Moorebank Intermodal Precinct

APPENDIX G – 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	• 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
	• Cumberland Plain Seeds were procured to provide technical oversight of revegetation effort	
December 2021	• 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	• 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	• 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).

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)	• Chloris gayana (Rhodes Grass) and small amounts of *Themeda quadrivalvis* (Grader Grass) were removed during this inspection • Some areas of *Lantana camara* (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 *Tagetes minuta* (Stinking Roger), and were slashed during this inspection (see adjacent photo).	

Inspection area	Weed abundances for current survey	Photo of inspection area
IMEX building and adjacent drainage infrastructure	• *Acacia falcata* (Hickory Wattle) continue to grow unimpeded by weeds.	

Inspection area	Weed abundances for current survey	Photo of inspection area
Warehouse areas	• Large areas of the native *Cynodon dactylon* (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 *Senecio madagascariensis* (Fireweed), *Plantago lanceolata* (Plantain), *Trifolium arvense* (Clover) and exotic grasses like *Chloris gayana* (Rhodes Grass), *Sporobolus africanus* (Parramatta Grass), *Paspalum urvillei* (Giant Paspalum) and *Ehrharta erect* (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
Eastern boundary drainage infrastructure	• Drainage infrastructure dominated by *Bulboschoenus fluviatilis* (Marsh club-rush) whilst other are dominated by *Typha orientalis* (Bulrush). Where space is present between stands of theses native emergent species small clumps of *Persicaria decipiens* (Slender Knotweed), *Daviesia ulicifolia*, *Ficinia nodosa* (Knotted Club-rush), *Carex tereticaulis* and *Juncus usitatus* are present. Other native species such as *Imperata cylindrica* and *Lomandra longifolia* were observed in the drainage channels. • Areas of erosion still present.	

Inspection area	Weed abundances for current survey	Photo of inspection area
Moorebank Precinct West (MPW)		
Landscaped areas along Bushmasters Avenue	• Landscapes vegetation is in good condition, with minor weed incursions • Weed species present include *Sonchus oleraceus* (Common Sowthistle), *Chloris virgata* (Rhodes Grass), *Bidens pilosa*, *Conyza bonariensis* (Fleabane), *Cyclospermum leptophyllum* (Slender Celery), and *Tagetes minuta* (Stinking Roger). • Areas with limtied to no landscaped vegetation are particularly susceptible to weed incursion from cleared areas (see adjacent photo)	

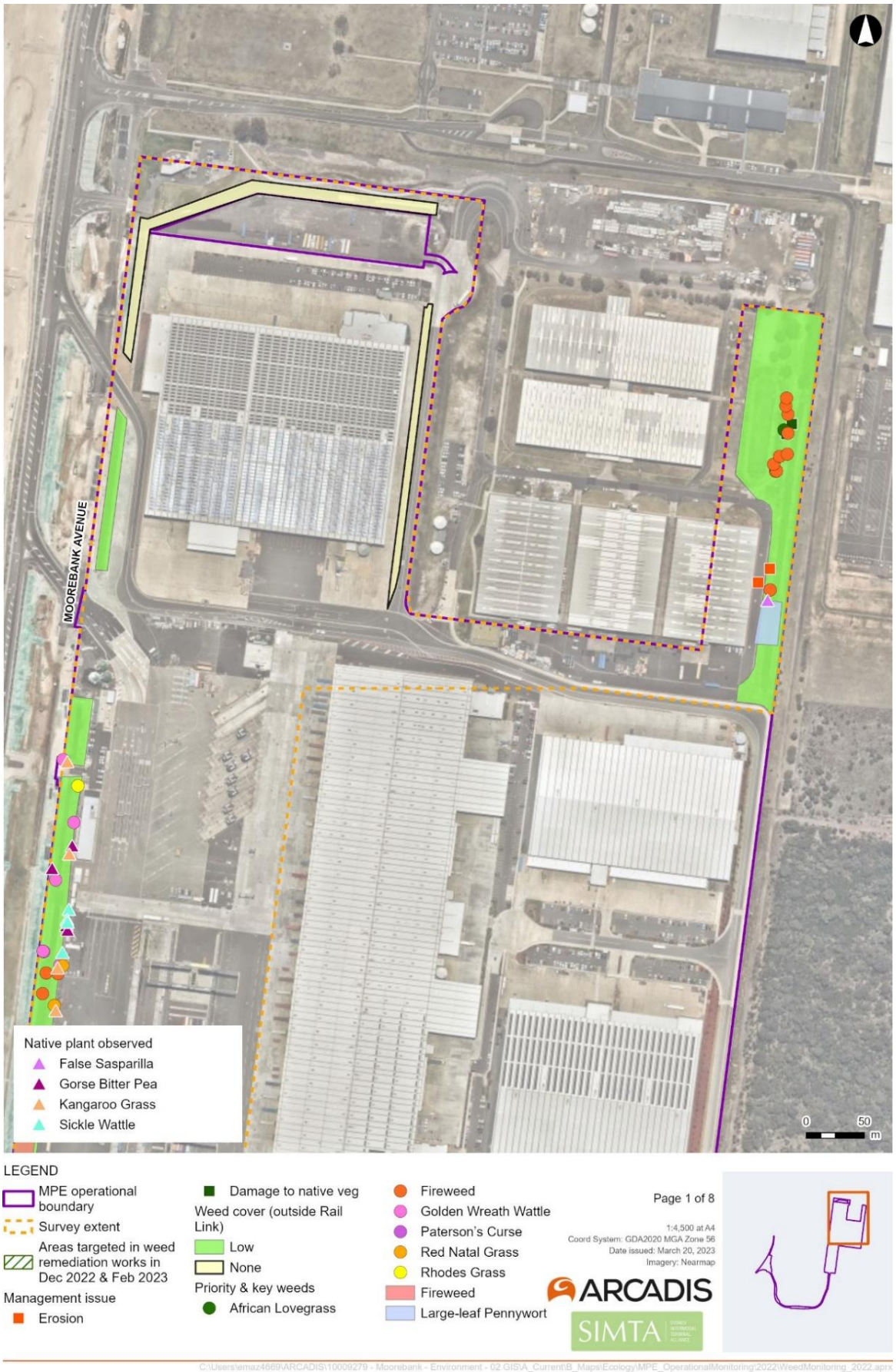


Figure 2 Instances of weeds, native species and threatened flora records in the survey extent and MIP operational boundary (1 of 8)

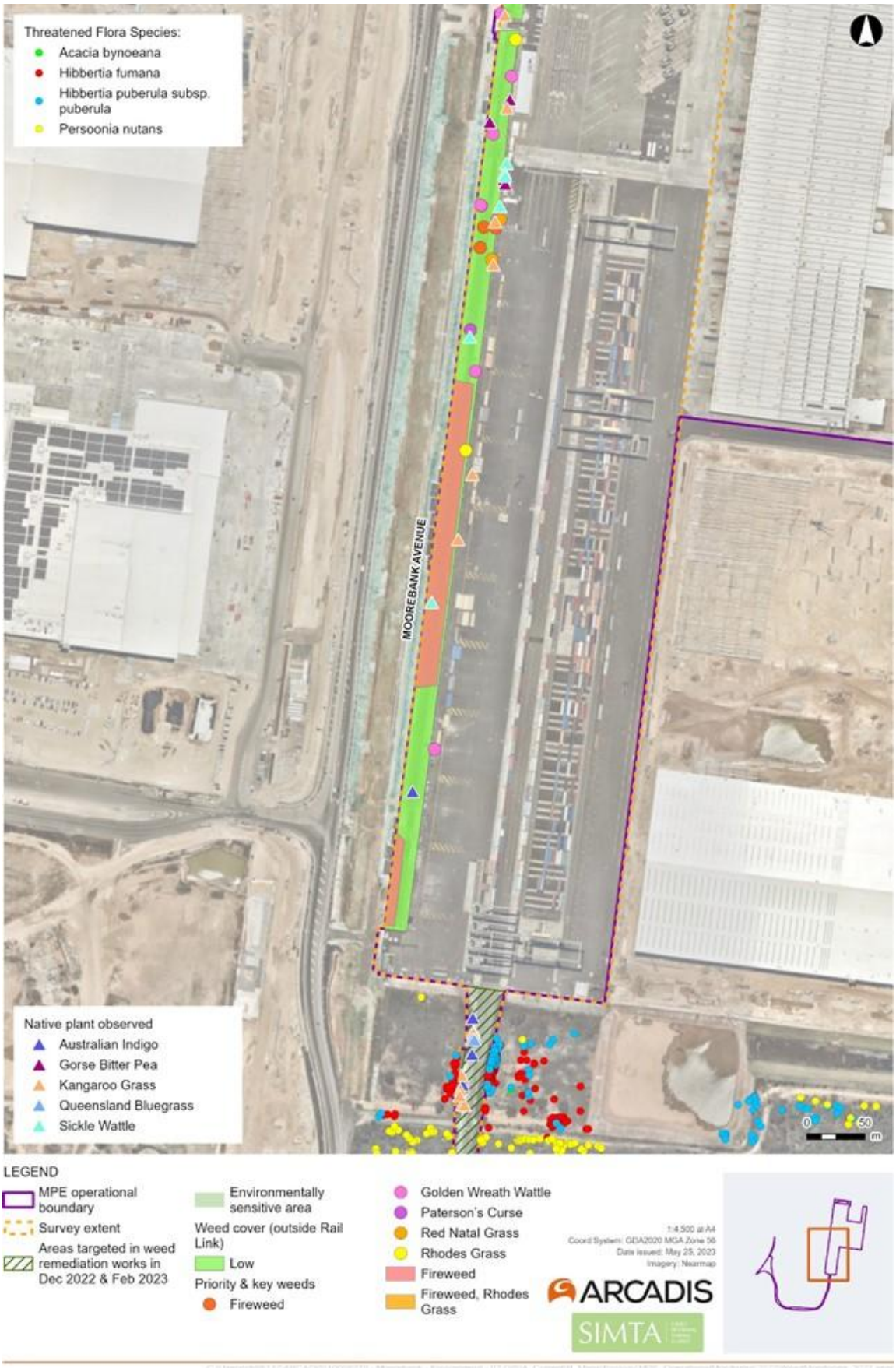


Figure 2 Instances of weeds, native species and threatened flora records in the survey extent and MIP operational boundary (2 of 8)

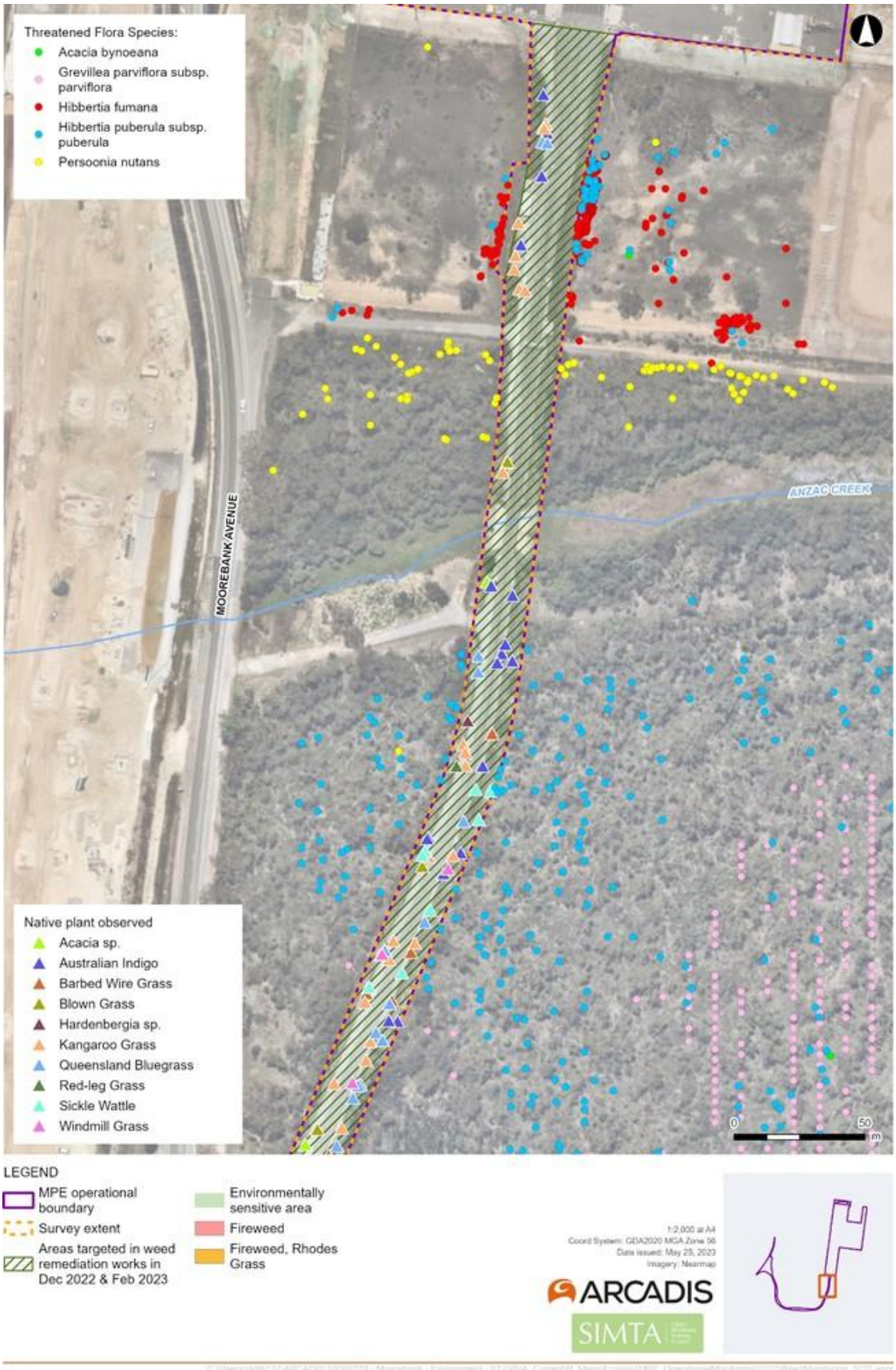


Figure 2 Instances of weeds, native species and threatened flora records in the survey extent and MIP operational boundary (3 of 8)

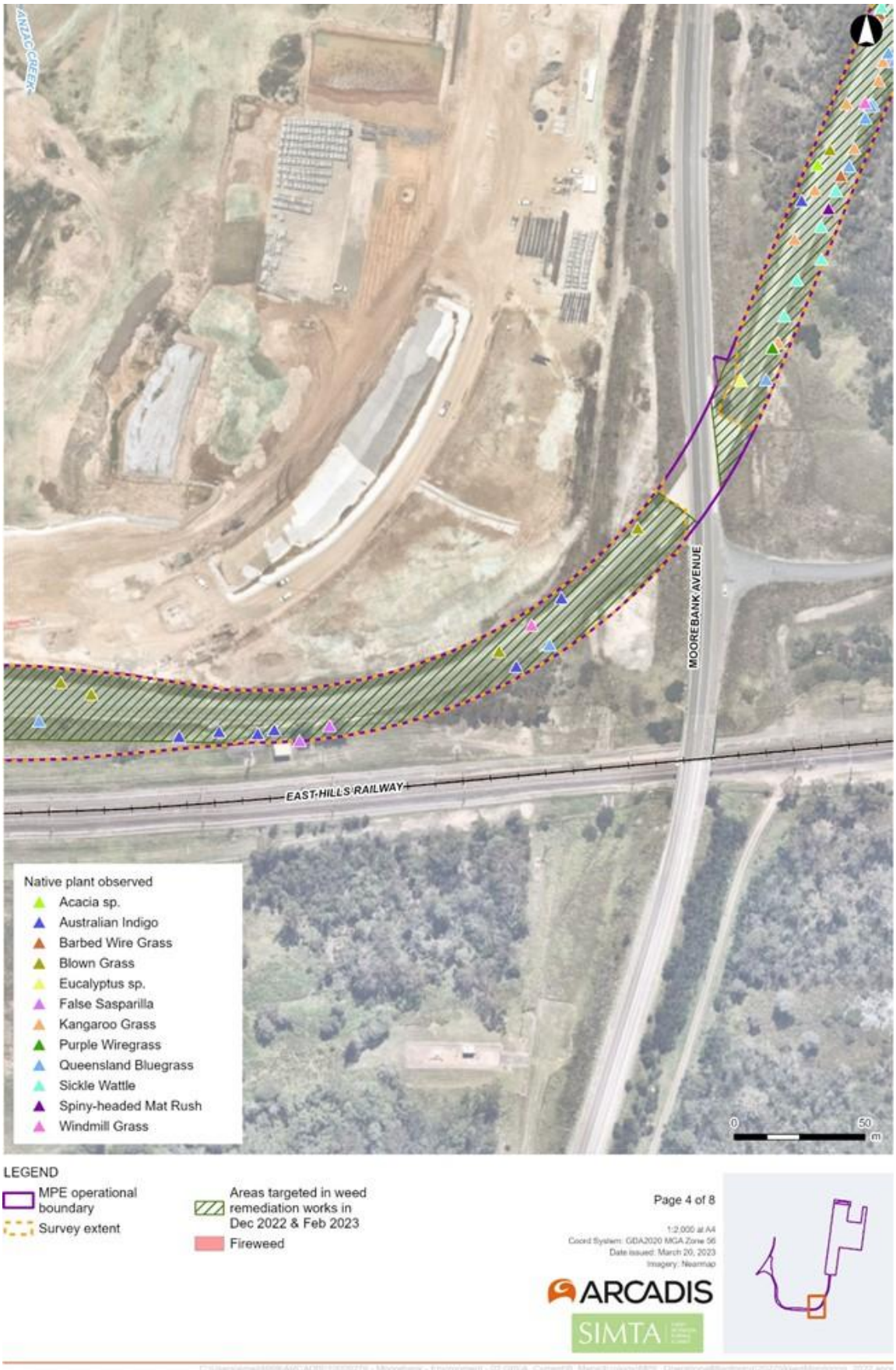


Figure 2 Instances of weeds, native species and threatened flora records in the survey extent and MIP operational boundary (4 of 8)

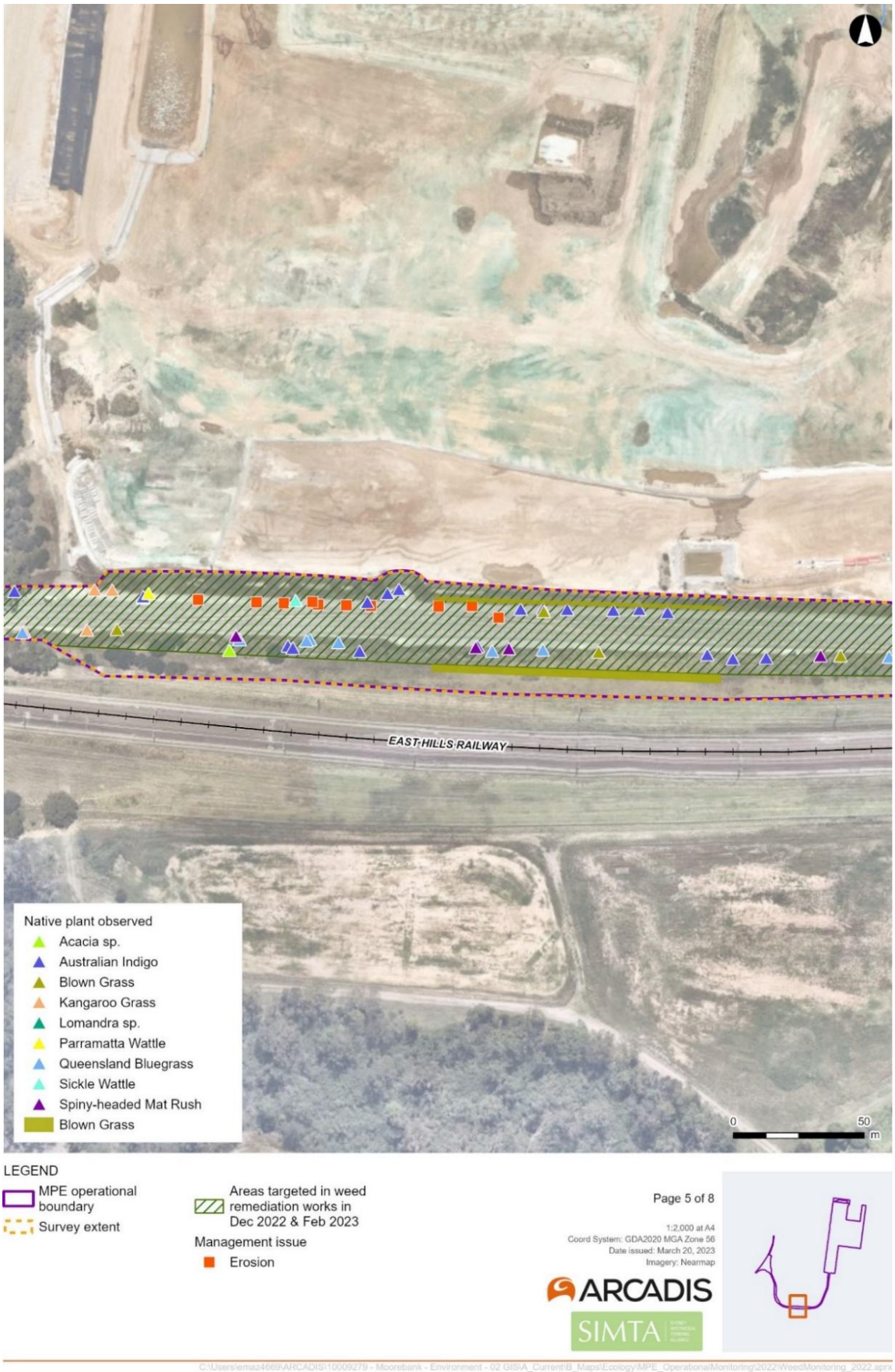


Figure 2 Instances of weeds, native species and threatened flora records in the survey extent and MIP operational boundary (5 of 8)

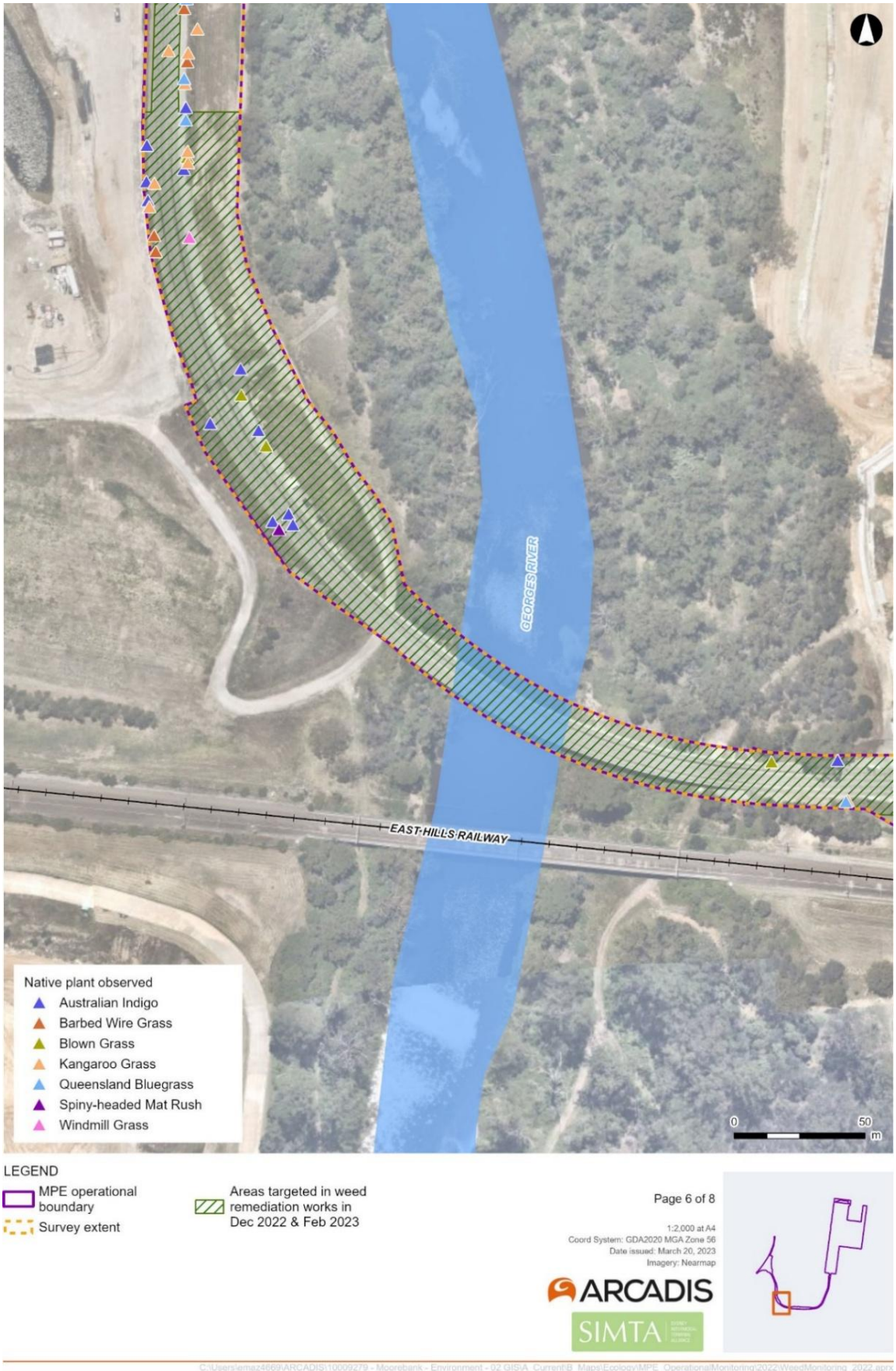


Figure 2 Instances of weeds, native species and threatened flora records in the survey extent and MIP operational boundary (6 of 8)

