employed to control weed colonisation on soft batters. However, it must be continued to limit the re-colonisation of weeds within the RALP.</p> <p>Future weed control actions will focus on removing and reducing the cover of priority and key weed species and suppressing the further colonisation of common weeds, which is consistent with the rehabilitation methodology proposed by Spray Grass Solutions and Cumberland Plain Seeds.</p>
6	Remove herbaceous and woody weeds within the operational area and trunk drainage infrastructure.	Reduction in herbaceous and woody weeds by applying control methods commensurate with the Operational Flora and Fauna Management Plan (Arcadis 2019)	Weed cover has generally remained low within trunk drainage infrastructure and at the north-eastern extent of the MIP East operational facility.

APPENDIX D RECOMMENDED ACTIONS CATALOGUE

Month of logging	Recommended action	Status (Not started, Commenced, Complete)	Comments
April 2020	Eradicate priority weeds species, including Bridal Creeper, Alligator Weed, Lantana, Fireweed and African Olive	Completed	Most instances of these weeds have been removed from the RALP. Small instances of Fireweed occur, however these are being managed by the current weed remediation works within the RALP.
April 2020	Remove key and aggressive weed species within RALP, including Golden Wreath Wattle, Moth Vine, Castor Oil Plant, Small-leafed Privet, Grader Grass and Balloon Vine	Commenced	Grader Grass has been observed colonising remediated areas within the RALP. This species should be removed to prevent further colonisation and infestations. Golden Wreath Wattle, Moth Vine and Castor Oil Plant on the southern side of the RALP in the area between the operational boundary and the East Hills line rail corridor. Consideration should be given to the management of these areas to reduce encroachment into recently remediated areas.
June 2020	Planning should commence to revegetate soft batters and un-developed areas within the MPE operational facility with native species in accordance with the approved Urban Design and Landscaping Plan (Arcadis 2019a, Arcadis 2020)	Commenced	Revegetation has commenced for remediated areas using a hydro-mulch containing a seed palette commensurate with the UDLP (Arcadis 2020). Previous instances of native seed setting have been colonized by weed species within the RALP and should be cleared and re-set with a native seed mix as soon as practical.
December 2020	Exotic species, specifically <i>Medicago polymorpha</i> (Burr Medic), should be removed from grassland on either side of the RALP at its eastern extent, closest to the operational area.	Commenced	Targeted manual removal, including slashing, has been conducted for exotic species outside the RALP fencing. A qualified bush regeneration contractor should be used to avoid impacts on

Month of logging	Recommended action	Status (Not started, Commenced, Complete)	Comments
			native species. Strictly no herbicide should be used in this area, and works should not extend beyond the RALP construction envelope. Where possible, contractors should not access/pass through adjacent areas.
December 2021	Collect litter scattered through the RALP and in adjacent areas	Commenced	Litter remains in the RALP and adjacent areas.
December 2021	Control aggressive weed species Coolatai Grass and Paterson's Curse within the RALP	Commenced	New instances of aggressive weed species Coolatai Grass and Paterson's Curse within the RALP should be removed as soon as practicable to avoid the spread of these species into ecologically sensitive areas adjacent to the RALP.
February 2022	Continued targeted slashing of woody and herbaceous weeds within the RALP.	Completed	Majority of large woody weeds have been removed from the RALP. Continue regular slashing of large woody weeds to remove the fertile seed head and discourage further germination of these weeds within the RALP should occur.
December 2022	Prioritise weed remediation works for priority and key weed species which have experienced accelerated growth in recent months.	Commenced	Areas of particularly high biomass of priority and key weed species should be prioritised for weed remediation works in coming months to avoid mass seeding events.
	Begin remediation of soft batters which have slipped following extreme rainfall events in recent weeks	Not started	Areas within the operational facility, including a number of areas within the RALP, require urgent batter remediation in areas of batter slipping.
December 2022	Begin weed remediation of gravel and ballast areas along RALP	Commenced	Removal of all vegetation in gravel and ballast areas due along RALP using slashing and

Month of logging	Recommended action	Status (Not started, Commenced, Complete)	Comments
			herbicide due to safety concerns of train operators and prevent spread of weeds.
December 2022	Continue weed remediation works along the soft batters within the RALP.	Commenced	Future weed remediation works should include targeted slashing and spraying of priority and key weed species, whilst avoiding native species by hand weeding within a one metre buffer zone of native individuals.
February 2023	Continue weed remediation works along the soft batters within the RALP beyond Georges River bridge.	Commenced	Future weed remediation works should include targeted slashing and spraying of priority and key weed species, whilst avoiding native species by hand weeding within a one metre buffer zone of native individuals.
April 2023	No weed remediation has occurred since February 2023. Expected to recommence in June 2023, in same areas that have previously been remediated.	Commenced	Future weed remediation works should include targeted slashing and spraying of priority and key weed species, whilst avoiding native species by hand weeding within a one metre buffer zone of native individuals.
June 2023	Continue weed remediation works along the soft batters within the RALP	Commenced	Future weed remediation works should include targeted slashing and spraying of priority and key weed species, whilst avoiding native species by hand weeding within a one metre buffer zone of native individuals.
December 2023	Toolijooa Environmental Restoration inducted as primary weed control contractors. Weed remediation recommenced throughout the RALP	Commenced	Future weed remediation works should include targeted slashing and spraying of priority and key weed species, whilst avoiding native species by hand weeding within a one metre buffer zone of native individuals.

APPENDIX E REMEDIATION PROGRESS PHOTOGRAPHS



April 2021



December 2023



June 2025



April 2021



December 2023



June 2025



April 2021



December 2023



June 2025



April 2021



December 2023



June 2025



April 2021



December 2023



June 2025



April 2021



December 2023



June 2025



April 2021



December 2023



June 2025

APPENDIX F FLORA SPECIES INVENTORY

Scientific name	Common name	Exotic	Priority/key weed
<i>Acacia falcata</i>	Hickory Wattle		
<i>Acacia parramattensis</i>	Parramatta Wattle		
<i>Acacia saligna</i>	Golden Wreath Wattle	*	
<i>Alternanthera philoxeroides</i>	Alligator weed	*	Priority
<i>Alternanthera pungens</i>	Khaki Weed	*	
<i>Araujia sericifera</i>	Moth Vine	*	
<i>Asparagus asparagoides</i>	Bridal Creeper	*	Priority
<i>Atriplex semibaccata</i>	Creeping Saltbush		
<i>Austrodanthonia spp.</i>	-		
<i>Avena spp.</i>	Oats	*	
<i>Bidens pilosa</i>	Cobbler's Pegs	*	
<i>Brassica rapa</i>	Field Mustard	*	
<i>Briza maxima</i>	Quaking Grass	*	
<i>Briza minor</i>	Shivery Grass	*	
<i>Cenchrus clandestinus</i>	Kikuyu Grass	*	
<i>Centaureum spp.</i>	-	*	
<i>Chloris gayana</i>	Rhodes Grass	*	Key
<i>Chloris truncata</i>	Windmill Grass		
<i>Cirsium vulgare</i>	Spear Thistle	*	
<i>Convolvulus erubescens</i>	Pink Bindweed		
<i>Conyza bonariensis</i>	Flaxleaf Fleabane	*	
<i>Cyclosporum leptophyllum</i>	Slender Celery	*	
<i>Cynodon dactylon</i>	Common Couch		
<i>Cymbopogon refractus</i>	Barbed Wire Grass		
<i>Cyperus eragrostis</i>	Umbrella Sedge	*	
<i>Daviesia ulicifolia</i>	Gorse Bitter Pea		
<i>Dichanthium sericeum</i>	Queensland Bluegrass		
<i>Dichondra repens</i>	Kidney Weed		
<i>Echium plantagineum</i>	Paterson's Curse	*	Key
<i>Eragrostis brownii</i>	Brown's Lovegrass		
<i>Eragrostis curvula</i>	African Lovegrass	*	Key
<i>Euchiton spp.</i>	-		
<i>Ficinia nodosa</i>	Knobby Club-rush		
<i>Foeniculum vulgare</i>	Fennel	*	
<i>Glycine clandestina</i>	-		

