Topsoil and Hygiene Management Plan

GREATER CONNECT ALLIANCE

Client contract number:	
Client project Number	
Document number:	GMB-292-ENV-MP-001
Revision date:	16/11/2021
Revision:	A

Document Approval

Rev.	Date	Prepared by	Reviewed by	Recommended by	Approved by	Remarks
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Details of Revision Amendments

Document Control

The Project Manager is responsible for ensuring that this plan is reviewed and approved. The Project Environmental Manager is responsible for updating this plan to reflect changes to environmental, legal and other requirements, as required.

Amendments

Any revisions or amendments must be approved by the Project Manager and/or client before being distributed / implemented.

Revision Details

Revision	Details
A	Draft
B	Final Draft
0	Issued for Review
1	Issued for Approval

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Part A: Overview

Structure of this Plan

The Topsoil and Hygiene Management Plan (THMP) has been developed to complement the Greater Connect Alliance (GCA) Construction Management Plan (CMP) and Environmental Management Plan (EMP) and outlines how the Project will achieve acceptable environmental and landscape outcomes by the application of the Scope of Works and Technical Criteria (SWTC).

The plan has the following structure:

Part A: Overview	This section clearly defines: Project Summary and Major Elements of the Project The Purpose of the THMP and Receiving Environment Objectives and Targets Legal and other requirements
Part B: Implementation and Monitoring	This section outlines in detail the key aspects for Topsoil and Hygiene Management Plan expectations. Control Measures Monitoring, Response Actions and Reporting
Part C: References	References
Part D: Appendices	This section provides information supporting the THMP including: Topsoil Classification and Weed Mapping

Project Overview

Project Summary

Roe Highway and Great Eastern Highway Bypass (GEHB) are strategic road corridors in Perth's north-east. They provide critical connections between Great Eastern Highway, Tonkin Highway and the Perth Metropolitan road network and support access to many key economic zones including Perth Airport precinct, the Kewdale, Hazelmere and Canning Vale industrial areas and freight distribution centres. The intersections of Roe Highway/GEHB and GEHB/ Abernethy Road experience high congestion and a high number of accidents, directly associated with the volume and diverse mix of traffic. This is expected to worsen with the planned closure of Stirling Crescent, which will divert more vehicles onto Abernethy Road. In April 2019, the Federal and State Governments initiated a remedy by allocating funds for the planning, development and construction of two new grade separated interchanges on Great Eastern Highway Bypass, at the intersections with Roe Highway and Abernethy Road.

The current planning and development for these interchanges considers the proposed realignment of the Midland Freight Rail, development around Airport North, the Kewdale-Hazelmere Regional Integrated Masterplan, reviews of local land use, updated traffic modelling and additional works planned on local government roads. In April 2020, the Western Australian Government announced the fast-tracking of the tendering process for a number of important projects, including the Great Eastern Highway Bypass Interchanges Project (Project), with the intent to commence construction works in 2021.

Major Elements of the Project

- A new grade separated interchange at Roe Highway and GEHB
- Upgrade works to Roe Highway from GEHB to Clayton St
- Duplication of the Roe Highway Bridge over the Helena River
- New grade separated interchange at GEHB and Abernethy Rd
- Construction of a four-lane bridge over the Helena River providing connection between the northern and southern sections of Lloyd St
- Connection of Lloyd St to GEHB
- Connection of Adelaide St to Abernethy Rd
- Duplication of Abernethy Rd between Adelaide St and south of Dundas Rd
- Upgrade of the intersection at Abernethy Rd and Kalamunda Rd
- New PSP sections on Roe Highway and GEHB
- PSP under/overpasses at Roe Highway/Great Eastern Highway Bypass interchange
- PSP under/overpasses at Abernethy Rd/Lloyd St interchange
- Rehabilitation, landscaping and revegetation over the disturbed and degraded areas of the site, including hard landscaping
- Production and integration of urban design elements, incorporating public art works and improved amenities

The primary objectives of the Project are to provide efficient and safe road access for all road users and to provide road infrastructure that supports economic development. In its delivery, the Project provides opportunity for innovative design and construction approaches to bring superior value for money and minimised risk to Main Roads Western Australia (MRWA), and to provide upskilling and employment opportunities for lower-tier contractors and Aboriginal people.

Purpose

Between the 2nd November 2021 and 4th November 2021, Gambara surveyed all work pack area locations of the Project area (WP1, WP2, WP3A, WP3B, WP4, WP5, WP6, WP7) for vegetation condition, specifically vegetation structure and weed load. Gambara was engaged by Greater Connect Alliance (GCA) to conduct this surveying with the outcome of a Topsoil and Hygiene Management Plan (THMP).

The purpose of this THMP is to address the environmental soil and hygiene aspects and risks involved with dieback (*Phytophthora cinnamomi*), declared weeds, nationally significant weeds, problematic weeds, topsoil and mulch, as well as detail the management measures to satisfy GCA commitments stated in the MRWA Scope of Works and Technical Criteria (SWTC) and GCA Environmental Management Plan (GHEBI-GCA-PLN-A000-PM-00012).

This Plan addresses hygiene procedures and topsoil/mulch management to be utilised in the prevention of the spread of Dieback (*Phytophthora cinnamomi*) and declared weeds within the Project area during the construction activities of the Project.

Implementation of the THMP will:

- Identify the environmental obligations attached to the tender / project and the hazards and risks associated with the works
- Assist in the prevention of unauthorised environmental harm
- Fulfil GCA environmental requirements as defined in the Contract, including complying with relevant permits and approvals
- Comply with all relevant environmental legislation
- Minimise negative impacts on the community that relate to the Project's environmental impacts
- Identify and implement feasible opportunities to reduce the environmental impact of the Project that are beyond contractual and compliance requirements

The Project Manager, with advice and input from senior construction staff, is responsible for the implementation of the Plan.

Scope and Receiving Environment

Dieback

Phytophthora cinnamomi is a soil-borne pathogen that invades and destroys the root and root collar cells of susceptible species of flora, primarily from the plant families Proteaceae, Epacridaceae, Dilleniaceae, Fabaceae, Xanthorrhoeaceae and Myrtaceae. This pathogen is a microscopic, pseudo-fungal organism requiring warm moist conditions to survive and spread. *Phytophthora cinnamomi* is a major threat to the biodiversity of south-western Australia and is recognised as a key threatening process under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.

The pathogen that causes dieback is widespread in areas with greater than 800mm of annual rainfall and less extensive in areas that receive between 600-800 mm of rainfall. The project area received approximately 636 mm of rainfall during 2020 (Perth Airport weather station) (Bureau of Meteorology 2021). This would place the area as being within the vulnerable zone, as defined by DBCA (Department of Parks and Wildlife, 2020).

The majority (85%) of the Project area is classified as 'Excluded' by Glevan (2020), due to the highly degraded nature of the area. Three Phytophthora Dieback 'Infested' areas, covering 8.5% of the Project area, were also observed, with the remaining area classified as 'Uninfested' (6%) and 'Uninterpretable' (0.5%) (Glevan 2020). For the purpose of topsoil management and hygiene, all areas designated 'Excluded' and 'Uninterpretable' have been classified as 'Infested' by Gambara. This is to mitigate the risk of infesting un-infested areas of the Project with 'Excluded' soils that may be unknowingly infested with dieback. Therefore, 94% of the Project area surveyed by Glevan has been classified as 'Infested' by Gambara, with the remaining 6% classified as 'Uninfested'. Descriptions of Glevan (2020) dieback classifications are present in Table 1.

Table 1. Glevan (2020) dieback category descriptions.

Vegetation Condition	Phytophthora Occurrence Category
Naturally vegetated areas - Keighery disturbance rating of 3 or less. Phytophthora occurrence categorisation is possible.	**Infested** - Determined to have plant disease symptoms consistent with the presence of Phytophthora cinnamomi.
	Uninfested - Determined to be free of plant disease symptoms that indicate the presence of P. cinnamomi
	Uninterpretable - Undisturbed areas where susceptible plants are absent, or too few to make a determination of the presence orabsence of P. cinnamomi.
Vegetation structure temporarily altered.	Temporarily **Uninterpretable** - Areas of disturbance where natural vegetation is likely to recover.
Vegetation structure severely altered - Keighery disturbance rating 4 or greater. Phytophthora occurrence assessment is not possible	**Excluded.**

Table sourced from Glevan (2020)

It should be noted that Glevan (2020) did not survey WP5 or WP7. These locations resemble those classified as 'Excluded' by Glevan, using the following definition 'areas within the development

envelope are excluded from assessment if the vegetation is suffering from significant disturbance'. Thus, Gambara has designated these work pack areas as 'Excluded' based on Glevan classifications, and therefore 'Infested' based on Gambara classifications. See Appendix 1 mapping for all dieback classifications.

Weeds

Weeds and non-native species of flora may establish and spread into native habitat during construction activities and especially those associated with development of remnant vegetation sites. Managing topsoil prior to construction and during works is vital in minimising the spread of weeds and seeds to natural woodlands and to adjacent vegetation habitats.

Portions of the Project are impacted by varying levels of weed incursion, especially within edge-effect zones bordering roads and paths. Weed species have a detrimental impact on the environment, out-competing and replacing native species, altering vegetation communities, and reducing available food/shelter for native fauna.

Greater Connect Alliance employees and contractors are obliged to comply with all relevant environmental Commonwealth and State legislation. Under the Biosecurity and Agriculture Management Regulations 2013, organisms are to be declared under the Act with certain legal requirements. Table 2 outlines these requirements.

Table 2. Weed classification requirements in Australia

Declaration Category	Requirements
Weeds of National Significance	Throughout Australia a set of 33 weeds which have been agreed by governments based on an assessment process to be prioritised these weeds based on their invasiveness, potential for spread and environmental and social and economic impacts. Weeds are listed via Department of Agriculture, Water & Environment. Management of these weeds is legislated at a State level.
Declared Pests	To protect Western Australian agriculture, the Department of Primary Industries and Regional Development regulates harmful plants under the *Biosecurity and Agriculture Management Act 2013*. If a declared pest is found in the area, land owners/occupiers and other persons must adhere to requirements under the *Biosecurity and Agriculture Management Act 2007* and its subsidiary legislation. Exclusion or control categories are set for each declared pests via local government boundaries. These categories are: C1 & C2 - Control measures to destroy, prevent or eradicate the weed. C3 - Reduces the number or contains the spread of the pest in the area. Unassigned - Declared pests that are recognised as having a harmful impact under certain circumstances, where their subsequent control requirements are determined by a Plan or other legislative arrangements under the Act.
Environmental Weeds	Weeds that invade bushland and threaten native plants. No legislative requirements under the Biosecurity and Agriculture Management Act 2007. Control advised to reduce environmental harm and ensure revegetation outcomes are achieved under the requirements of the SWTC.
Woody Weeds	Weeds that can grow large, are difficult to control, and typically form groves. No legislative requirements under the Biosecurity and Agriculture Management Act 2007. Control advised to reduce environmental harm and ensure revegetation outcomes are achieved under the requirements of the SWTC.

During field surveys, Gambara identified 27 species of weeds throughout the entire Project area. Of these, the following Weeds of National Significance (WoNS) and Declared Pest weed species pose a major threat to topsoil and mulch hygiene and should be sprayed with herbicide prior to clearing works to ensure compliance with Biosecurity and Agriculture Management Act 2013.

- *Gomphocarpus fruticosus* (Narrow Leaf Cotton Bush) – Declared Pest (C3)
- *Echium plantagineum* (Paterson's Curse) – Declared Pest (Unassigned)
- *Solanum linnaeanum* (Apple of Sodom) – Declared Pest (Unassigned)
- *Zantedeschia aethiopica* (Arum lily) – Declared Pest (Unassigned)
- *Opuntia stricta* (Common Prickly Pear) - Declared Pest and WoNS (C3)
- *Asparagus asparagoides* (Bridal Creeper) – Declared Pest and WoNS (Unassigned)
- *Rubus anglocandicans* (Blackberry) – Declared Pest and WoNS (C3)

Numerous Woody Weed and Environmental Weed species were identified throughout the site. These species pose a threat to mulch hygiene and should be excluded from all mulching works to avoid weed infestation of mulch.

- *Arundo donax* (Giant Reed) – Woody Weed
- *Ricinus communis* (Castor Oil) – Woody Weed
- *Zanthoxylum piperitum* (Japanese Pepper) – Woody Weed
- *Leptospermum laevigatum* (Victorian Tea Tree) – Woody Weed
- *Ficus carica* (Common Fig) – Woody Weed
- *Cytisus proliferus* (Tagasaste) – Woody Weed
- *Olea europaea subsp. Europaea* (Olive) – Woody Weed
- *Nicotiana glauca* (Tree Tobacco) – Woody Weed
- *Morus alba* (Mulberry) – Woody Weed
- *Melia azedarach* (Cape Lilac) – Woody Weed
- *Erythrina indica* (Indian Coral Tree) – Woody Weed
- *Agave americana* (Century Plant) – Woody Weed
- *Typha orientalis* (Bulrush) – Environmental Weed
- *Crassula ovata* (Money Plant) – Environmental Weed
- *Watsonia bulbillifera* (Wattsonia) – Environmental Weed
- *Solanum nigrum* (Blackberry Nightshade) – Environmental Weed
- Cortaderia selloana (Pampas Grass) – Environmental Weed
- *Phytolacca octandra* (Inkweed) – Environmental Weed
- *Ipomoea cairica* (Coast Morning Glory) – Environmental Weed

Environmental weeds should be sprayed prior to clearing reduce environmental harm and ensure revegetation outcomes are achieved under the requirements of the SWTC.