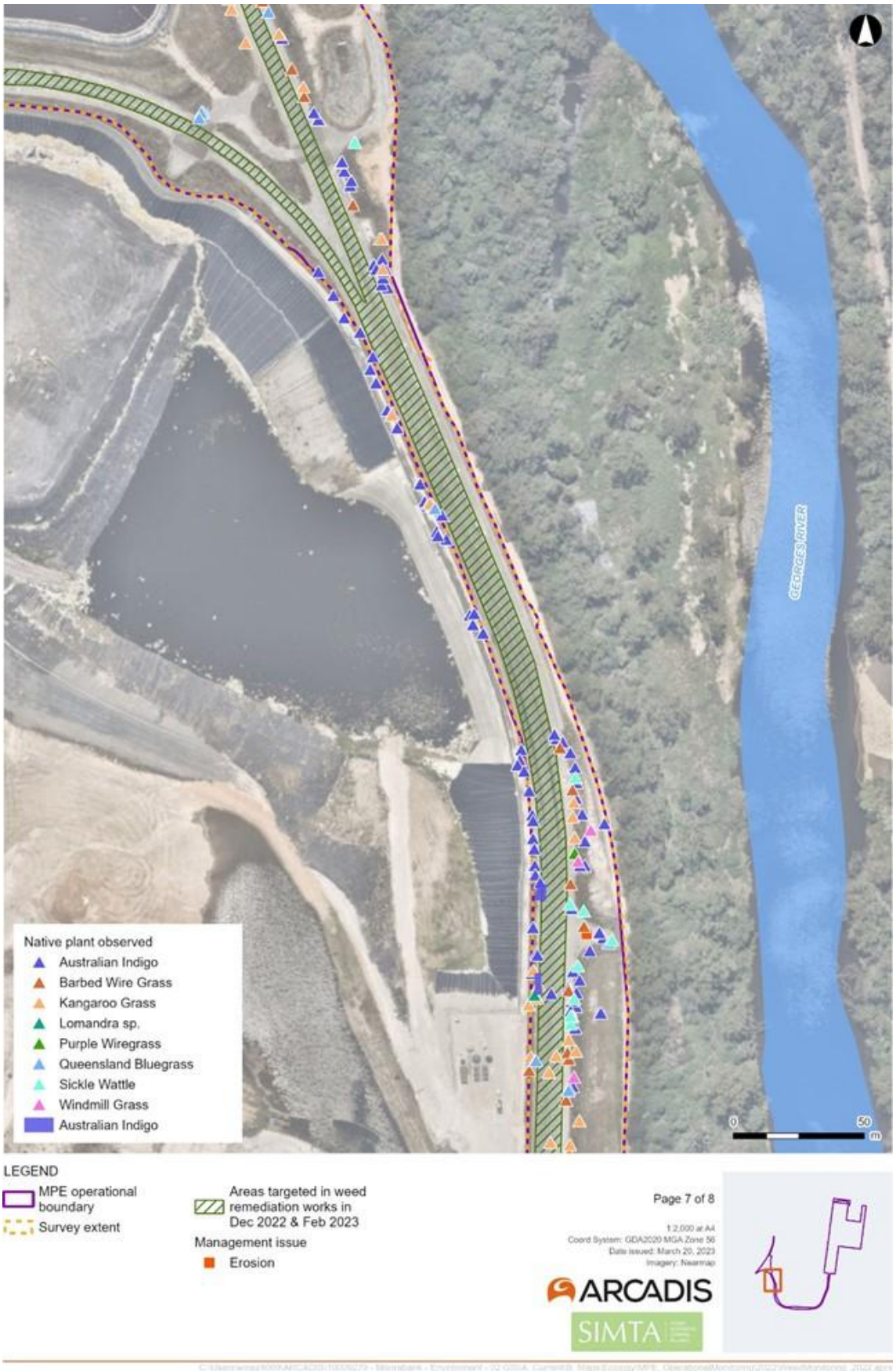


Figure 2 Instances of weeds, native species and threatened flora records in the survey extent and MIP operational boundary (7 of 8)

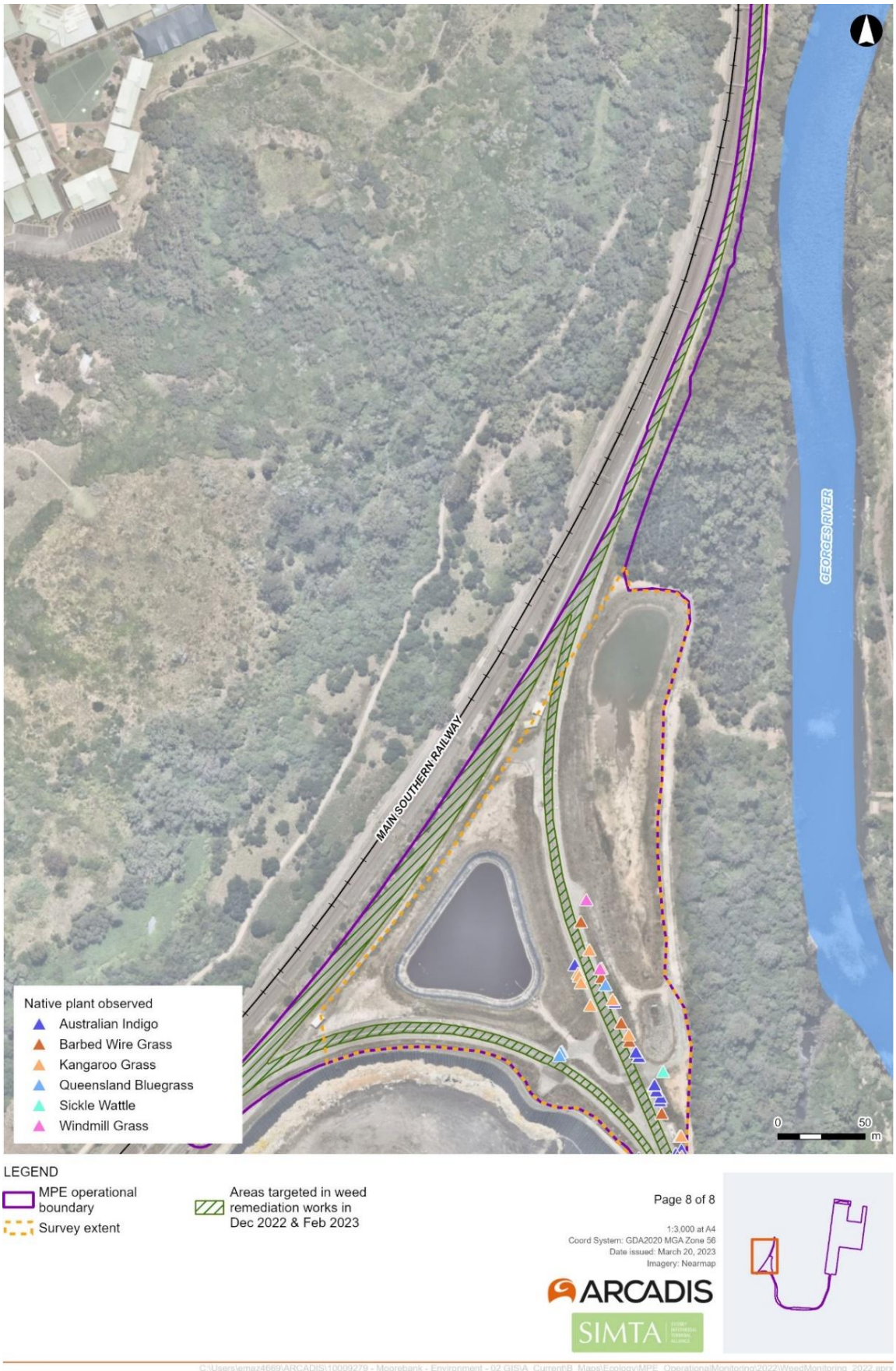


Figure 2 Instances of weeds, native species and threatened flora records in the survey extent and MIP operational boundary (8 of 8)

Recommendations

Weed monitoring and weed remedition works should continue throughout the 2025/26 monitoinrg year. Table 4 summrises 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 critera 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	• 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)	• Weed remediation works will focus on controlling priority and key weed species (Appendix A and Appendix B)
	• Suppression of environmental weeds and encroachment into areas of bushland should occur where possible
	• 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 *Themeda quadrivalvis* (Grader Grass) and *Senecio madagascariensis* (Fireweed) due to their relatively small root system
	• 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
	• Priority and aggressive weed species outside revegetated RALP areas should be removed. Weeds that should be targeted include *Senecio madagascariensis* (Fireweed)
	• Large patches of *Eragrostis curvula* (African Lovegrass), *Chloris gayana* (Rhodes Grass) and *Themeda quadrivalvis* (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, *Chloris gayana* (Rhodes Grass) and *Eragrostis curvula* (African Lovegrass), include glyphosate or flupropanate, while plants are actively growing during summer and spring. Native vegetation outside the

Area	Recommendation
	RALP fence must not be impacted by herbicide during weed remediation works • 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
	• 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
	• Continue to collect litter from within the RALP and in adjacent areas
IMEX building and adjacent drainage infrastructure	• 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	• 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	• 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	• 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. *cuspitada*)

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 (*Echienum 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: *Senecio madagascariensis* (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.	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. 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.
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).	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. 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.
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 *Medicago polymorpha* (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

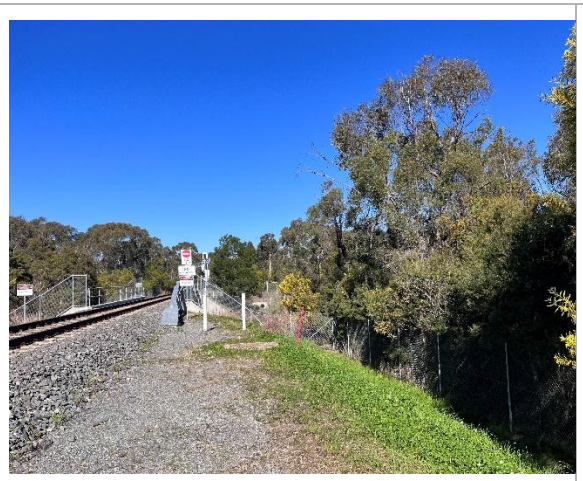
December 2023

June 2025

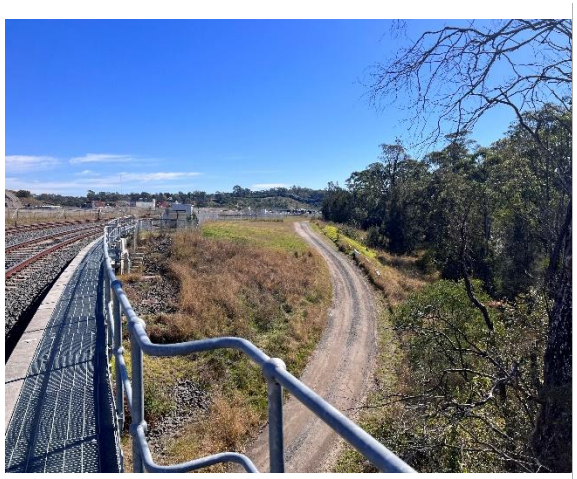
April 2021

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

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

Scientific name	Common name	Exotic	Priority/key weed
Verbena rigida var. Rigida	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	• 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
	• Cumberland Plain Seeds were procured to provide technical oversight of revegetation effort	
December 2021	• 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	• 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	• 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).

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)	• 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
IMEX building and adjacent drainage infrastructure	• *Acacia falcata* (Hickory Wattle) continue to grow unimpeded by weeds.	

Inspection area	Weed abundances for current survey	Photo of inspection area
Warehouse areas	• Large areas of the native *Cynodon dactylon* (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 *Senecio madagascariensis* (Fireweed), *Plantago lanceolata* (Plantain), *Trifolium arvense* (Clover) and exotic grasses like *Chloris gayana* (Rhodes Grass), *Sporobolus africanus* (Parramatta Grass), *Paspalum urvillei* (Giant Paspalum) and *Ehrharta erect* (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
Eastern boundary drainage infrastructure	• Drainage infrastructure dominated by *Bulboschoenus fluviatilis* (Marsh club-rush) whilst other are dominated by *Typha orientalis* (Bulrush). Where space is present between stands of theses native emergent species small clumps of *Persicaria decipiens* (Slender Knotweed), *Daviesia ulicifolia*, *Ficinia nodosa* (Knotted Club-rush), *Carex tereticaulis* and *Juncus usitatus* are present. Other native species such as *Imperata cylindrica* and *Lomandra longifolia* were observed in the drainage channels. • Areas of erosion still present.	

Inspection area	Weed abundances for current survey	Photo of inspection area
Moorebank Precinct West (MPW)		
Landscaped areas along Bushmasters Avenue	• Landscapes vegetation is in good condition, with minor weed incursions • Weed species present include *Sonchus oleraceus* (Common Sowthistle), *Chloris virgata* (Rhodes Grass), *Bidens pilosa*, *Conyza bonariensis* (Fleabane), *Cyclospermum leptophyllum* (Slender Celery), and *Tagetes minuta* (Stinking Roger). • Areas with limtied 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	• Suppression of Medicago and other herbacious weeds occuring in this area (*Sonchus oleraceus* (Common Sowthistle), *Circium vulagre*) • Methods include slashing and hand removal around native species	

Inspection area	Weed abundances for current survey	Photo of inspection area
Sediment basins adjacent to BioBank site	• Spot spraying, and hand pulling of weeds occuring along boundary of basins and BioBank site	

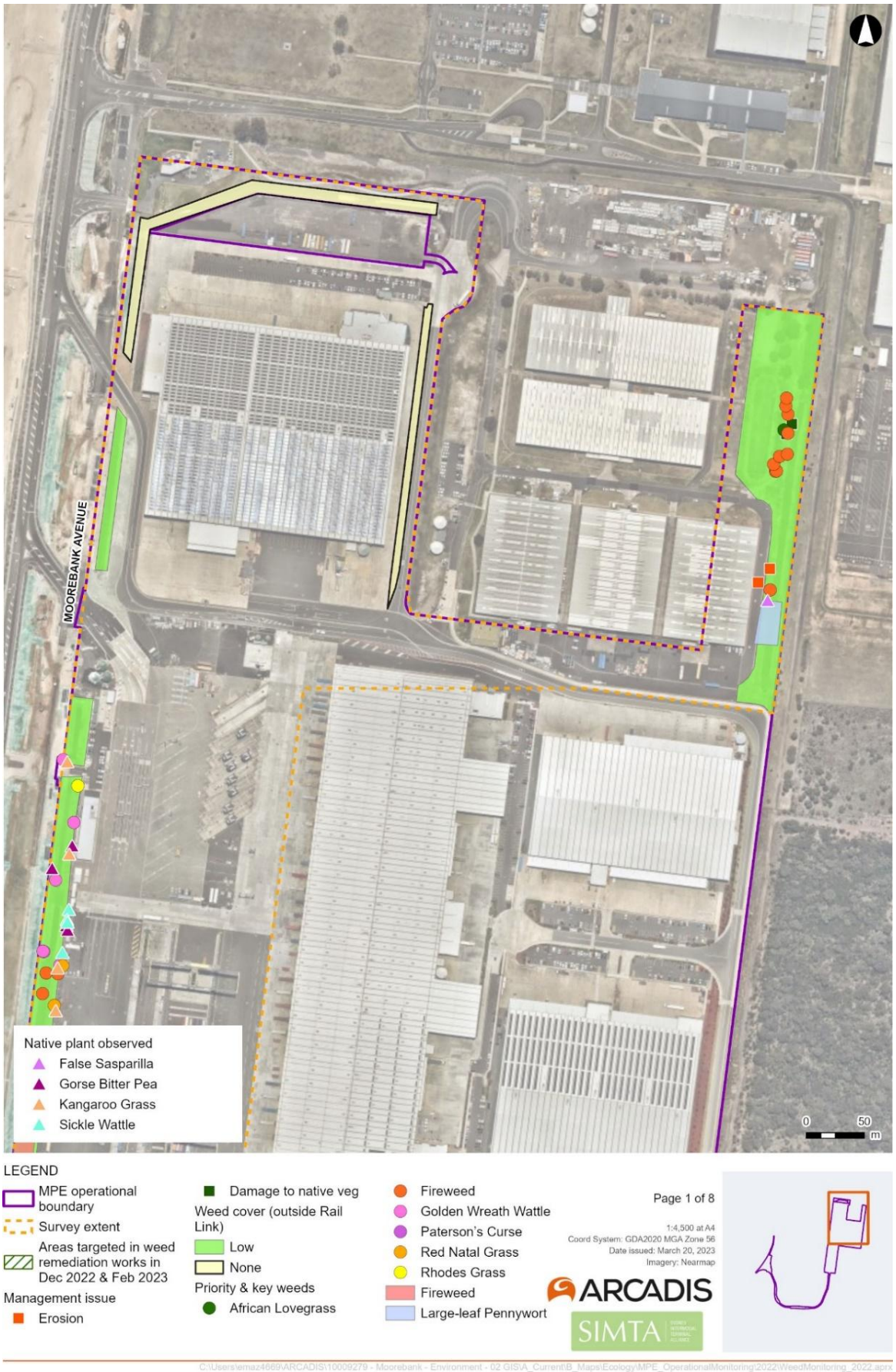


Figure 2 Instances of weeds, native species and threatened flora records in the survey extent and MIP operational boundary (1 of 8)

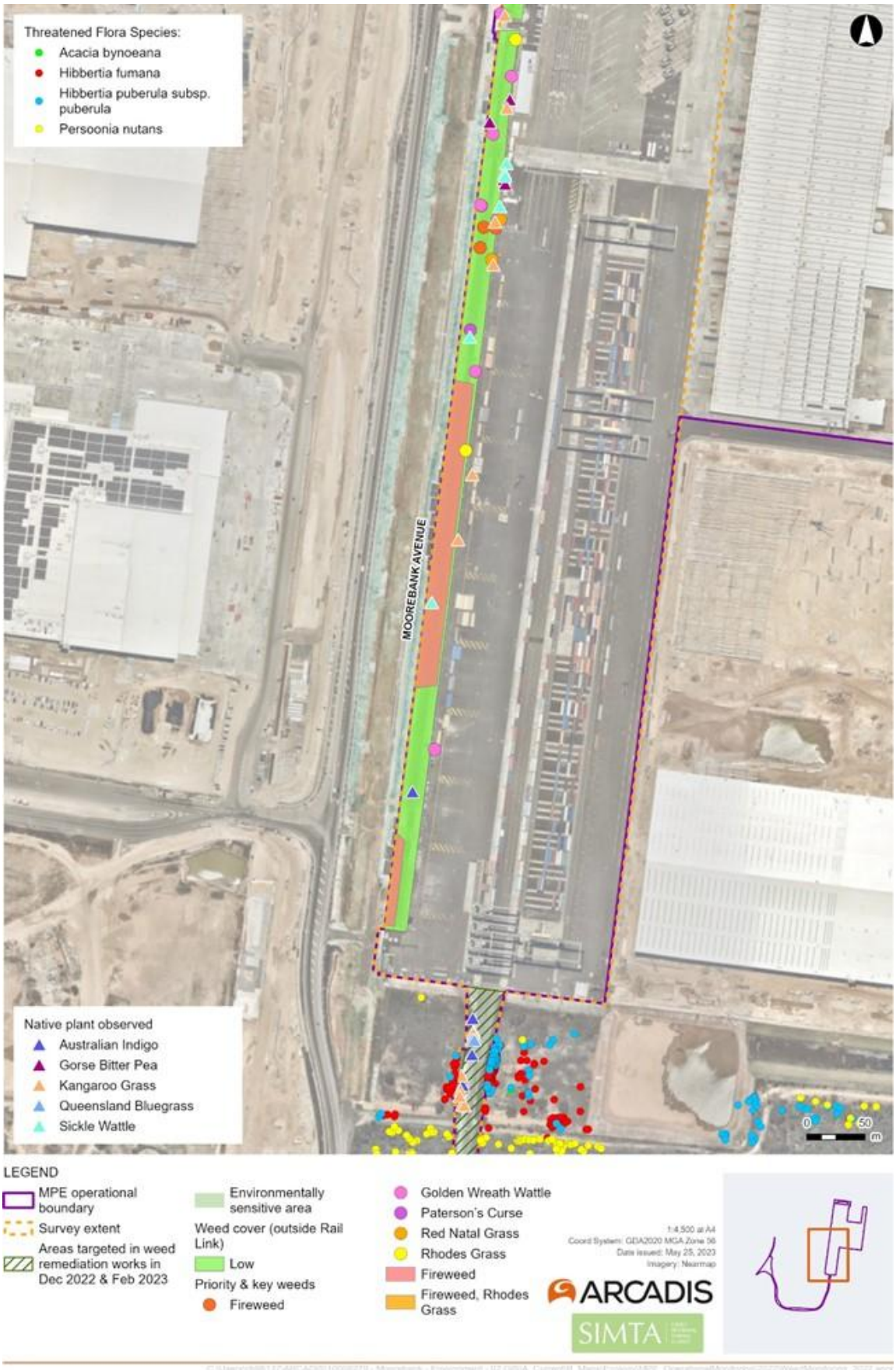


Figure 2 Instances of weeds, native species and threatened flora records in the survey extent and MIP operational boundary (2 of 8)

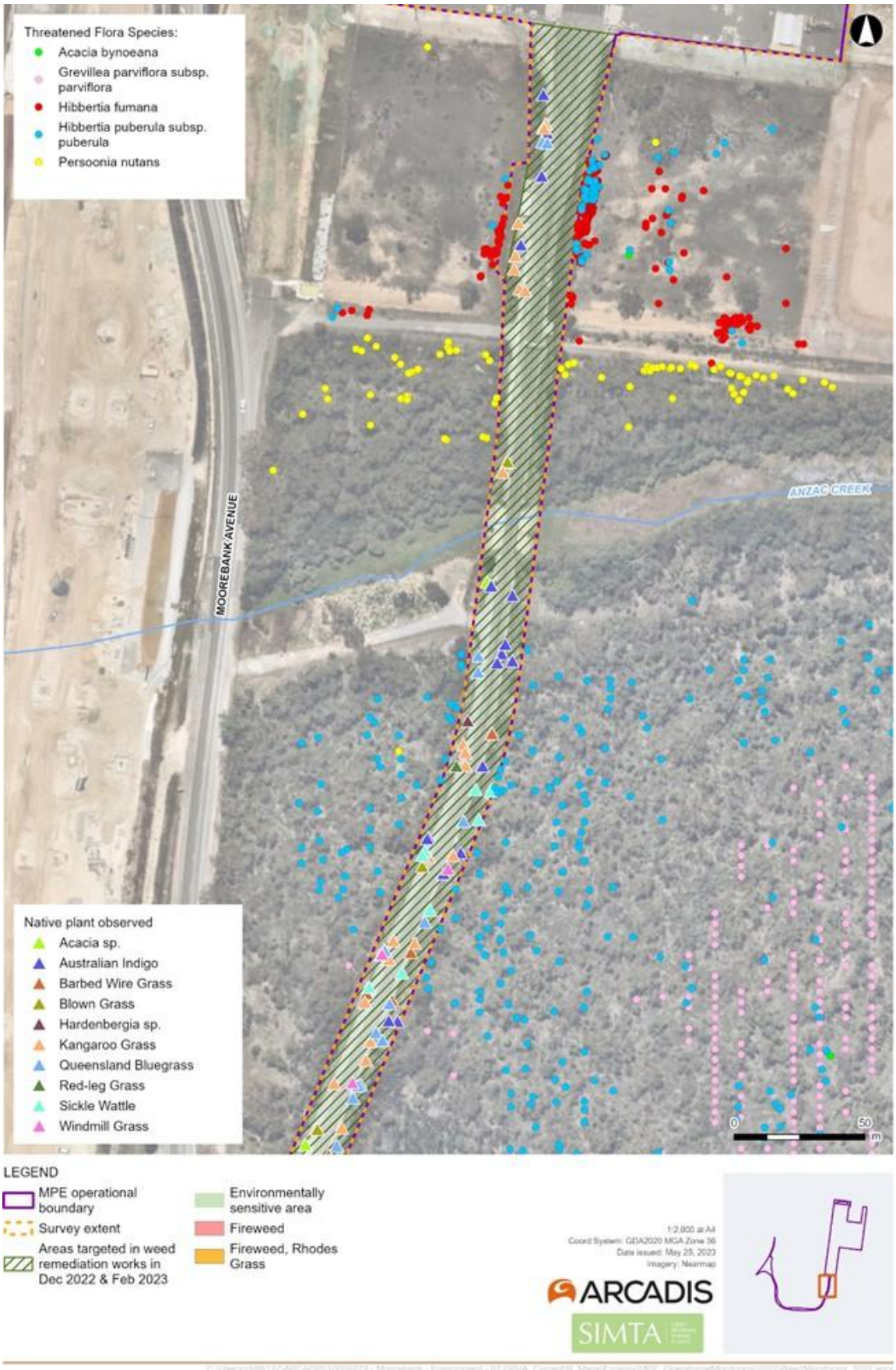


Figure 2 Instances of weeds, native species and threatened flora records in the survey extent and MIP operational boundary (3 of 8)