Scientific name	Common name	Exotic	Priority/key weed
<i>Hardenbergia violacea</i>	False Sarsaparilla		
<i>Hypochoeris radicata</i>	Catsear	*	
<i>Indigofera australis</i>	Australian Indigo		
<i>Juncus usitatus</i>	-		
<i>Lantana camara</i>	Lantana	*	Priority
<i>Lachnagrostis filiformis</i>	Blown Grass		
<i>Lactuca serriola</i>	Prickly Lettuce	*	
<i>Linum trigynum</i>	French Flax	*	
<i>Lolium perenne</i>	Perennial Ryegrass	*	
<i>Lomandra longifolia</i>	Spiny-headed Mat-rush		
<i>Lysimachia arvensis</i>	Scarlet Pimpernel	*	
<i>Ludwigia peruviana</i>	Peruvian water primrose	*	Priority
<i>Medicago polymorpha</i>	Burr Medic	*	
<i>Melilotus alba</i>	Bokhara	*	
<i>Melinis repens</i>	Red Natal Grass	*	Key
<i>Modiola caroliniana</i>	Red-flowered Mallow	*	
<i>Olea europaea subsp. cuspidate</i>	African Olive	*	Priority
<i>Paspalum dilatatum</i>	Paspalum	*	
<i>Persicaria decipiens</i>	Slender Knotweed		
<i>Phytolacca octandra</i>	Inkweed	*	
<i>Plantago lanceolata</i>	Lamb's Tongues	*	
<i>Portulaca oleracea</i>	Common Purslane		
<i>Rumex crispus</i>	Curled Dock	*	
<i>Senecio madagascariensis</i>	Fireweed	*	Priority
<i>Setaria parviflora</i>	-	*	
<i>Sida rhombifolia</i>	Paddy's Lucerne	*	Key
<i>Solanum nigrum</i>	Black-berry Nightshade	*	
<i>Solanum sisymbriifolium</i>		*	
<i>Sonchus oleraceus</i>	Common Sowthistle	*	
<i>Tagetes minuta</i>	Stinking Roger	*	
<i>Themeda quadrivalvis</i>	Grader Grass	*	Key
<i>Themeda triandra</i>	-		
<i>Trifolium arvense</i>	Haresfoot Clover	*	
<i>Trifolium repens</i>	White Clover	*	
<i>Trifolium michelianum</i>	Bolansa Clover	*	
<i>Verbena bonariensis</i>	Purpletop	*	

Scientific name	Common name	Exotic	Priority/key weed
<i>Verbena rigida</i> var. <i>Rigida</i>	Veined Verbena	*	

MIP BI-MONTHLY WEED MONITORING REPORT – AUGUST 2025

Introduction

Arcadis has been commissioned to conduct bi-monthly weed monitoring surveys within the operational areas of Moorebank Precinct East (MPE) and Moorebank Precinct West (MPW). These areas together are known as the Moorebank Intermodal Precinct (MIP).

The MPE operational facility includes the Import and Export Terminal (IMEX), Rail Access Land Package (RALP), warehouses, distribution facilities and freight village, and stormwater trunk drainage infrastructure and landscaping areas. The MPW operational facility includes the landscaped vegetation along Bushmasters Avenue (Figure 1).

Regular monitoring of the MIP operational facilities will inform the land manager of weed cover, and the presence of any weeds listed as 'priority' for the Greater Sydney Local Land Services region under the *Biosecurity Act 2015*.

The schedule for the bi-monthly weed monitoring inspections for the 2025-26 monitoring year are detailed in Table 1. This document will be treated as live throughout the monitoring year and will be updated at the end of each inspection.

Table 1 Schedule for bi-monthly weed inspections

Inspection month	Date completed
June 2025	25/06/2025
August 2025	27/08/2025
October 2025	TBC
December 2026	TBC
February 2026	TBC
April 2026	TBC

Background

Arcadis has been monitoring the MPE operational facility for weed occurrence since April 2020. The RALP, which includes the MPE operational RALP, has seen significant change and works over the time Arcadis has conducted weed monitoring. Additionally, works conducted in MPW in 2023/24 have changed the layout and vegetation spread in the RALP. Several weed remediation events have occurred since the inception of weed monitoring, detailed below in Table 2.

Table 2 Summary of weed events throughout monitoring history

Timing	Summary of events	Weed contractor
Spring 2020	<ul style="list-style-type: none"> Weeds removed from batters and revegetated with native species, as per the Urban Design and Landscaping Plan (UDLP) for MPE 	Spray Grass Solutions

Timing	Summary of events	Weed contractor
	<ul style="list-style-type: none"> Cumberland Plain Seeds were procured to provide technical oversight of revegetation effort 	
December 2021	<ul style="list-style-type: none"> As per recommendations from Spray Grass Solutions and Cumberland Plain Seeds, the monitoring methodology was changed Changes included reporting on cover on 'priority' weeds species and key weeds specific to the project. 	
December 2022 to June 2023	<ul style="list-style-type: none"> Weed remediation works commenced Priority weed species were targeted Native species were identified throughout the RALP to avoid accidental removal. 	P&E Services
December 2023 to present	<ul style="list-style-type: none"> Weed remediation works continued Regular maintenance of priority weed species via slashing, hand removal and herbicide spraying 	Toolijooa Environmental Restoration

Methodology

Arcadis ecologist Kate Mauger attended the MIP operational area on 27 August 2025. Monitoring involved traversing the MIP operational facility on foot, surveying landscaped areas, stormwater infrastructure and soft batters adjoining the RALP for increases in weed abundance of the identified species in Appendix A and Appendix B. The areas surveyed are presented in Figure 1.

The weather on the 27 August was cloudy, with a maximum temperature of 20.3°C, and the weather recorded at Holsworthy Aerodrome (station 066161) (BOM 2025).

Study Limitations

The data presented within this report is restricted to what was observed and recorded by the attending Arcadis ecologists during the site assessment on 27 August 2025.

Monitoring of weeds was restricted to the operational facility; weeds were not assessed within the bounds of the active construction areas surrounding new warehouses or other infrastructure.

Surveys were not undertaken in areas extending beyond the junction between the QUBE RALP and the Southern Sydney Freight Line (SSFL).



- Legend
- MPW operational boundary
 - MPE operational boundary
 - Weed monitoring survey extent

1:15,000 at A4
 GDA2020 MGA Zone 56
 Date issued: July 3, 2025
 Imagery: Esri

C:\Users\emaz4669\ARCADIS\30228596 - Moorebank Logistics Precinct 2 - 02 GIS\A_Current\B_Maps\Ecology\MPE_OperationalMonitoring\2022\WeedMonitoring_2022_v2.aprx
 Created by : EM Updated by : QA by : NB

Figure 1. Survey extent within the MPI operational facility

Results

Results of the weed monitoring surveys during the August 2025 survey are summarised below in Table 3. Weed records, previously recorded threatened flora species records, and instances of native species within the survey extent are shown in Figure 2.

Progress photographs of monitoring locations are provided in Appendix E and a complete flora species inventory in Appendix F.

Table 3 Summary of weed abundances across all inspection areas in MPI, for the current survey

Inspection area	Weed abundances for current survey	Photo of inspection area
Moorebank Precinct East (MPE)		
Rail Access Land Package (RALP)	<ul style="list-style-type: none"> • Weed growth has been slow since June 2025 inspection • Small instances of Fireweed slashed • Steep areas along berms are being avoided for slashing due to safety concerns. Additionally, the small amounts of exotic vegetation are currently stabilising these berms, and will be targeted once construction is finalised in the MPW areas. 	

Inspection area	Weed abundances for current survey	Photo of inspection area
<p>IMEX building and adjacent drainage infrastructure</p>	<ul style="list-style-type: none">• <i>Acacia falcata</i> (Hickory Wattle) continue to grow unimpeded by weeds.	