The location of these Weeds of National Significance, Declared Weeds, Environmental Weeds and Woody Weeds were recorded via GPS and are displayed Appendix 1 Figures 1 to 12. Management controls for these weeds are present in Appendix 2.

Various common weeds were also observed throughout the Project area such as *Lolium rigidum* (Ryegrass), *Ehrharta calycina* (Veldt Grass), *Eragrostis curvula* (African Lovegrass), *Pelargonium capitatum* (Rose Pelargonium) and *Fumaria capreolata* (Whiteflower Fumitory).

Percentage weed cover, alongside vegetation structure, within the Project area has been used to identify sources of topsoil for reuse. The assessment classified areas within the Project area as either:

- Weeds <30%
- Weeds ≥30%

Areas that have less than 30% weed cover were deemed suitable for topsoil retention. These have been referred to as 'Conserved' areas. Areas that have equal to or greater than 30% weed cover were deemed unsuitable for topsoil retention. These have been referred to as 'Degraded' areas. These classifications are based on Keighery Vegetation Condition Scale ratings. Areas that are rated between 'Pristine' and 'Very Good-Good' are classified as 'Conserved'. Areas that are rated between 'Good' and 'Completely Degraded' are classified as 'Degraded'.

Topsoil

The presence of quality topsoil is a significant component in the success of a revegetation project. Good topsoil contains native seeds and plant propagules, mycorrhiza (symbiotic fungi), nutrients and organic matter. As the majority of the topsoil within the Project area is degraded, imported topsoil is required to fulfill topsoil site requirements.

Gambara surveyed all vegetation sites within the Project area for weed load and vegetation condition. It is determined that, based on vegetation condition classifications, any locations of the survey area which is determined to rate between Excellent and Very Good to Good condition, is acceptable for conservation and re-use for landscaping purposes, as vegetation structure is favourable for seed bank and weed load is 30% or below. The vegetation condition surveying was performed using the Keighery (1994) rating scale (Table 3), with a focus on weed load.

Table 3. Keighery (1994) Vegetation Condition Scales

Keighery (1994) Vegetation Condition Scale		
Scale	**Vegetation Condition**	**Description**
1	**Pristine**	Pristine or nearly so; no obvious signs of disturbance.
2	**Excellent**	Vegetation structure intact; disturbance affecting individual species and weeds are non-aggressive species.
3	**Very Good**	Vegetation structure altered; obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
4	**Good**	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
5	**Degraded**	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
6	**Completely Degraded**	The structure of the vegetation is no longer intact, and the area is completely or The structure of the vegetation is no longer intact, and the area is completely oralmost completely without native species. These

		areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees and shrubs.

Table sourced from Glevan (2020)

Field surveying conducted by Gambara concluded that topsoil within the Project area should be grouped into four different categories based on vegetation condition suitability and *Phytophthora cinnamomi* presence. Infested and uninfested refers to presence or lack thereof of non-native Phytophthora species:

- Dieback Uninfested-Conserved (DU-C)
- Dieback Infested-Conserved (DI-C)
- Dieback Uninfested-Degraded (DU-D)
- Dieback Infested-Degraded (DI).

DU-C topsoil is of locations in the development area that were identified as Uninfested by Glevan Consulting (2020), as well as determined to be classified between Pristine and Very Good to Good in vegetation condition.

DI-C topsoil is of locations determined to be Infested by Glevan Consulting (2020) and Gambara (2021) as well as classified between Pristine and Very Good to Good in vegetation condition.

DU-D is topsoil of locations determined to be between Good and Completely Degraded/Cleared in vegetation condition but identified as Uninfested by Glevan Consulting (2020).

DI-D topsoil is of locations determined to be Infested by Glevan Consulting (2019) and Gambara (2021), and between Good and Completely Degraded/Cleared in vegetation condition. Topsoil classifications have been summarised in Table 4.

Table 4. Project classification of topsoil.

Vegetation Condition Rating	Weed Occurrence Category	Dieback Status	Project Classification
Pristine – Very Good to Good	<30% Weed Cover	Uninfested	Dieback Uninfested-Conserved (DU-C)
Good – Completely Degraded/Cleared	≥30% Cover	Infested (Excluded)	Dieback Infested-Degraded (DI-D)
Pristine – Very Good to Good	<30% Weed Cover	Infested (Excluded)	Dieback Infested-Conserved (DI-C)
Good – Completely Degraded/Cleared	≥30% Cover	Uninfested	Dieback Uninfested-Degraded (DU-D)

Topsoil classifications throughout the Project area are present in Figures 1 to 12 of Appendix 1.

Table 5 outlines the compatibility of topsoil movement within the Project area. All topsoil should be managed as per the SWTC Section 4 'Design requirements', Clause 4.12(c), and Section 9 'Environmental issues', Clauses 9.4(a) and 9.4(b), as displayed in Table 6.

Dieback Infested topsoil should only be stockpiled in areas classified as 'Infested'. Dieback Uninfested topsoil should only be stockpiled in areas classified as 'Uninfested' unless the Uninfested topsoil will be used in an Infested area. In the case of 'degraded' topsoil (DI-D or DU-D), this stockpiling should only be utilised prior to disposal or burying, as per Table 7.

Topsoil to be retained for the revegetation works will be sourced from areas classified as 'Conserved' (DI-C or DU-C). These areas and materials will be labelled as 'Conserved' and segregated from 'Degraded' topsoil. Conserved topsoil will be collected up to a nominal depth of 150mm; the top 45mm will likely contain most of the seed and other organic elements. Where the overall Project programme allows, Conserved topsoil will be collected at a time when the soil has a low moisture content. Cleared areas and dry, dust-prone areas or stockpiles will be stabilised to prevent dust lift off. Conserved topsoil is to be stockpiled in mounds of less than 1.5 metres in height. Implement semi-permanent dust control treatments (e.g. hydromulching, dust stabilisers, tarps or geo-textile materials) on stockpiles that are to be left for longer than one month.

Conserved topsoil stockpiles will be managed and signposted to ensure no cross contamination occurs. All stockpiled topsoil will be clearly marked with a unique stockpile identification indicating source location, dieback status, and overall project classification of 'Conserved' or Degraded'. Material is to be handled in accordance with the management practices presented in this Plan and all relevant Main Roads and GCA documents. A 1:1 mixture of Conserved topsoil and Conserved mulch shall be respread at 100mm thick. Where a shortfall of Conserved topsoil exists within a project zone, an imported soil suitable for sustaining healthy plant growth shall be used as topsoil, mixed equally with mulch and spread at 100mm depth.

Table 5. Compatibility of topsoil movement (for re-spread) between classifications

Zone Type	Movement Compatibility Zone
DU-C	DU-C
	DI-C
	DI-D
	DU-D
DI-C	DI-C
	DI-D
DI-D	None-Dispose or Bury
DU-D	None-Dispose or Bury

Table 6. SWTC topsoil management specifications

SWTC Section	SWTC Clause	Requirement
4	4.12(c)	iv. (A) measures to maximise the reuse of existing Site materials (such as vegetation and topsoil) and the effective management of these materials on Site. All weed infested topsoil recovered from the Site must not be reused as topsoil. (B) topsoil and mulch can only be

			imported if there is a shortfall of material recovered from the Site. Any imported topsoil and mulch must be certified weed free and must be sourced from chipped hardwoods with no fines present.
9	9.4(a)	ix. x.	Topsoil from weedy areas must be disposed off Site or by burying under at least 0.5 m of clean material. Systems must be developed and implemented to ensure traceability of disposed weed infested topsoil. Weed free topsoil must be stripped and stockpiled for reuse in revegetation of disturbed areas.
9	9.4(b)	ii. iii.	develop and implement a system of controls to prevent the introduction and spread of dieback and/or weeds within or adjacent to the Site; and the dieback hygiene program must include precautions to be taken for the re-use of topsoil.

Table 7. Compatibility of topsoil stockpiling between classifications

Zone Type	Stockpiling Compatibility Zone
DU-C	DU-C
	DU-D
DI-C	DI-C
	DI-D
DI-D	DI-C (before disposal or burying)
	DI-D (before disposal or burying)
DU-D	DU-C (before disposal or burying)
	DU-D (before disposal or burying)

Mulch

Within the project site, vegetation was surveyed to ensure only material native to Western Australia will be incorporated for revegetation and landscaping works. The mulch classification criteria are detailed in Table 8

Table 8. Mulch management by classification

Category	Project Classification
Native to Western Australia	Conserved
Introduced Weed Species	Degraded

During the Gambara (2021) survey of the Project area, various weed species/groves of weed species to be excluded from mulch were marked with pink flagging tape. Weed species that need to be excluded from mulching are woody weeds, Declared Pests, Weeds of National Significance and other environmental weeds.

Mulch is to be stockpiled in mounds of less than 1.5 metres in height and labelled with unique stockpile identification indicating source location, dieback status and overall project classification. Mulch taken from dieback infested areas should only be stockpiled and utilised in dieback infested areas. Mulch taken from dieback uninfested areas can be utilised in either dieback infested or dieback uninfested areas. Uninfested mulch should only be stockpiled in infested areas if it is to be spread in infested areas.

Objectives and Targets

The controls, management measures and monitoring included within this Plan are for the purpose of ensuring the requirements of the SWTC, as shown in Table 9, are achieved.

Table 9: SWTC Clauses relevant to the THMP

SWTC Section	SWTC Clause	Requirement
4	4.12(c)	v. (A) measures to maximise the reuse of existing Site materials (such as vegetation and topsoil) and the effective management of these materials on Site. All weed infested topsoil recovered from the Site must not be reused as topsoil. (B) topsoil and mulch can only be imported if there is a shortfall of material recovered from the Site. Any imported topsoil and mulch must be certified weed free and must be sourced from chipped hardwoods with no fines present. (C) measures to protect existing vegetation retained within the Site. (E) a control program (for all weed and pest species and diseases) which includes the timing of measures to be implemented during the Project Works and minimum maintenance requirements during the applicable Defects Correction Period.
9	9.4(a)	i. Clearing and topsoil operations must be planned and integrated so as to prevent the spread or proliferation of weeds or diseases. ii. All machinery entering the Site must be cleaned of soil and plant debris. iii. Clearing is to be restricted to only those areas where works are to be constructed. The extent of clearing of the road alignment must not exceed 0.5 m from the limit of earthworks. iv. The clearing envelope must be pegged out on the ground prior to works commencing. v. Annually to 31 December and on final completion of clearing, the clearing extent must be surveyed and the survey results provided to the Main Roads' Representative as an ESRI shapefile georeferenced to GDA 94 within 1 month of the reporting period.

SWTC Section	SWTC Clause	Requirement
		vi. Any damage caused by the Alliance to vegetation, landforms or fauna habitat outside approved clearing areas must be reinstated at the Alliance's cost and in consultation with the relevant Authorities. vii. Reinstatement of damaged areas must be carried out under the direction of a suitably qualified environmental consultant engaged by the Alliance. Reinstatement works must involve whatever tasks are required or recommended by the consultant and relevant Authorities in order that the damaged areas are restored to pre-existing condition within the shortest possible time. viii. Areas to be cleared for construction must be assessed for weed infestation to determine whether topsoil is to be salvaged for reuse in rehabilitation and landscaping. ix. Topsoil from weedy areas must be disposed off Site or by burying under at least 0.5 m of clean material. Systems must be developed and implemented to ensure traceability of disposed weed infested topsoil. x. Weed free topsoil must be stripped and stockpiled for reuse in revegetation of disturbed areas. xi. Salvaged topsoil must be respread as close as possible to the areas from which it was sourced. xii. All weed free native vegetation must be chipped and stockpiled for later reuse in rehabilitation.
9	9.4(b)	i. The Alliance must develop a hygiene management plan to manage the potential introduction and spread of weeds and disease. ii. The Alliance must: (A) confirm the dieback status of areas within the Site; (B) confirm the weed status of areas within the Site; (C) develop and implement a system of controls to prevent the introduction and spread of dieback and/or weeds within

SWTC Section	SWTC Clause	Requirement
		or adjacent to the Site; and (D) the dieback hygiene program must include precautions to be taken for the re-use of topsoil
9	9.4(c)	i. The Alliance must develop and implement procedures, including appropriate testing, to identify, handle and dispose of contaminated soil and water in accordance with the requirements of the relevant Authorities.