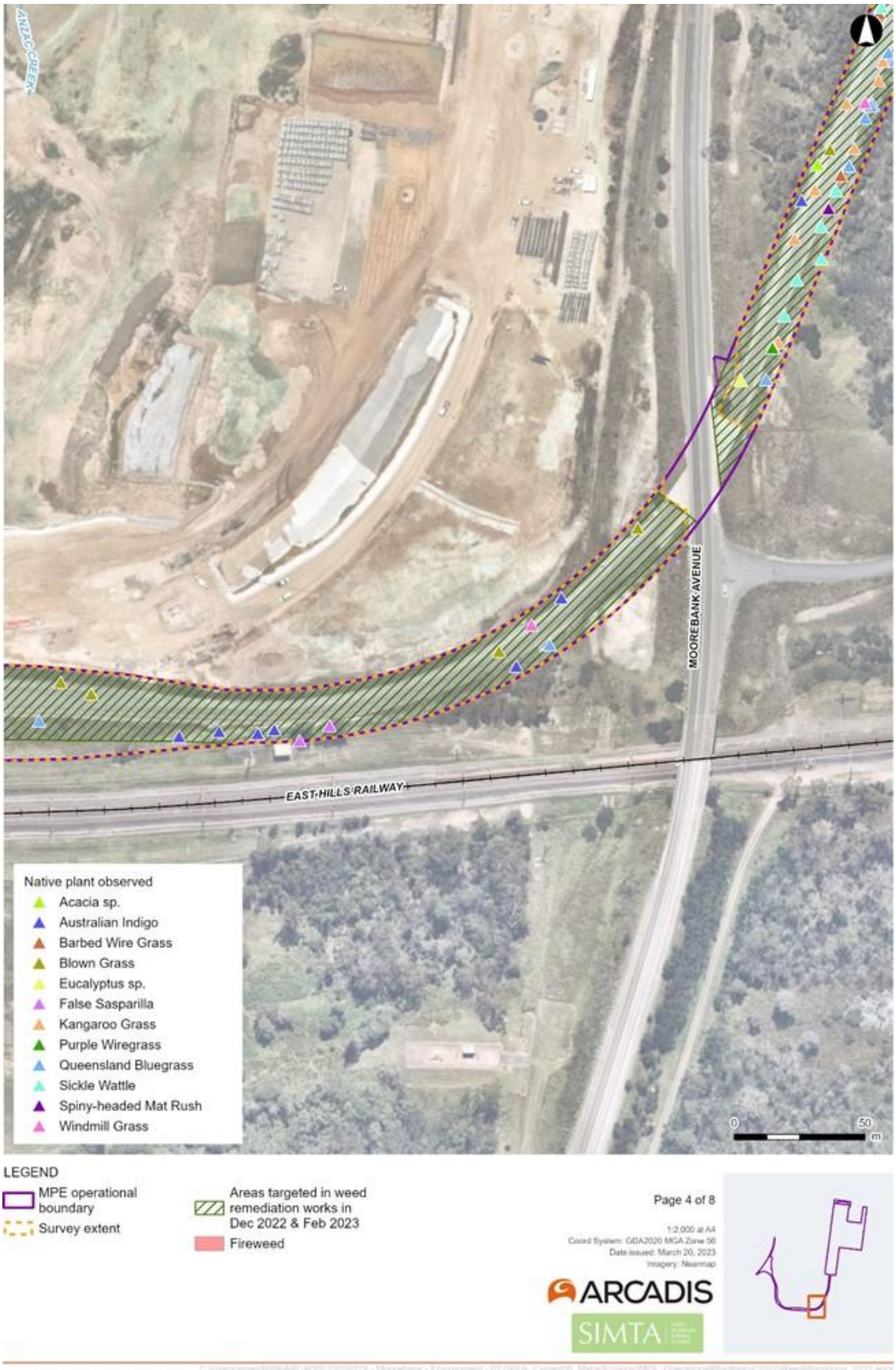


Figure 2 Instances of weeds, native species and threatened flora records in the survey extent and MIP operational boundary (4 of 8)

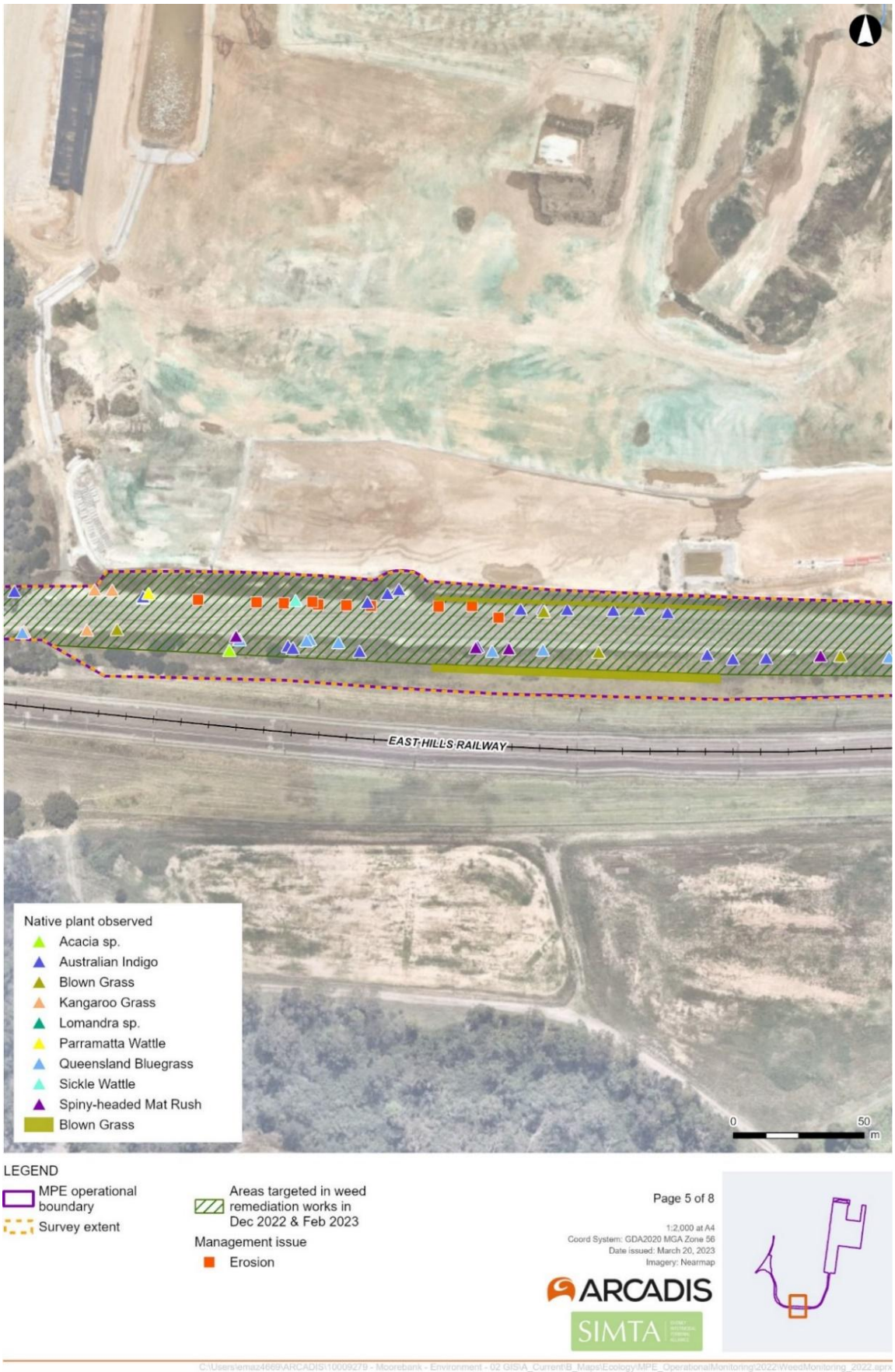


Figure 2 Instances of weeds, native species and threatened flora records in the survey extent and MIP operational boundary (5 of 8)

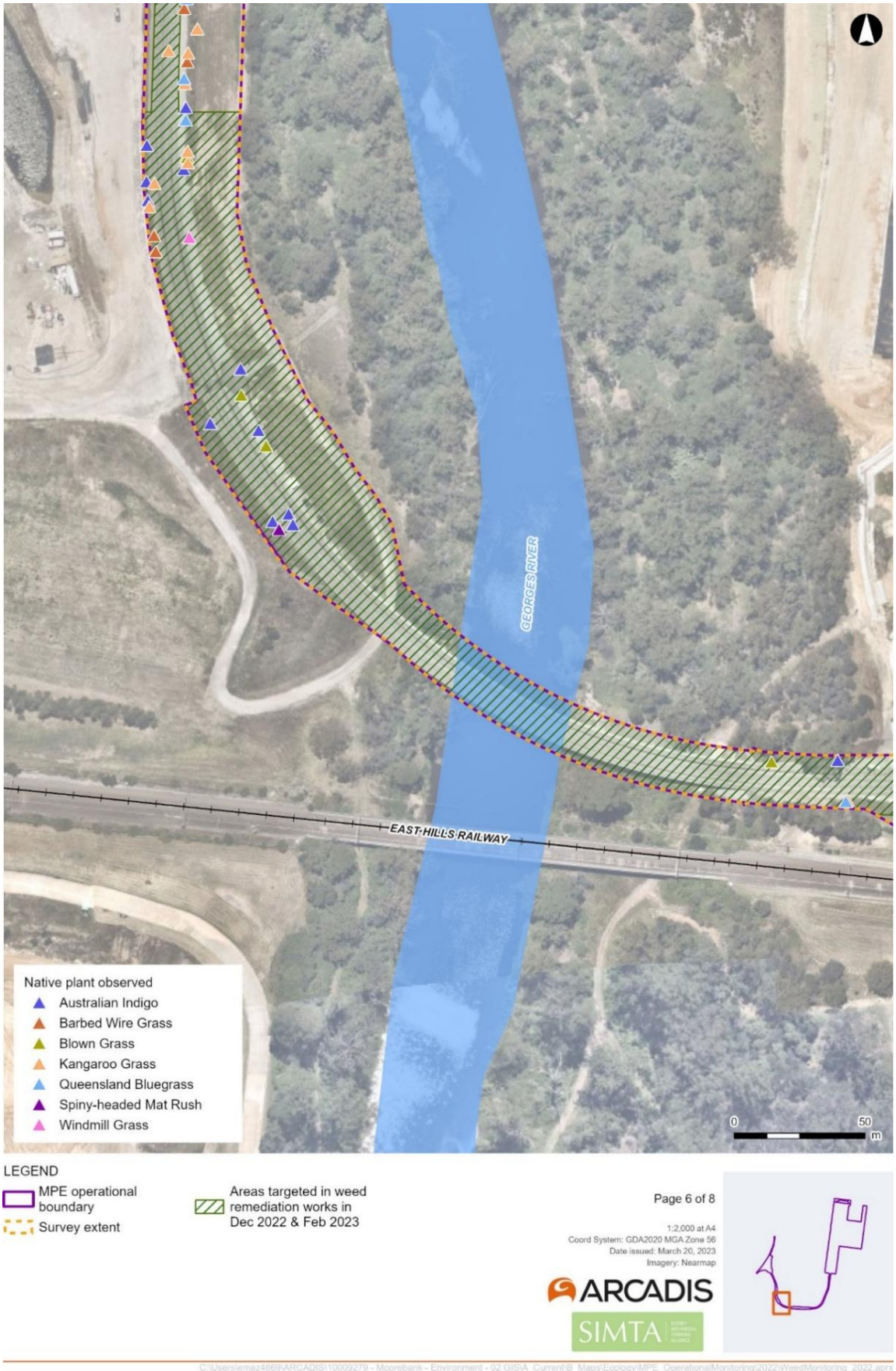


Figure 2 Instances of weeds, native species and threatened flora records in the survey extent and MIP operational boundary (6 of 8)

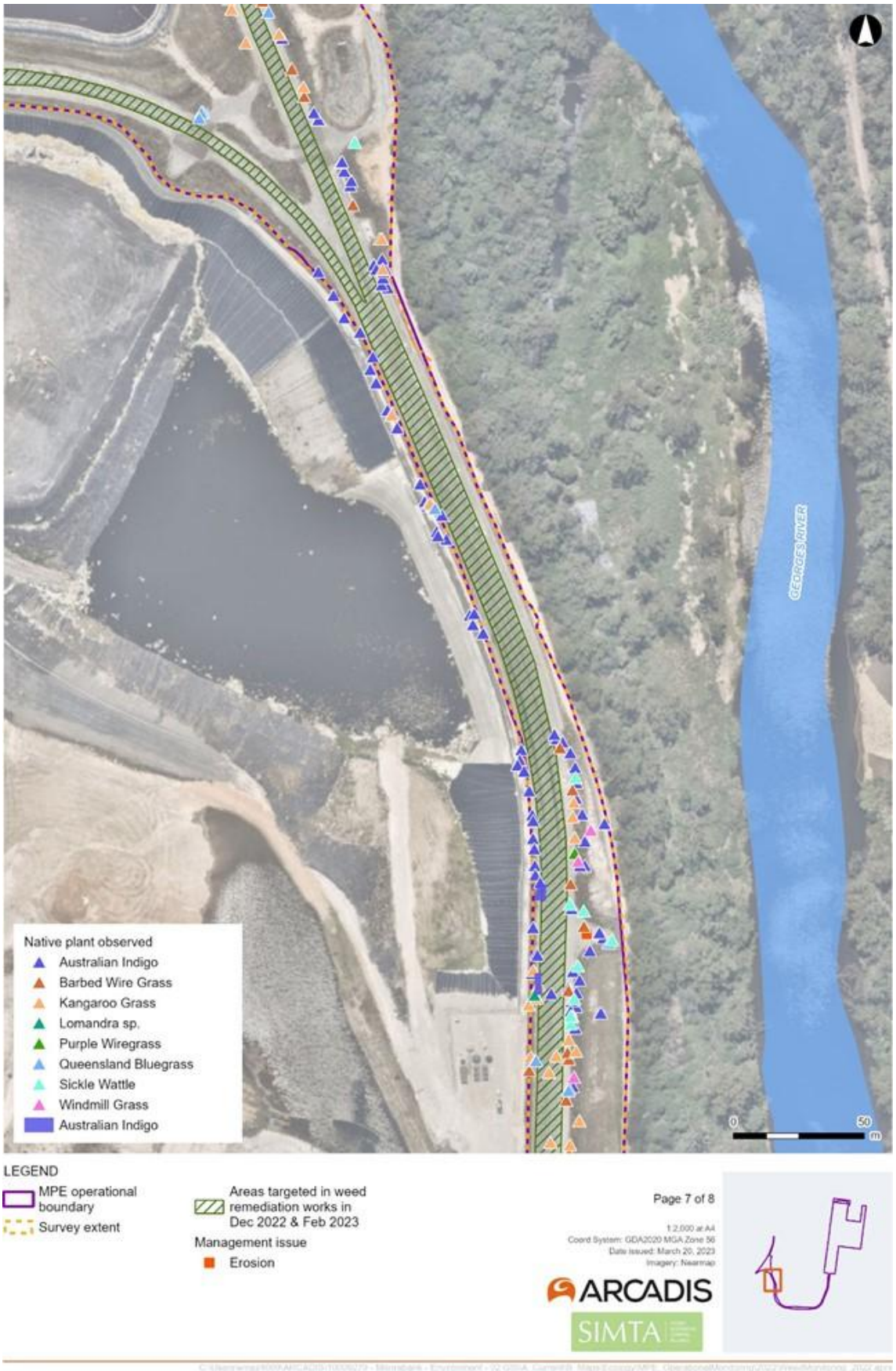


Figure 2 Instances of weeds, native species and threatened flora records in the survey extent and MIP operational boundary (7 of 8)

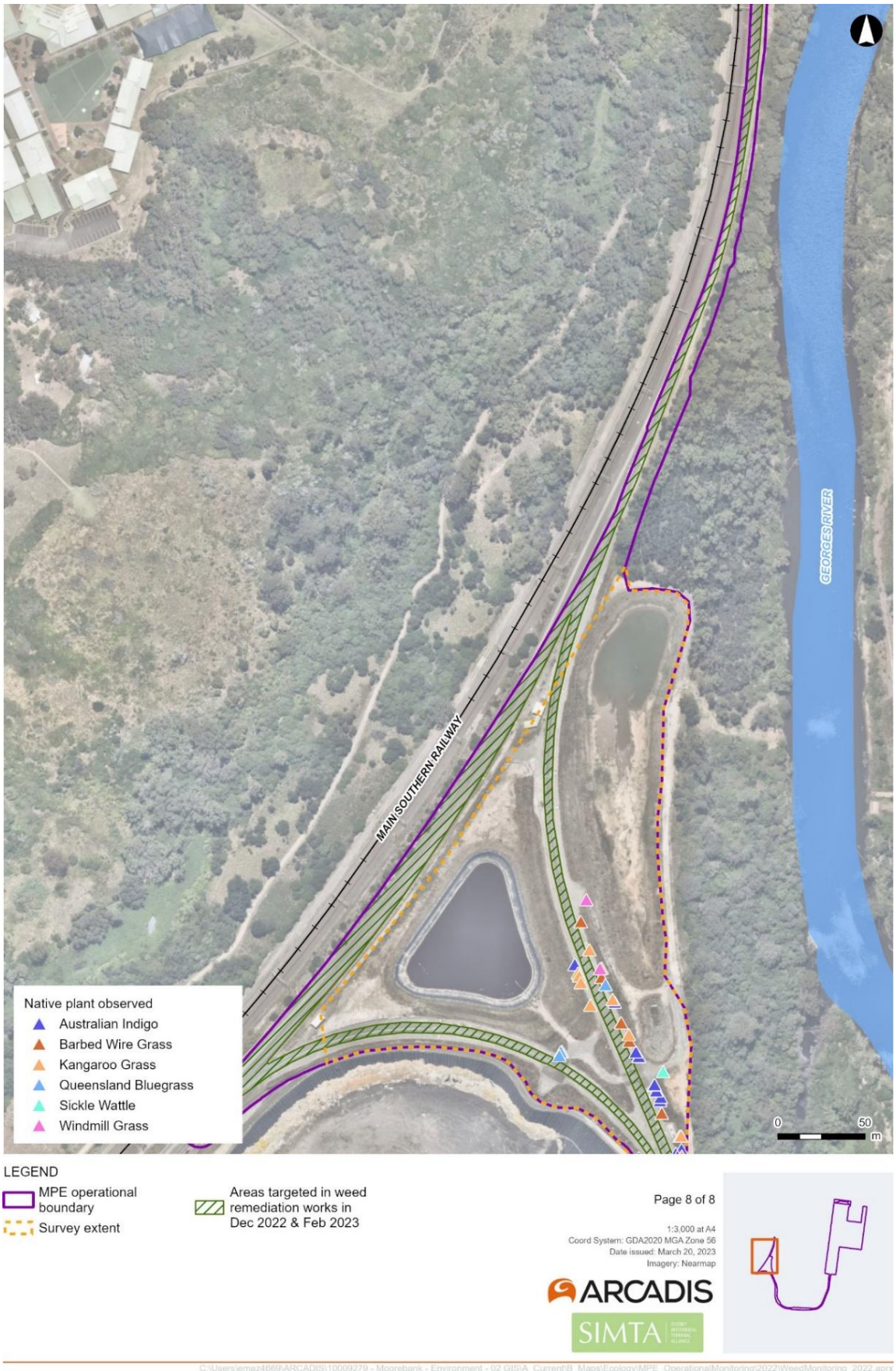


Figure 2 Instances of weeds, native species and threatened flora records in the survey extent and MIP operational boundary (8 of 8)

Recommendations

Weed monitoring and weed remedition works should continue throughout the 2025/26 monitoinrg year. Table 4 summrises 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 critera 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	• 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)	• Weed remediation works will focus on controlling priority and key weed species (Appendix A and Appendix B)
	• Suppression of environmental weeds and encroachment into areas of bushland should occur where possible
	• 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 *Themeda quadrivalvis* (Grader Grass) and *Senecio madagascariensis* (Fireweed) due to their relatively small root system
	• 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
	• Priority and aggressive weed species outside revegetated RALP areas should be removed. Weeds that should be targeted include *Senecio madagascariensis* (Fireweed)
	• Large patches of *Eragrostis curvula* (African Lovegrass), *Chloris gayana* (Rhodes Grass) and *Themeda quadrivalvis* (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, *Chloris gayana* (Rhodes Grass) and *Eragrostis curvula* (African Lovegrass), include glyphosate or flupropanate, while plants are actively growing during summer and spring. Native vegetation outside the

Area	Recommendation
	RALP fence must not be impacted by herbicide during weed remediation works • 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
	• 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
	• Continue to collect litter from within the RALP and in adjacent areas
IMEX building and adjacent drainage infrastructure	• 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	• 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	• 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	• 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. *cuspitada*)

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 (*Echienum 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: *Senecio madagascariensis* (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.	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. 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.
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).	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. 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.
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

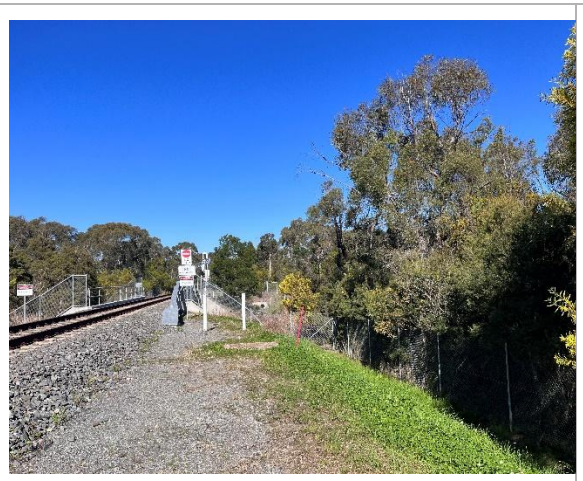
Month of logging	Recommended action	Status (Not started, Commenced, Complete)	Comments
April 2020	Eradicate priority weeds species, including Bridal Creeper, Alligator Weed, Lantana, Fireweed and African Olive	Completed	Most instances of these weeds have been removed from the RALP. Small instances of 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 *Medicago polymorpha* (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

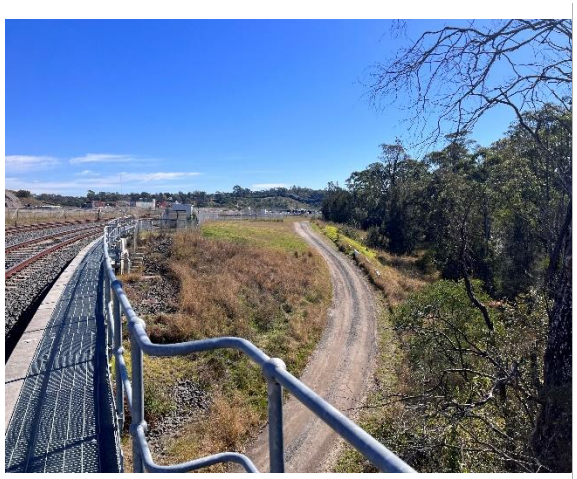
Month of logging	Recommended action	Status (Not started, Commenced, Complete)	Comments
			herbicide due to safety concerns of train operators and prevent spread of weeds.
December 2022	Continue weed remediation works along the soft batters within the RALP.	Commenced	Future weed remediation works should 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
		
April 2021	December 2023	August 2025

		
April 2021	December 2023	August 2025
		
April 2021	December 2023	August 2025

		
April 2021	December 2023	August 2025
		
April 2021	December 2023	August 2025

		
April 2021	**December 2023**	**August 2025**

APPENDIX F FLORA SPECIES INVENTORY

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

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

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

MIP BI-MONTHLY WEED MONITORING REPORT – OCTOBER 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	05/11/2025
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	• 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
	• Cumberland Plain Seeds were procured to provide technical oversight of revegetation effort	
December 2021	• 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	• 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	• 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 5 November 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.