Inspection area	Weed abundances for current survey	Photo of inspection area
Warehouse areas	<ul style="list-style-type: none"> • Large areas of the native <i>Cynodon dactylon</i> (Couch Grass) are present across most of these areas and is generally outcompeting weed species. • Occurrences of weeds in the warehouse area and the adjacent drainage infrastructure is restricted to scattered individuals of <i>Senecio madagascariensis</i> (Fireweed), <i>Plantago lanceolata</i> (Plantain), <i>Trifolium arvense</i> (Clover) and exotic grasses like <i>Chloris gayana</i> (Rhodes Grass), <i>Sporobolus africanus</i> (Parramatta Grass), <i>Paspalum urvillei</i> (Giant Paspalum) and <i>Ehrharta erect</i> (Panic Veldtgrass) • Majority of this area has now been claimed by the Moorebank Avenue Upgrade project. 	

Inspection area	Weed abundances for current survey	Photo of inspection area
<p>Eastern boundary drainage infrastructure</p>	<ul style="list-style-type: none"> • Drainage infrastructure dominated by <i>Bulboschoenus fluviatilis</i> (Marsh club-rush) whilst other are dominated by <i>Typha orientalis</i> (Bulrush). Where space is present between stands of these native emergent species small clumps of <i>Pericaria decipiens</i> (Slender Knotweed), <i>Daviesia ulicifolia</i>, <i>Ficinia nodosa</i> (Knotted Club-rush), <i>Carex tereticaulis</i> and <i>Juncus usitatus</i> are present. Other native species such as <i>Imperata cylindrica</i> and <i>Lomandra longifolia</i> were observed in the drainage channels. • Areas of erosion still present. 	 <p>The photograph shows an outdoor drainage infrastructure site. In the foreground, there is a concrete base for a utility pole. A metal fence runs across the middle ground, with a green safety netting attached to its base. The ground is covered with dry grass and some weeds. In the background, there are trees, a utility tower, and a building under a cloudy sky.</p>

Inspection area	Weed abundances for current survey	Photo of inspection area
Moorebank Precinct West (MPW)		
<p>Landscaped areas along Bushmasters Avenue</p>	<ul style="list-style-type: none"> • Landscapes vegetation is in good condition, with minor weed incursions • Weed species present include <i>Sonchus oleraceus</i> (Common Sowthistle), <i>Chloris virgata</i> (Rhodes Grass), <i>Bidens pilosa</i>, <i>Conyza bonariensis</i> (Fleabane), <i>Cyclosporum leptophyllum</i> (Slender Celery), and <i>Tagetes minuta</i> (Stinking Roger). • Areas with limited to no landscaped vegetation are particularly susceptible to weed incursion from cleared areas (see adjacent photo) 	

Inspection area	Weed abundances for current survey	Photo of inspection area
APZ area – northern MPW	<ul style="list-style-type: none">• Suppression of <i>Medicago</i> and other herbaceous weeds occurring in this area (<i>Sonchus oleraceus</i> (Common Sowthistle), <i>Cirsium vulgare</i>)• Methods include slashing and hand removal around native species	 A photograph showing a long, narrow strip of land enclosed by a black chain-link fence topped with barbed wire. The ground is covered with a mix of green grasses and weeds. In the background, there are several tall, thin trees and a cloudy sky. The fence runs along the right side of the strip, and the vegetation is on the left.

Inspection area	Weed abundances for current survey	Photo of inspection area
<p>Sediment basins adjacent to BioBank site</p>	<ul style="list-style-type: none">• Spot spraying, and hand pulling of weeds occurring along boundary of basins and BioBank site	



LEGEND

MPE operational boundary	Damage to native veg	Fireweed
Survey extent	Weed cover (outside Rail Link)	Golden Wreath Wattle
Areas targeted in weed remediation works in Dec 2022 & Feb 2023	Low	Paterson's Curse
None	Priority & key weeds	Red Natal Grass
Management issue	African Lovegrass	Rhodes Grass
Erosion		Fireweed
		Large-leaf Pennywort

Page 1 of 8

1:4,500 at A4
 Coord System: GDA2020 MGA Zone 56
 Date issued: March 20, 2023
 Imagery: Nearmap

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Figure 2 Instances of weeds, native species and threatened flora records in the survey extent and MIP operational boundary (1 of 8)

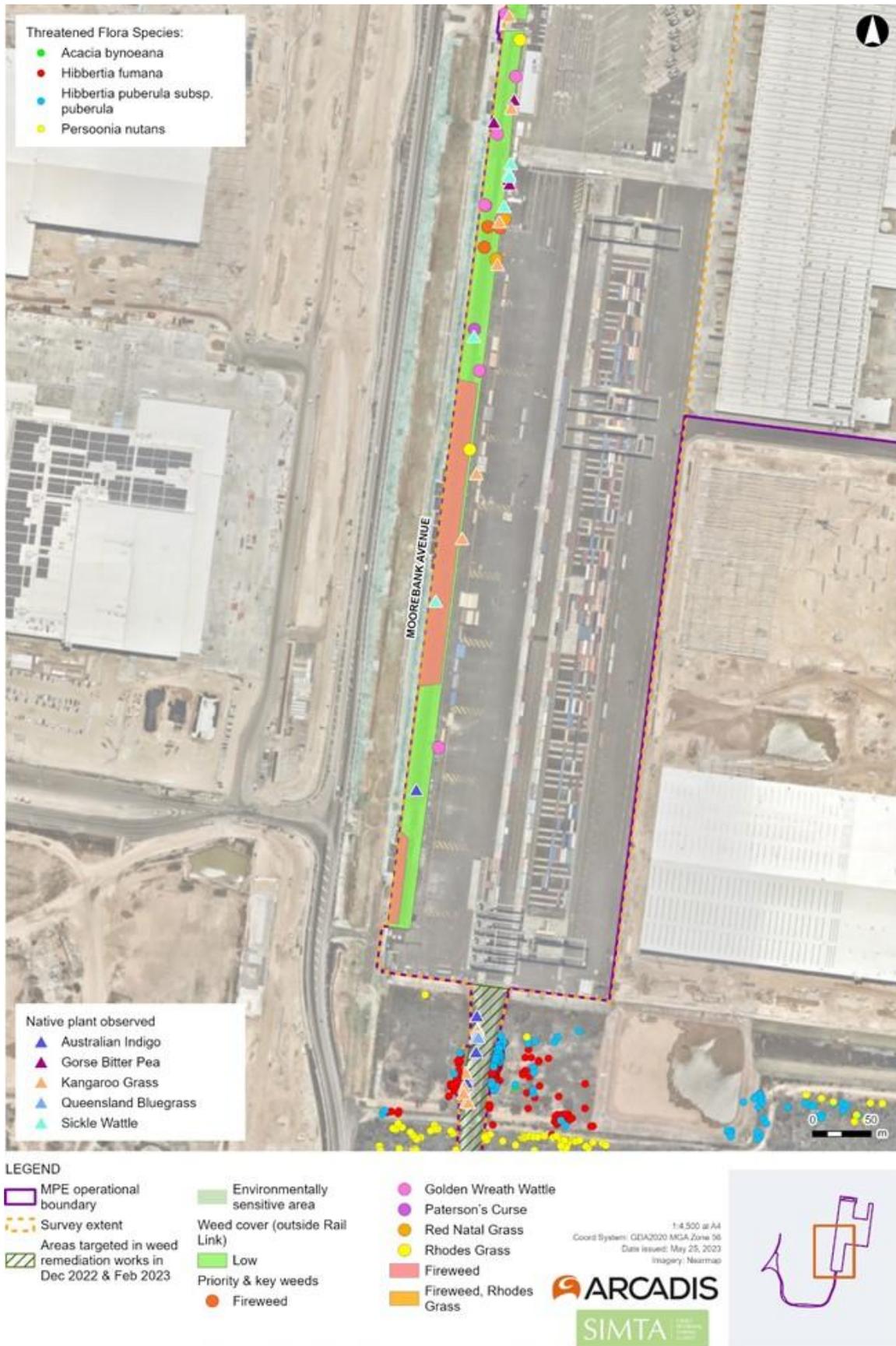


Figure 2 Instances of weeds, native species and threatened flora records in the survey extent and MIP operational boundary (2 of 8)