The Greater Connect Alliance intends to:

- Limit indirect impacts regarding declared weed establishment and dispersion.
- Ensure that the spread of *Phytophthora cinnamomi* in and out of the Project area is minimised as far as practicable during construction.
- Ensure that impacts to flora and vegetation from the introduction or spread of declared weeds are minimised as far as practicable during construction.

All topsoil and mulch management will be carried out in accordance with the SWTC and EMP.

Legal and other requirements

Dieback management is required under the following regulatory mechanisms within Western Australia:

- Phytophthora dieback is listed as a Key Threatening Process with the Federal Government under the Environment Protection and Biodiversity Conservation Act 1999.

- Environmental Protection Act 1986 Part V S.50.A "serious environmental harm" provisions.

Management of Declared Weeds is required under the following regulatory mechanisms within Western Australia:

- Control of declared species is defined under the Biosecurity and Agriculture Management Act 2007.

Legislation and Regulations

This plan has been developed to comply with:

- Biosecurity and Agriculture Management Act 2007
- Conservation and Land Management Act 1984
- Environmental Protection Act 1986
- Environmental Protection and Biodiversity Conservation Act 1999 (Cwth)
- Environmental Protection Regulations 1987
- Health Pesticide Regulations 2011
- Landfill Waste Classification and Waste Definitions 1996
- Occupational Safety and Health Act 1984
- Occupational Safety and Health Regulations 1996
- Wildlife Conservation Act 1950.
- Clearing Permit 818/13
- Ministerial Statement 376

Client Documents

The following documents have been referenced whilst developing this Plan:

- Biota (2021) *Great Eastern Highway Bypass Interchanges (Roe Highway and Abernethy Road) Biological Survey*
- Greater Connect Alliance (2021) *Environmental Management Plan*
- Great Eastern Highway Bypass Interchanges (2021) *Construction Management Plan*
- Glevan Consulting (2020) *Great Eastern Highway Bypass Interchanges Project - Phytophthora Dieback occurrence assessment*
- Main Roads Western Australia (2021) *Scope of Works and Technical Criteria*

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Part B: Implementation

Control and Management Measures

The control measures below focus on the protection of vegetation from infestation by *Phytophthora cinnamomi* and both declared and problematic weeds. This is generally achieved by preventing the introduction of *P. cinnamomi* and weeds from outside the site and the use of "Clean on Entry/Exit" (COE) points (Appendix 1). Soil and hygiene controls and management strategies are displayed in Table 10.

Table 10: Soil and hygiene controls and management strategies

Aspect	Controls and Management Measures	Timeframe	Risk-based Priority
General	▪ Include weather conditions in daily pre-start meetings to describe plant and personnel movement protocols. ▪ Earthworks, stockpiles to receive dust and sedimentation minimisation measures i.e. water truck, dust suppression and bunding/windrows. ▪ When water carts are used, the overspray will be minimised to limit the influence on fringe vegetation and off-site run-off. ▪ Trucks and plant to follow designated haul roads and access roads at all times and park in allocated areas. ▪ Access roads and tracks to be clearly identified.	▪ Construction ▪ Post-construction	Medium
Dieback Management • Minimise the risk of introduction and/or spread of dieback	▪ Dieback Infested areas will be marked on construction drawings and clearly demarcated on site. ▪ Topsoil from Dieback Infected zones can be utilised within same zone classification when said topsoil is being classified as Conserved. Topsoil from areas classified as both Dieback Infested and Degraded will be buried to at least 0.5 m under fill or disposed offsite at a licensed landfill facility. ▪ Silt fences and temporary cut off drains will be established within the Project area adjacent to down-slope conservation areas to prevent potential spread of dieback with sediment and runoff into the conservation areas. ▪ Should silt fences and/or cut off drains be overtopped by storm events during construction, remedial works will be undertaken to remove sediment from down-slope conservation areas, using manual methods and cleaned equipment. ▪ Clean on Entry and/or Exit (CoE) procedures will be implemented on site, and entry and exit records kept for CoE points. ▪ CoE points will be established within the Project area at the boundaries of 'Dieback uninfested' mapped areas including restriction of topsoil movements from 'Infested' to 'Uninfested' areas. ▪ Movement of plant and vehicles within the Project area will be minimised as far as practicable, particularly during wet conditions. ▪ Clearing activities will be staged during the summer-autumn dry period as far as is practicable, to minimise the risk of spreading Phytophthora. ▪ Public access will be restricted through the construction site. ▪ Dieback hygiene procedures prepared for use on site including training in use of clean down stations.	▪ Construction ▪ Post-construction	High
Weed and Declared Weed Management • Minimise the risk of introduction and/or spread of declared weeds	▪ Weed and pest awareness training/toolboxes, posters and Inductions to be provided on site (e.g. Identification of Japanese Pepper, Blackberry, Arum Lily, Bridal Creeper). ▪ The extent of weeds, including Declared Plants, will be mapped prior to construction. ▪ Newly identified declared weeds within the Project area will be managed in accordance with the Biosecurity and Agriculture Management Act 2007 and subsidiary regulations. ▪ Use of weed mapping to identify weed infested areas and conduct weed treatments to control populations of significant weeds on site prior to clearing. ▪ Weed infested areas dominated by woody weeds (e.g. Victorian Tea Tree and Japanese Pepper) will be cleared separately in the construction works. ▪ Woody weeds will be stockpiled separately from native vegetation, mulched where it is deemed necessary, and disposed within a landfill site or buried in an alternative location under the approval of the Main Roads Representative. ▪ Weed coverage will be monitored throughout the Project's construction phase. Remedial measures will be utilised to manage weed increases on-site. ▪ Weed control in active work areas will be conducted every three (3) months during construction. Herbicides to be applied on cleared areas to prevent weed growth during construction will be applied during favourable (low wind) conditions, thereby avoiding impacts on adjacent retained vegetation. ▪ The use of herbicides will be avoided where possible within close proximity in areas of significant vegetation or flora population. ▪ All persons engaged in spraying herbicides on site shall have a current Pesticide Operator's licence in accordance with the Health Pesticide Regulations 2011. A copy of Pesticide Operator licences will be forwarded to the Main Roads Representative. ▪ Weekly Environmental and Sustainability Site Inspections are to record any increase in weed distributions and new weeds ▪ Herbicides are to be applied specific to the sensitivity of the area and in favourable conditions to minimise overspray ▪ Records of weed control of soil treatment undertaken on-site shall be maintained ▪ Establish landscaping and/or revegetation on roadside batters as quickly as practicable post - construction to reduce the risk of weed establishment and spread to adjacent native vegetation. ▪ All construction plant, vehicles, tools and footwear will be inspected and cleaned down as required, prior to entry to the construction site and prior to departure from the construction site. Clean down will consist of brushing, gouging, scraping and/or water blasting to remove soil or plant material. ▪ Declared Plants within the construction site will be treated according to their Control Codes and advice from Department of Primary Industries and Regional Development (DPIRD), with the aim of eradication where possible but as a minimum prevent offsite movement.	▪ Construction ▪ Post-construction	High

Aspect	Controls and Management Measures	Timeframe	Risk-based Priority
	▪ WoNS and environmental weeds within the DE will be treated according to the weed control management outlined by Weeds Australia http://weeds.ala.org.au/) with the aim of controlling off-site movement. ▪ All plant and machinery to access the Project area (including construction, revegetation and monitoring) will be inspected by the contractor prior to entry at the work site and be confirmed to be clean and free of vegetation and soil material.		
Topsoil Management	▪ Conserved topsoil within the Project area will be harvested, stockpiled and reused in accordance with Main Roads' Scope of Works Technical Criteria (SWTC). ▪ Topsoil will be assessed for suitability for revegetation / landscaping and harvested with consideration to requirements specified in the Project Specific Revegetation Management Plan. ▪ Topsoil and vegetative matter from weed infested areas within the construction site will be buried to at least 0.5 m under fill or disposed offsite at a licensed landfill facility. ▪ Conserved topsoil stockpiles will be managed and signposted to ensure no cross contamination occurs. All stockpiled topsoil will be clearly marked with a unique stockpile identification indicating source location, dieback status, and overall project classification as per Table 4. Material to be handled in accordance with the management practices presented in this Plan and all relevant Main Roads and GCA documents. ▪ Imported topsoil will be sourced from suppliers with weed control programs in place or be treated prior to use. ▪ All applications of herbicide will be undertaken by a qualified professional and in a manner that avoids impact to adjacent native vegetation. ▪ Topsoil / plant material is to be sourced from certified suppliers with appropriate Dieback and weed hygiene control measures. ▪ Topsoil to be retained for the revegetation programme will be sourced from areas mapped as being in Pristine to Very Good-Good condition, having less than 30% weed cover. These areas and materials will be labelled as 'Conserved' and segregated from 'Degraded' topsoil. Infested and uninfested conserved topsoil to be stored separately. ▪ Conserved topsoil will be collected up to a nominal depth of 150mm; the top 45mm will likely contain most of the seed and other organic elements. Where the overall Project programme allows, conserved topsoil will be collected at a time when the soil has a low moisture content. ▪ Conserved topsoil is to be stockpiled in mounds of less than 1.5 metres in height. ▪ Implement semi-permanent dust control treatments (e.g. hydromulching, dust stabilisers, tarps or geo-textile materials) on stockpiles that are to be left for longer than one month.	▪ Construction ▪ Post-construction	High
Mulch Management	▪ Mulch is to be sourced from site works and approved commercial suppliers ▪ Cleared native vegetation will be mulched/chipped and stockpiled for respread in revegetation and landscaping. Weed-free mulch shall be classified and labelled as 'Conserved'. ▪ Mulch taken from site will be reused in the same dieback zones as it was harvested and uninfested mulch may be used in infested zones. ▪ Mulch from within infested dieback status areas is not to be used or transported into areas determined Uninfested or moved for storage off-site unless used within a site of similar infection status. ▪ Mulch stockpiling within each dieback zone category is permissible, but should not occur across zone boundaries, except where the source is uninfested. ▪ When Conserved mulch must be stored for a period it is to be stockpiled in mounds of less than seven metres in height. ▪ Semi-permanent dust control treatments (e.g. hydromulching, dust stabilisers, tarps or geo-textile materials) on stockpiles will be implemented that are to be left for longer than one month. ▪ Conserved mulch stockpiles will be managed and signposted to ensure no cross contamination occurs. ▪ All stockpiled topsoil will be clearly marked with a unique stockpile identification indicating source location, dieback status, vegetation complex and overall project classification of 'Conserved' or Degraded'. Material be handled in accordance with the management practices presented in this Plan and all relevant Main Roads and GCA documents. ▪ Conserved mulch shall be mixed with topsoil at a rate of 50% mulch and 50% topsoil. The mixed product shall be respread within all revegetation zones of the project at 100mm depth. ▪ Where a shortfall of mulch exists within a project zone, mulch shall be imported. All imported mulch materials shall be pasteurised in accordance with AS 4454 Composts, soil conditioners and mulches. Imported mulch may be mixed with site won mulch. ▪ Imported mulch will be recorded in a Soil Material Tracking System (MTS) and be accompanied by written Certification of suitability for use on-site i.e. no weeds or dieback, and product testing from the supplier. ▪ The boundaries to the areas of conserved mulch for use in site rehabilitation and landscaping works will be determined from Landscape Design drawings. ▪ Topsoil & mulch will be spread nominally 100mm within revegetation and landscape areas. ▪ Mulch containing weed is not suitable for reuse within revegetation areas and will be labelled as 'Degraded' and disposed offsite to a licenced facility or buried under at least 0.5 meters if clean fill.	▪ Construction ▪ Post-construction	High
Revegetation and Landscaping	▪ Revegetation / landscaping will be designed to be self-sustaining, structurally and species diverse vegetation, with minimal watering requirements for establishment. ▪ Where possible, local provenance native species will be used to revegetate areas within the Project area. Seeds will be collected from native vegetation within and adjacent to the Project area at an optimum time, prior to any clearing or earthworks. ▪ Revegetation / landscape species within the Project area shall be as agreed with a GCA representative.	▪ Construction ▪ Post-construction	High

Aspect	Controls and Management Measures	Timeframe	Risk-based Priority
	▪ Revegetation / landscaping will be maintained for the first three years (at least two summers) following establishment, including monitoring and weed control within and adjacent to revegetation areas, replacement of die off, and managing erosion and access.		
Respread of Topsoil and Mulch	▪ All stockpiled topsoil will be clearly marked with a unique stockpile identification indicating source location, dieback status and overall project classification as per Table 4. Material be handled in accordance with the management practices presented in this Plan and all relevant GCA and Main Roads documents. ▪ Conserved mulch shall be mixed with topsoil at a rate of 50% mulch and 50% topsoil. The mixed product shall be respread within all revegetation zones of the project at 100mm depth. ▪ Where a shortfall of Conserved topsoil exists within a project zone, an imported soil suitable for sustaining healthy plant growth shall be used. ▪ Imported soil will be recorded in a Soil Material Tracking System (MTS) and be accompanied by written Certification of suitability for use on-site i.e. no weeds or dieback, and product testing from the supplier. ▪ Areas of Conserved topsoil for use in site rehabilitation and landscaping works will be determined from Landscape Design drawings. ▪ Topsoil, and then mulch mix will be spread nominally 100mm within revegetation and landscape areas. ▪ Topsoil from within Good to Completely Degraded areas, which contains greater than 30% weed cover and occurs with an infested or excluded dieback area, will not be used for landscaping or revegetation and labelled as 'Degraded' . ▪ Topsoil within Degraded areas shall be stripped or raked to a depth to remove substantial organic matter (typically 50mm depth) ,buried beneath 0.5m of material (in accordance with Main Roads Specifications) or disposed at a licensed facility. ▪ Topsoil from Infested dieback area will not to be used or transported into areas determined dieback-free.	▪ Construction ▪ Post-construction	High

Monitoring, Response Actions and Reporting

Monitoring and Reporting

The purpose of monitoring is to provide data and evidence for the management targets and strategies that give an understanding of whether the environmental objective is being achieved. Through monitoring, the Project can gain an understanding of whether environmental concerns have increased since works began, and if additional management actions can be employed, as well as current actions reviewed and revised as necessary. Internal monitoring of the environmental aspects of the road construction will occur throughout the Proposal, through the Environmental Management Representative. Any non-conformances with the requirements of this THMP, the EMP and the SWTC, will be discussed between the MRWA Representative, Construction Manager/Supervisor and/or Environmental Management Representative and rectified or mitigated as soon as possible to ensure minimal ongoing environmental harm. Relevant procedures will be amended/updated as necessary and inductions and other workforce communication will be undertaken in a timely manner to minimise the risk of reoccurrences.