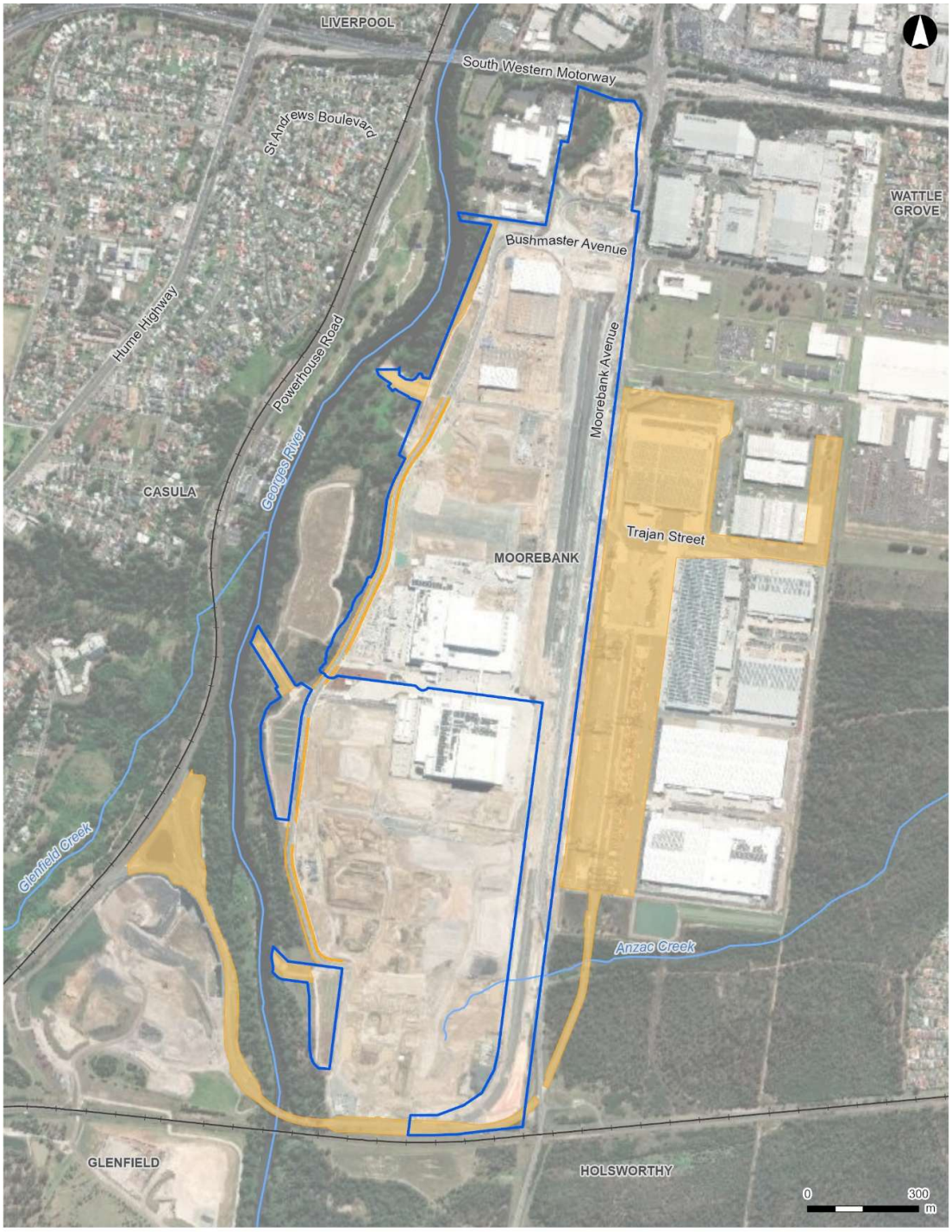
The weather on the 5 November was sunny, with a maximum temperature of 28°C, and the weather recorded at Holsworthy Aerodrome (station 066161) (BOM 2025).

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 5 November 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
- Weed monitoring survey extent

1:15,000 at A4
GDA2020 MGA Zone 56
Date issued: November 21, 2025
Imagery: Esri

ARCADIS

SIMTA

C:\Users\emaz4669\ARCADIS\30228596 - Moorebank Logistics Precinct 2 - 02 GIS\A_Current\B_Maps\Ecology\MPE_OperationalMonitoring\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 October/November 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)	• Weed growth continous to be supressed, particuraly in the areas immedaitely adjacent to the BioBank site. Large instances of native grasses (*Themeda triandra*) are growing substantially • 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
IMEX building and adjacent drainage infrastructure	• *Acacia falcata* (Hickory Wattle) continue to grow unimpeded by weeds.	

Inspection area	Weed abundances for current survey	Photo of inspection area
Warehouse areas	• Majority of this area has now been claimed by the Moorebank Avenue Upgrade project and is unable to be surveyed adequately • Occurrences of weeds in the warehouse area and the adjacent drainage infrastructure is restricted to scattered individuals of *Senecio madagascariensis* (Fireweed), *Plantago lanceolata* (Plantain), *Trifolium arvense* (Clover) and exotic grasses like *Chloris gayana* (Rhodes Grass), *Sporobolus africanus* (Parramatta Grass), *Paspalum urvillei* (Giant Paspalum) and *Ehrharta erect* (Panic Veldtgrass).	

Inspection area	Weed abundances for current survey	Photo of inspection area
Eastern boundary drainage infrastructure	• Majority of this area has now been claimed by the Moorebank Avenue Upgrade project and is unable to be surveyed adequately • Drainage infrastructure dominated by *Bulboschoenus fluviatilis* (Marsh club-rush) whilst other are dominated by *Typha orientalis* (Bulrush). Where space is present between stands of theses native emergent species small clumps of *Persicaria decipiens* (Slender Knotweed), *Daviesia ulicifolia*, *Ficinia nodosa* (Knotted Club-rush), *Carex tereticaulis* and *Juncus usitatus* are present. Other native species such as *Imperata cylindrica* and *Lomandra longifolia* were observed in the drainage channels. • Areas of erosion still present.	

Inspection area	Weed abundances for current survey	Photo of inspection area
Moorebank Precinct West (MPW)		
Landscaped areas along Bushmasters Avenue	• Landscapes vegetation is in good condition, with minor weed incursions • Weed species present include *Sonchus oleraceus* (Common Sowthistle), *Chloris virgata* (Rhodes Grass), *Bidens pilosa*, *Conyza bonariensis* (Fleabane), *Cyclospermum leptophyllum* (Slender Celery), and *Tagetes minuta* (Stinking Roger). • Areas with limtied 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	• Suppression of *Medicago polymorpha* and other herbacious weeds occuring in this area (*Sonchus oleraceus* (Common Sowthistle), *Circium vulagre*) • Methods include slashing and hand removal around native species • Large stands of the native shrub *Dodonea viscosa* are growing unimpeded.	

Sediment basins adjacent to BioBank site	• Spot spraying, and hand pulling of weeds occuring along boundary of basins and BioBank site • No significant increases in weed coverage were observed around the basin outlet points	

Inspection area	Weed abundances for current survey	Photo of inspection area
		

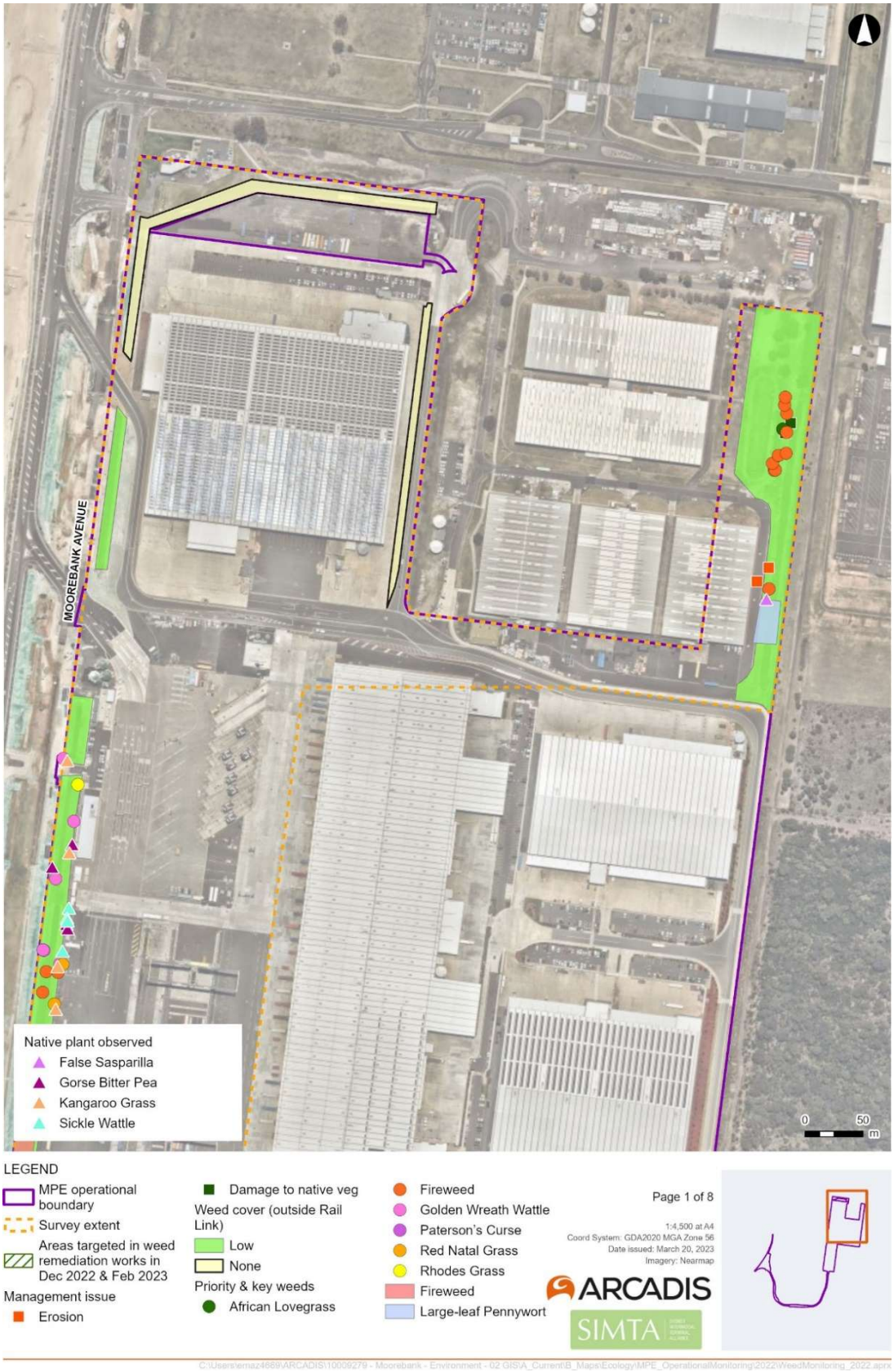


Figure 2 Instances of weeds, native species and threatened flora records in the survey extent and MIP operational boundary (1 of 8)

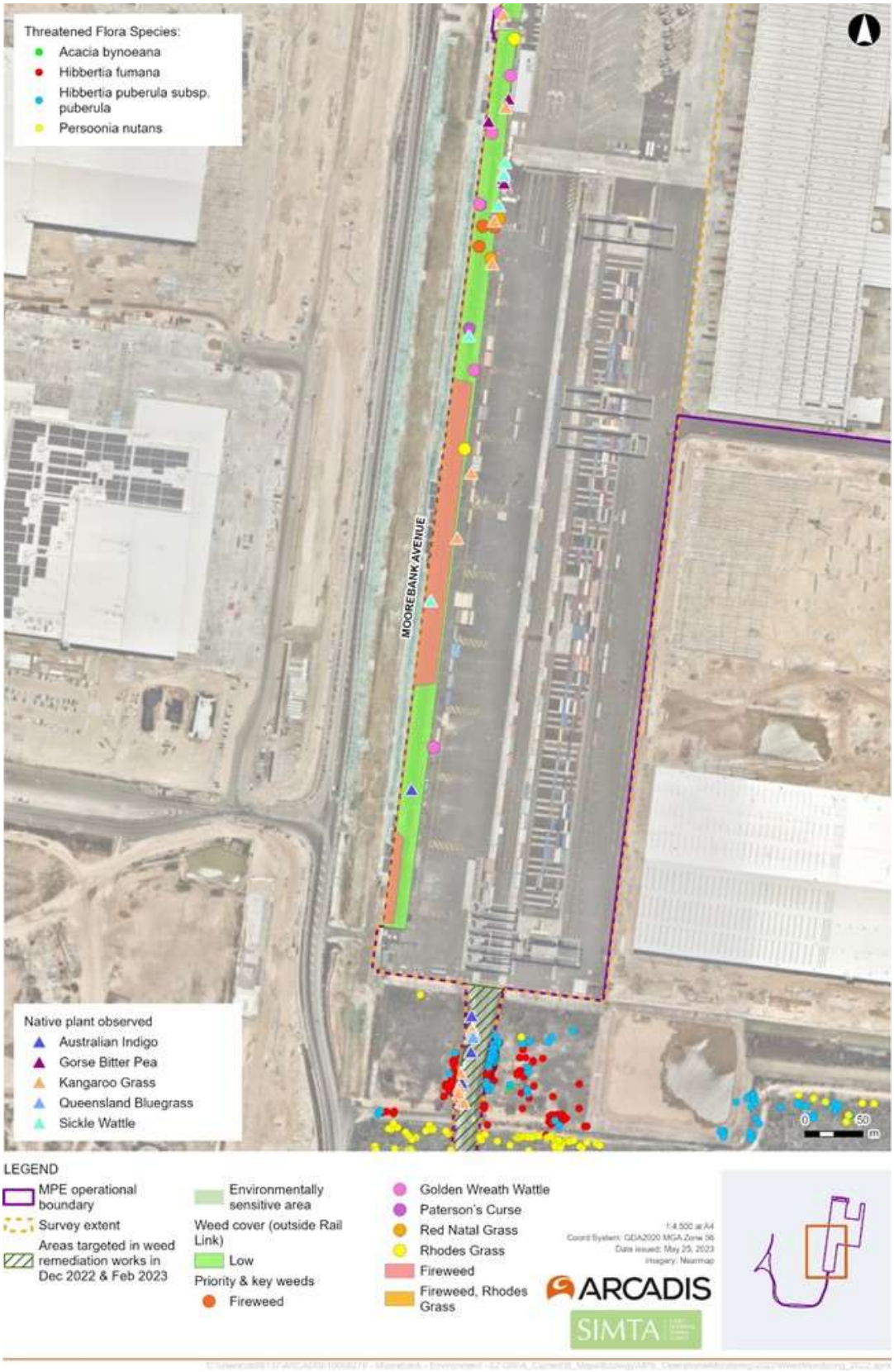


Figure 2 Instances of weeds, native species and threatened flora records in the survey extent and MIP operational boundary (2 of 8)

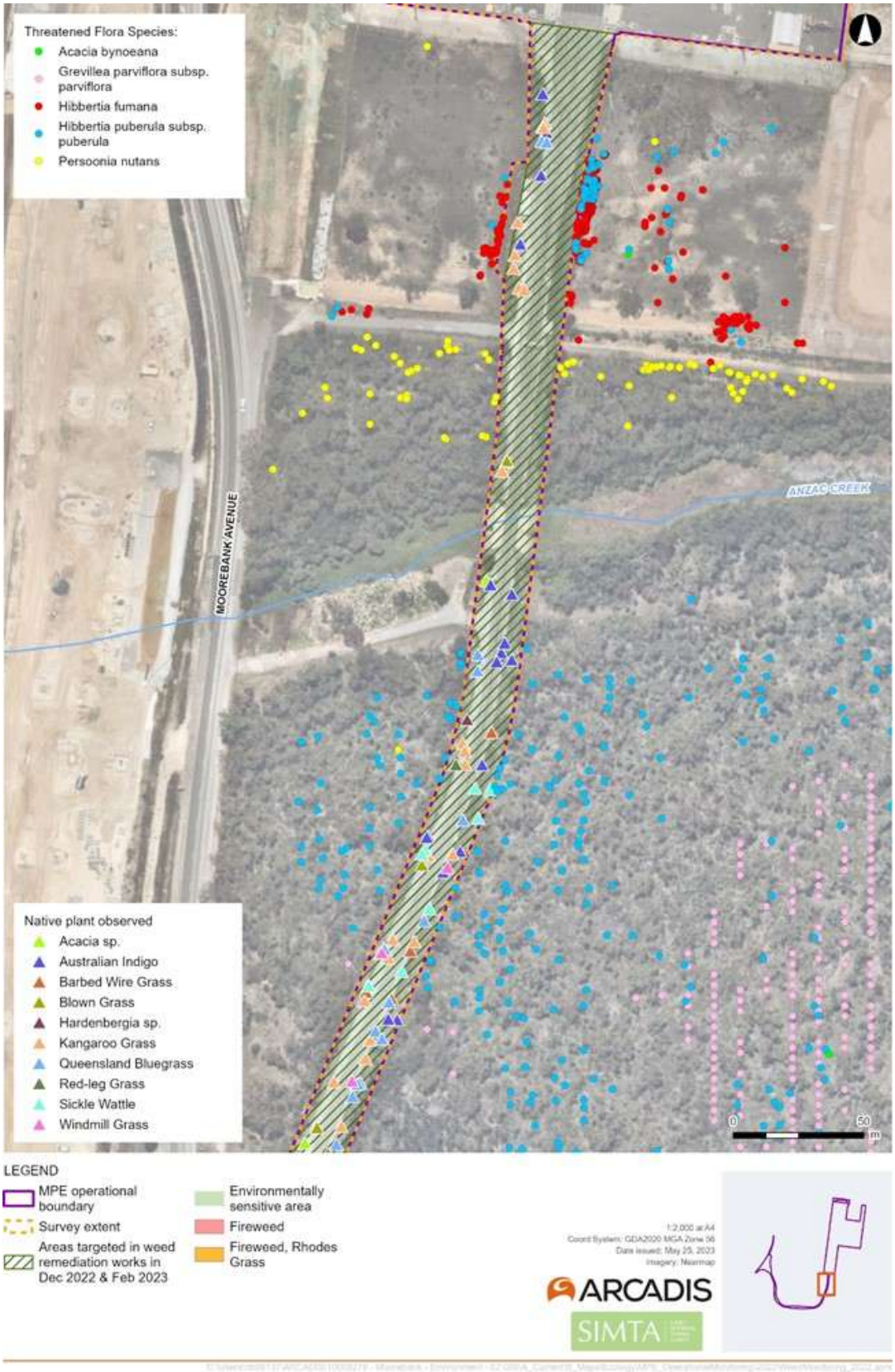


Figure 2 Instances of weeds, native species and threatened flora records in the survey extent and MIP operational boundary (3 of 8)

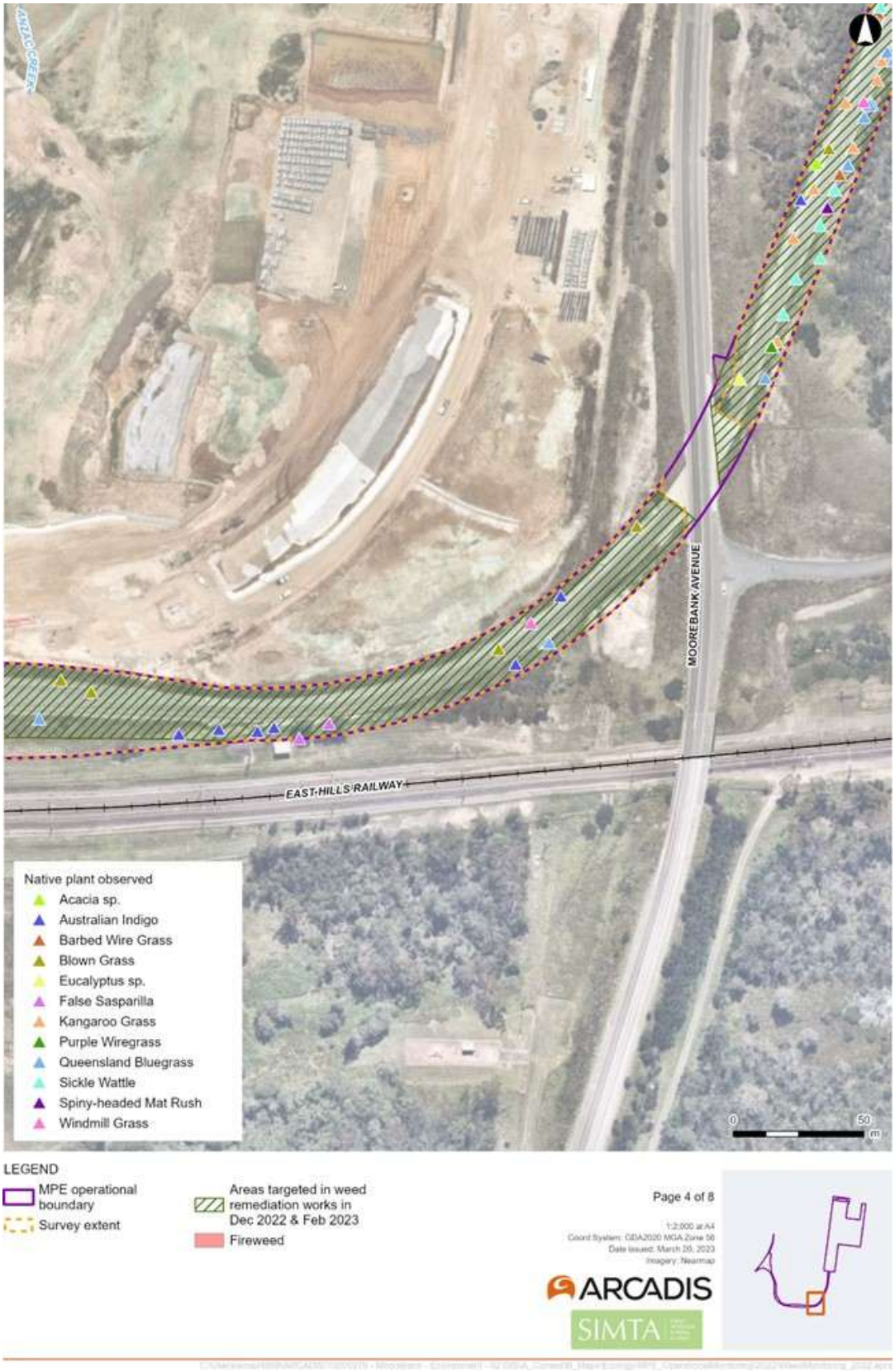


Figure 2 Instances of weeds, native species and threatened flora records in the survey extent and MIP operational boundary (4 of 8)

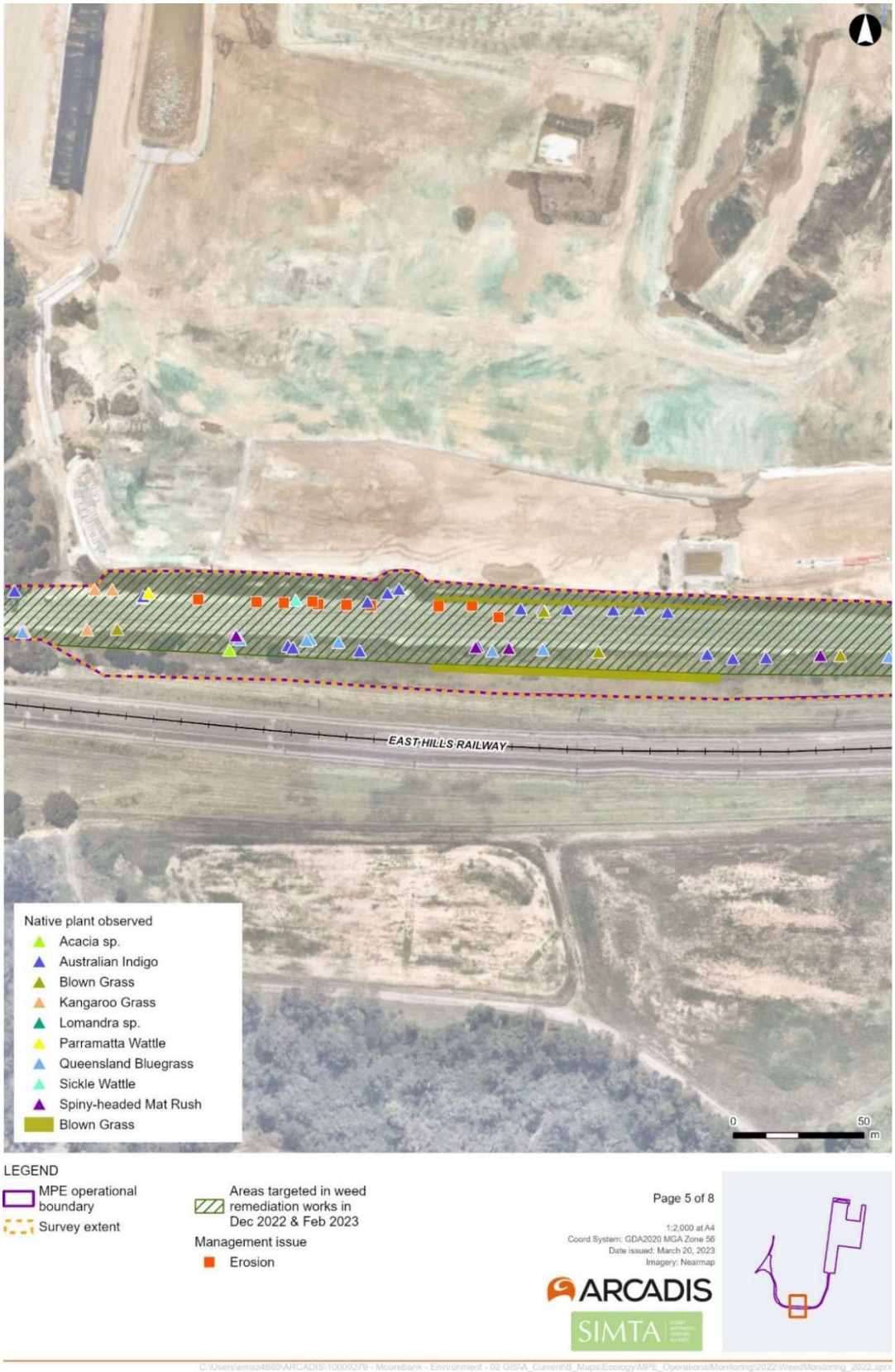


Figure 2 Instances of weeds, native species and threatened flora records in the survey extent and MIP operational boundary (5 of 8)