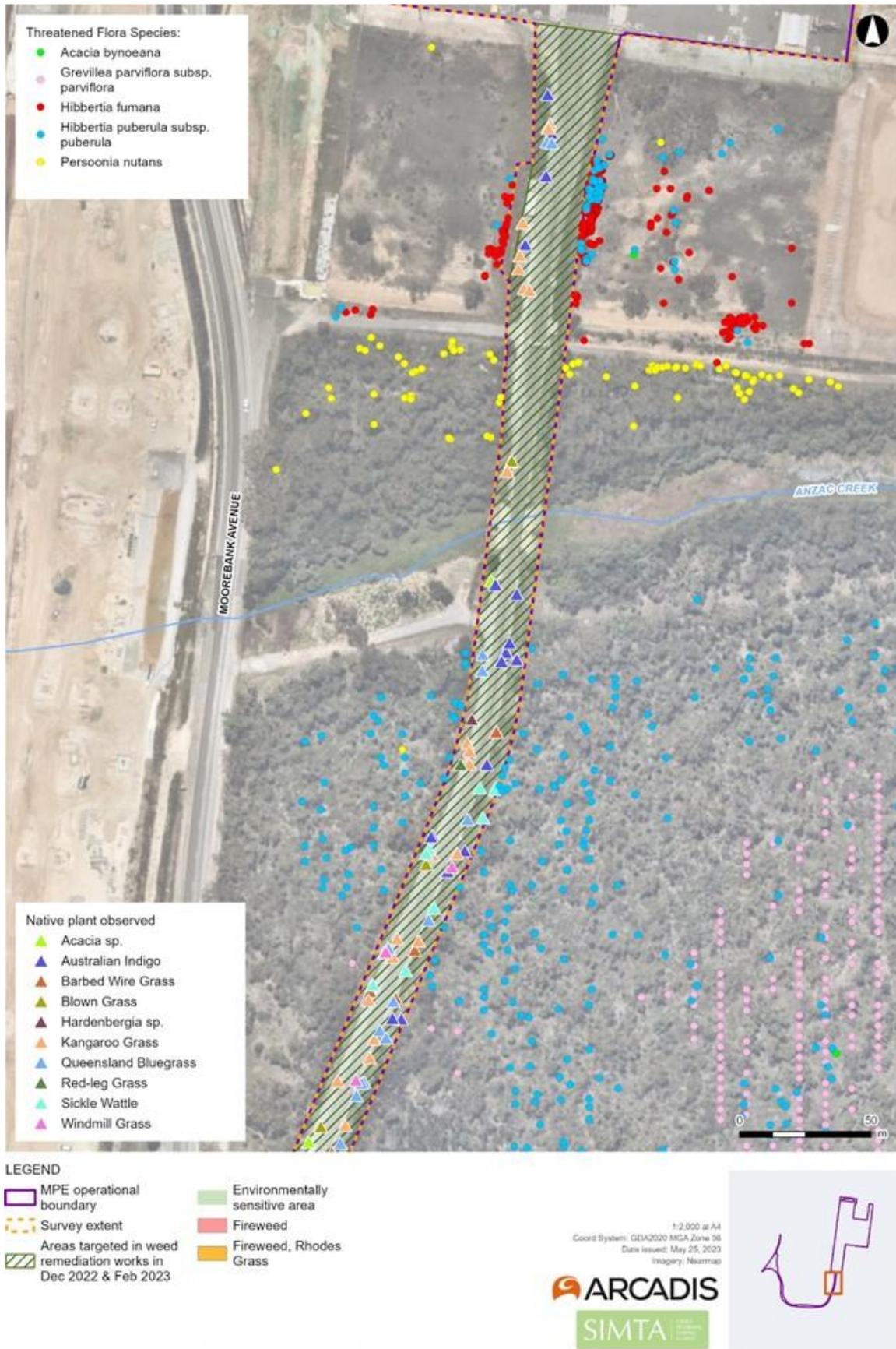


Figure 2 Instances of weeds, native species and threatened flora records in the survey extent and MIP operational boundary (3 of 8)

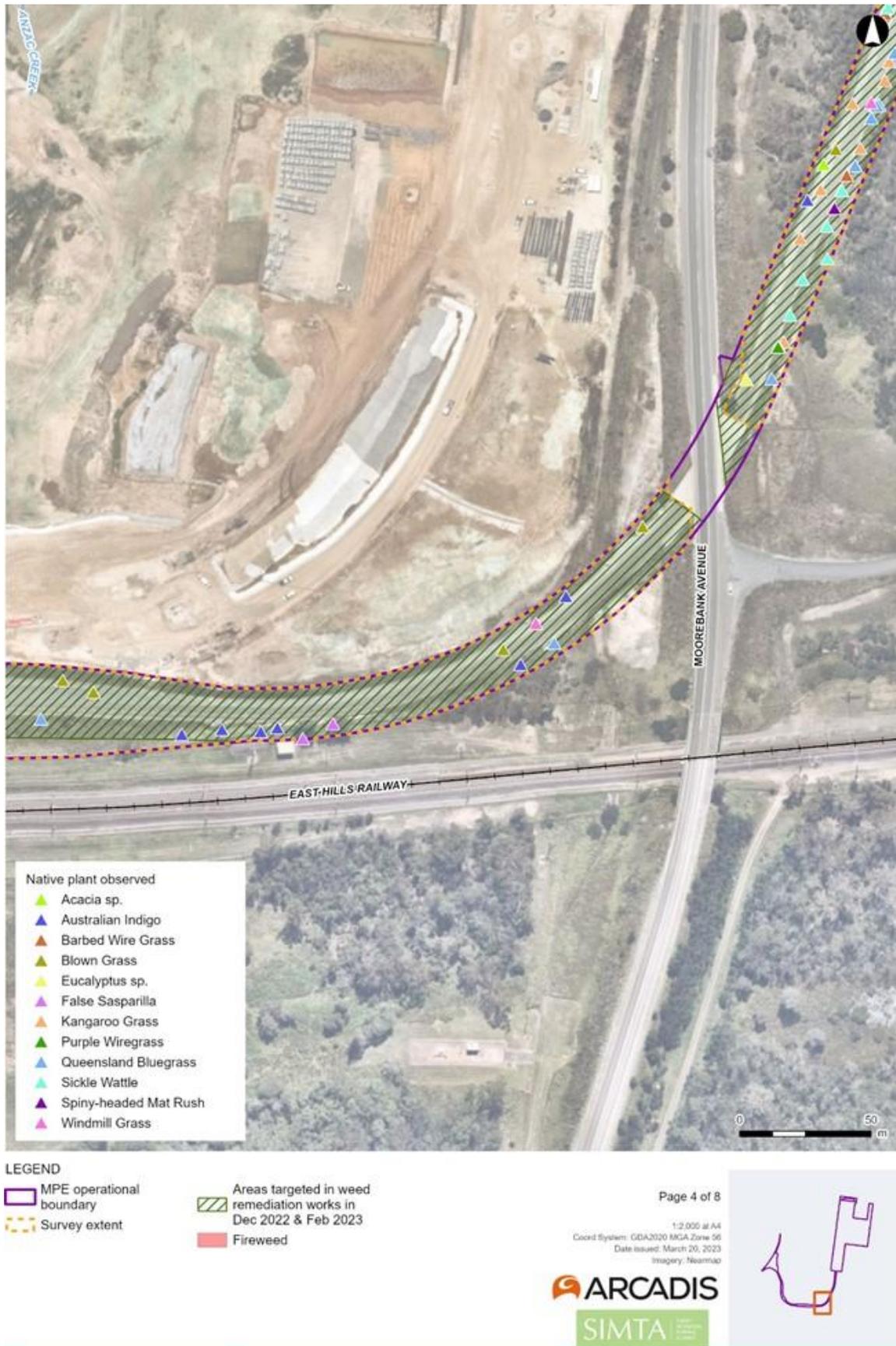
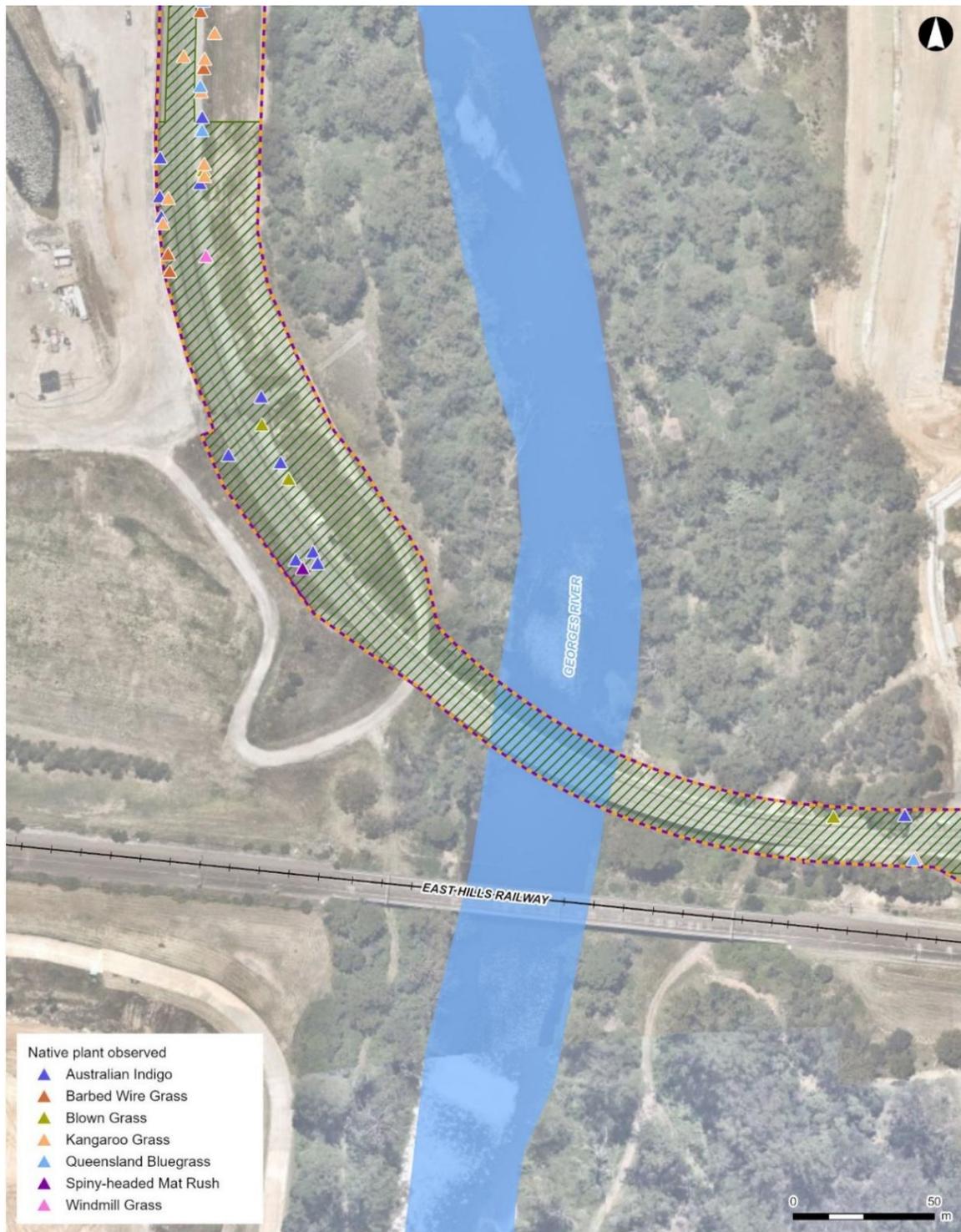