Dieback Management

During construction, weekly inspections of clean down stations and hygiene operations will occur, to assure dieback hygiene management protocols are being adhered to. Also, weekly inspection of dieback demarcation will occur, to ensure infested and uninfested zones are clearly marked and seperated. Monthly site inspections of topsoil management will occur, with site inspection reports to be produced. This will ensure topsoil is being correctly handled and stored, as to ensure no dieback spread.

Weed Management

During construction, the Project Environmental Manager will conduct routine monitoring of the project site to identify weed incursions. Monthly site inspections will also occur, resulting in weed treatment reports, as to maintain weed control program and weed control substance use.

Weekly Monitoring

Daily and weekly observations of the construction site will be conducted to ensure the objectives of the EMP and THMP are implemented and that the required management actions are in place. During construction weekly inspection of clean down stations and hygiene operations will occur, as well as weekly inspections of dieback demarcation.

Incident Reporting

Environmental incidences and non-compliances will be identified and recorded as soon as possible by the relevant responsible persons within the contractor organisation. Incidents will be mitigated or rectified where possible within 48 hours of being identified. Nonconformances will be reported to the GCA Representative within 48 hours of identification. Any non-conformance to this THMP and the EMP is to be reported to EPA Services and investigated to determine:

- Why the non-conformance occurred?
- What was the environmental harm or alteration of the environment that resulted from the non-conformance?
- What changes to project activities and/or management plans is required?
- Measures to prevent, control or abate the environmental harm that may have occurred.

Monthly Reporting

During construction, monthly site inspections with follow up site inspection and weed treatment reports to report on and maintain weed control measures and topsoil procedures.

Auditing

Internal and external audits will be undertaken as per the GCA contract schedule and the results reported back to the Environmental Management Representative where relevant, in order for them to undertake corrective action

Part C: References

Bureau of Meteorology, 2021. *Perth Airport Weather Station – Annual Rainfall Data*

Biota, 2020. *Great Eastern Highway Bypass Interchanges (Roe Highway and Abernethy Road) Biological Survey*

Department of Biodiversity, Conservation and Attractions, 2020. *Phytophthora Dieback Management Manual*

Department of Environment, 2014. *Environmental Management Plan Guidelines*

Glevan Consulting, 2020. *Great Eastern Highway Bypass Interchanges Project Phytophthora Dieback occurrence assessment*

Greater Connect Alliance, 2021. *Environmental Management Plan. GHEBI-GCA-PLN-A000-PM-00012*

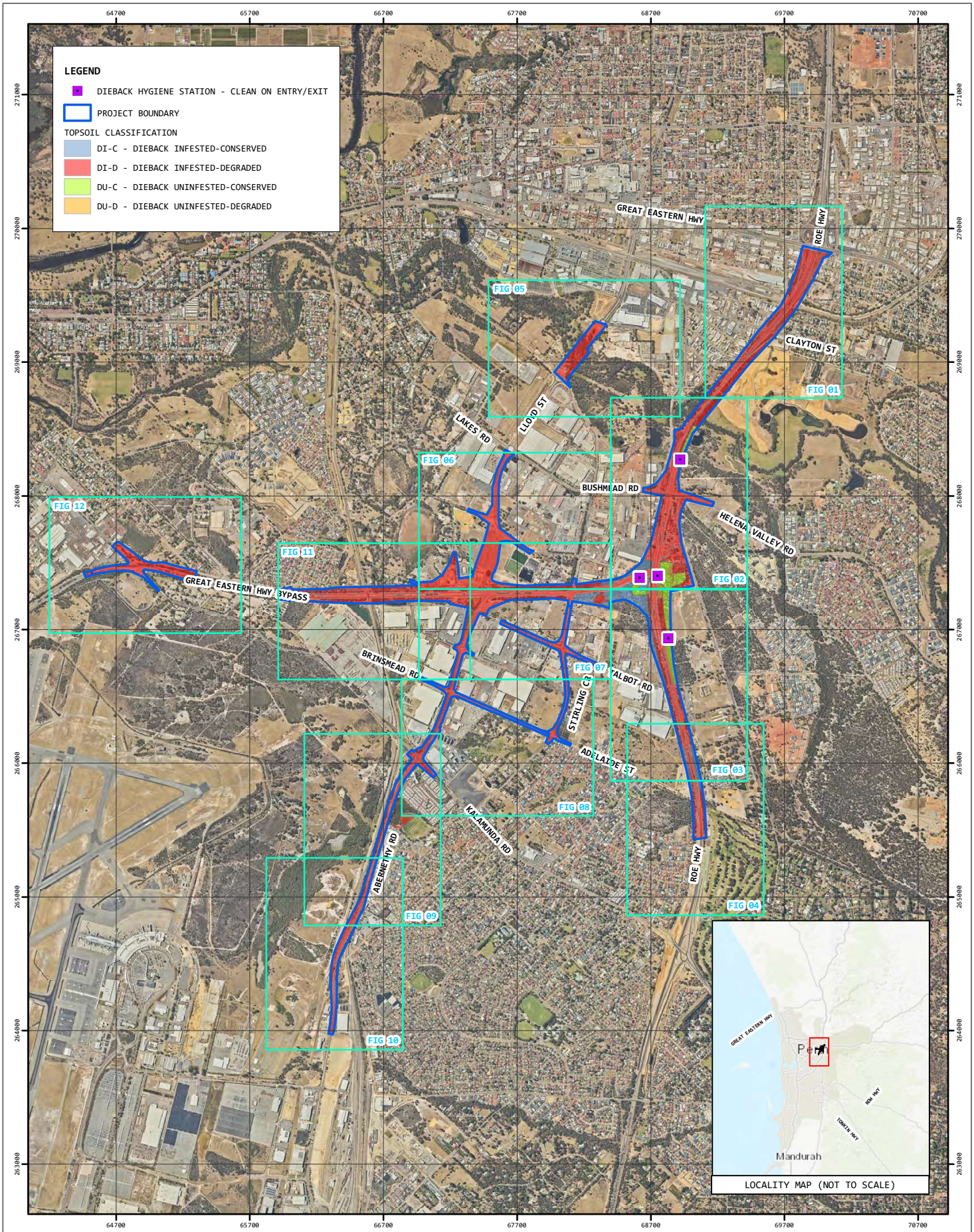
Great Eastern Highway Bypass Interchanges, 2021. *Construction Management Plan. GEHBI-GCA-PLN-A000-PM-00008.*

Keighery, B 1994. *Bushland plant survey: a guide to plant community survey for the community*, Wildflower Society of Western Australia (Inc.)

Main Roads Western Australia, 2021. *Scope of Works and Technical Criteria*

Appendix 1

Topsoil Classification and Weed Mapping



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PROJECT TITLE
GREAT EASTERN HIGHWAY BYPASS INTERCHANGES

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PROJECT OVERVIEW
TOPSOIL CLASSIFICATION

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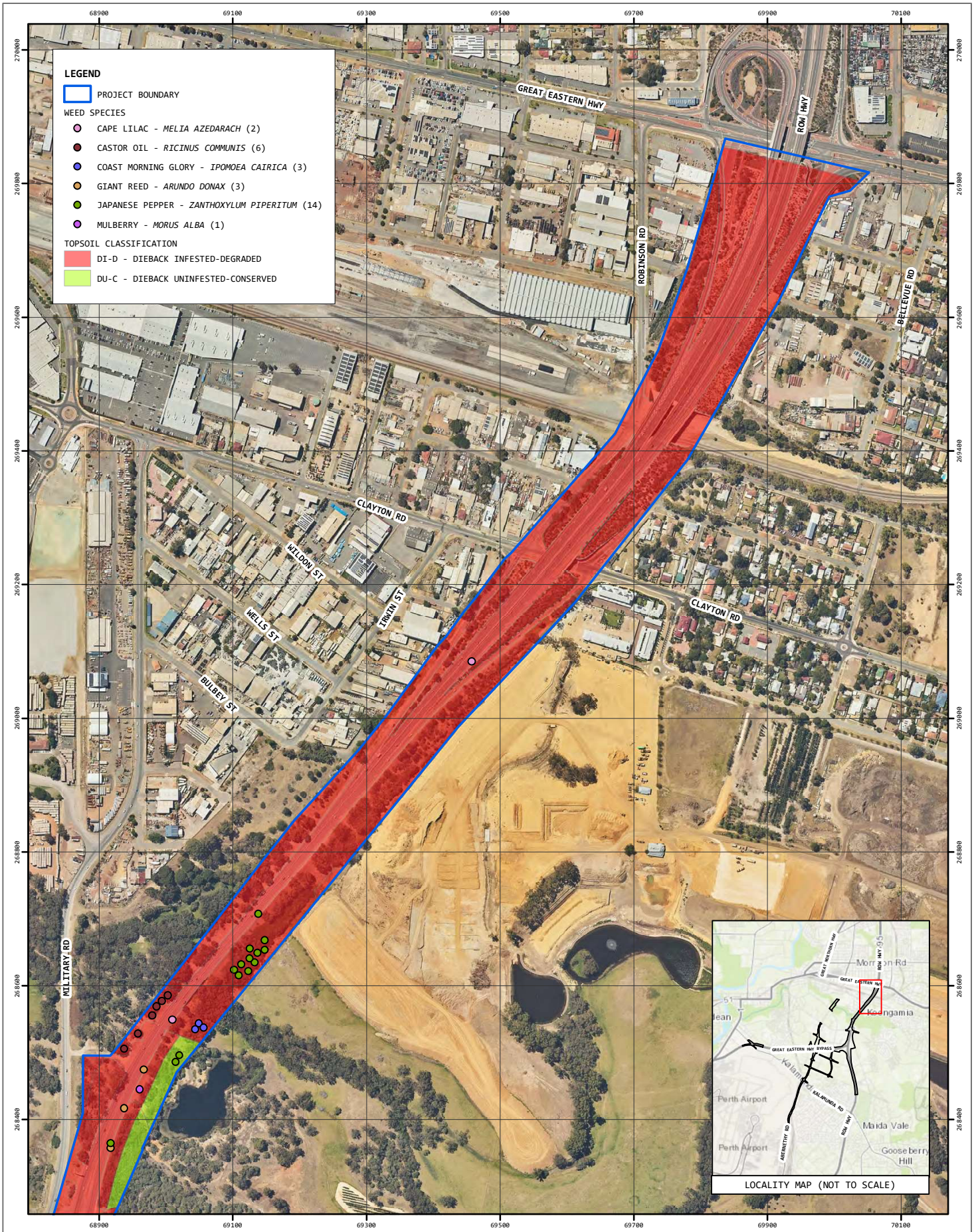