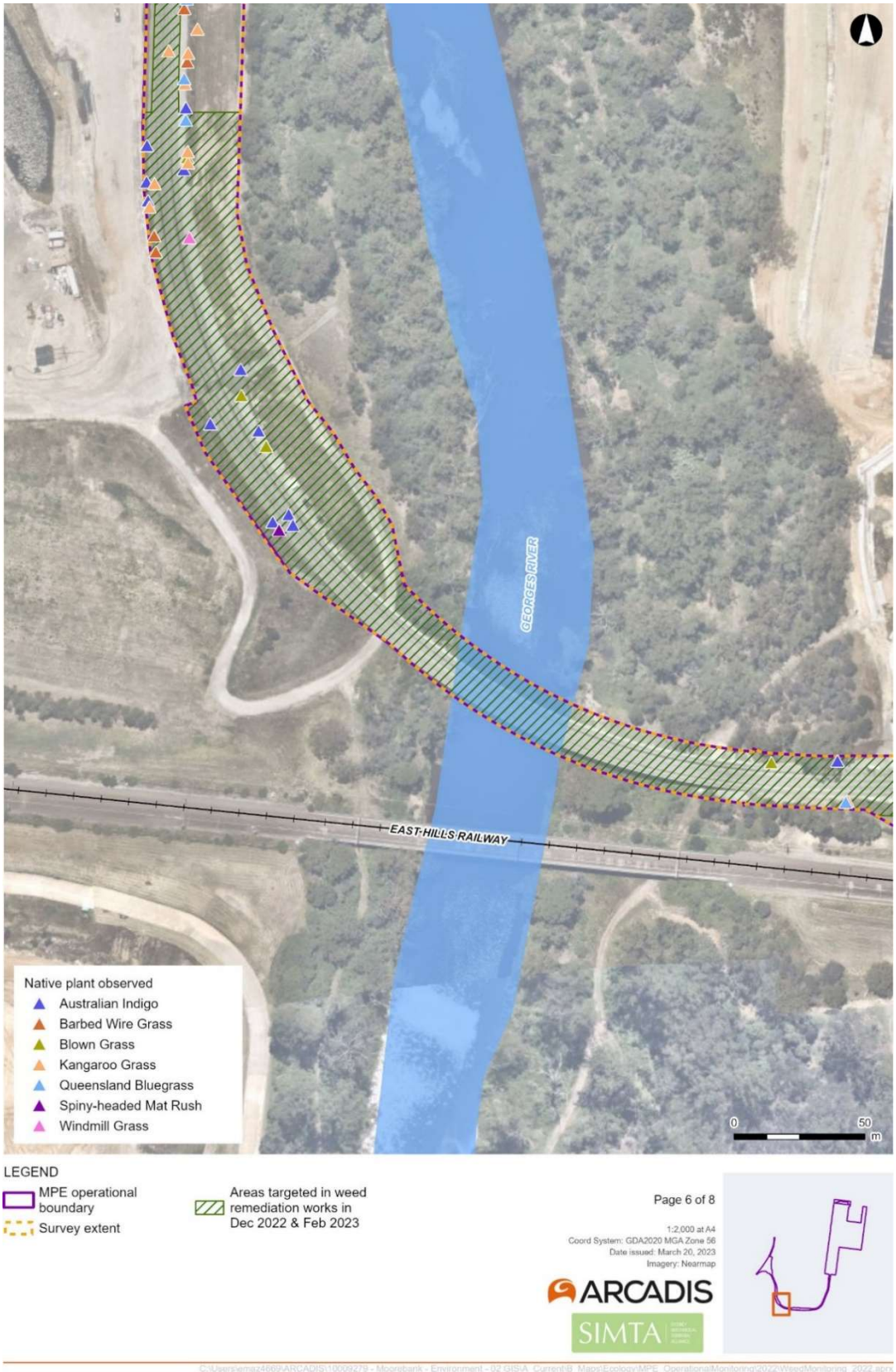


Figure 2 Instances of weeds, native species and threatened flora records in the survey extent and MIP operational boundary (6 of 8)

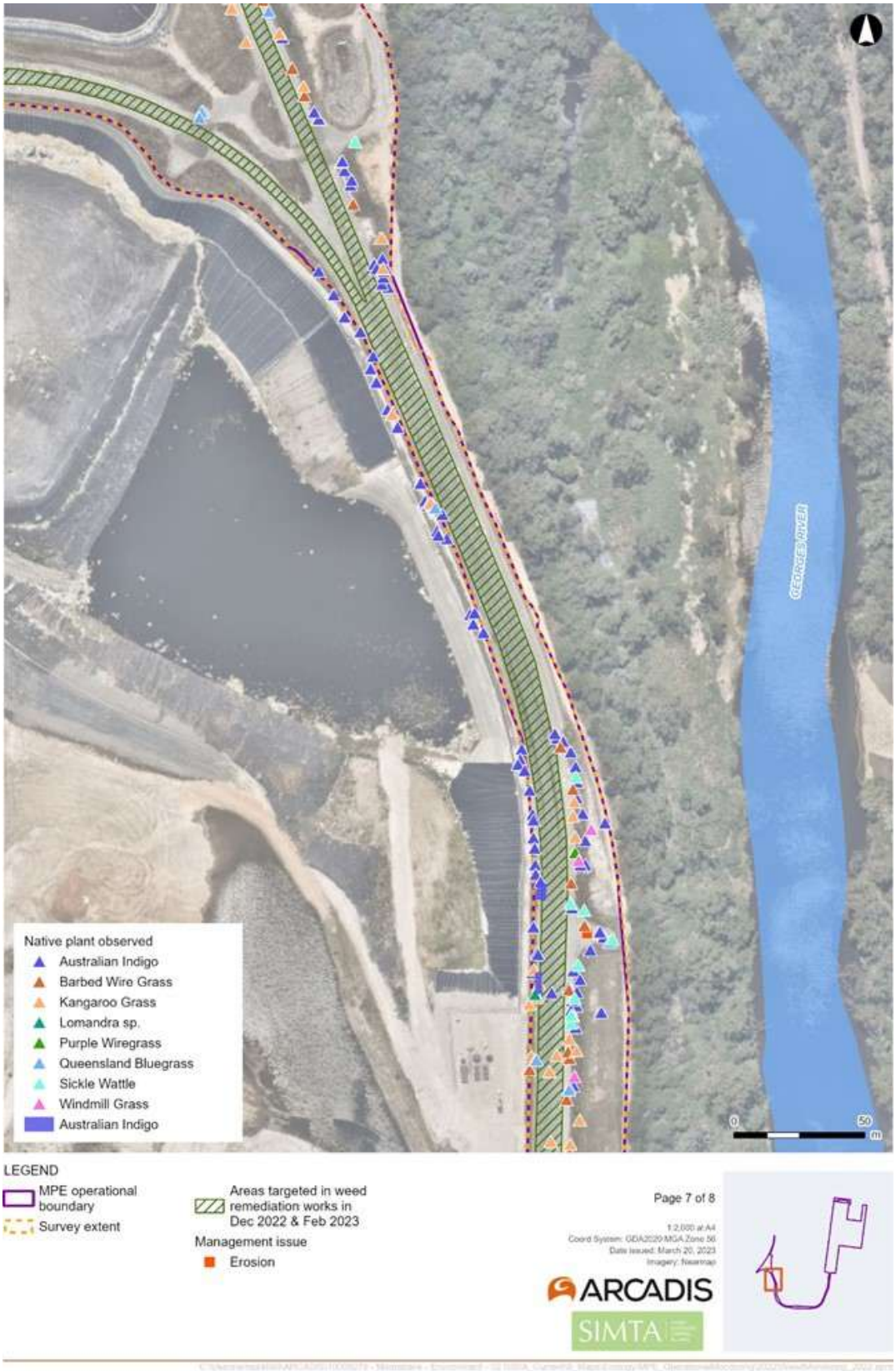


Figure 2 Instances of weeds, native species and threatened flora records in the survey extent and MIP operational boundary (7 of 8)

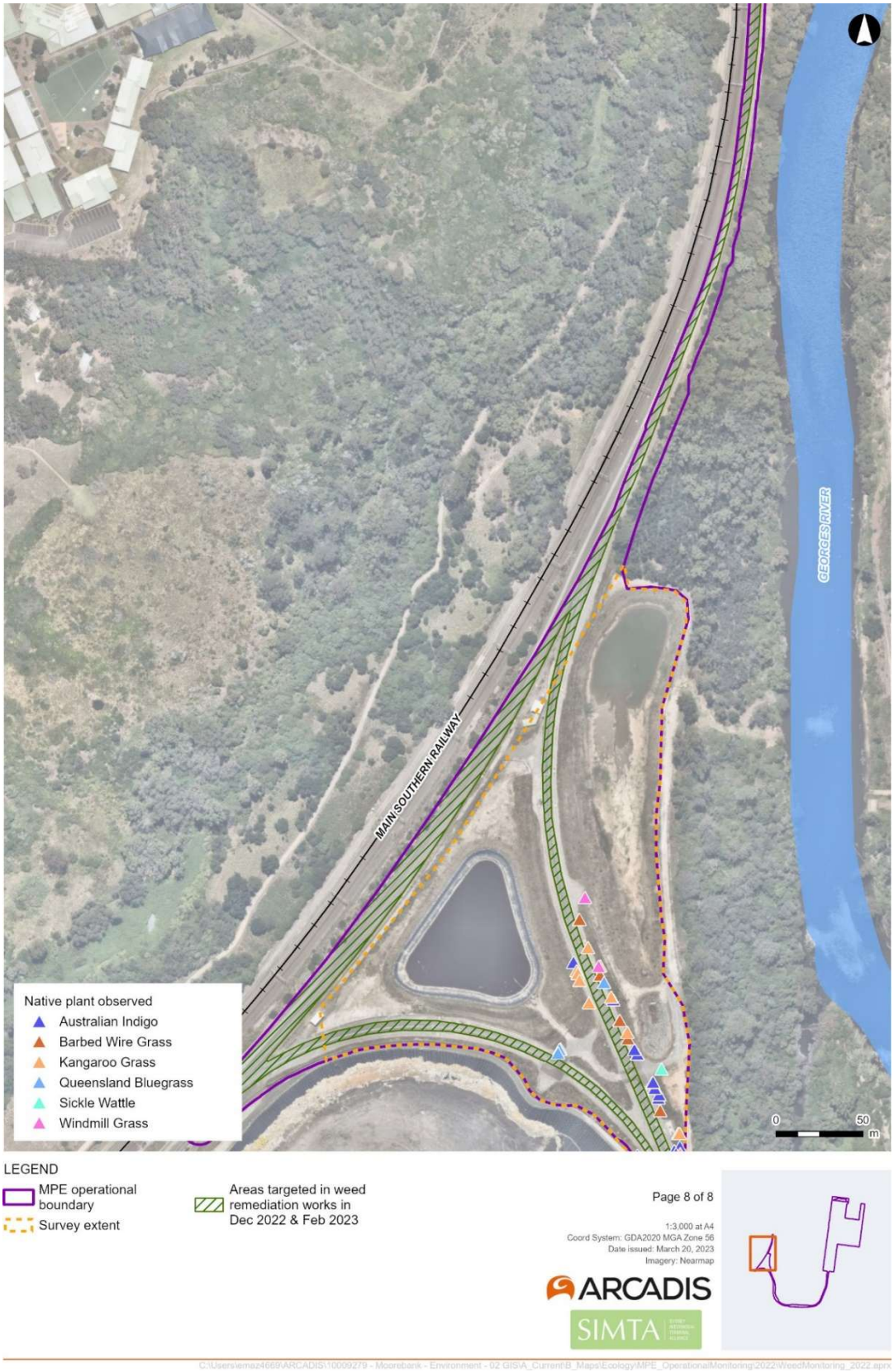


Figure 2 Instances of weeds, native species and threatened flora records in the survey extent and MIP operational boundary (8 of 8)

Recommendations

Weed monitoring and weed remedition works should continue throughout the 2025/26 monitoinrg year. Table 4 summrises 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 critera 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	• 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)	• Weed remediation works will focus on controlling priority and key weed species (Appendix A and Appendix B)
	• Suppression of environmental weeds and encroachment into areas of bushland should occur where possible
	• 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 *Themeda quadrivalvis* (Grader Grass) and *Senecio madagascariensis* (Fireweed) due to their relatively small root system
	• 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
	• Priority and aggressive weed species outside revegetated RALP areas should be removed. Weeds that should be targeted include *Senecio madagascariensis* (Fireweed)
	• Large patches of *Eragrostis curvula* (African Lovegrass), *Chloris gayana* (Rhodes Grass) and *Themeda quadrivalvis* (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, *Chloris gayana* (Rhodes Grass) and *Eragrostis curvula* (African Lovegrass), include glyphosate or flupropanate, while plants are actively growing during summer and spring. Native vegetation outside the

Area	Recommendation
	RALP fence must not be impacted by herbicide during weed remediation works • 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
	• 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
	• Continue to collect litter from within the RALP and in adjacent areas
IMEX building and adjacent drainage infrastructure	• 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	• 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	• 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	• 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
APZ area – northern MPW	• 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
Sediment basins adjacent to BioBank site	• 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

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. *cuspitada*)

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 (*Echienum 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: *Senecio madagascariensis* (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.	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. 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.
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).	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. 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.
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.

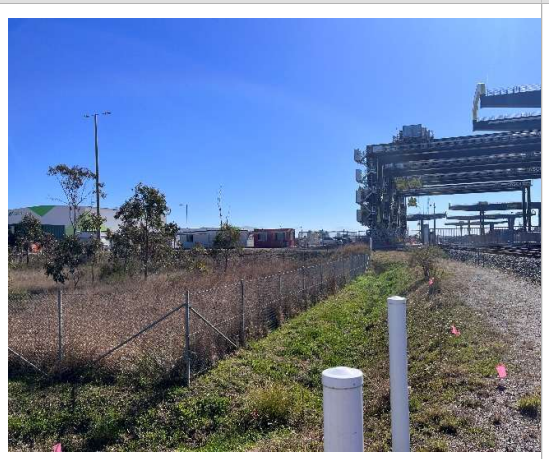
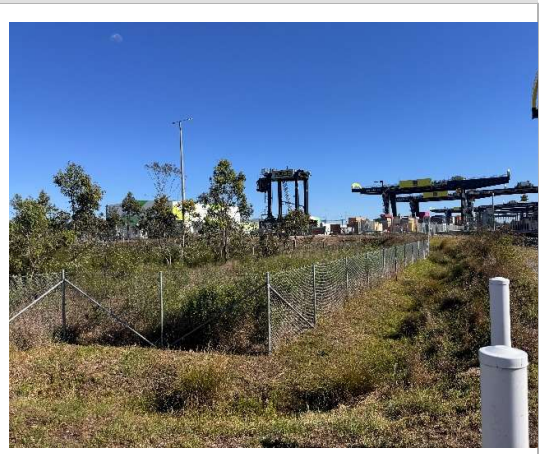
APPENDIX D RECOMMENDED ACTIONS CATALOGUE

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 *Medicago polymorpha* (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	October/November 2025
		
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	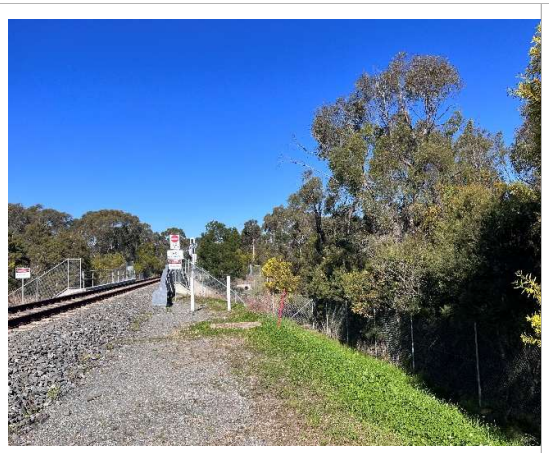	
April 2021	December 2023	October/November 2025
		
April 2021	December 2023	October/November 2025

		
April 2021	December 2023	October/November 2025
		
April 2021	December 2023	October/November 2025

		
April 2021	**December 2023**	**October/November 2025**

APPENDIX F FLORA SPECIES INVENTORY

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

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

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

Moorebank Intermodal Precinct

APPENDIX H – BTODR REPORTING

To be submitted separately

Moorebank Intermodal Precinct

APPENDIX I – OPERATIONS INCIDENT REGISTER

Report ID	ReportStatusDesc	Region	BuildingName	SiteName	ManagerName	ManagerContact	ManagerEmail	PartA_LineManagerName	PartA_LineManagerEmail
IR148625	All Actions Completed	NSW	400 Moorebank Ave, MOOREBANK (MOOREBANK (MLP Estate))	Knight Frank Facilities Response Centre	Mitch Casey	0451 816 900	mitch.casey@au.knightfrank.com	Steven Contarino	steven.contarino@au.knightfrank.com
IR150079	All Actions Completed	NSW	400 Moorebank Ave, MOOREBANK (MOOREBANK (MLP Estate))	Knight Frank Facilities Response Centre	Mitch Casey	0451 816 900	mitch.casey@au.knightfrank.com	Steven Contarino	steven.contarino@au.knightfrank.com
IR150441	All Actions Completed	NSW	400 Moorebank Ave, MOOREBANK (MOOREBANK (MLP Estate))	Knight Frank Facilities Response Centre	Steven Contarino	0431 289 275	steven.contarino@au.knightfrank.com	Nidal Mechhawi	nidal.mechhawi@au.knightfrank.com
IR150445	All Actions Completed	NSW	400 Moorebank Ave, MOOREBANK (MOOREBANK (MLP Estate))	Knight Frank Facilities Response Centre	Steven Contarino	0431 289 275	steven.contarino@au.knightfrank.com	Steven Contarino	steven.contarino@au.knightfrank.com
IR150566	All Actions Completed	NSW	400 Moorebank Ave, MOOREBANK (MOOREBANK (MLP Estate))	Knight Frank Facilities Response Centre	Steven Contarino	0431 289 275	steven.contarino@au.knightfrank.com	Steven Contarino	steven.contarino@au.knightfrank.com
IR151004	All Actions Completed	NSW	400 Moorebank Ave, MOOREBANK (MOOREBANK (MLP Estate))	Knight Frank Facilities Response Centre	Mitch Casey	0451 816 900	mitch.casey@au.knightfrank.com	Steven Contarino	steven.contarino@au.knightfrank.com
IR151005	All Actions Completed	NSW	400 Moorebank Ave, MOOREBANK (MOOREBANK (MLP Estate))	Knight Frank Facilities Response Centre	Mitch Casey	0451 816 900	mitch.casey@au.knightfrank.com	Steven Contarino	steven.contarino@au.knightfrank.com
IR151006	All Actions Completed	NSW	, MOOREBANK (MOOREBANK (Warehouse 4A East))	Knight Frank Facilities Response Centre	Mitch Casey	0451 816 900	mitch.casey@au.knightfrank.com	Steven Contarino	steven.contarino@au.knightfrank.com
IR152104	All Actions Completed	NSW	400 Moorebank Ave, MOOREBANK (MOOREBANK (MLP Estate))	Knight Frank Facilities Response Centre	Chalith Liyanage	0489 293 831	Chalith.Liyanage@au.knightfrank.com	Steven Contarino	steven.contarino@au.knightfrank.com

Report ID	PartA_LodgedDate	PartA_LodgedMonth	PartA_Section2_Type	PartA_Section2_RiskLevelRating	PartA_Section3_Gender	PartA_Section3_EmployerDetails	PartA_Section3_PreExistingMedical	PartA_Section4_IncidentDate	PartA_Section4_DateReported		PartA_Section5_InjuryType	PartA_Section6_InjuryLocation	PartA_Section7_InjuryCause	PartA_Section8_PropertyDamageDetails
IR148625	1-May-25	5	Theft	Medium	Male		No	29/04/2025 18:00	30/04/2025 17:30	- PSI Security called at 5:33pm on Wednesday 30/04/25 with Conn Marrey also on the call. - They advised that their compound (under Vaughan Civil PC) had a break and enter incident sometime between the night of the 29th of April to 30th of April, 5:33pm. Vaughan Civil are keeping equipment in the vacant warehouses, 53 and 54. - Conn reported that keys had been stolen. Confirmed to be current keys that provide access to Warehouse 53 and 54. - Conn (Vaughan Civil) organised ad hoc static guards from PSI to attend site and monitor switch rooms and Warehouse 53/54. - PSI site security downloaded and installed Vaughan Civil CCTV program to review footage from inside warehouse 53 and 54 to ensure that their equipment had not been stolen. - PSI site security reviewed footage from the site cameras. - PSI site security increased patrols for night of 01/05. - Champagne Building Maintenance engaged by Knight Frank for rekeying of Warehouse 53 and 54. Scheduled for 01/05/25. Time of the incident is unknown but is between Tuesday night (29/4/25) to Wednesday (30/04/25) evening at 5:30pm				
IR150079	26-Jun-25	6	Injury	Medium	Female		Yes : Epilepsy	26/06/2025 11:15	26/06/2025 11:15	Remy advised that she blacked out prior to crashing into the rear of the truck. CCTV footage shows that the car was speeding and out of control just prior to impact.	Other:Paramedic on site advised that the injured person was okay and that bruising was present.	Other:As above	Other:Vehicle/ Medical Episode	
IR150441	11-Jul-25	7	Property Damage	Medium	Male		No	29/06/2025 1:00	29/06/2025 1:00	Approx at 01:00 CCTV security has spotted three vehicles were doing burnout in front of warehouse 5 (QUBE).				Criminal Activity - Police Called, General Property Damage $0 - $500
IR150445	11-Jul-25	7	Near Miss	Medium	Male		No	03/06/2025 14:00	03/06/2025 14:30	White Hilux leaving Kmart (Catch) who was leaving MPE who, when leaving the stub roads, decided to pull out in front of a MF semi - he had adequate vision and was speeding the whole time, but he gunned it to avoid stopping. I was driving a few cars behind him and he had significant time to stop. This was a dangerous				
IR150566	17-Jul-25	7	Property Damage	Medium	Male		No	14/07/2025 0:00	17/07/2025 9:30	Matt Goldfinch from L Edwards has reported a momentary HV power outage				General Property Damage $1000+
IR151004	4-Aug-25	8	Theft	Medium	Male		No	02/08/2025 1:00	02/08/2025 1:30	At 01:04am, PSI Security received a phone call from 'Guardian' (security system contractor) advising that activity had occurred at the VC compound. PSI immediately reviewed the footage and identified intruders trying to break into the compound. PSI contacted 000 immediately. Five police cars arrived at 01:15am with K9 unit. CST Campbell from Liverpool police station has confirmed that offenders has been caught trying to flee the site through Moorebank Ave. Police off site at 02:30. Event number will be supplied when police incident report has completed. Security informed Con Murray from VC Management. Incident report has been sent to Management.				
IR151005	4-Aug-25	8	Injury	Medium	Male	PSI Corporate	Unknown	03/08/2025 21:30	04/08/2025 1:30	At approximately 9:30pm on Sunday, 03 August, i got bitten by a fox just outside of the CCTV shed. Hashmat notified the security and KF team via a group Whatsapp at 1:20am on Monday, 04 August of the bite and later confirmed at 08:04am that he was okay and only sustained a couple of holes to his pants.	Other:Bite	Leg lower [Left side of Body]	Bite/Sting, Other:Wild animal (Fox)	
IR151006	4-Aug-25	8	Property Damage	Low	Male		No	25/07/2025 11:15	28/07/2025 9:30	Retrospective for 25th of July. Infinity Fire Protection (incumbent contractor) was carrying out a hose reel repair and during the works, a component failed and caused water to continuously gush around the site of the hose reel replacement - a concrete floor warehouse. The issue was resolved and repair completed. The tenant had sweeper equipment on site and helped clean up the excess water.				Property/Stock damage (tenant)
IR152104	15-Sep-25	9	Environmental	Low	Male		No	08/09/2025 15:00	12/09/2025 15:30	Vaughan Civil workers observed a small grass fire along the ABB fence line within the Substation footprint. Workers used portable fire extinguishers and a hose to suppress and fully extinguish the fire. ABB were notified on-site. No injuries occurred and damage was limited to minor grass burn. Photos were taken and report submitted via email.				