Figure 2 Instances of weeds, native species and threatened flora records in the survey extent and MIP operational boundary (4 of 8)



Figure 2 Instances of weeds, native species and threatened flora records in the survey monitoring extent and MIP operational boundary (5 of 8)



LEGEND

- MPE operational boundary
- Areas targeted in weed remediation works in Dec 2022 & Feb 2023
- Survey extent

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1:2,000 at A4
 Coord System: GDA2020 MGA Zone 56
 Date issued: March 20, 2023
 Imagery: Nearmap



Figure 2 Instances of weeds, native species and threatened flora records in the survey extent and MIP operational boundary (6 of 8)

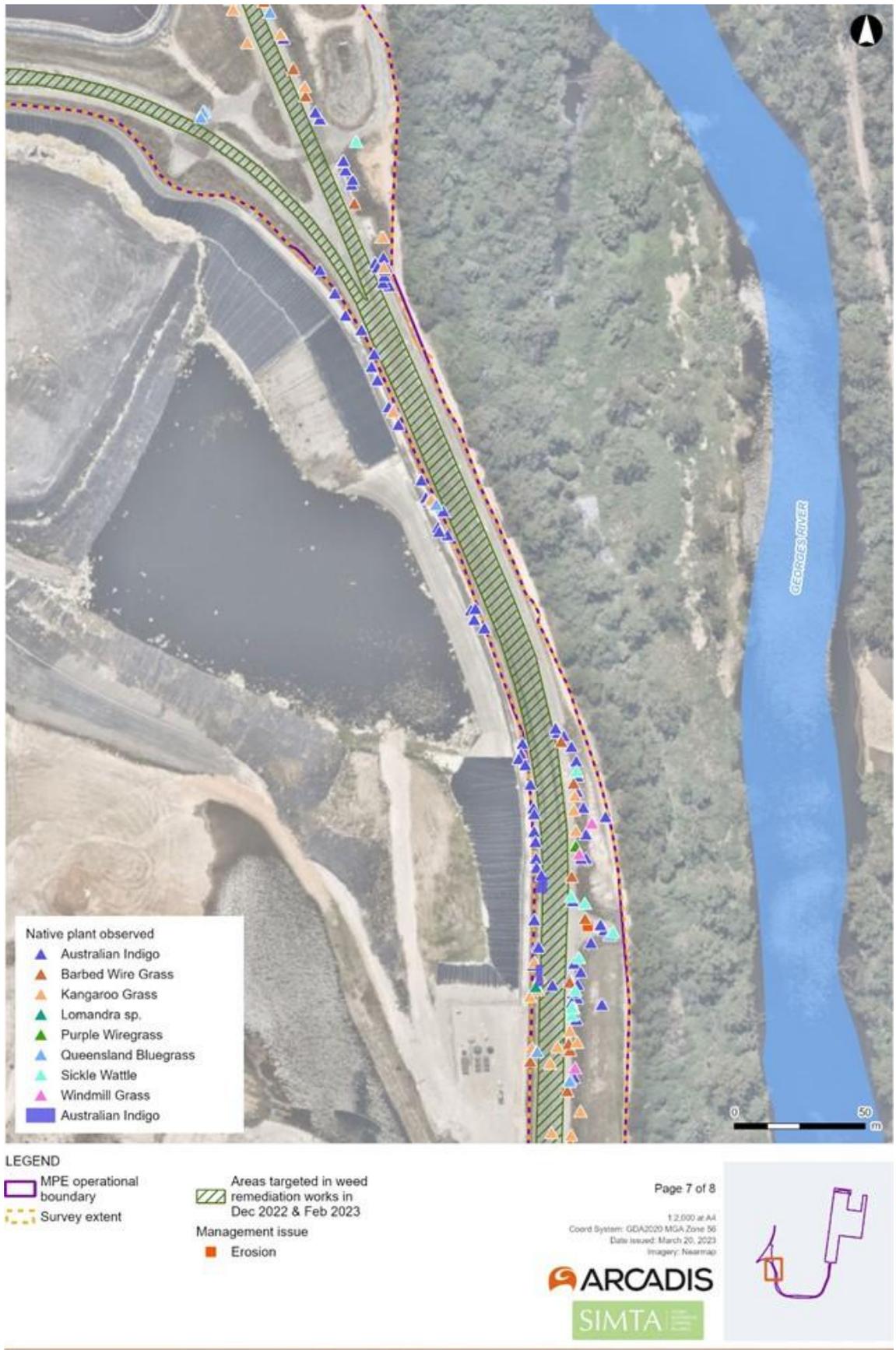
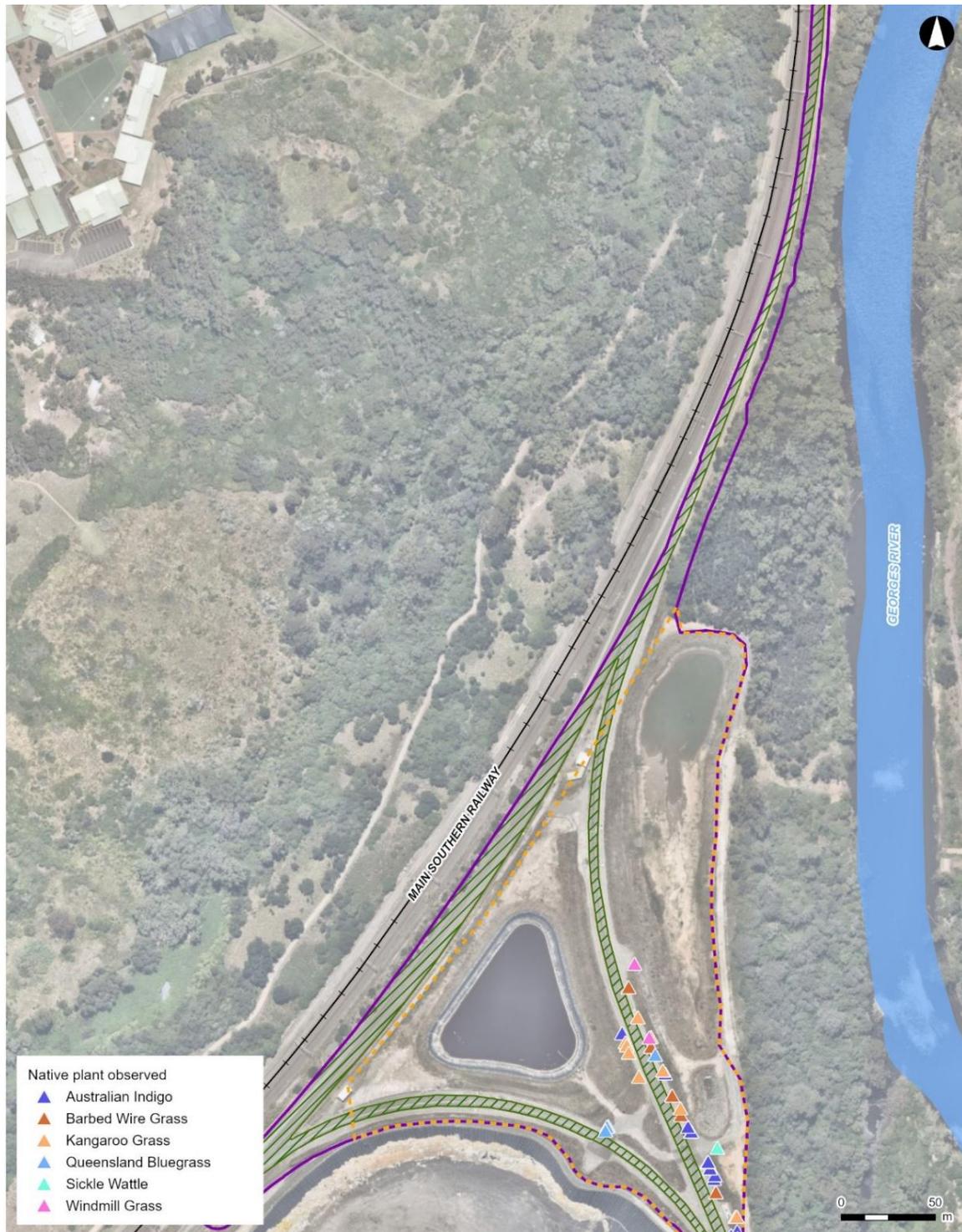