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GREAT EASTERN HIGHWAY BYPASS INTERCHANGES

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WEED LOCATIONS & TOPSOIL CLASSIFICATION
FIG 01

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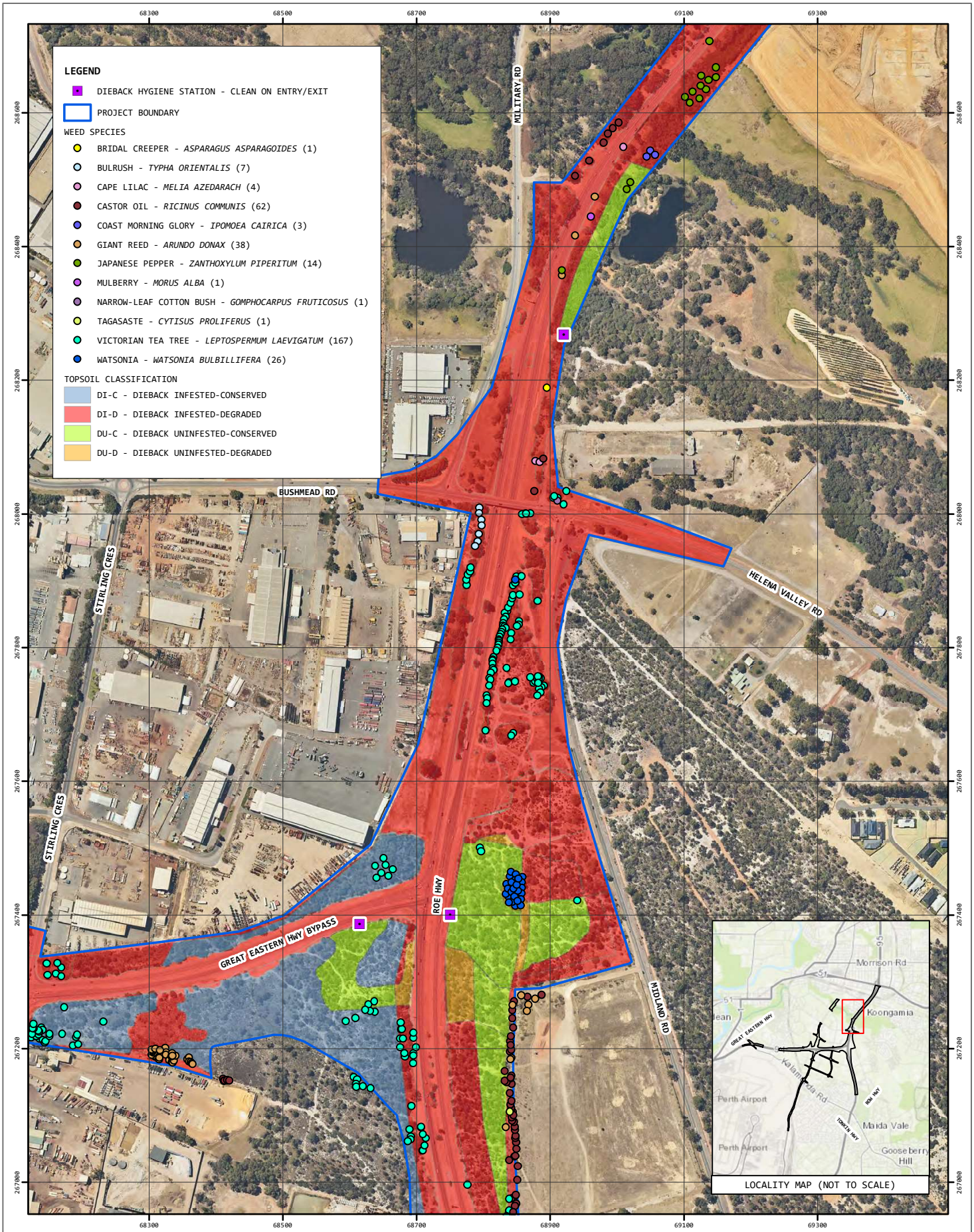

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GREAT EASTERN HIGHWAY BYPASS INTERCHANGES

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WEED LOCATIONS & TOPSOIL CLASSIFICATION
FIG 02

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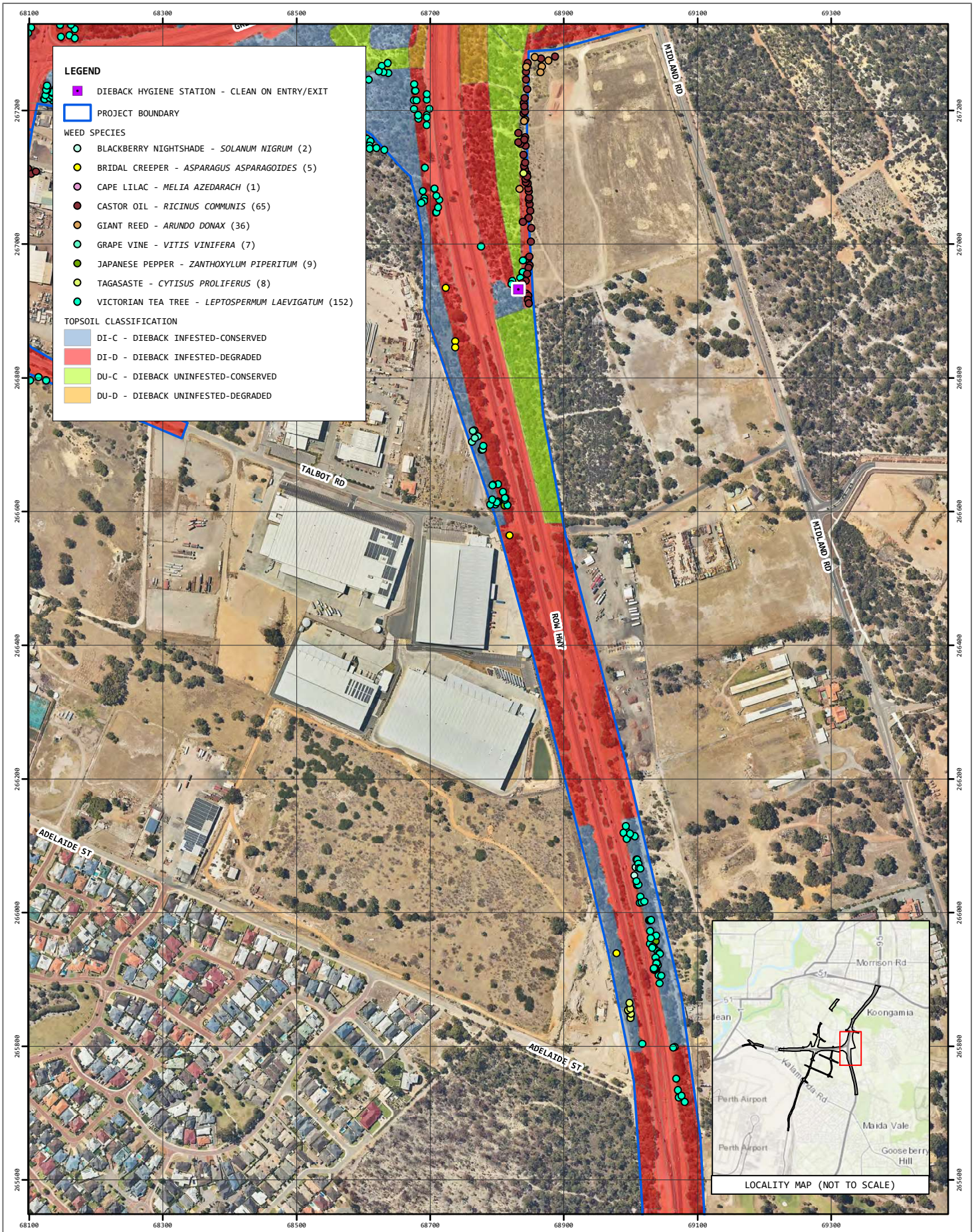

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GREAT EASTERN HIGHWAY BYPASS INTERCHANGES

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WEED LOCATIONS & TOPSOIL CLASSIFICATION
FIG 03

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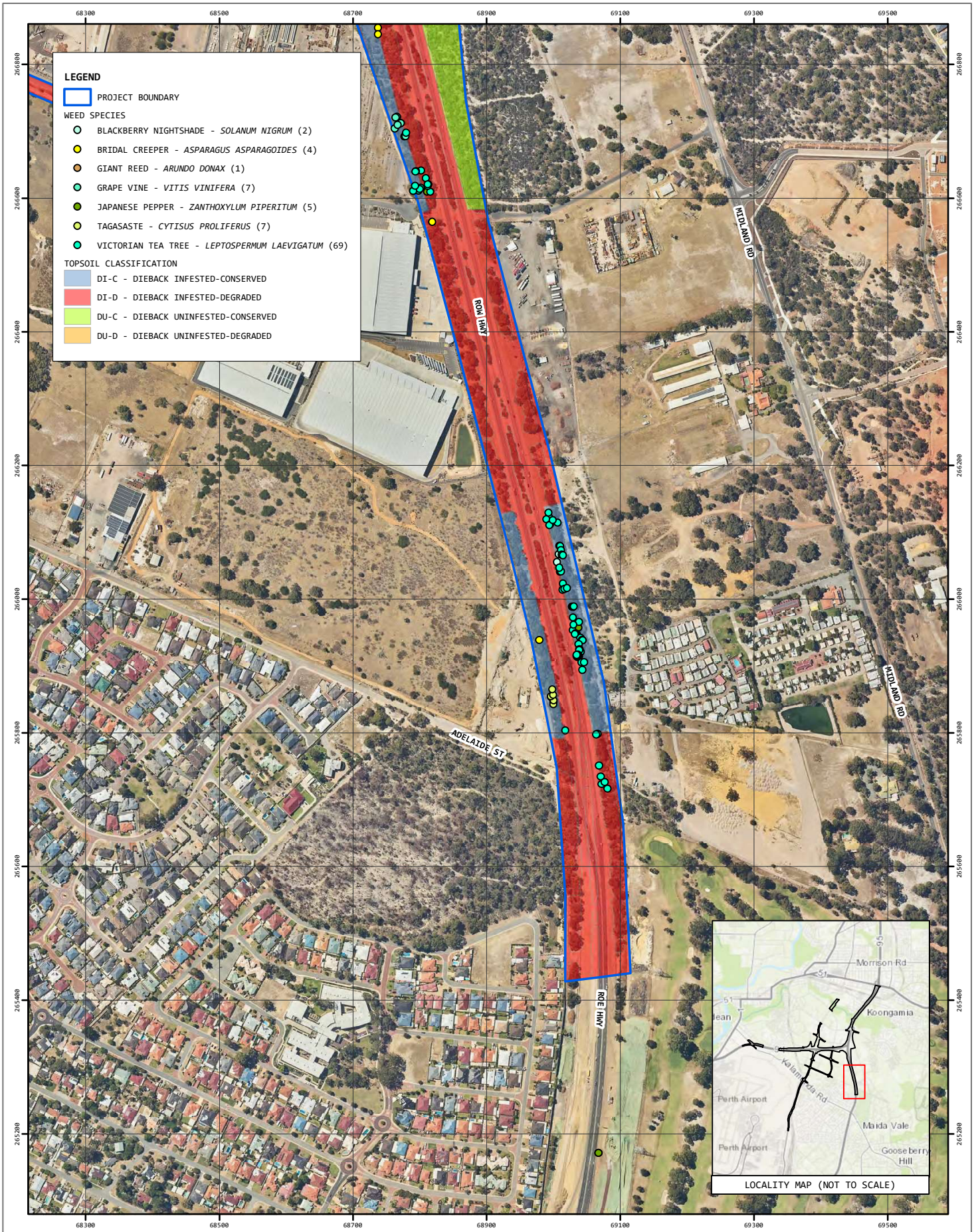