Report ID	PartB_LodgedDate	PartB_Consequence	PartB_Likelihood	PartB_RiskRating	PartB_WhoNotified	PartB_IncidentDescription	PartB_ImmediateActionTaken	PartB_InjuryFirstAidProvided	PartB_InjuryHospital	PartB_InjuryAmbulance	PartB_InjuryAttendedDoctor	PartB_IncidentLocation	PartB_EmployeeResumedNormalAct
IR148625	30-Apr-25	Major	Possible	High Risk	Incident Was Notifiable: No	Refer to part A.	- Vaughan Civil notified site security. - Vaughan Civil engaged 2 ad hoc guards to monitor Warehouse 53 and 54. - PSI site security reviewed site cameras to try and verify person(s) involved in theft/ break and enter incident. - PSI site security downloaded Vaughan Civil CCTV program and assisted by reviewing their cameras which are installed within warehouses 53 and 54, to verify if any Vaughan Civil equipment was stolen. - Knight Frank engaged Champagne Building Maintenance to rekey warehouses 53 and 54. Scheduled for attendance on the following day 01/05/25. Keys to be provided to security only.					Other (Vaughan Civil compound, which is under the	
IR150079	26-Jun-25	Major	Possible	High Risk	Incident Was Notifiable: No External State / Territory Authority Notified: No		000 called. Ambulance on site by the time KF attended to crash and rendering aid and taking Remy to the hospital. Tow truck arrived on site to remove damaged vehicle. FRNSW - arrived on site for cleanup. Site security setup traffic bollard and managed traffic flow while the vehicle	Yes (Unknown. Rendered by paramedics.)	Yes (Unknown)	Yes	Unknown	Common Area	
IR150441	11-Jul-25	Moderate	Rare	Low Risk	Incident Was Notifiable: No		Police called and footage handed over. Unknown persons of inrterest told not to					Common Area	
IR150445	11-Jul-25	Moderate	Unlikely	Low Risk	Incident Was Notifiable: No		Teannt broadcast sent to advise and remind them of					Common Area	
IR150566	17-Jul-25	Major	Rare	Low Risk	Incident Was Notifiable: No	The root cause of the event was identified as an upstream fault on the Endeavour Energy network, which was confirmed by Matthew Goldfinch (Operations Manager, L. Edwards Pty Ltd) following contact with Endeavour Energy's control room	L Edwards is the incumbent HV contarctor representing Endeavor Energy.					Common Area	
IR151004	4-Aug-25	Moderate	Possible	Medium Risk	Incident Was Notifiable: No		000 contacted. Police arrived on site with K9 units and apprehended offenders trying to flee. Vaughan Civil made aware of the incident.					Other (Vaughan Civil compound, which is under the	
IR151005	4-Aug-25	Minor	Possible	Low Risk	Incident Was Notifiable: No	This occurred at the security hut, in proximity to bushland. A pest control shoot is organised for the night of the 4th of August by a stakeholder at the precinct. This will be reported to that party.	This occurred at the security hut, in proximity to bushland. A pest control shoot is organised for the night of the 4th of August by a stakeholder at the precinct. This will be reported to that	No (At the time of incident occurring, KF are not	No	No	Unknown	Common Area	
IR151006	4-Aug-25	Moderate	Possible	Medium Risk	Incident Was Notifiable: No	Faulty component caused the water leak.	Infinity Fire Protection had parts on hand at the time of the incident to rectify the issue. Tenant assisted in cleaning of water and confirmed no					Tenancy Area	
IR152104	15-Sep-25	Minor	Likely	Medium Risk	Incident Was Notifiable: No	Small grass fire observed adjacent to ABB fence line. No hot works were being undertaken by Vaughan Civil at the time. The fire origin is assumed to be a spark/ember from ABB operations.	Workers extinguished the fire using portable extinguishers. drowned the grass further with a hose from the Substation pad ABB were notified immediately. Area visually inspected and confirmed safe. Incident recorded with photos					Other (MIP Substation – along ABB fence line, Moo	

Moorebank Intermodal Precinct

APPENDIX J – STORMWATER INFRASTRUCTURE

Moorebank Precinct East – Stage 2 WSUD Independent Audit

Report Prepared for:
Department of Planning, Housing & Infrastructure

November, 2025
Project No. 255

Prepared by:
Sustainability Workshop Ltd

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Document Information

Project title	Moorebank Precinct East – Condition of Consent B51 – Independent Audit	
Document title	Moorebank Precinct East Stage 2 – WSUD – 2025 Independent Audit Report	Project number 255
Description		
Client Contact	Mark Howley	

	Name	Signature	Issue:	Date
Prepared by	Mark Liebman		2	10/11/25
Checked by				
Issued by	Mark Liebman			
Filename	S:\Projects\255 MPE WSUD Audit CoC 51\Audit 2025 - MPE and MPW\MPE\2025 Audit Report - MPE - COC B51 - WSUD Rev 2 10.11.25.docx			

Document History

	Issue 0		Issue 1		Issue 2	
Issue to:	Date	No. Copies	Date	No. Copies	Date	No. Copies
Mark Howley	17/10/25	PDF				
Mark Howley			20/10/25	PDF	10/11/25	PDF

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EXECUTIVE SUMMARY

Sustainability Workshop Ltd was engaged to carry out an independent audit of the operation of the water sensitive urban design elements of Moorebank Precinct East (MPE) Stage 2 which currently includes Warehouses 1,3,4, 5,6,7 and IMEX.

Moorebank Precinct East (MPE) Stage 2 was approved under State Significant Development (SSD) 7628. This audit was carried out pursuant to SSD 7628, condition of consent (CoC) B51 which requires the independent auditor to:

1) Verify the condition of the treatment systems
2) Verify and document that the systems are working as intended
3) Verify the systems have been cleaned adequately
4) Verify there is no excessive build up of material
5) Identify any rectification issues required for the systems to adequately perform its intended function.

A site meeting followed by an inspection of the stormwater assets included in the scope of the audit was undertaken on the 10th September, 2025.

Prior to the site meeting a link to applicable maintenance records was provided. Following the meeting, clarification was requested and obtained on some minor issues.

The audit finds that:

1) The Moorebank Avenue Deviation construction is underway and impacting the eastern part of the site but not the operation of the water quality management systems. Warehouse East 2A and 2B have not yet been constructed and the original warehouses remain. A check of Bureau of Meteorology data reveals there were no days with greater than 100mm of rainfall within the audit period.
2) In general, the WSUD infrastructure continues to be diligently maintained in accordance with CoC B51.
3) The condition of the systems including GPTs and combined water quality and OSD basins (OCD1, OSD10, OSD2) are generally good. Refer to Attachment 1 for the locations of these devices.
4) Despite some water quality indicators suggesting poor performance, I find that it is in fact very likely that the constructed elements of the system are working as intended to deliver best practice WSUD. I had previously recommend a change in water quality sampling protocols as I do not consider dry weather sampling provides an indication of system performance.
5) The systems are being cleaned and maintained so they remain functional, and the maintainer has a good and evolving understanding of the systems.

6) No excessive build-up of material is evident, and I have seen evidence of good cleaning practice to remove deposited material.

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1. Project Overview

Sustainability Workshop was engaged to carry out an independent audit of Moorebank Precinct East (MPE) Stage 2 Water Sensitive urban Design. Approval for works was issued under State Significant Development (SSD) 7628.

Completed works include Area 1 and 2 (warehouses 1,3,4,5,6 and 7) and IMEX

Warehouse 2 remains as a series of 5 smaller warehouses referred to as Warehouses 50-54.

The project is a large transport and industrial land development located east of the Georges River. The Moorebank Avenue road realignment works are currently in construction.

This audit report focuses only on stormwater quality infrastructure and the operation and maintenance thereof. There are four OSD basins, including OSD 1 (a combined OSD and bioretention basin), OSD 2 which is currently used as a construction phase sediment basin now with lower operating water level to facilitate the Moorebank Avenue construction, OSD 9 which is purely for OSD purposes and OSD 10 which is linear bioretention system parallel to the old Moorebank Ave alignment. In addition, there are 5 GPTs and rainwater tanks on each warehouse. Litter baskets are also used to treat stormwater around Warehouse 5.

From a stormwater quality perspective, large industrial areas shed high volumes of stormwater. The stormwater can be contaminated with various pollutants in both particulate and dissolved forms, notably Zinc from roofs.

The design development process responded to several consent conditions which required that the proponent comply with what is commonly termed "best practice" stormwater management. That is, assuming that stormwater treatment assets were designed and constructed to best practice then it would be reasonable to expect a best practice outcome.

That outcome is defined in terms of pollutant removal fractions for total suspended solids, total phosphorus and total nitrogen. An approved stormwater system was modelled using MUSIC which is a widely adopted water quality model, design drawings prepared and approved and construction of various elements serving the warehouses undertaken.

In the absence of specific detailed water quality monitoring to verify the performance of the WSUD assets, it is deemed appropriate to rely on the condition assessment of the stormwater treatment assets, together with other evidence, such as maintenance log books and defects works to form an opinion of the performance of the system. In summary, we are relying on the "best practice" nature of stormwater management systems to indicate best practice performance. This is a fairly typical approach with stormwater audits.

On practical completion, built assets are handed over to the site manager which is Knight Frank. Knight Frank has engaged a Contractor, MID Plumbing to both help identify defects as well as to undertake routine maintenance of the stormwater assets.

A stormwater infrastructure operation and maintenance plan (SIOMP), was required and approved by DPIE and prepared by the proponent, SIMTA. The SIOMP identified the routine and non-routine maintenance activities required for the various stormwater assets including water quality assets such as CDS gross pollutant traps and bioretention basins.

We note that maintenance log books have been prepared to align with the specific actions included in the SIOMP.

1.2. Approval Requirements

SSD 7628 condition of consent (CoC) B51 requires an annual independent audit.

1.3. Audit Team

The audit of the water quality elements of the MPE Stage 2 site was undertaken by Mark Liebman, CPEng, MIEAust. Mark has over 25 years water quality management experience. He co-authored the design guides, notably the Blacktown City Council Water Sensitive Urban Design Standard Drawings which were used as reference guides for the design of the MPE Stage 2 site.

Mark is also an independent evaluator used by Stormwater Australia to assess the water quality performance of stormwater treatment devices against the newly released stormwater quality improvement device evaluation protocol (SQIDEP). Mark has also undertaken numerous evaluations of stormwater quality improvement devices for Blacktown Council which are relied on by numerous other Council's including Liverpool City Council.

Mark is suitably qualified and has demonstrable experience in WSUD.

1.4. Audit Objectives

The audit objective is to satisfy State Significant Development, condition of consent B51

1.5. Audit Scope

Moorebank Precinct East (MPE) Stage 2 was approved under State Significant Development (SSD)7628. Sustainability Workshop was engaged to carry out an audit of the Area 1, 2 and IMEX operations.

The scope of this report therefore includes Moorebank Precinct East (MPE) Stage 2 (Area 1 and 2) works. This includes the four warehouses (WH 1, 3, 4 ,5,6 and 7) and IMEX.

Condition B51 specifically requires the independent auditor to:

1) Verify the condition of the treatment systems
2) Verify and document that the systems are working as intended
3) Verify the systems have been cleaned adequately
4) Verify there is no excessive build up of material
5) Identify any rectification issues required for the systems to adequately perform its intended function.

2.0 AUDIT METHODOLOGY

2.1. Audit Process

The Independent Audit was conducted in a manner consistent with AS/NZS ISO 19011.2019 – Guidelines for Auditing Management Systems and the methodology set out in the Department's IAPAR. An overview of the audit activities, as specified in AS/NZS ISO 19011, is presented in Figure 1.

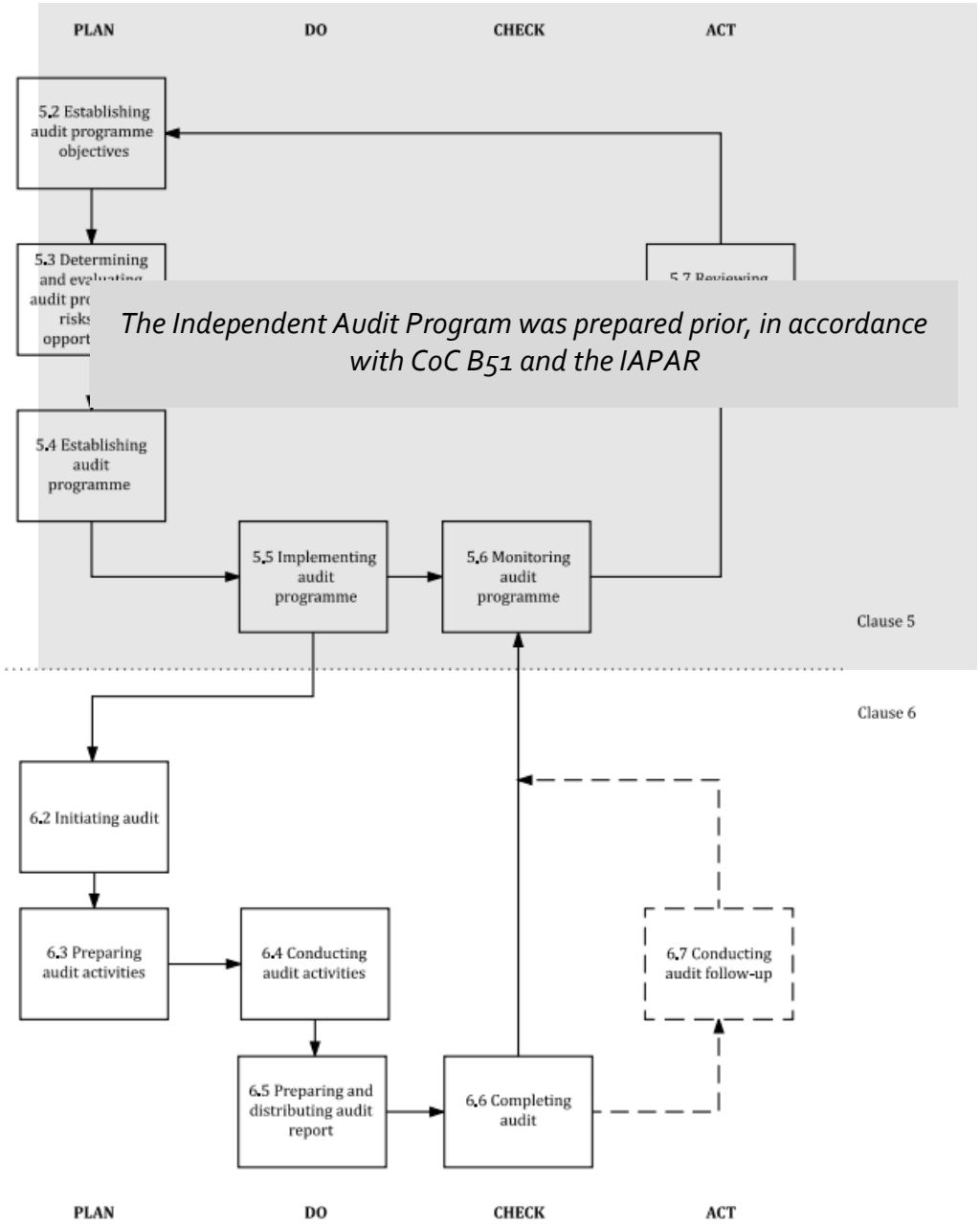

Figure 1 Audit activities overview (modified from AS/NZS ISO 19011). Subclause numbering refers to the relevant subclauses in the Standard.

2.2. Audit Process Detail

2.2.1. Initiation and Scope Development

Prior to the audit we confirmed the scope of the audit and inspected the site to gauge the level of complexity of the audit.

2.2.2. Preparation

Prior to the audit a number of documents were reviewed including:

- *Stormwater Infrastructure Operation and Maintenance Plan, Moorebank Logistics Park – East Precinct, Moorebank Intermodal Terminal Alliance, 13/12/24 – Rev 9.*

2.2.3. Site Personnel involvement

The on-site audit activities took place on 10th September, 2025. The following personnel took part in the audit:

- Mark Liebman – WSUD Auditor – Sustainability Workshop
- Baz Richards – Landscape Architect - Sustainability Workshop
- Mark Howley – Senior Project Manager – Tactical
- Matthew Kim – Project Manager – Tactical
- Mark Cugola – Director – MID Plumbing
- Daniel Anderson – Director and Ecologist from Apical

2.2.4. Meetings

The on-site audit activities took place on 10th September, 2025.

2.2.5. Interviews

A brief formal interview was undertaken on the 10th September, 2025 with Mark Howley, Matthew Kim, Mark Cugola from MID Plumbing and Daniel Anderson from Apical. Numerous questions and discussions occurred throughout the site inspection.

2.2.6. Site Inspection

A site inspection was undertaken on the 10th September, 2025 following the audit meeting. The site inspection involved:

1) Viewing CDS locations
2) Viewing OSD 9
3) Viewing OSD Basin 1 which is a combined OSD and bioretention system.
4) Viewing OSD 10 (Near Map aerial inspection only as access unavailable)
5) Inspecting Swales 1 to 4.

2.2.7. Document Review

Following the site inspection, a number of documents have been reviewed including:

- *Moorebank Precinct West - Stage 2 Proposal Environmental Impact Statement – (SSD16-7628),* Arcadis, October 2016 (the EIS) – notably Appendix P.
- *Stormwater Infrastructure Operation and Maintenance Plan, Moorebank Logistics Park – East Precinct, Moorebank Intermodal Terminal Alliance, 13/12/24 – Rev 9.*
- *SSD7628 Consolidated Consent included in the above document.*
- *Stormwater Management Plan SSD 7628 by Costin Roe, Rev A, dated 12 Sept 2018.*
- *Various Work as Executed Drawing Sheets including but not limited PIWE – ARC – CV – DWG – 11202 – H, DWG 11527.*
- *Basis of Design Report -Precinct Infrastructure Works East (PIWE) Package 1A, 19 July 2018.*
- *Maintenance log books and photographic evidence prepared by MID Plumbing dated:*
  - *July 2024 – Maintenance logbook report (annual), quotation for maintenance works and photographic evidence*
  - *September 2024 – Stormwater pit cleaning and photographic evidence*
  - *October 2024 – Maintenance logbook report (quarterly) and photographic evidence and stormwater water quality monitoring data and reporting*
  - *January 2025 – Maintenance logbook (6 monthly service) and photographic evidence*
  - *April 2025 – Maintenance logbook report (quarterly) quotation for maintenance works and photographic evidence and stormwater water quality monitoring data and reporting*
- *Various Safe Work Method Statements for pit cleaning.*

2.2.8. General Audit Findings

Independent Audit findings were based on verifiable evidence. The evidence included:

- relevant records, documents and reports
- interviews of relevant site personnel
- photographs
- figures and plans; and
- site inspections of relevant locations, activities and processes.

2.2.9. Compliance Evaluation

The Auditor determined the compliance status of each compliance requirement in the Audit Table, using the descriptors from Table 2 of the IAPAR, being:

- **Compliant** – The Auditor has collected sufficient verifiable evidence to demonstrate that all elements of the requirement have been complied with within the scope of the audit.
- **Non-compliant** – The Auditor has determined that one or more specific elements of the conditions or requirements have not been complied with within the scope of the audit.
- **Not triggered** – A requirement has an activation or timing trigger that has not been met at the time when the audit is undertaken, therefore an assessment of compliance is not relevant.

Observations and notes may also be made to provide context, identify opportunities for improvement or highlight positive initiatives.

2.2.10. Completing the Audit

The Independent Audit Report was distributed to the proponent to check factual matters and for input into actions in response to findings (where relevant). The Auditor retained the right to make findings or recommendations based on the facts presented.

3.0 FINDINGS

3.1. Documents Audited

The SIOMP defines various maintenance actions and their associated frequencies. These have been documented in various tables in the SIOMP.

Each of these actions has been copied into a corresponding maintenance action within the maintenance logbooks which are completed and submitted quarterly by MID Plumbing in accordance with the quarterly reporting requirements of the SIOMP.

The maintenance log books have been audited for completeness by both verifying that all activities noted in the SIOMP have been correctly translated into the maintenance log books and then by verifying that all activities scheduled have been completed according to the log book.

3.2. Evidence Sighted

Difference sources of evidence have been sighted including:

1) Completed maintenance log books.
2) Evidence of contractor engagement viewed within the log books from photos included within them – generally the photos were within separate documents but locations and images readily identifiable.
3) Evidence of contractor engagement to carry out GPT maintenance from photos included in the log books and also separately via evidence of a contractor receipt.
4) Evidence of contractor maintenance reported within the log books for the bioretention basin including quotes for rectification works.
5) Visual inspections undertaken during the site – notably OSD Basin 1 which is the combined bioretention and OSD basin, OSD 9, Swales 1 to 4 and OSD2 at the south of the site.

At no time were any confined spaces entered. It is noted the CDS units are defined as confined spaces. The lids of the CDS units was not lifted and so the internal condition of the units cold not be determined during this audit. However clear photographic evidence was provided of the units under maintenance by TDK using eductor/combi trucks.

3.1. Compliance with Audit Objectives

CoC B51 requires the independent auditor to:

1) Verify the condition of the treatment systems within the scope
2) Verify and document that the systems are working as intended
3) Verify the systems have been cleaned adequately
4) Verify there is no excessive build up of material

Table 1 to 4 summarise the audit findings with respect to each of these requirements.

Table 1 Verification of the condition of the treatment systems within the scope

Asset Type	Details of item
OSD Basin 1 **Combined bioretention and OSD Basin**	The condition of OSD 1 was found to be very good. Plants are now well established. Weed removal had taken place. There was no litter debris within the basin. Jute mesh had been placed around batter slopes which have not been planted. Minimal sediment was present on the surface of the basin. The inlet/level spreading trench appears stable. One thing to note was the observation of a hare sited during the audit. Continue to monitor and repair any damage if required. Fill in holes with suitable filter sand. If it begins breeding or becomes problematic, engage an ecologist or pest controller for advice.
CDS units	Condition B51 requires the condition of the water quality management infrastructure assets to be determined. In order for this to be determined inspection of open CDS units needs to be undertaken. We note there was not an opportunity for the independent auditor to assess the condition of the CDS units. It has been reported that 25.56 tonnes of waste was removed and disposed from all GPTs. It has been observed that the GPTs have been maintained twice during the audit period – this is in accordance with best practice. The CDS unit which serves OSD 2 adjacent WH7 was previously known to be drowned by the basin and could not be maintained or the condition verified without draining the water quality pond it was connected to. OSD 2 is now being pumped out into a tributary that heads east and goes under the new Moorebank Avenue Road realignment (currently under construction). Cleaning of the CDS unit is now possible because it is no longer drowned. It contains estimated 18 tonnes of waste. A quote to remove was provided to KF for approval in late October 25. Evidence of cleaning should be sighted in next year's audit.
Grass Swales including OSD10	The condition of the grass swales observed was good. There was the presence of a large amount of reeds within the swale on the eastern boundary which will improve water quality outcomes. OSD10 is in good condition with vegetation well established. Confirmed via Near Map aerial photography as we were unable to view OSD 10.
Litter baskets	Evidence from the log books shows that litter baskets are being actively maintained and from the volume of material removed performing very well.
Rainwater Tanks	Not scheduled – every 2 years.
First flush devices and filters	Evidence of the condition of first flush filters being maintained was provided. Those that were maintained appear to be in good order.

Table 2 Verify and Document the System is Working as intended

Asset Type	Details of item
OSD Basin 1	The basin is well vegetated and maintained (no evidence of ponding, scouring or litter). It is therefore very likely to be working as intended.

Combined bioretention and OSD Basin	
CDS Units	A total of 25.56 tonnes of material was removed from the units and they are working as intended. GPT 5 is working though has had a drowned weir in the past but will now be functioning as intended due to the water level in OSD 2 being lowered.
Grass Swales including OSD10	The grass swales are not technically part of the water quality management system on the site however they are included in the SIOMP and they will influence water quality. OSD10 is likely to be working well as it is well vegetated on both banks. Swale on eastern boundary was well vegetated with dense reeds. This is likely to be delivering good water quality outcomes.

Table 3 Verification the Systems have been cleaned adequately

Asset Type	Details of item
OSD Basin 1 **Combined bioretention and OSD Basin**	We verify OSD Basin 1 to have been thoroughly cleaned.
CDS Units & Litter baskets	Based on the maintenance log books together with additional evidence that the CDS units have been cleaned adequately as required by the SIOMP. Litter baskets were maintained during the audit period as required. Cleaning of the GPTs twice per annum, as is occurring, is best practice. 25.56 tonnes of material was collected from the GPTs. GPT 5 needs to have an estimated 18 tonnes of material removed.
Grass Swales including OSD10	We verify the swales were generally free from litter, debris and sediment and had been cleaned adequately. From an analysis of aerial images – OSD10 is well maintained and clean.

Table 4 Verification there is no excessive build up of material within the systems

Asset Type	Details of item
OSD Basin 1 **Combined bioretention and OSD Basin**	We verify that there is no excessive build up of material within the system.
CDS Units	We verify that there is no excessive build up of material within the systems except for GPT 5. GPT 5 has been subjected to inundation due to the intentionally raised water levels in OSD 2. Now that OSD 2 water levels are lower, GPT 5 can be cleaned out. A quote has been submitted to KF for approval.
GrassSwales including OSD10	We verify that there is no excessive build up of material within the swales. OSD10 was not inspected though from analysis of aerial imagery as well as logbook photos, it appears to be free from excessive build up of materials.

3.2. Non-compliance, Observations and Actions

No non-compliances were detected.

This section including Table 5, presents observations from the Independent Audit. Actions are also presented in the table.

Table 5 Condition of consent B51 Audit findings and actions

Type	Details of item	Proposed or completed action	By whom and by when	Status
Observation	Good maintenance practices	continue	Maintenance Contractor	
Observation	There is an opportunity to now vegetate the batters of OSD 1 as it appears to be a permanent basin (with reference to Masterplan)	MID Plumbing to provide a quote, to top soil and plant out batters of OSD 1.	Maintenance Contractor	

3.3. Rectification Measures

Appendix A includes a number of site photos.

We note we were unable to observe GPT units and so can't recommend any rectification measures beyond those already identified by MID Plumbing including removal of about 18 tonnes of material deposited in GPT 5.

3.3.1. Bioretention basin (OSD 1)

Based on the latest masterplan, it appears that OSD 1 remains unchanged in the masterplan, Assuming this to be correct, it is recommended then that the batters of OSD 1 be vegetated in accordance with the original design drawings.

In the absence of these drawings, the planting list (for batters) included in the following Blacktown City Council WSUD design drawings (also adopted by Liverpool City Council) and found here:

https://www.blacktown.nsw.gov.au/files/assets/public/wsud/standard-drawings/wsud_standard_drawing_2022.pdf

Sheet 12 lists appropriate species and densities for the batters. It is recommended that prior to planting that a quality topsoil, compliant with AS4419 be placed to a minimum depth of 150mm on the batters.

3.3.2. GPTs and Litter baskets

GPT 5 have its accumulated sludge removed now that it can be emptied.