Figure 2 Instances of weeds, native species and threatened flora records in the survey extent and MIP operational boundary (7 of 8)



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 Coord System: GDA2020 MGA Zone 56
 Date issued: March 20, 2023
 Imagery: Nearmap

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Figure 2 Instances of weeds, native species and threatened flora records in the survey extent and MIP operational boundary (8 of 8)

Recommendations

Weed monitoring and weed remediation works should continue throughout the 2025/26 monitoring year. Table 4 summarises the recommendations for weed remediation within the MIP. Additionally, the weed remediation works being conducted by Toolijooa in the RALP have been compared against the criteria in Appendix C and are considered to be consistent.

Recommended actions documented in previous weed monitoring reports are included in Appendix D. The catalogue has been reviewed and updated to reflect works which have been completed and is considerate of the revegetation methodology proposed by Spray Grass Solutions and Cumberland Plain Seeds.

Table 4 Recommended actions for weed remediation in the MIP

Area	Recommendation
All areas	<ul style="list-style-type: none"> Targeted weed remediation to continue during the 2025/26 monitoring year and is to be conducted using the same methods and at the same locations as previously conducted
Rail Access Land Package (RALP)	<ul style="list-style-type: none"> Weed remediation works will focus on controlling priority and key weed species (Appendix A and Appendix B)
	<ul style="list-style-type: none"> Suppression of environmental weeds and encroachment into areas of bushland should occur where possible
	<ul style="list-style-type: none"> Hand weeding should be conducted for individuals, whereas slashing and herbicide spraying should be adopted to target larger patches of weeds. However, extreme care must be taken when conducting any weed management within the RALP, as many native grasses have become established Hand weeding is only feasible on annual species such as <i>Themeda quadrivalvis</i> (Grader Grass) and <i>Senecio madagascariensis</i> (Fireweed) due to their relatively small root system
	<ul style="list-style-type: none"> Contractors should identify the extent of the works zone and discuss 'No Go' zones with all involved in the works. Weeding must be restricted to identified weeds and native species to be retained should be identified prior to works commencing
	<ul style="list-style-type: none"> Priority and aggressive weed species outside revegetated RALP areas should be removed. Weeds that should be targeted include <i>Senecio madagascariensis</i> (Fireweed) Large patches of <i>Eragrostis curvula</i> (African Lovegrass), <i>Chloris gayana</i> (Rhodes Grass) and <i>Themeda quadrivalvis</i> (Grader Grass) between the RALP and the East Hills train line should be slashed regularly to prevent seeding events (Figure 2 (5 of 8)). This will reduce the colonisation of these grasses into revegetation areas Slashing should only occur when plants are not seeding to prevent further spread. As more native species become established in these areas, slashing may impact their growth; therefore, non-targeted slashing should be avoided Application of herbicide within the RALP and in areas adjacent to the Moorebank biobank site should be conducted to prevent overspray (off-target poisoning). If herbicide application occurs, recommended herbicides for tussock grass, <i>Chloris gayana</i> (Rhodes Grass) and <i>Eragrostis curvula</i> (African Lovegrass), include glyphosate or flupropanate, while plants are actively growing during summer and spring. Native vegetation outside the

Area	Recommendation
	<p>RALP fence must not be impacted by herbicide during weed remediation works</p> <ul style="list-style-type: none"> • No herbicide spraying should be conducted outside the RALP, specifically adjacent to ecologically sensitive areas south of the MPE Operational facility (Figure 2). Manual weed remediation works in ecologically sensitive areas should not extend beyond the construction envelope of the RALP. If further clarification is necessary, the project ecologist should be consulted <hr/> <ul style="list-style-type: none"> • Batters that currently have limited vegetation cover should be colonised by a native seed mix as soon as practical. This will ensure that these areas are not colonised by weed species and will further reduce erosion during heavy rainfall events <hr/> <ul style="list-style-type: none"> • Continue to collect litter from within the RALP and in adjacent areas
IMEX building and adjacent drainage infrastructure	<ul style="list-style-type: none"> • Soft batters within the trunk drainage system and retention basin/swale at the north-eastern extent of the facility should be inspected for weed growth. Weed levels should be controlled through herbicide application, slashing and hand weeding. Weed remediation works should be conducted in accordance with the approved Weed Management Plan
Warehouse areas	<ul style="list-style-type: none"> • Weed levels should be controlled through herbicide application, slashing and hand weeding. Weed remediation works should be conducted in accordance with the approved Weed Management Plan
Eastern boundary drainage infrastructure	<ul style="list-style-type: none"> • Weed levels should be controlled through herbicide application, slashing and hand weeding. Weed remediation works should be conducted in accordance with the approved Weed Management Plan • Erosion in the drainage infrastructure should be controlled by planting additional native ground cover species to maintain batters during heavy rainfall events
Landscaped areas along Bushmasters Avenue	<ul style="list-style-type: none"> • Continued maintenance of these landscaped areas should be maintained at a frequency that does not increase the current abundance of identified weed species. This is pertinent for areas where landscaped species have died back, and bare ground is more abundant • Areas adjacent to cleared areas in the MPW operational area should be sprayed for weeds to limited the potential for spreading