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GREAT EASTERN HIGHWAY BYPASS INTERCHANGES

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WEED LOCATIONS & TOPSOIL CLASSIFICATION
FIG 04

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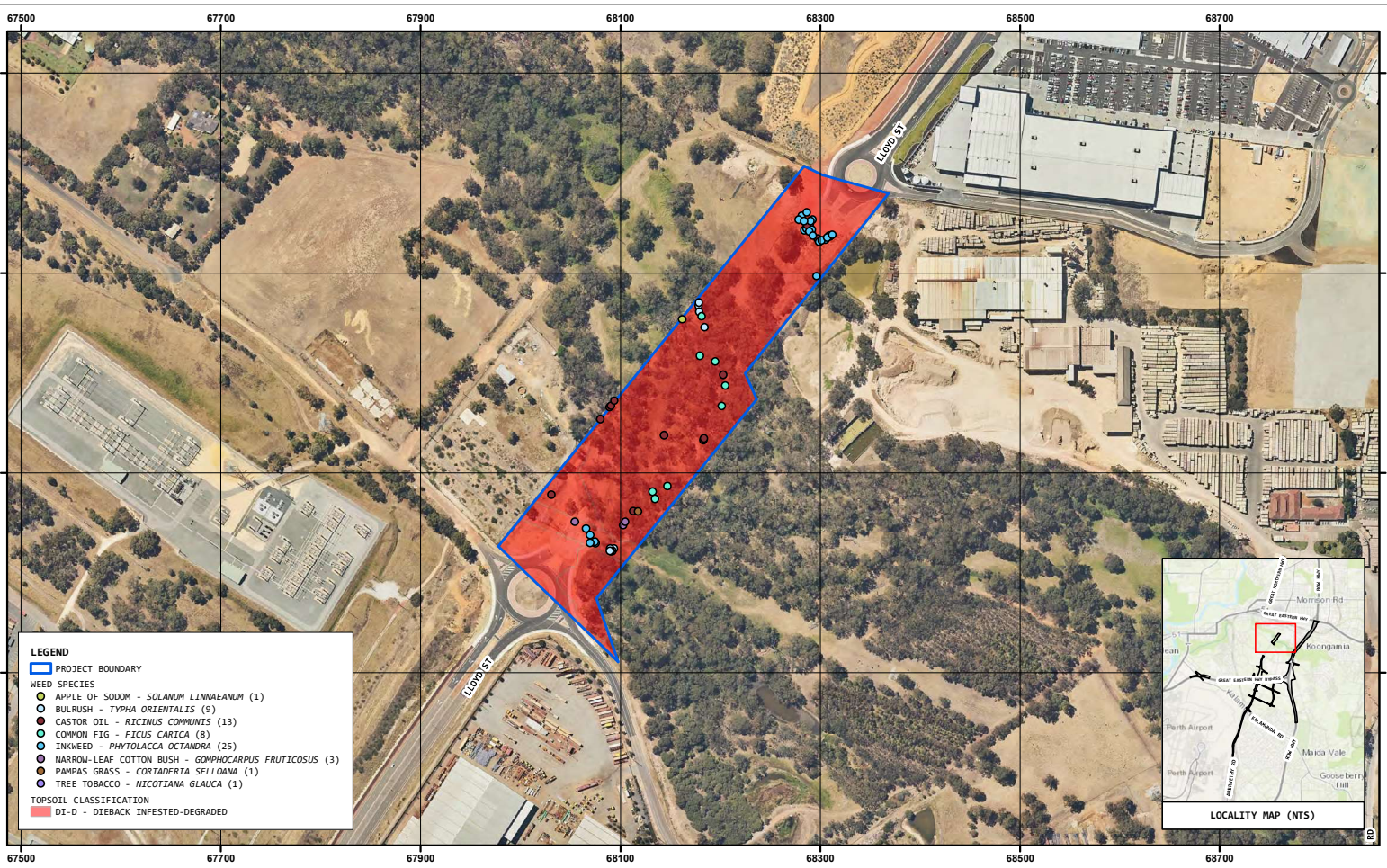

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GREAT EASTERN HIGHWAY BYPASS INTERCHANGES

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WEED LOCATIONS & TOPSOIL CLASSIFICATION
FIG 05

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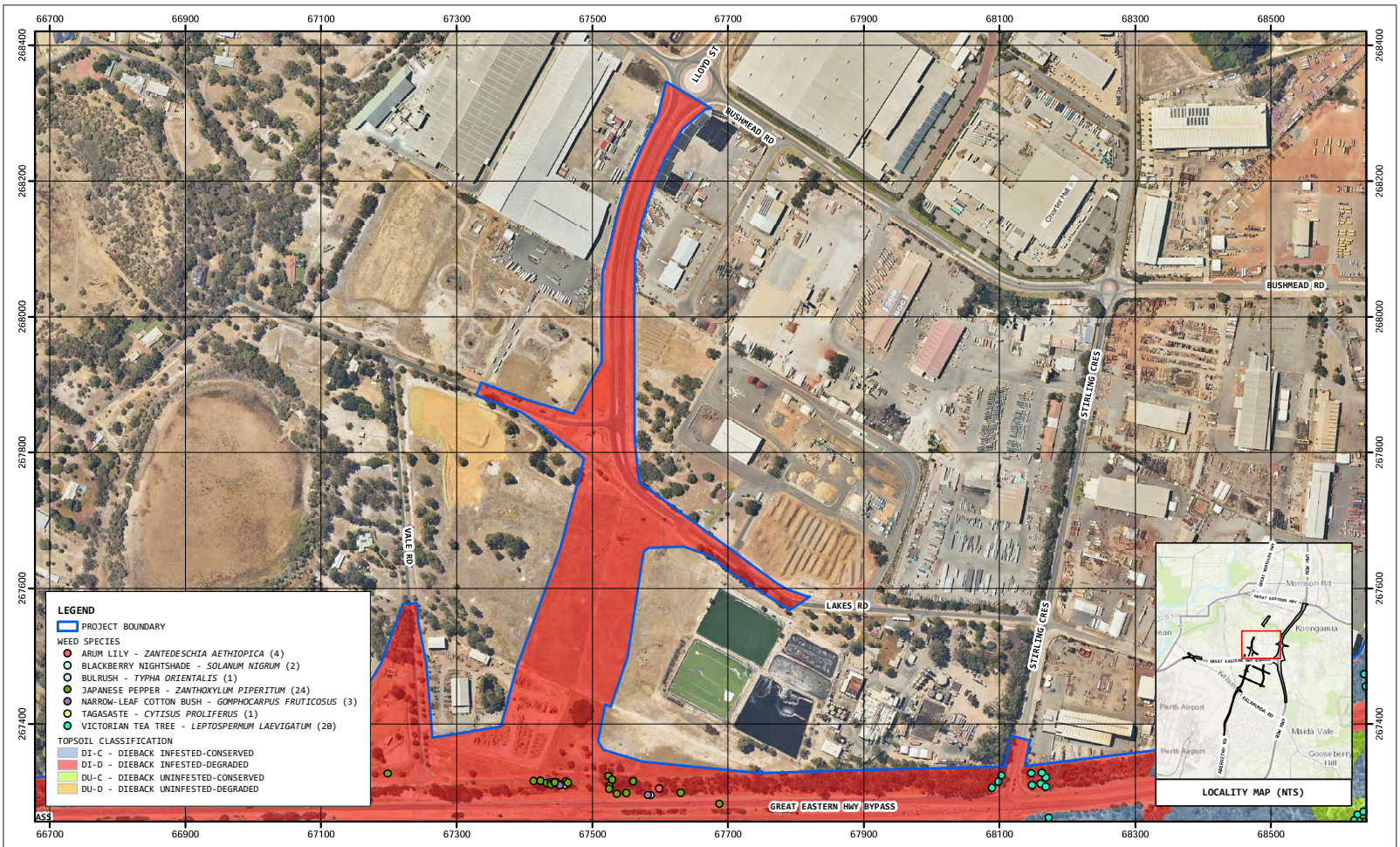

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GREAT EASTERN HIGHWAY BYPASS INTERCHANGES

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WEED LOCATIONS & TOPSOIL CLASSIFICATION
FIG 06

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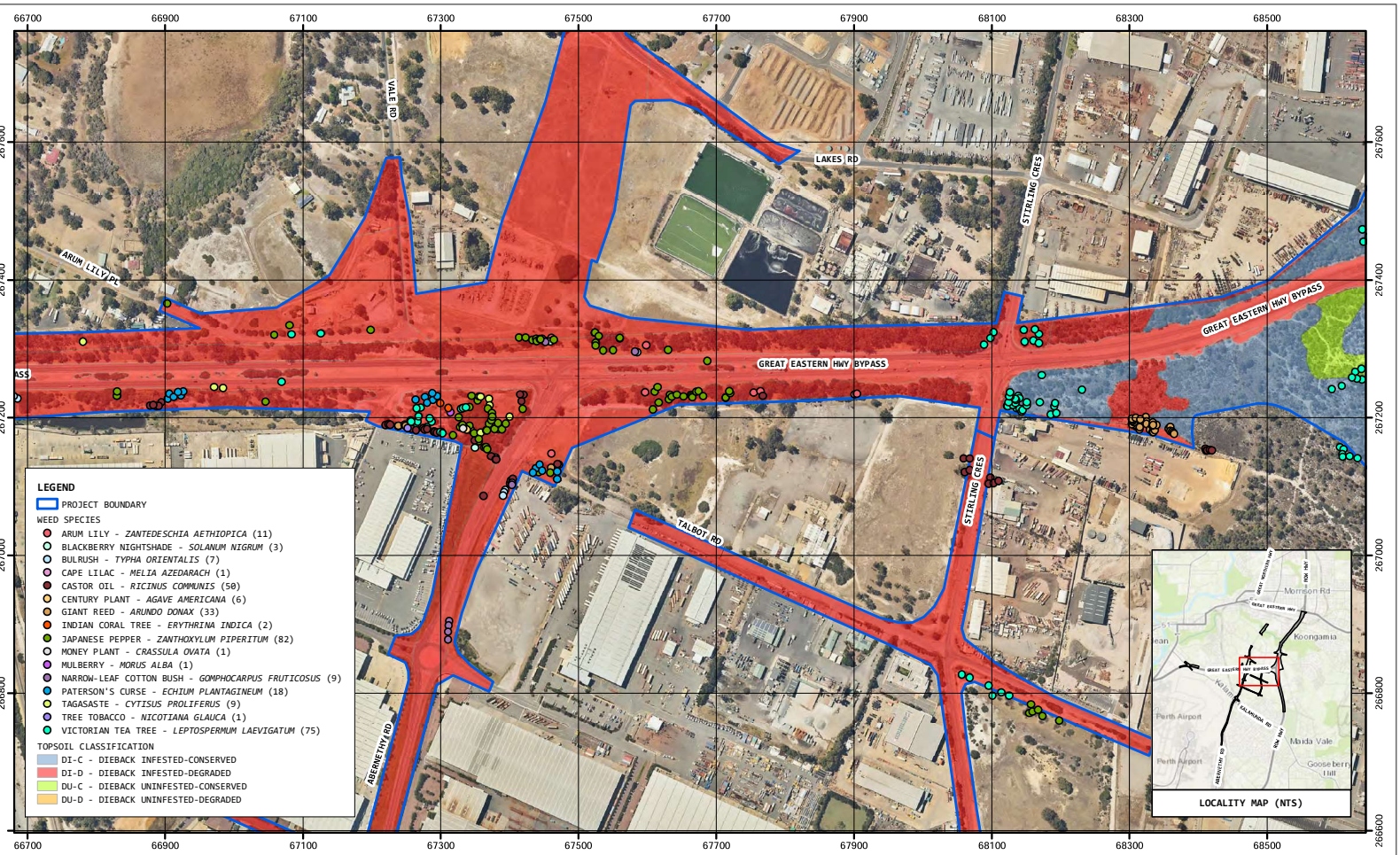

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WEED LOCATIONS & TOPSOIL CLASSIFICATION
FIG 07

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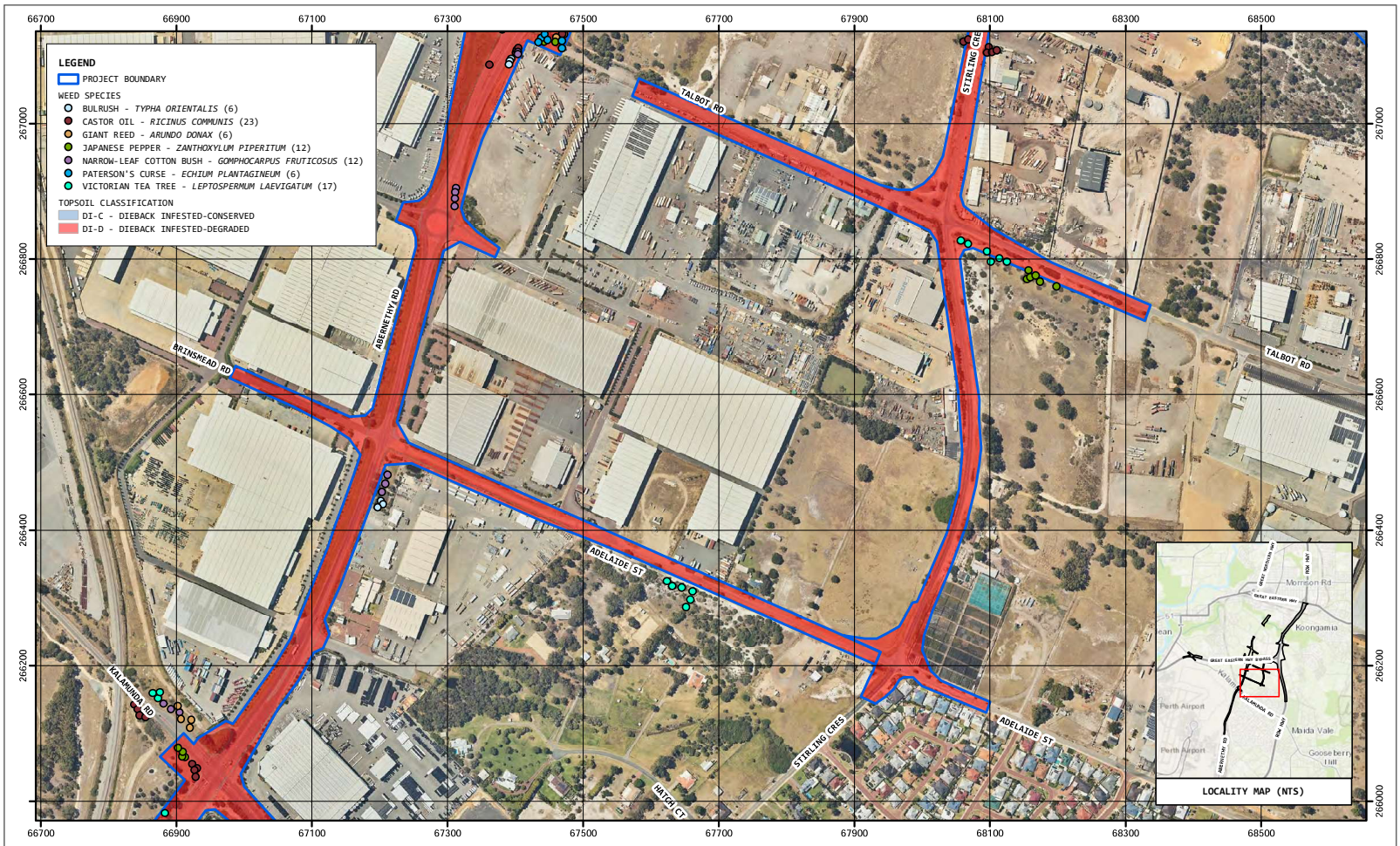