A quote has been provided to replace degraded litter baskets around Warehouse 5. The baskets should be replaced.

3.3.3. OSD10 and Swales

Continue to monitor bank the stability of grass embankments due to average grass coverage. Grassed areas adjacent to swales should also be monitored for erosion and this stopped as soon as practicable.

CONCLUSIONS

We conclude that the development is, in all probability, complying with COC B51 and that the constructed stormwater systems are working as intended and are being maintained and cleaned. They are free from excessive build-up of material.

Three minor observations have been made during this audit though we find no evidence of non compliance with COC B51.

A couple of rectification measures have been included in this report and Sustainability Workshop would be happy to discuss these further. The recommendations are largely based on the assumption that a reduced life cycle cost is an operational objective.

We commend ESR, Tactical, MID Plumbing (Apical) and Knight Frank for their on-going work in establishing the site in accordance with stormwater quality best practice management.

The vegetative coverage in OSD 1 continues to be one of the best examples in western Sydney and we commend MID Plumbing and Apical for their care and work. It appears that OSD1 has a confirmed future and there is an opportunity to plant out the batters of the basin in accordance with the original design drawings or using species shown on the Blacktown Council WSUD Standard drawings which were hyperlinked in this report.

Appendix A
Site Inspection Photos

Photo	Description
	OSD 1 bioretention basin showing plant growth throughout the whole basin, denuded batters – batters recommended for planting pursuant to masterplan finalisation.
	Swale adjacent to the OSD 1 in good condition – Previous bank stabilisation works successful and under guard rail shade cloth placement is preventing litter blowing in.

	Swale adjacent to the OSD 1 in good condition – (limited access associated with Moorebank Avenue realignment construction works).
	Near OSD2 (Moorebank Avenue deviation under construction in background) Red pipe is conveying inflows from OSD 2 pump station.

	Pump to drain OSD2 which continues to operate as a pump out basin.
	OSD 9 cleaned and well maintained.

Attachment 1
SIOMP Features Map

Moorebank Intermodal Precinct

APPENDIX K – ARTIFICIAL HOLLOW MANAGEMENT STRATEGY

Artificial hollow management strategy

Moorebank Intermodal Precinct

November 2025

Contents

1 Overview

The Moorebank Intermodal Precinct (MIP) is located in the Liverpool Local Government Area (LGA), 27 kilometres south-west of the Sydney central business district. Native vegetation and threatened species habitat required removal to facilitate development of the MIP and its various components including an import and export terminal connected to the South Sydney Freight Line (SSFL), warehousing and associated infrastructure. Impacts to biodiversity was assessed through the preparation of ecological impact assessments for the various development applications.

Although impacts to biodiversity was assessed through these impact assessment and offsets ultimately delivered, state Conditions of Consent and the Commonwealth Conditions of Approval identified a requirement to compensate for removal of tree hollows. The requirement for tree hollow replacement with artificial hollows (nest boxes) was stepped out and described in a Nest Box Strategy (NBS) (CPB 2017) prepared as a component of the Construction Flora and Fauna Management Pan for the initial stages of the development in 2017.

To compensate for the removal of 108 tree hollows from the MIP development a total of 247 nest boxes were installed within native bushland areas which fringe the development to the east (Bootland) and to the west (Georges River Corridor).

Since installation, annual monitoring surveys have been undertaken to review the effectiveness of the artificial hollows (nest boxes) and provide management recommendations to ensure nest boxes remain functional and do not endanger fauna. Overtime, the number of functional nest boxes has gradually decreased despite yearly efforts to repair and re-install boxes identified as dysfunctional during monitoring surveys. In the near future it is likely that considerably more of the nest boxes at MIP will become dilapidated and will require decommissioning.

A revision and update to the NBS is being undertaken by Arcadis on behalf of ESR (property owner) to:

- Outline ESRs obligatory requirement to maintain tree hollow offsets (artificial hollows) as owners of the MIP facility.
- Revise the strategy for replacing nest boxes as they are decommissioned, so that replacement artificial hollows are installed in optimum locations, utilise current technologies and best practice methods, and are most suitable to the target species.
- Provide recommendations to increase the longevity and accessibility and provide solutions to increase the management a monitoring efficiency of artificial hollows.

It is intended that this Artificial Hollow Management Strategy, once approved by the NSW Planning Secretary (or alternate as appropriate), will supersede the NBS (CPB 2017) and provide direction to ESR going forward for how artificial hollows will be managed across MIP to maintain the required tree hollow offset.

1.1 Requirement for offsetting

Nest boxes have been installed to compensate for the loss of tree hollows which were removed during vegetation clearing which occurred across the MIP to facilitate development. The requirement to offset tree hollows, which were progressively removed across the MIP development site, was identified in the state Conditions of Consent (CoC) (SSD 6766; SSD 5066) for the various stage of the and the overarching Commonwealth Conditions of Approval (CoA) (2011/6229).

A Nest Box Strategy (NBS) (CPVB 2017) was developed to identify the requirements for offsetting within the project CoC and CoA and describe how nest boxes would be installed at MIP. The main conditions which relate to the offsetting tree hollows as identified in the NBS is summarised in Table 1-1.

Table 1-1. Conditions relevant to installation and monitoring of nest boxes within MIP

Approval document	Condition	Description
EPBC Approval No. 2011/6229:	Annexure A - mitigation measures: 7.4.1.3 n	*Consider installation of nest boxes in woodland vegetation in the rail corridor that may offer alternative nesting habitat to hollow dependent species recorded in the study area.*
SSD 6766	E34 d) (ii) (b) clearing procedures (including nest box plan) within	*The identification of areas to be cleared and details of management measures to avoid residual habitat damage or*

Approval document	Condition	Description
	Table 1 Ministers Conditions of Consent	*loss and to minimise or eliminate time lags between the removal and subsequent replacement of habitat such as:* *clearing procedures (including nest box plan)*
	Final compilation of mitigation measures: 8C	*A nest box management strategy will be prepared prior to clearing hollow-bearing trees. The strategy will inform the installation of nest boxes in retained native vegetation in the riparian corridor of the Georges River and the woodland in the Southern Bootland and the ongoing monitoring and maintenance of nest boxes through the construction and operational phases.*
SSD 5506	Condition D21 (d) (ii) (d)	*The identification of areas to be cleared and details of management measures to avoid residual habitat damage or loss and to minimise or eliminate time lags between the removal and subsequent replacement of habitat such as:* *clearing procedures (including nest box plan)*

The NBS (CPB 2017) identified that a *"minimum offset ratio of 1:1 is typical on infrastructure projects, however based on the very small number of hollows to be removed, a ratio of 2:1 has been implemented on this project."* Further development at MIP, following preparation of the NBS required the removal of additional hollow-bearing trees bring the total number of hollows impacted across MIP to 108. A breakdown of the number of tree hollows removed for the various developments which make up the MIP is summarised in Table 1-2.

Table 1-2. Tree hollows removed by the Moorebank Intermodal Precinct project

Development component	Impacts to hollow-bearing trees
Import Export Terminal (IMEX)	25 hollows were identified across 13 hollow-bearing trees.
Rail Access Link Package (RALP):	33 hollows were identified across 30 hollow-bearing trees.
Precinct East Demolition Remediation (PEDR)	50 hollows across 39 hollow-bearing trees.

It was identified in an addendum (Biosis 2017) to the NBS that: *"Given the larger number of tree hollows to be removed… the minimum offset ratio of 1:1 of nest boxes per hollow removed should be applied. The higher offset ratio of 2:1 is only recommended where very few hollows are to be removed."*

As such, the requirement to offset the removal of 108 tree hollows is installation and maintenance of 108 nest boxes at the Moorebank Intermodal Precinct.

The NBS stipulated that the design of artificial hollows be suitable for the following threatened species identified as having potential to occur in the biodiversity impact assessments conducted for the various development approvals at the precinct:

- Barking Owl (*Ninox connivens*)
- Brown Treecreeper (Eastern subspecies) (*Climacteris picumnus* subsp. *victoriae*)
- Gang-gang Cockatoo (*Callocephalon fimbriatum*)
- Little Lorikeet (*Glossopsitta pusilla*)
- Eastern Pygmy-possum (*Cercartetus nanus*)
- Squirrel Glider (*Petaurus norfolkensis*).

It should be noted that only Little Lorikeet was confirmed to use the site during targeted surveys.

The artificial hollows were to be managed in perpetuity, ensuring they are maintained to a high standard and provide long lasting habitat for threatened species.

1.2 Implementation of the Nest Box Strategy

A total of 247 nest boxes were recorded by Arcadis during the first monitoring event undertaken in spring 2018. The presence of 247 nest boxes indicates that tree hollow removal was offset at a ratio of 2.3 nest boxes per hollow removed, which exceeds the conservative ratio of two artificial nest boxes for each hollow removed (2:1)

recommended in the NBS. There are no project documents which explain why more than the recommended number of 108 nest boxes (Biosis, 2017) were installed.

The 247 nest boxes were installed across two locations adjoining the MIP, which were later included in the Moorebank biobanks site under Biodiversity Agreement (BA 341). These locations comprised the Georges River Corridor (termed Moorebank offset area in BA 341) and within the Bootland (termed Wattle Grove offset area in BA341). Installation in these locations aligned with the recommendations of the NBS (CPB 2017). A description of these areas and the nest boxes that were installed has been summarised in Table 1-2.

Table 1-3. Installation locations for artificial hollows

Location	Description
Georges River Corridor (Riparian Corridor)	The Georges River Corridor is comprised of a narrow, linear strip of bushland that extends for approximately three kilometres, alongside the MPW project. This vegetation is within the Moorebank offset area. A total of 195 nest boxes have been installed in this area, including a mix of boxes designed for microbats, small, medium and large arboreal mammals, small birds, parrots, cockatoos and owls.
Bootland (Wattle Grove offset area)	The Bootland is located to the east of the MIP site. It is comprised of relatively intact native vegetation, providing potential habitat for several hollow dependant fauna species. A total of 52 nest boxes have been installed in this area, including a mix of boxes designed for microbats, small, medium and large arboreal mammals, small birds, parrots, cockatoos and owls. The southern Bootland was recently burned by intense bushfires and this vegetation is currently regenerating.

Since the initial monitoring survey (2018) there has been a reduction in the number of functional nest boxes across the site from 247 to 187 due to deterioration and decommission for various reasons (Arcadis 2025). There have also been some changes to the location of nest boxes along the Georges River Corridor and within the Bootland due to nest boxes being re-located from the impact area of MIP and the more recently the Moorebank Avenue Realignment project. A map showing the current locations of the 187 functional nest boxes is shown in Figure 1-1.

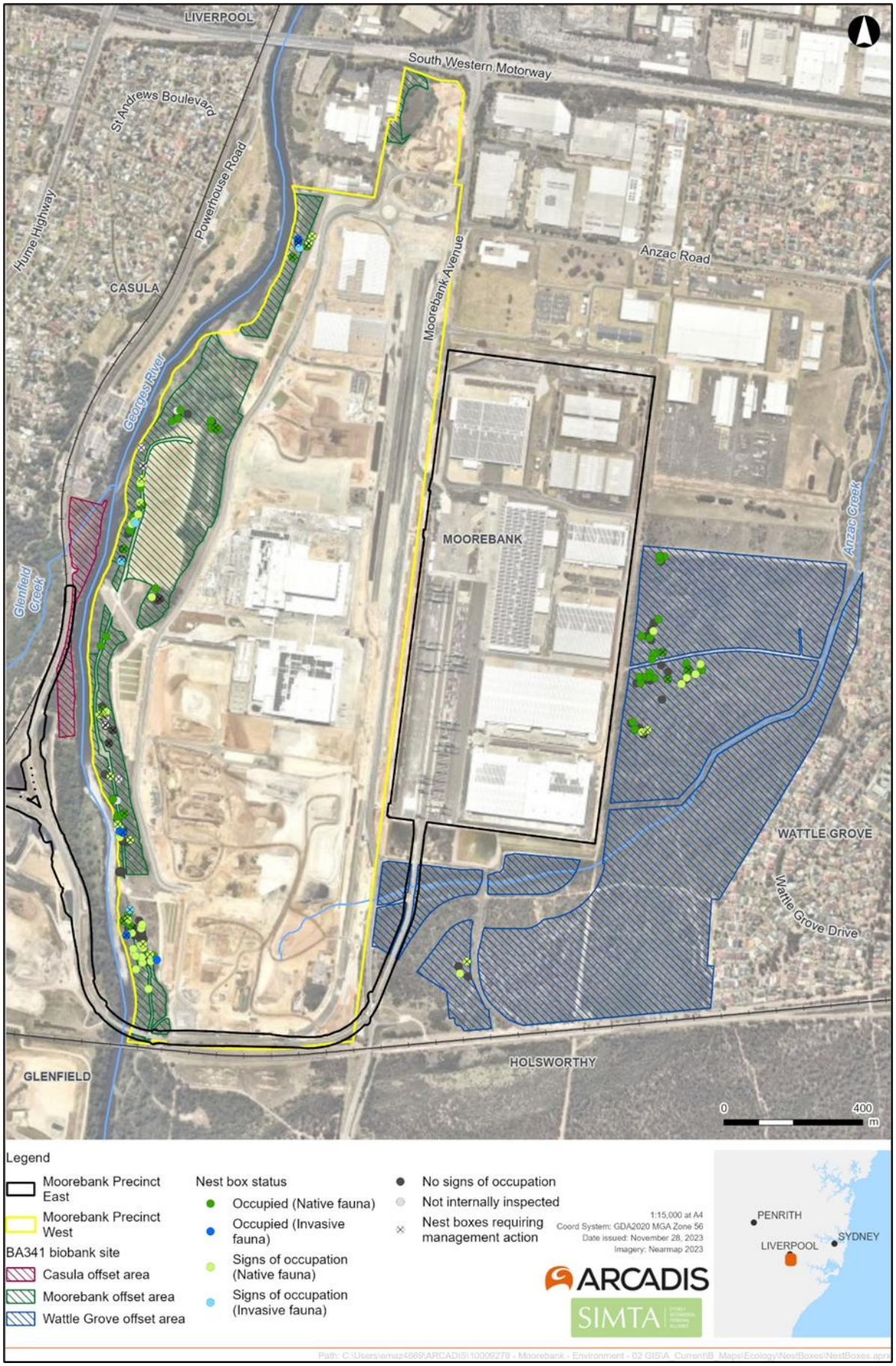

Figure 1-1. A map showing the locations of nest boxes checked in spring 2024.

2 Scope of this report

This Artificial Hollow Management Strategy (AHMS) has been prepared to supersede the NBS (CPB, 2017) and Addendum to the NBS (Biosis, 2017), and provide further direction to ESR regarding their obligatory requirement to maintain tree hollow offsets (artificial hollows) within the broader MIP facility. The strategy also considers and incorporates current best practice methods to replace dysfunctional nest boxes (artificial hollows) to maintain the minimum offset requirement of 108 hollows.

2.1 Objectives

This Artificial Hollow Management Strategy will supersede the NBS (CPB 2017) and provide direction to ESR going forward for how artificial hollows will be managed across MIP to maintain the required tree hollow offset.

The aim of this Artificial Hollow Management Strategy (AHMS) is to provide clear expectations and expert guidance on the implementation of the tree hollow offsets at MIP. The objectives of the strategy include:

- Review the offsetting requirement for impacted hollows and review the number of replacement artificial hollows, considering the results of annual monitoring over the past 5 year.
- Provide a list of target species for the artificial hollows
- Provide guidance on the sourcing, installation and monitoring of artificial hollows
- List any permit requirements for the installation and monitoring
- Provides clear objectives and guidance for future replacement and management of the artificial hollows at the MIP site to improve hollow longevity and accessibility

2.2 Guidelines and literature

Reports, best practice guidelines and plans of relevance to the preparation of this AHMS include:

- Beyer & Goldingay, 2006. The value of nest boxes in the research and management of Australian hollow-using arboreal marsupials. Wildlife Research 33: 161-174.
- BirdLife Australia (undated). Nest Boxes – Technical Information. Available at: http://birdlife.org.au/images/uploads/education_sheets/INFO-Nestbox-technical.pdf.
- Gibbons and Lindenmayer, 2002. Tree Hollows and Wildlife Conservation in Australia. CSIRO Publishing, Collingwood, Australia.
- Gleeson and Gleeson, 2012. Reducing the Impacts of Development on Wildlife. CSIRO Publishing, Collingwood.
- Goldingay and Stevens, 2009. Use of artificial tree hollows by Australian birds and bats. Wildlife Research 36: 81-97.
- Goldingay, 2009. Characteristics of tree hollows used by Australian birds and bats. Wildlife Research 36: 394-409.
- Goldingay, R. et al (2018). Outcomes of decades long installation of nest boxes for arboreal mammals in southern Australia.
- Lindenmayer, D. B. et al (2017). The anatomy of a failed offset
- OEH, 2015. Threatened Species Profile Database.
- TSSC, 2007. Loss of hollow-bearing trees – Key threatening process declaration. NSW Threatened Species Scientific Committee. Accessed online – http://www.environment.nsw.gov.au/determinations/lossofhollowtreesktp.htm.

3 Safety and permits

In New South Wales, an animal research permit is required for monitoring of the nest boxes. This includes an approved animal ethics application.

Australian Bat Lyssavirus (ABLV) is a virus which is similar to rabies and can be transmitted from bats to humans. It can be transmitted from flying foxes and microbats. It is a fatal disease. It can only be spread through

saliva and is not spread through urine or droppings. It has been detected in bat species in Australia on a few occasions . It is important that only trained and appropriately vaccinated individuals handle microbats in artificial cavities, if absolutely necessary to do so.

4 Review of artificial hollows at MIP

A maximum number of 253 nest boxes was recorded across the Georges River corridor (Moorebank offset area) and Bootland (Wattle Grove offset area) in spring 2019. During the most recent monitoring event (spring 2024) 214 of the 253 nest boxes remain. Of the 214 nest boxes monitored, 163 were functional and providing potential habitat to hollow-dependant fauna. The other 50 nest boxes were appraised to be dysfunctional and requiring some level of repair.

Review of fauna use and uptake of nest boxes across five years of monitoring has revealed high utilisation by suite of native fauna species including Sugar Gliders, Australia Wood Duck, Green Tree Frog, Rainbow Lorikeet and Southern Boobook Owl. Utilisation rates recorded across monitoring years has been shown in Figure 4-1. Nest box utilisation by native fauna are considered adequate if occupancy rates are greater than 10 per cent (Lindenmayer et al. 2017, Goldingay et al. 2018). Greater than 10 per cent occupancy has been recorded across all monitoring years. None of the target threatened species (Barking Owl, Brown Treecreeper, Gang-gang Cockatoo, Little Lorikeet, Eastern Pygmy-possum and Squirrel Glider) have been recorded using the nest boxes since monitoring commenced in 2018.

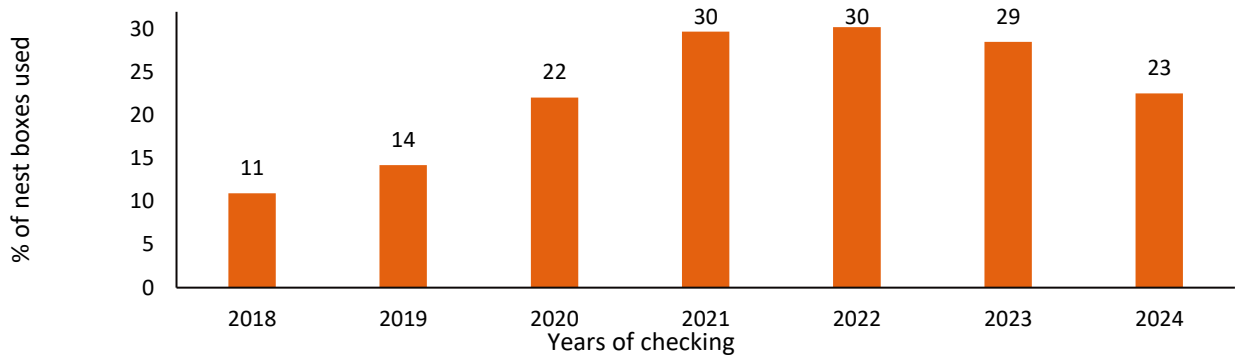

Figure 4-1. Nest box utilisation rates recorded during monitoring between 2018 -2024

Monitoring of these artificial hollows has identified high levels of attrition with many requiring reinstallations, refurbishments and replacements. Nest box maintenance works has been undertaken several times over the past five years in response to necessary actions identified in monitoring reports.

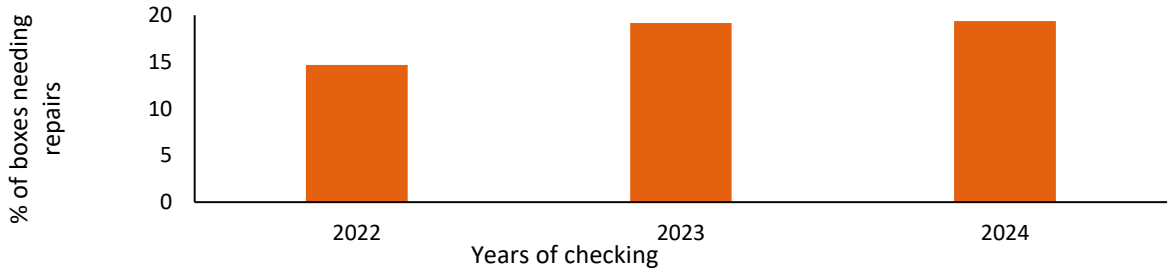

Figure 4-2. Percentage of nest boxes idnetfied as requiring repairs over the past three years

Monitoring has also identified an over-saturation of artificial hollows along the Georges River. Nest boxes were historically installed on every suitable tree and in some cases, multiple nest boxes of a similar design have been installed on a single tree. Monitoring data along this corridor has shown a lower utilisation rate when compared to locations where nest boxes have a greater spacing in the Bootland. The oversaturation of nest boxes is not considered optimal for target species and is currently only providing habitat to common species such as Ringtail Possums which do not rely on tree hollows.

5 Revised artificial hollow strategy

Based on the results of nest box monitoring over the past six years it is recommended that the artificial hollow management strategy at MIP be revised as per the recommendations set out in this plan. The proposed strategy has been set out below. It is anticipated that the strategy will be implemented over the next five to 10 years as existing boxes require replacing or decommissioning. It is not proposed that nest boxes will be prematurely decommissioned or relocated to expediate implementation of this revised strategy.

Number of artificial hollows to be maintained as offsets for loss of tree hollows

It is recommended that the artificial hollow offset ratio of 1:1 as recommended in the Addendum to the NBS (Biosis, 2017) for hollows removed be maintained. This equates to 108 artificial hollows across the MIP.

As of spring 2024 there was a total of 214 nest boxes across MIP. It is recommended that these boxes continue to be monitored, however when they are decommissioned, they are not replaced until the number of nest boxes reduces to 108. At which point any nest boxes that need replacing to meet the minimum offset requirement of 108 artificial hollows should be consider the recommendations discussed in this section.

Placement locations for artificial hollows

In considering the available habitat across the MIP for the target species, it is recommended that the 108 artificial hollows be distributed in five clusters (see Figure 5-1) across the Bootland (Wattle Grove Offset Area) and along the Georges River corridor (Moorebank Offset Area). Arcadis recommends that artificial hollows be installed in clusters because it will allow for an even coverage and ensures maximum opportunities for target species. Some species such as arboreal mammals also require nest sites that are nearby so that they can move between the suitable nest sites.

To relocate all of the artificial hollows into these clusters would take time to implement and may impact on the resident species utilising the hollows. It is proposed that installation of these clusters be undertaken in a gradual process over five to ten years which includes not replacing decommissioned nest boxes in the Georges River biobank until the minimum cluster size has been reached.

The Bootland (Wattle Grove Offset Area), which contains rich habitat for the target fauna species contains a relatively low number of nest boxes currently. It is recommended to distribute artificial hollows across these areas to ensure maximum opportunities for target species uptake. Nest boxes requiring repair or replacement along the Georges River or in over saturated areas should be progressively added to the Bootland until the cluster numbers are achieved.

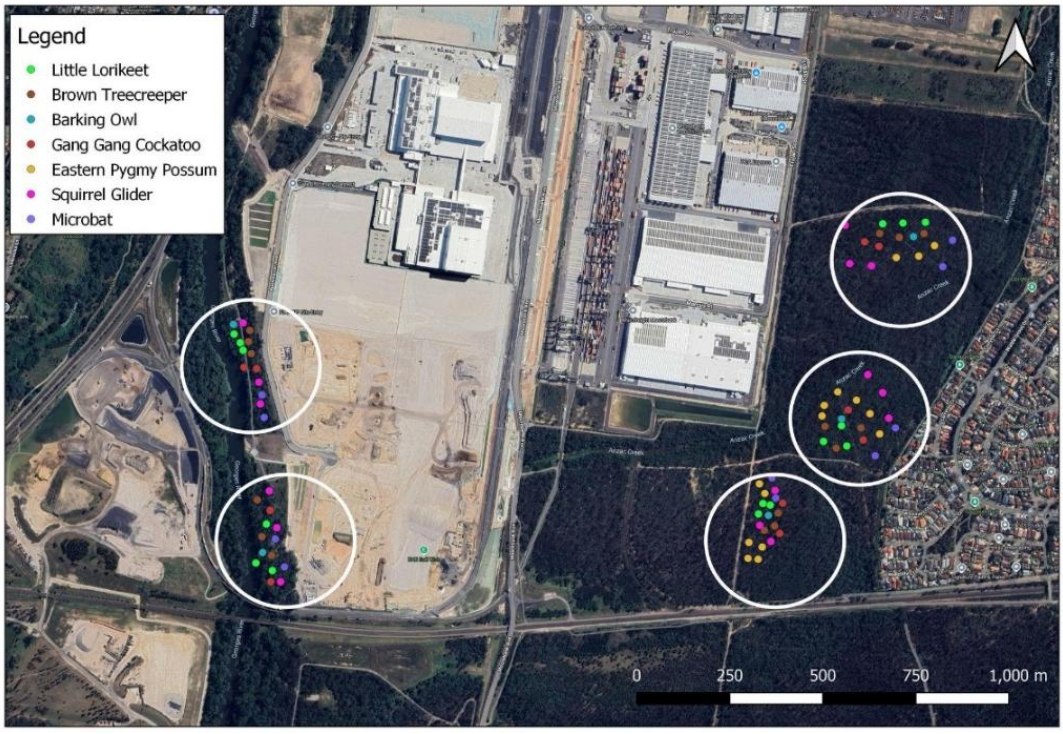

Figure 5-1. Proposed clusters of artificial hollows. Note that the habitat on the Georges River is considered of lower suitability for Eastern Pygmy-possum and therefore more hollows for this species have been added to Wattle Grove sites.