References

Arcadis (2019a) Urban Design and Landscape Plan. Moorebank Precinct East Stage 1

Arcadis (2019b) Operational Flora and Fauna Management Plan. Moorebank Logistics Park – East Precinct

Arcadis (2019c) Landscape Vegetation Management Sub Plan. Moorebank Precinct East Stage 2

Arcadis (2020) MPE Operational – Weed Monitoring Report December 2020

Arcadis (2020) Urban Design and Landscape Plan. Moorebank Precinct East Stage 2

Bureau of Meteorology (BOM) (2021) Climate Data Online. Weather and Climate: Holsworthy Aerodrome NSW (station 066161) <http://www.bom.gov.au/climate/dwo/IDCJDW2161.latest.shtml>

NSW Department of Primary Industries (DPI) (accessed 2021) NSW WeedWise. priority weeds for the Greater Sydney. <https://weeds.dpi.nsw.gov.au/WeedBiosecurities?AreaId=3>

APPENDIX A PRIORITY WEED PROFILES



Lantana (*Lantana camara*)



Fireweed (*Senecio madagarsensis*)



Alligator Weed (*Alternanthera philoxeroides*)



African Olive (*Olea europea* subsp. *cuspidata*)



Lantana (*Lantana camara*)



Fireweed (*Senecio madagarsensis*)



Bridal Creeper (*Asparagus asparagoides*)



Peruvian Primrose (*Ludwigia peruviana*)

APPENDIX B KEY WEED PROFILES



Rhodes Grass (*Chloris gayana*)



African Love Grass (*Eragrostis curvula*)



Patterson's Curse (*Echium planteganium*)



Coolatai Grass (*Hyparrhenia hirta*)



Grader Grass (*Themeda quadrivalvis*)



Red Natal Grass (*Melinis repens*)

APPENDIX C WEED REMEDIATION WORKS TRACKING

Priority	Action	Action description	Current performance assessment
1	Eradicate 'priority' weeds	Target 'priority' weed species through manual removal and herbicide treatment. Herbicide application should consider timing (i.e., applying herbicide when weeds are actively growing) and best practice methodologies. Areas outlined by coloured polygons in Figure 2 should be prioritised.	One priority weed species are present within the RALP: <i>Senecio madagascariensis</i> (Fireweed). These should be removed as a priority. Progress has been made through remediation works within the RALP. Continued management must be undertaken to work towards eradication.
2	Removal of key and aggressive weed species	Key weed species, including African Lovegrass, Rhodes Grass, Paterson's Curse, Coolatai Grass and Grader Grass, should be removed from revegetated areas of soft batter. Aggressive weed species, including Moth Vine and Castor Oil Plant, should be removed from all operational areas using a combination of manual and herbicide control. Areas outlined by coloured polygons in Figure 2 should be prioritised.	Key weed species, including Rhodes Grass, African Lovegrass, Coolatai Grass, Paterson's Curse, and Grader Grass, are colonising soft batters in the RALP. These weeds should be removed. Progress has been made through remediation works within the RALP. Continued management must be undertaken to work towards eradication.
3	Suppress further colonisation of environmental weeds and encroachment into areas of bushland	Control of exotic species adjacent to the biobank site and ecologically sensitive areas. Manual removal should be adopted in areas adjacent to threatened flora locations. Areas outlined by coloured polygons in Figure 2 should be prioritised.	Weed growth is stabilising through continued weed management on soft batters adjacent to the biobank site and ecologically sensitive areas. Manual removal, including routine slashing, is being used to prevent present weeds from reaching seeding maturity and further encroaching on adjacent high-value areas (biobank site and ecologically sensitive areas containing threatened plant species). All works should be restricted to the operational area and not extend into the biobank site or identified ecologically sensitive areas. Slashing should only be conducted when weed species are not in flower to prevent further spread. Appropriate slashing time is during winter for most species.

Priority	Action	Action description	Current performance assessment
4	Slashing of invasive grasses to prevent seeding.	Management of invasive grasses such as Rhodes Grass and African Love Grass through regular mowing or slashing. Areas outlined by coloured polygons in Figure 2 should be prioritised.	<p>Slashing has been adopted to manage the regrowth of invasive grasses (African Lovegrass, Grader Grass) within the RALP in ballast and gravel areas. Some areas beyond the Georges River bridge are yet to be managed.</p> <p>Slashing should be used to manage large expanses of exotic grassland to prevent seeding events. However, as native grasses become established, extreme care must be taken, and indiscriminate slashing must be avoided. A contractor with knowledge of native species should be employed to carry out this task, in failing that, an ecologist should be on site to monitor weed remediation.</p>
5	Reduce cover of weeds within the RALP	Reduction of weed cover by applying control methods commensurate with the Operational Flora and Fauna Management Plan (Arcadis 2019).	<p>Works should involve targeted slashing of mature plants and removing flowering and seed heads to minimise seeding. Targeted slashing has been previously employed to control weed colonisation on soft batters. However, it must be continued to limit the re-colonisation of weeds within the RALP.</p> <p>Future weed control actions will focus on removing and reducing the cover of priority and key weed species and suppressing the further colonisation of common weeds, which is consistent with the rehabilitation methodology proposed by Spray Grass Solutions and Cumberland Plain Seeds.</p>
6	Remove herbaceous and woody weeds within the operational area and trunk drainage infrastructure.	Reduction in herbaceous and woody weeds by applying control methods commensurate with the Operational Flora and Fauna Management Plan (Arcadis 2019)	Weed cover has generally remained low within trunk drainage infrastructure and at the north-eastern extent of the MIP East operational facility.

APPENDIX D RECOMMENDED ACTIONS CATALOGUE

Month of logging	Recommended action	Status (Not started, Commenced, Complete)	Comments
April 2020	Eradicate priority weeds species, including Bridal Creeper, Alligator Weed, Lantana, Fireweed and African Olive	Completed	Most instances of these weeds have been removed from the RALP. Small instances of Fireweed occur, however these are being managed by the current weed remediation works within the RALP.
April 2020	Remove key and aggressive weed species within RALP, including Golden Wreath Wattle, Moth Vine, Castor Oil Plant, Small-leafed Privet, Grader Grass and Balloon Vine	Commenced	Grader Grass has been observed colonising remediated areas within the RALP. This species should be removed to prevent further colonisation and infestations. Golden Wreath Wattle, Moth Vine and Castor Oil Plant on the southern side of the RALP in the area between the operational boundary and the East Hills line rail corridor. Consideration should be given to the management of these areas to reduce encroachment into recently remediated areas.
June 2020	Planning should commence to revegetate soft batters and un-developed areas within the MPE operational facility with native species in accordance with the approved Urban Design and Landscaping Plan (Arcadis 2019a, Arcadis 2020)	Commenced	Revegetation has commenced for remediated areas using a hydro-mulch containing a seed palette commensurate with the UDLP (Arcadis 2020). Previous instances of native seed setting have been colonized by weed species within the RALP and should be cleared and re-set with a native seed mix as soon as practical.
December 2020	Exotic species, specifically <i>Medicago polymorpha</i> (Burr Medic), should be removed from grassland on either side of the RALP at its eastern extent, closest to the operational area.	Commenced	Targeted manual removal, including slashing, has been conducted for exotic species outside the RALP fencing. A qualified bush regeneration contractor should be used to avoid impacts on