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WEED LOCATIONS & TOPSOIL CLASSIFICATION
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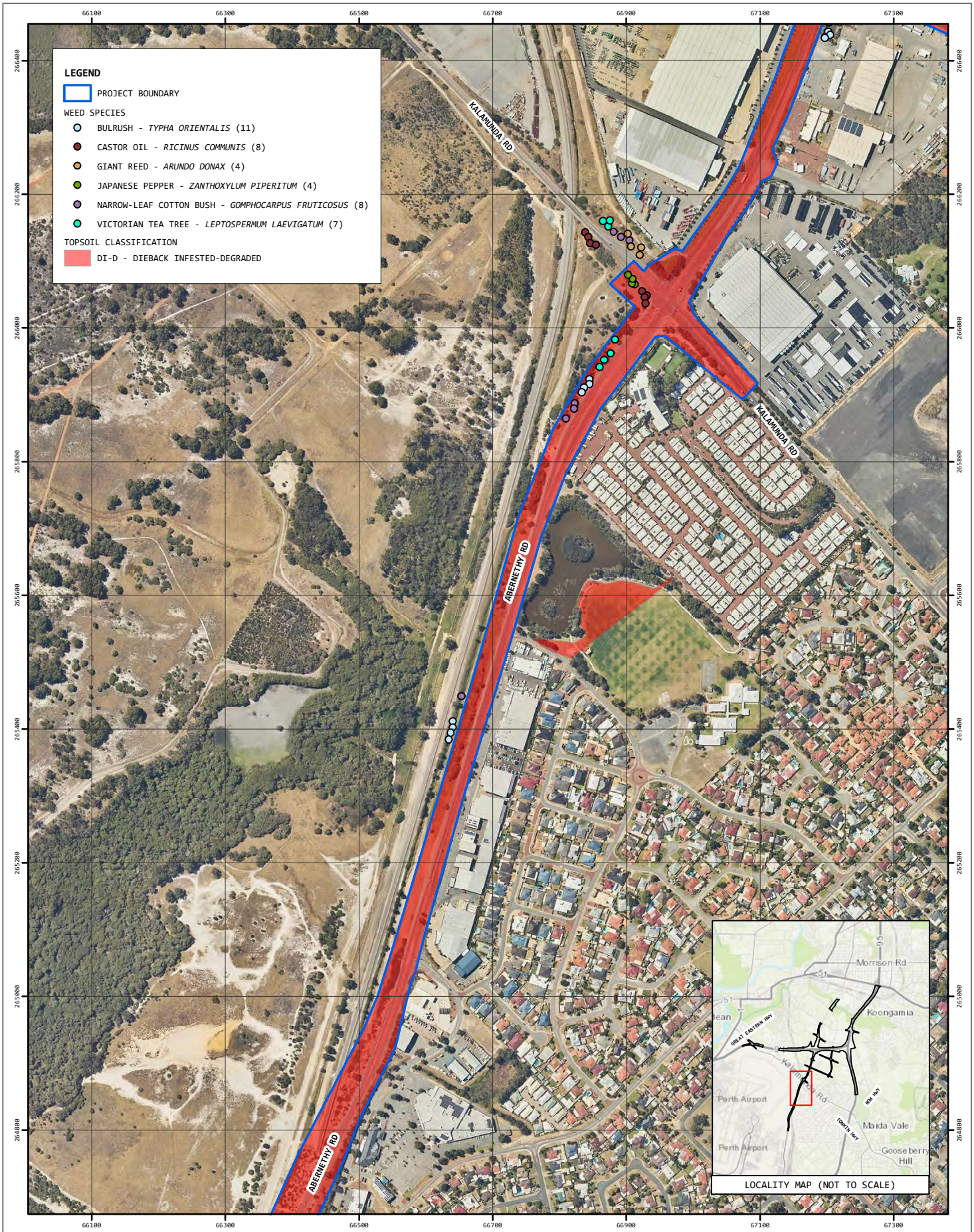

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WEED LOCATIONS & TOPSOIL CLASSIFICATION
FIG 09

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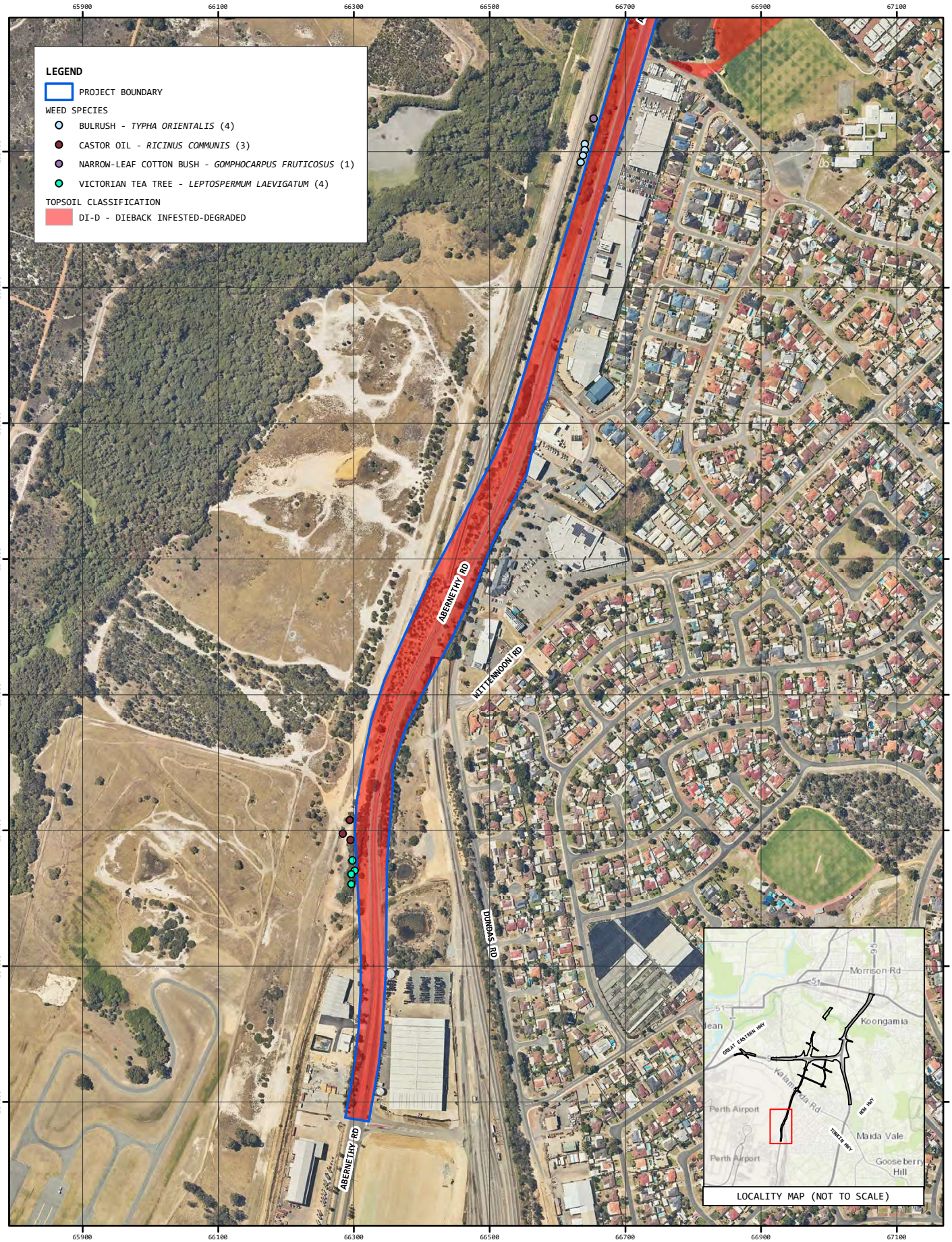

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FALSE NORTHING: 3,800,000.0000
CENTRAL MERIDIAN: 115.8167
SCALE FACTOR: 1.0000
LATITUDE OF ORIGIN: 0.0000
UNITS: METER

SCALE

0 45 90 180 270 360 METERS

DRAWN	E TAN	REVISION	A
CHECKED	M. OSWALD	DATE	15/11/2021

GAMBARA

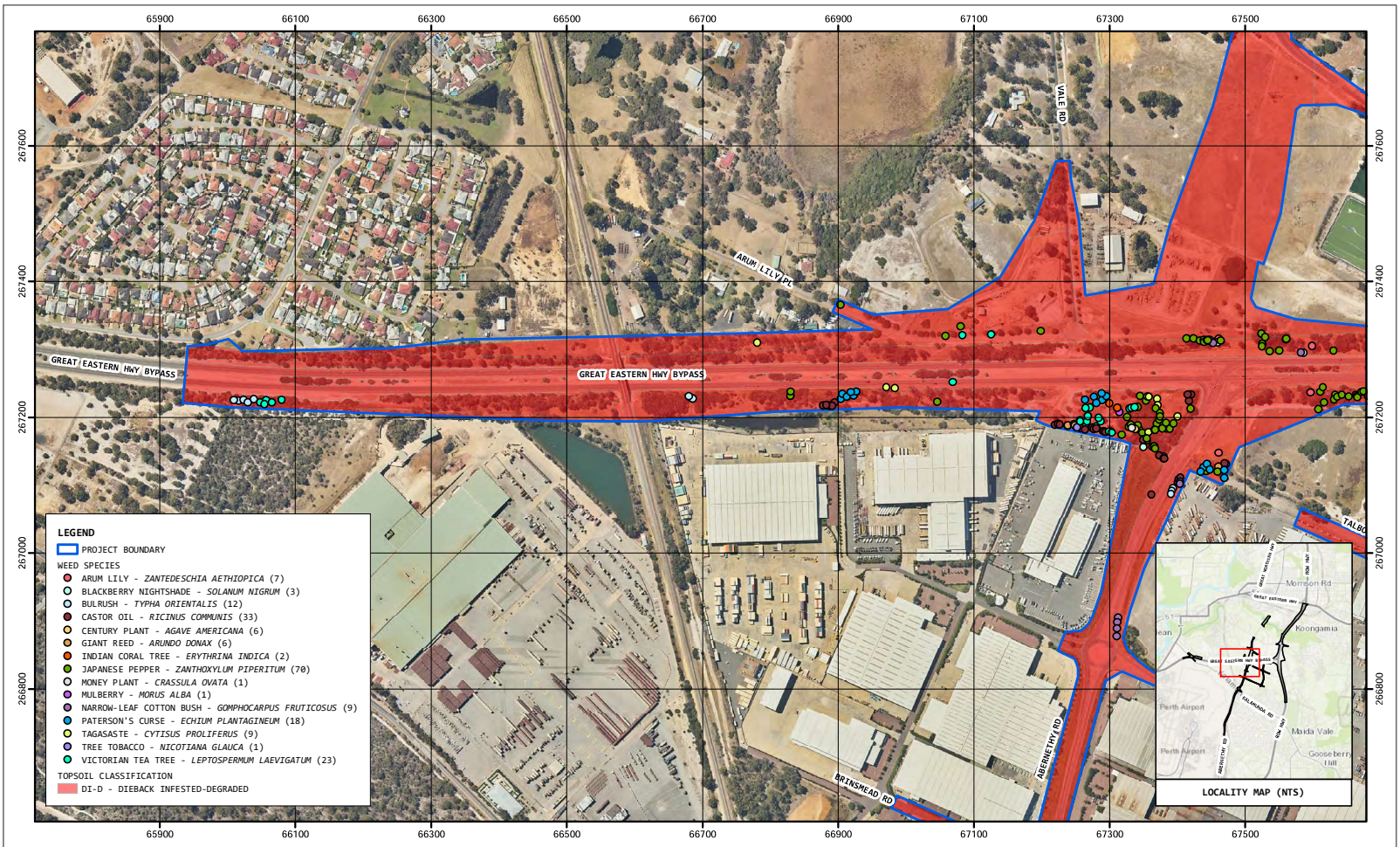
PROJECT TITLE

GREAT EASTERN HIGHWAY BYPASS INTERCHANGES

DRAWING TITLE

WEED LOCATIONS & TOPSOIL CLASSIFICATION
FIG 10

DOCUMENT PATH: C:\USERS\YIHUA\DOCUMENTS\ARCGIS\PROJECTS\09 - GREAT EASTERN HIGHWAY BYPASS INTERCHANGES\02 - GIS\02 - MXDS\02J - WEED LOCATION & TOPSOIL CLASSIFICATION DETAIL 10.MXD