Artificial hollow target species

The current nest boxes that have been installed are generic designs and are not specific to the target threatened species including Barking Owl, Brown Treecreeper, Gang-gang Cockatoo, Little Lorikeet, Eastern Pygmy-possum and Squirrel Glider. To increase the chances of uptake by these target species it is recommended that artificial hollows installed to replace decommission nest boxes are designed for the target species. Additionally, the installation locations will prioritise the most suitable areas of habitat for the target species.

Table 5-1 provides an overview of each cluster. This number is based off an ecological assessment by Arcadis staff which have factored in multiple hollows for species that require a few dens versus species such as owl which only need hollows for breeding.

Species-specific artificial hollows should be installed strategically to ensure they are close to any required resources which could be important. It is also recommended that social animals have cavities installed in clusters (Terry et al. 2021). All hollows must be installed at suitable heights for both the species needs and for ease of access for monitoring and maintenance (<8m). A summary of artificial hollow considerations for the target species is summarised in Table 5-2.

Table 5-1. Recommended clusters of artificial hollows for target species

Target species	Artificial hollows per cluster	Total number of artificial hollows
Little Lorikeet	3	25
Brown Treecreeper	3	15
Barking Owl	1	5
Gang Gang Cockatoo	2	10
Eastern Pygmy possum	3-6	23
Squirrel Glider	3	20
Microbat	2	10
Total required		**108**

Table 5-2 Target species hollow dimensions and height to install

Target species	Listing status BC Act / EPBC Act	Artificial cavity installation tips	Nest Box Dimensions			
			Internal (mm)	Depth (mm)	Entrance (mm)	Height above ground (m)
Birds						
Little Lorikeet (*Glossopsitta pusilla*)	Vulnerable	Hollows should be installed in a cluster of three hollows in smooth barked varieties such as scribbly gum	150x150	350	35	2–6
Brown Treecreeper (*Climacteris picumnus* subsp. *Victoriae*)	Vulnerable		90-150	350	40	3 –6
Barking Owl (*Ninox connivens*)	Vulnerable		250x300	500	100	4–6
Gang-gang Cockatoo (*Callocephalon fimbriatum*)	Endangered / Endangered	Install near foraging resources and water. Cockatoos have a tendency to chew nest boxes. Consider installing a hardwood front on these boxes to reduce chewing impacts.	300x400	500	200	6
Mammals						
Eastern Pygmy-possum (*Cercartatus nanus*)	Vulnerable	Hollows should be installed close to the ground. Proximity to nectar rich resources and dense cover preferred.	150x150	300	30	1-2m
Squirrel Glider (*Petaurus norfolkensis*)	Vulnerable	Install in a minimum cluster of three hollows,	150x250	300	45	3–6
Microbats						
Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)	Vulnerable	Microbat hollows should consist of an entrance with a slit.	100x100	400	25mm	3–5
Eastern Freetail-bat (*Mormopterus norfolkensis*)	Vulnerable		100x100	400	25mm	3–5
Greater Broad-nosed Bat (*Scoteanax rueppellii*)	Vulnerable		100x100	400	25mm	3–5

Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*)	Vulnerable		100x100	400	25mm	3–5

6 Implementation recommendations

6.1 Types of artificial hollows

6.1.1 Nest boxes

Essential to nest box designs is thick, timber that will protect the inhabitants from extremes in weather. Timber materials suitable include ply (both marine and construction), pine and hardwood. It is important to avoid the use of treated timbers which can contain arsenic and other chemicals which can be hazardous to wildlife. Thicker materials will buffer temperatures and ensure greater protection. Research by Griffiths et al. (2018) found that nest boxes provided poor protection to inhabitants during extreme heat. Construction of nest boxes using very thin materials should be avoided. While some researchers have experimented with insulation with positive results, thicker timber will provide additional buffering from external temperatures and are going to be easier to construct and source. Placement of nest boxes in shady positions and orientation can also reduce heat impacts. If there is a small number of hollows available, animals may have no choice but to use inferior hollows out of desperation which could result in impact to the animal's welfare.

Protecting a nest box from moisture will ensure greater longevity and lower costs in maintenance. Key to this success is ensuring the box is joined together using galvanised screws rather than nails. As some moisture cannot be avoided, if nails are used there is a higher chance that the joins will open up. Screws instead will grip better and ensure that gaps between joins are unlikely. A waterproof glue is essential between joins.

The top of the nest box must also overhang on all sides including the rear. Lids that are flush mounted against the rear of the box are at risk of water entering the box and dripping down the inside. The overhang at the back should only be approximately 10mm. An optional strip of foam weather-sealing along the underside of the lid could also prevent moisture from getting inside.

All nest boxes must be painted with a thick exterior water-based paint such as Dulux Weathershield. This paint dries as a membrane which provides exceptional protection from water and moisture. Cheaper fence paints act like a stain and will not provide adequate protection. In addition, a white-based paint should be used for the exterior. A study by Griffth et al. (2017) showed that in extreme heat, a white based paint reflected heat and was able to stay slightly cooler.

Plate 6-1. Commercially available nest boxes are usually constructed from ply

Internal ladders are important especially for deep boxes which can trap juvenile birds before fledging. Wire mesh ladders inside of nest boxes should be avoided due to the risk that this can become a hazard to wildlife with sharp edges. Instead, it is recommended that ladders either consist of pieces of timber glued in place or grooves cut in place.

Sourcing nest boxes from large suppliers can be an easy way to obtain them. However, it is important that the construction requirements discussed here are implemented into the box designs. Many large suppliers are either inexperienced with nest boxes or design their nest boxes for backyard hobbyists (Plate 6-1, Plate 6-2). The latter means that boxes are not designed to last many years with minimal maintenance. Nest boxes should consist of a waterproofed box. Avoid the use of mounting brackets on the back of nest boxes which can trap moisture. Ensuring that nest boxes have been constructed using appropriate materials will ensure long lifespans.

Plate 6-2. Commercially available nest boxes (left) often do not consist of appropriate water proofing and water will begin to damage the roof and back of the boxes. Lacquer wears very quickly on nest boxes and will need to be reapplied. In contrast, nest boxes painted (right) with a high-quality exterior paint such as Dulux Weathershield will last much longer.

A summary of nest box construction requirements include:

- Timber of a minimum of 18mm thickness is to be used for all nest boxes
- Preferred materials consist of ply, pine or hardwood preferred (avoid treated timber)
- Galvanized screws should be used instead of nails
- A waterproof glue should be used between the joins
- External surfaces must be painted with membrane paint such as Dulux Weathershield. The paint colour must be a white base (with a tint)
- An overhang (a minimum of 10mm) on each side including the rear which sits up against the tree. The overhang should extend further on the side of the entrance hole
- Drainage holes should be installed in the base
- All boxes must have numbers printed on the box to ensure easy identification

6.1.2 Log hollows

The process to collect log hollows can remove habitat on the ground for terrestrial species that rely on them. Collection of log hollows should be undertaken either through a process of where they can be salvaged before they are destroyed or carved using a drill.

Research has shown (Griffiths et al. 2018) that log hollows perform similar to natural tree hollows in buffering external temperatures. They are also likely to last much longer than nest boxes and have less maintenance. However, the limitations occur through the installation methods. Log hollows can be very heavy which makes them a risk during installation. Secondly, their large weight can also mean that installation methods using chains can have the potential impact on tree health.

6.1.3 Carved hollows

There are multiple designs of carved hollows. Each with varying design benefits. However, the use of the Hollow Hog should be preferred over other methods. This is because the Hollow Hog creates a large cavity from only

a small piece of living outer tissue being removed. This minimises risks to tree health. In addition, larger faceplates have been found to warp and be rejected by trees.

Where possible, it is also recommended that an entrance spout (Plate 6-3) be provided to reduce chances of callous regrowth over the entrance hollow. Care should be taken to ensure that the entrance spout be only short in length to allow for an inspection camera to be able to enter and inspect from the ground. A short entrance hollow spout is required. Where possible, the spouts should be positioned so that they point slightly downwards to prevent water egress.

Carved hollows required larger trees and are suited to smaller species such as eastern pygmy possum, little lorikeet, squirrel glider and microbats.

Plate 6-3. An example Hollow Hog with a short spout. The short spout will assist with preventing water egress while also allowing for a ground-based pole camera to be inserted without the need to climb the tree. Image by Matt Stephens from Hollow Hog

6.2 Installation methods

The locations for installation of the artificial hollows should broadly affect the locations where hollows have been removed. However, care also should be taken to install hollows where there is suitable habitat for the target species. Where possible, nest boxes should be installed at least 50 metres from the boundary of vegetation clearance. This will reduce edge effects from noise and light pollution ensuring a greater chance of the nest boxes being occupied.

To date, nest boxes have been mostly installed in the Georges River despite their only being a small amount of suitable habitat in this section. Furthermore, recent burns and floods have also degraded this section of habitat. It is recommended that any future nest box installations preference the Wattle Grove (Bootland) sites, particularly the areas to the south that contain suitable habitat for Eastern pygmy possum and Squirrel glider. If any nest boxes need to be relocated or installed, and they do not contain evidence of use, they should be moved to the Wattle Grove site.

Locations for installation should be based on the following criteria:

- Suitability of the vegetation for the target species.
- Distance from the hollow-bearing tree to be removed.
- Distance from existing and future disturbances.

Other site selection criteria will need to be assessed at the time of installation, such as:

- Proximity of other hollow resources in the immediate vicinity.
- Similarity of vegetation structure immediately surrounding the hollow-bearing tree and nest box location.

The Project Ecologist or experienced nest box installer will therefore use their discretion to determine the final location of the nest box.

All artificial cavities should be installed on the southeastern side of the tree. This ensures that they are in the shadow of the sun during summer heat reducing the impacts from extreme temperatures. All cavities must not be installed higher than 5 metres. This ensures they can readily be accessed with a ground operated inspection camera. It also ensures that if the cavity requires maintenance that it can be easily accessed or even removed via an extension ladder. The existing nest boxes should be lowered over the next few years so that they are all at management heights.

6.2.1 Nest boxes

Incorrectly installed nest boxes pose a risk to both wildlife and people. Two methods for securing nest boxes are as follows:

Habisure method (recommended)

This installation method was designed by Alan Franks from Hollow Log Homes (Franks and Franks 2006). This involves using a wire that has a folding spring built into the shape of the wire. As the tree grows, the wire spring expands, extending the lifespan of the box and reducing impacts to the tree from potential ringbarking. A piece of hose should be used on the opposite side of the box and the wire threaded through to prevent the wire digging into the tree. The Habisure method is considered a safe approach for tree health.

Occasionally the Habisure wire can become stiff and not expand as the tree grows resulting in ringbarking. In addition, installation with too much slack in the wire can result in the nest boxes and log hollows leaning over. All nest boxes and log hollows installed using this method should be monitored annual and adjustments made.

Nail hang method (optional)

Goldingay et al. (2018) attributed the nail hang method of attachment of nest boxes to trees as a key component in delivery of a successful 20 year long project in the Bendigo region. In this method, nest boxes are hung on an angled nail threaded through a small hole on the back of the box. As the tree grows, the box is shifted along the nail, extending the lifespan of the nest box. It is possible that this method could have a minor impact on the tree due to the nail, however, given the longevity of both the nest boxes and tree in the study by Goldingay et. al, (2018), it is considered that any impacts would be minor.

Other methods of attachment

Occasionally, both these methods may not be suitable. Very large heavy nest boxes may need to be attached using arborist ropes. Where possible, Council must avoid the use of attachment via a screw or other fixed method. By not allowing for movement as the tree grows, the nest box or log hollow can split and fall off the tree.

6.2.2 Carved hollows

Mechanically carved hollows utilise the sides of the tree so that they are much better are buffering external temperatures during extreme heat. This means that carved hollows are superior to nest boxes but do have some drawbacks. The most significant one is that the cavity size is limited by the diameter of the tree trunk or branch where the hollow will be constructed. To minimise the risk of tree failure due to the installation of carved hollows, trees should have at least two thirds of their thickness following construction of a chainsaw hollow (Mattheck et al., 1994). This means for instance, if a hollow requires a flood space with a depth of 20cm, the tree selected would be required to be over 60cm diameter at the hollow height. Care must also be taken for the thickness of the faceplate which may also take up some of that internal cavity space. Therefore, smaller cavities are of preference when mechanically carving tree hollows. The only exception to this rule is in a tree where the canopy has been removed and the risk of movement from wind is significantly reduced. Either way, an experienced arborist company should be consulted prior to any mechanically carved hollows and a risk assessment completed.

Callous regrowth has been shown to be a potential problem for mechanically carved tree hollows (Terry et al. 2021). However, there is some evidence that when a spout is provided in the form of a natural hollow, that is prevents this regrowth over the entrance. If a spout is to be used, it is important that it only be short (approximately 10cm) to ensure that a pole mounted camera can easily inspect inside the carved hollow.

Another issue identified with mechanically carved tree hollows are termites which can fill a newly carved hollow up with sawdust. This prevents other animals from using the hollow. Preliminary research into preventing this species has shown that placing some eucalyptus leaves inside of the hollow may be enough to deter them (Matt Stephens pers. coms).

Height

All artificial hollows should also be installed at an appropriate height which will allow to easy access with a ladder in the event of a nest box requiring maintenance. The height should also take into consideration the species needs – eg/Eastern Pygmy Possum utilise hollows at <1.5m high). Future hollow additions should not be located higher than 5 metres off the ground. Any relocated nest boxes should be installed at this height or lower.

There is a common misconception that animals require hollows to be located high in a tree canopy (Beyer and Goldingay 2006). If there is a need for a hollow, animals will usually accept what is available (Goldingay pers comms December 2022). Franks and Franks (2006) state that the majority of fauna in gardens will readily use cavities no higher than 3 m. Additionally, Grant (1997) states that nest boxes [and other hollows] should be installed 'as high as possible for the protection of their occupants but low enough for safe and regular maintenance.' Installing hollows in very high (>5m) locations can make reaching them difficult and add to costs when monitoring and maintenance is required. Installing hollows at heights between 3 and 5 m would ensure minimal disturbance from people, foxes and cats but still allow easy, safe access via a ladder when required. This will also reduce cost for monitoring ana maintenance as tree climbers will not be required.

6.3 Pest animal prevention

In an urban setting, feral species may utilise the artificial hollows. This includes Common (Indian) myna and European honeybee. A common misconception is that artificial hollows attract pest species. In actual fact, the use of all hollows, be it natural or artificial can be used by pest species. These unwanted animals do not preference artificial cavities over natural hollows. There are some strategies that can be used to reduce the chances of pest species.

6.3.1 European honeybee

The use of hollows by the introduced European honeybee (Plate 6-4) has been identified as a serious threat to hollow dependent fauna (Goldingay et al. 2020) and is listed a threatening process in NSW as part of the Biodiversity Conservation Act. These aggressive insects can evict other inhabitants. Bees have been shown to preference larger artificial cavities (Franks and Franks 2006). They may only stay for short periods in smaller cavities before moving on. They can also pose a threat to people in public parks as they can be very aggressive.

There is some evidence that placing wool or Lanolin on the underside of the top of an artificial hollow can deter bees from attaching their wax. Others have also burnt the underside of a lid. It is recommended that treatment of artificial cavities be undertaken as an insurance measure to prevent bees from becoming established. This should include placing wool on the underside of lids of all nest boxes and log hollows. Carved hollows which have a natural timber may be more difficult to attach carpet. In the case of a carved hollow, it is recommended to spray Lanolin on the top of the hollow.

If bees are found inside of an artificial cavity, steps should be taken to monitor the situation for up to three months. Sometimes, bees may move on by themselves. If the hive persists, it is recommended that professional removal be undertaken if it can be achieved safely. If public safety is a concern, the bees will need to be removed as soon as possible. This can be easier in a nest box which can be removed. But a mechanically carved hollow is much more difficult.

Hives can be treated with an insecticide and then the entrance closed up until the bees have all died. This must be undertaken at night when the bees are asleep and the risk to people are less. Treatment of bees is another reason why artificial cavities should be installed at management heights which allows for easy access with an extension ladder.

Plate 6-4. European honeybees have been found in nest boxes at Moorebank.

6.3.2 Common (Indian) myna

The Common myna frequently uses hollows to build nests and raise young. The species is known to build a nest in more nests than it will use. The impact of this bird on the local environment is likely to be overstated (Haythorp 2013). However, it is recommended where possible that excluding this species from the nest boxes be undertaken to ensure maximum opportunities for locally native species. A baffle design has frequently been added to nest boxes to discourage use by mynas (Homan 2000). However, a study by Haythorp (2013) make recommendations to improve the baffle design so that it still allowed eastern rosellas while excluding mynas. She found that many rosellas entered a nest box using the roof and the baffle would impede this access. Instead, she suggested that the baffle be attached from the sides of the box with the top open which would allow the birds to readily access the entrance hole from the top.

Table 6-1 provides some additional measures which can be used to reduce pest species use of the nest boxes. These measures can be implemented during construction and installation or can be implemented if pest species are noted during monitoring activities.

Table 6-1 Measures to minimise pest species occupation

Pest species	Appropriate measure
Common Myna	An overhanging sheet of ply in front of the entrance (known as a Myna baffle) successfully deters Common Myna whilst allowing native species to use them. Note the text above which describes how to best produce a baffle but still allow other parrots to utilise the box.
Ants and other insects	The box lid can be left open for a few weeks and the ants will usually move on quickly after this. If the ants do not relocate, talcum powder may be applied to the entrance, edges and inside of the nest boxes prevents use by ants.
European Honeybee	Lining the upper surfaces of nest box with a piece of carpet or Lanolin will help in prevent bees from attaching their wax to the surface.

7 Monitoring

The monitoring program should continue with the aim to identify fauna occupancy rates and to identify any required maintenance activities. All accessible artificial hollows should be checked annually in spring.

A pole mounted inspection camera is recommended to undertake monitoring as it is the most time efficient and will also have minimal distance on inhabitants. The following information should be recorded at each artificial hollow:

- Name of surveyor
- Inspection details (such as date and time)
- Nest box number and location
- Occupancy status including species observed and number of individuals
- Evidence of use (either species or evidence scratches, debris, feathers or whitewash).
- General condition of the nest box (Excellent, good, average, poor, repair required)
- Any recommended maintenance requirements (eg. Lid is missing, etc)
- Any other notes such as changes to land use or reasons for low occupancy

Annual monitoring will allow for the success of the artificial hollows to be evaluated and changes to be made as required to improve the functionality of the program.

8 Annual reporting

Following each annual spring monitoring event, a summary report will be prepared to describe the results of the monitoring program and identifying any corrective maintenance activities that were completed or are recommended. This report will be provided to ESR who will include in their annual reporting submission to NSW Planning Secretary (or alternate as appropriate), as part of the operational compliance reporting requirements.

The general structure of a report would likely include the following headings:

- Background (Offset requirement, nest box details, previous monitoring results)
- Methodology (Surveyors, Inspection details, Number of artificial hollows)
- Results (Occupancy and utilisation rates, artificial hollow condition)
- Discussion (Native fauna; Invasive fauna; Maintenance requirements)
- Appendix 1 (Nest boxes requiring maintenance)
- Appendix 2 (Fauna recorded in nest boxes)

In addition, species records for both native and non-native fauna are required to be submitted on an annual basis to NSW BioNet to remain compliant with the requirements of operating under a NSW Scientific Licence.

9 Maintenance

All artificial cavities will require maintenance to maximise lifespans. Some researchers have shown that nest boxes in particular have high attribution rates (Lindemayer et al. 2009) due to water egress damaging the timber. However, other studies (Goldingay et al. 2018) has shown that when implemented correctly, nest boxes can provide critical habitat to hollow dependent fauna over many decades.

Ensuring that the artificial cavities have been designed correctly will maximise the lifespans and ensure minimal maintenance is required. This includes ensuring that the cavities are appropriately water sealed and quality fittings are used including galvanised hinges and screws.

As artificial cavities are exposed to the weather and animals, they begin to wear. Cavities that require attention should be addressed immediately. As trees grow, the mountings of artificial cavities can require modification. Habisure springs may require adjustment to prevent ringbarking of trees. The monitoring should determine the cavities which will need attention.

Artificial hollow maintenance must be undertaken on an annual basis following the monitoring. Common maintenance activities that may be required include:

- The need to remove pest species
- Replacement of damaged artificial hollows
- Removal of excessive nesting material
- Moving artificial hollows that are not functioning correctly
- Checking that boxes are draining adequately

Any required maintenance activities should be noted within the annual report and classified as urgent or non-urgent activities. Urgent activities are ones that significantly hinder the ability of the nest box to deliver the objective of providing habitat for native species and should be actioned within 8 weeks of submission of the annual report. Non-urgent maintenance activities may be slight defects or temporary issues that do not require immediate action but that should be reassessed in the following monitoring event. All artificial hollows should be fully functional following any maintenance and repairs.

10 Adaptive management

Continued monitoring will provide data on utilisation and suitability of artificial hollows at MIP. The characteristics of an artificial hollow including its type, location, and specifics on how it has been installed can be evaluated. The findings from these monitoring events should be considered when implementing the strategy in proceeding years.

For example, if nest boxes are found to be frequently used by Eastern Pygmy Possums during monitoring surveys, whereas carved hollows for this species have recorded low (or no) signs of usage, future artificial hollows for this species should prioritise nest boxes over carved hollows.

It is suggested that this AHMS be reviewed and updated (as required) after five years. Progress towards implementing the strategy should be reviewed and the results of monitoring over the previous five years should be considered to determine if any of the recommendations from this strategy require updating. A literature review should also be completed to confirm that recommendations regarding artificial hollows in this report are still current and best practice.

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Moorebank Intermodal Precinct

APPENDIX L – COMPLIANCE REPORT DECLARATION FORM

Project Name	Moorebank Intermodal Precinct (MIP) – East Precinct
Project Application Number	SSD 6766 & SSD 7628
Description of Project	Moorebank Intermodal Precinct aims to streamline the freight logistics supply chain from port to store, deliver savings to businesses and consumers, and help service the rapidly growing demand for imported goods in south-west Sydney. It is located approximately 27 kilometres (km) south-west of the Sydney Central Business District and approximately 26 km west of Port Botany within the Liverpool Local Government Area. The MLP is divided into an East Precinct and a West Precinct, located east and west of Moorebank Avenue respectively. The East Precinct includes the 24/7 operation of an import-export terminal (IMEX), rail link connecting to the South Sydney Freight Line (SSFL), warehousing and distribution facilities and freight village.
Project Address	Moorebank Intermodal Precinct, Moorebank, NSW, 2170
Proponent	The Trust Company Limited (ACN 004 027 749
Title of Compliance Report	Moorebank Intermodal Precinct East Precinct – Operation Compliance Report
Date	Friday, 19 December 2025

I declare that I have reviewed relevant evidence and prepared the contents of the attached Compliance Report and to the best of my knowledge:

- the Compliance Report has been prepared in accordance with all relevant conditions of consent;
- the Compliance Report has been prepared in accordance with the Compliance Reporting Post Approval Requirements;
- the findings of the Compliance Report are reported truthfully, accurately and completely.
- due diligence and professional judgement have been exercised in preparing the Compliance Report; and
- the Compliance Report is an accurate summary of the compliance status of the development.

Notes:

- Under section 10.6 of the Environmental Planning and Assessment Act 1979 a person must not include false or misleading information (or provide information for inclusion in) a report of monitoring data or an audit report produced to the Minister in connection with an audit if the person knows that the information is false or misleading in a material respect. The proponent of an approved project must not fail to include information in (or provide information for inclusion in) a report of monitoring data or an audit report produced to the Minister in connection with an audit if the person knows that the information is materially relevant to the monitoring or audit. The maximum penalty is, in the case of a corporation, $1 million and for an individual, $250,000; and

Moorebank Intermodal Precinct

APPENDIX L – COMPLIANCE REPORT DECLARATION FORM

- The Crimes Act 1900 contains other offences relating to false and misleading information: section 307B (giving false or misleading information – maximum penalty 2 years' imprisonment or 200 penalty units, or both).

Name of Authorised Reporting Officer	Richard Mason
Title	Possum Environmental Consulting
Signature	
Qualification	Bachelor of Science – Environmental Science
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