Month of logging	Recommended action	Status (Not started, Commenced, Complete)	Comments
			native species. Strictly no herbicide should be used in this area, and works should not extend beyond the RALP construction envelope. Where possible, contractors should not access/pass through adjacent areas.
December 2021	Collect litter scattered through the RALP and in adjacent areas	Commenced	Litter remains in the RALP and adjacent areas.
December 2021	Control aggressive weed species Coolatai Grass and Paterson's Curse within the RALP	Commenced	New instances of aggressive weed species Coolatai Grass and Paterson's Curse within the RALP should be removed as soon as practicable to avoid the spread of these species into ecologically sensitive areas adjacent to the RALP.
February 2022	Continued targeted slashing of woody and herbaceous weeds within the RALP.	Completed	Majority of large woody weeds have been removed from the RALP. Continue regular slashing of large woody weeds to remove the fertile seed head and discourage further germination of these weeds within the RALP should occur.
December 2022	Prioritise weed remediation works for priority and key weed species which have experienced accelerated growth in recent months.	Commenced	Areas of particularly high biomass of priority and key weed species should be prioritised for weed remediation works in coming months to avoid mass seeding events.
	Begin remediation of soft batters which have slipped following extreme rainfall events in recent weeks	Not started	Areas within the operational facility, including a number of areas within the RALP, require urgent batter remediation in areas of batter slipping.
December 2022	Begin weed remediation of gravel and ballast areas along RALP	Commenced	Removal of all vegetation in gravel and ballast areas due along RALP using slashing and

Month of logging	Recommended action	Status (Not started, Commenced, Complete)	Comments
			herbicide due to safety concerns of train operators and prevent spread of weeds.
December 2022	Continue weed remediation works along the soft batters within the RALP.	Commenced	Future weed remediation works should include targeted slashing and spraying of priority and key weed species, whilst avoiding native species by hand weeding within a one metre buffer zone of native individuals.
February 2023	Continue weed remediation works along the soft batters within the RALP beyond Georges River bridge.	Commenced	Future weed remediation works should include targeted slashing and spraying of priority and key weed species, whilst avoiding native species by hand weeding within a one metre buffer zone of native individuals.
April 2023	No weed remediation has occurred since February 2023. Expected to recommence in June 2023, in same areas that have previously been remediated.	Commenced	Future weed remediation works should include targeted slashing and spraying of priority and key weed species, whilst avoiding native species by hand weeding within a one metre buffer zone of native individuals.
June 2023	Continue weed remediation works along the soft batters within the RALP	Commenced	Future weed remediation works should include targeted slashing and spraying of priority and key weed species, whilst avoiding native species by hand weeding within a one metre buffer zone of native individuals.
December 2023	Toolijooa Environmental Restoration inducted as primary weed control contractors. Weed remediation recommenced throughout the RALP	Commenced	Future weed remediation works should include targeted slashing and spraying of priority and key weed species, whilst avoiding native species by hand weeding within a one metre buffer zone of native individuals.

APPENDIX E REMEDIATION PROGRESS PHOTOGRAPHS



April 2021



December 2023



August 2025



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APPENDIX F FLORA SPECIES INVENTORY

Scientific name	Common name	Exotic	Priority/key weed
<i>Acacia falcata</i>	Hickory Wattle		
<i>Acacia parramattensis</i>	Parramatta Wattle		
<i>Acacia saligna</i>	Golden Wreath Wattle	*	
<i>Alternanthera philoxeroides</i>	Alligator weed	*	Priority
<i>Alternanthera pungens</i>	Khaki Weed	*	
<i>Araujia sericifera</i>	Moth Vine	*	
<i>Asparagus asparagoides</i>	Bridal Creeper	*	Priority
<i>Atriplex semibaccata</i>	Creeping Saltbush		
<i>Austrodanthonia spp.</i>	-		
<i>Avena spp.</i>	Oats	*	
<i>Bidens pilosa</i>	Cobbler's Pegs	*	
<i>Brassica rapa</i>	Field Mustard	*	
<i>Briza maxima</i>	Quaking Grass	*	
<i>Briza minor</i>	Shivery Grass	*	
<i>Cenchrus clandestinus</i>	Kikuyu Grass	*	
<i>Centaureum spp.</i>	-	*	
<i>Chloris gayana</i>	Rhodes Grass	*	Key
<i>Chloris truncata</i>	Windmill Grass		
<i>Cirsium vulgare</i>	Spear Thistle	*	
<i>Convolvulus erubescens</i>	Pink Bindweed		
<i>Conyza bonariensis</i>	Flaxleaf Fleabane	*	
<i>Cyclosporum leptophyllum</i>	Slender Celery	*	
<i>Cynodon dactylon</i>	Common Couch		
<i>Cymbopogon refractus</i>	Barbed Wire Grass		
<i>Cyperus eragrostis</i>	Umbrella Sedge	*	
<i>Daviesia ulicifolia</i>	Gorse Bitter Pea		
<i>Dichanthium sericeum</i>	Queensland Bluegrass		
<i>Dichondra repens</i>	Kidney Weed		
<i>Echium plantagineum</i>	Paterson's Curse	*	Key
<i>Eragrostis brownii</i>	Brown's Lovegrass		
<i>Eragrostis curvula</i>	African Lovegrass	*	Key
<i>Euchiton spp.</i>	-		
<i>Ficinia nodosa</i>	Knobby Club-rush		
<i>Foeniculum vulgare</i>	Fennel	*	
<i>Glycine clandestina</i>	-		

Scientific name	Common name	Exotic	Priority/key weed
<i>Hardenbergia violacea</i>	False Sarsaparilla		
<i>Hypochoeris radicata</i>	Catsear	*	
<i>Indigofera australis</i>	Australian Indigo		
<i>Juncus usitatus</i>	-		
<i>Lantana camara</i>	Lantana	*	Priority
<i>Lachnagrostis filiformis</i>	Blown Grass		
<i>Lactuca serriola</i>	Prickly Lettuce	*	
<i>Linum trigynum</i>	French Flax	*	
<i>Lolium perenne</i>	Perennial Ryegrass	*	
<i>Lomandra longifolia</i>	Spiny-headed Mat-rush		
<i>Lysimachia arvensis</i>	Scarlet Pimpernel	*	
<i>Ludwigia peruviana</i>	Peruvian water primrose	*	Priority
<i>Medicago polymorpha</i>	Burr Medic	*	
<i>Melilotus alba</i>	Bokhara	*	
<i>Melinis repens</i>	Red Natal Grass	*	Key
<i>Modiola caroliniana</i>	Red-flowered Mallow	*	
<i>Olea europaea subsp. cuspidate</i>	African Olive	*	Priority
<i>Paspalum dilatatum</i>	Paspalum	*	
<i>Persicaria decipiens</i>	Slender Knotweed		
<i>Phytolacca octandra</i>	Inkweed	*	
<i>Plantago lanceolata</i>	Lamb's Tongues	*	
<i>Portulaca oleracea</i>	Common Purslane		
<i>Rumex crispus</i>	Curled Dock	*	
<i>Senecio madagascariensis</i>	Fireweed	*	Priority
<i>Setaria parviflora</i>	-	*	
<i>Sida rhombifolia</i>	Paddy's Lucerne	*	Key
<i>Solanum nigrum</i>	Black-berry Nightshade	*	
<i>Solanum sisymbriifolium</i>		*	
<i>Sonchus oleraceus</i>	Common Sowthistle	*	
<i>Tagetes minuta</i>	Stinking Roger	*	
<i>Themeda quadrivalvis</i>	Grader Grass	*	Key
<i>Themeda triandra</i>	-		
<i>Trifolium arvense</i>	Haresfoot Clover	*	
<i>Trifolium repens</i>	White Clover	*	
<i>Trifolium michelianum</i>	Bolansa Clover	*	
<i>Verbena bonariensis</i>	Purpletop	*	

Scientific name	Common name	Exotic	Priority/key weed
<i>Verbena rigida</i> var. <i>Rigida</i>	Veined Verbena	*	