COORDINATE SYSTEM: GDA 1994 PERTH COASTAL GRID 1994
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
FALSE EASTING: 50,000.0000
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CENTRAL MERIDIAN: 115.8167
SCALE FACTOR: 1.0000
LATITUDE OF ORIGIN: 0.0000
UNITS: METER

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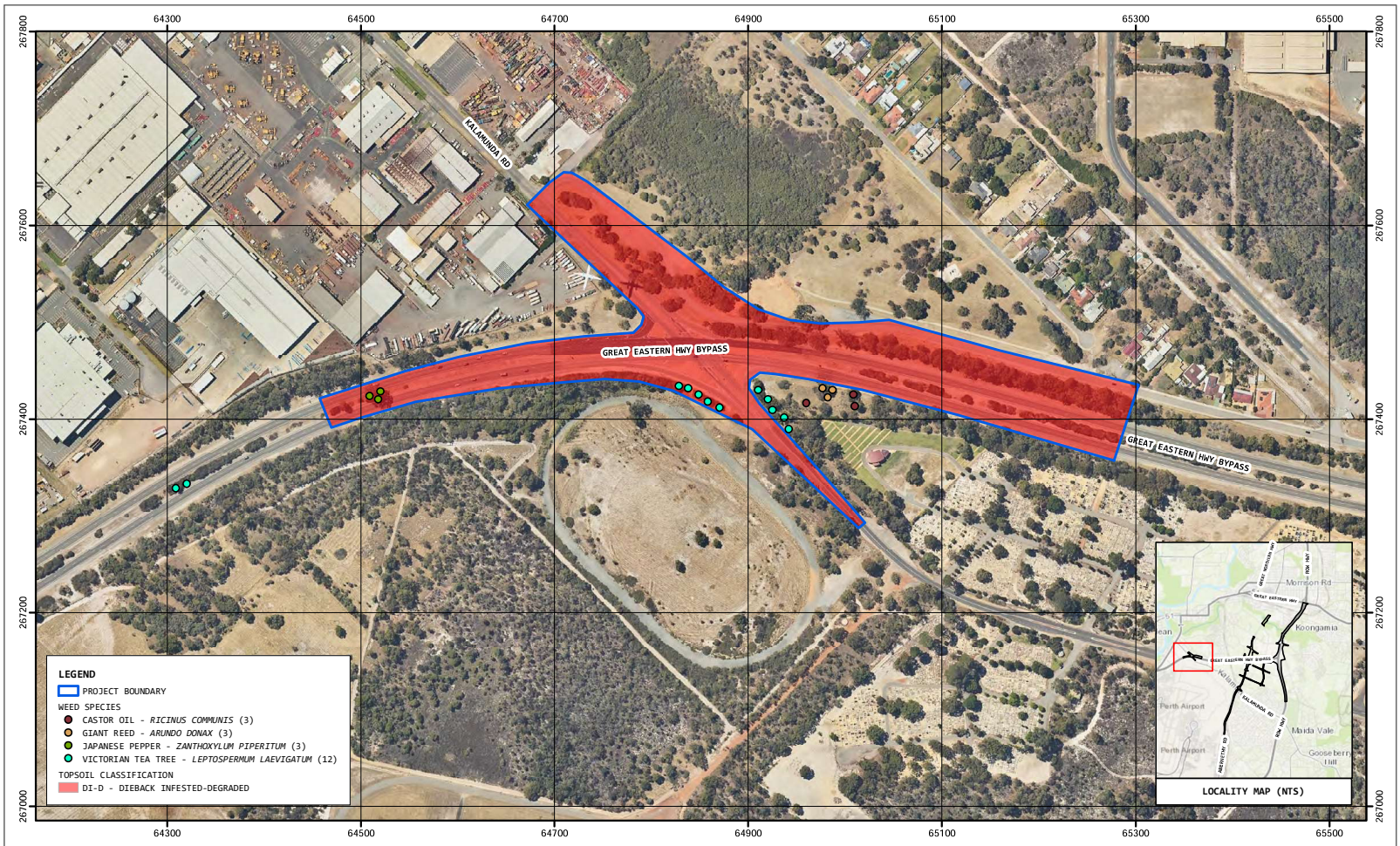
DRAWN	E TAN	REVISION	A
CHECKED	M. OSWALD	DATE	15/11/2021

GAMBARA

PROJECT TITLE
GREAT EASTERN HIGHWAY BYPASS INTERCHANGES

DRAWING TITLE
WEED LOCATIONS & TOPSOIL CLASSIFICATION
FIG 11

DOCUMENT PATH: C:\USERS\YIHUA\DOCUMENTS\ARCGIS\PROJECTS\09 - GREAT EASTERN HIGHWAY BYPASS INTERCHANGES\02 - GIS\02 - MXDS\02K - WEED LOCATION & TOPSOIL CLASSIFICATION DETAIL 11.MXD



COORDINATE SYSTEM: GDA 1994 PERTH COASTAL GRID 1994
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
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FALSE NORTHING: 3,800,000.0000
CENTRAL MERIDIAN: 115.8167
SCALE FACTOR: 1.0000
LATITUDE OF ORIGIN: 0.0000
UNITS: METER

SCALE

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DRAWN	E TAN	REVISION	A
CHECKED	M. OSWALD	DATE	15/11/2021

GAMBARA

PROJECT TITLE

GREAT EASTERN HIGHWAY BYPASS INTERCHANGES

DRAWING TITLE

WEED LOCATIONS & TOPSOIL CLASSIFICATION
FIG 12

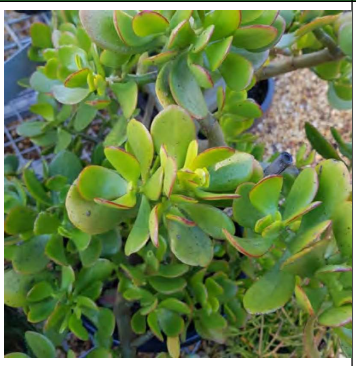
DOCUMENT PATH: C:\USERS\YIHUA\DOCUMENTS\ARCGIS\PROJECTS\09 - GREAT EASTERN HIGHWAY BYPASS INTERCHANGES\02 - GIS\02 - MXDS\02K - WEED LOCATION & TOPSOIL CLASSIFICATION DETAIL 11.MXD

Appendix 2
Observed Weeds

Weed Species	Optimum Timing of Control	Recommended Control Measures	Comments	Photograph Reference	Pre-Clearing Control	Clearing Control	Post-Clearing Control
Species: *Gomphocarpus fruticosus* **Common Name:** Narrowleaf Cottonbush **Status:** Declared Pest	September – December	Foliar spray with 1.5% Glyphosate or try cut and paint using 50% Glyphosate. Read the manufacturers' labels and material safety data sheets before using herbicides.	Major threat to the conservation values of Swan Coastal Plain including Banksia woodlands.		Hand removal of plants before clearing takes place. When situated in groves, no action required until clearing.	Plants must be separated from native mulch and disposed in accordance with Management Plan.	If any plants identified during site inspections, record location and follow recommended control measures.
Species: *Echium plantagineum* **Common Name:** Paterson's Curse **Status:** Declared Pest	May – August	Spot spray in late autumn/winter when most seed has germinated for the year with 0.5 g/10 L chlorsulfuron + wetting agent, this will also help prevent further germination. Glyphosate at 75 ml -100 ml/15 L or metsulfuron methyl 5 g/ 100 L applied at early flowering will control existing plants.	Causes acute disruption of ecological processes, dominates and/or significantly alters vegetation structure, composition and function of ecosystems.		Spray with herbicide prior to clearing activities.	If specimens identified during mulch or topsoil works, spray with herbicide and ensure specimen isn't included in mulch or topsoil	If any plants identified during site inspections, record location and follow recommended control measures.
Species: *Solanum linnaeanum* **Common Name:** Apple of Sodom **Status:** Declared Pest	December – February, March – May	Hand pull seedlings and young plants with gloves, remove roots also. Collect all fruit from the infested area.Burn isolated plants and all pulled plant material, including seedlings, fruit.	May cause acute disruption of ecological processes, dominates and/or significantly alters vegetation structure, composition and function of ecosystems.		Hand pull specimens prior to clearing.	If specimens identified during mulch or topsoil works, hand pull and ensure specimen isn't included in mulch or topsoil	If any plants identified during site inspections, record location and follow recommended control measures.
Species: *Opuntia stricta* **Common Name:** Common Prickly Pear **Status:** Declared Pest and WoNS	June – August	Physical removal appears to be one of the most effective control methods for Prickly Pears, but the spines make manual removal of these species difficult. Care must also be taken to remove and properly dispose of, usually by burning, all vegetative and fruit material. The root system must also be dug out to prevent regrowth. Biological control using Cactoblastis moths or Cochineal insects can be effective on dense populations.	If left will spread over bushland and impact on ecological processes and plant communities.		Physically remove specimen from site prior to clearing.	Plants must be separated from native mulch and disposed in accordance with Management Plan.	If any plants identified during site inspections, record location and follow recommended control measures.
Species: *Asparagus asparagoides* **Common Name:** Bridal Creeper **Status:** Declared Pest and WoNS	July – August	Spray 0.2 g metsulfuron methyl + Pulse in 15 L water (or 2.5 – 5g /ha + Pulse). Best results achieved when flowering. Biological control agents are available.	If left will spread over bushland and may impact on plant communities. It is considered extremely invasive and smothers vegetation, forms monocultures and increases fire risk during summer die-off phase.		Spray with herbicide prior to clearing works.	Pre-control required prior to clearing. If identified during clearing, cease operations, and follow recommended control measures. Ensure plants are not	If any plants identified during site inspections, record location and follow recommended control measures.

Weed Species	Optimum Timing of Control	Recommended Control Measures	Comments	Photograph Reference	Pre-Clearing Control	Clearing Control	Post-Clearing Control
						included in topsoil or mulch.	
Species: *Zantedeschia aethiopica* **Common Name:** Arum lily **Status:** Declared Pest	June – September	For the most effective control spot spray metsulfuron methyl 0.4 g/15 L of water (or 5g /ha) + 225 mL Glyphosate + Pulse. As Glyphosate is non selective, only apply where there is no chance of off target application on native vegetation. Otherwise, spot spray metsulfuron methyl or chlorsulfuron 0.4 g/15 L of water (or 5g /ha) + Pulse.	If left will spread over damp areas of bushland and readily out competes native plant communities. It generally survives fire.		Spray with herbicide prior clearing.	Spray with herbicide and ensure plants are excluded from topsoil and mulch.	If any plants identified during site inspections, record location and follow recommended control measures.
Species: *Ipomoea purpurea* **Common Name:** Coast Morning glory **Status:** Weed	March – August	Scrape and paint stem with 20-50% Glyphosate or alternatively, cut vine at chest height and lay lower sections on the ground before spraying 1.5 % Glyphosate over them.	This rampant twining weed is capable of smothering all vegetation. Along creeks and rivers it smothers fringing trees.		Spray with herbicide prior to clearing.	Pre-control required prior to clearing. If identified during clearing, cease operations, and follow recommended control measures. Ensure weeds are excluded from topsoil and mulch.	If any plants identified during site inspections, record location and follow recommended control measures.
Species: *Agave americana* **Common Name:** Century plant **Status:** Weed	November – January	Stem inject herbicide into base of leaves using 1 part Tordon®/5 parts diesel. Read the manufacturers' labels and material safety data sheets before using herbicides.	Agave can form thick thickets by suckering and can reduce native species diversity.		No pre-clearing control.	Plants must be separated from native mulch and disposed in accordance with Management Plan.	If any plants identified during site inspections, record location and follow recommended control measures.
Species: *Ricinus communis* **Common Name:** Castor Oil **Status:** Weed	September - December	Foliar spray seedlings and small plants using 1% glyphosate.	Remove when seen especially after winter rains.		No pre-clearing control.	Plants must be separated from native mulch and disposed in accordance with Management Plan.	If any plants identified during site inspections, record location and follow recommended control measures.
Species: *Schinus terebinthifolius* **Common Name:** Japanese pepper tree **Status:** Weed	December – March	Stem inject older plants using 50% Glyphosate or basal bark with 250 ml Access in 15 L of diesel to bottom 50 cm of trunk during summer.	If left will spread over bushland and impact on plant communities. It can form dense thickets which shade out and smother native vegetation, and can block access to creeks.		No pre-clearing control.	Plants must be separated from native mulch and disposed in accordance with Management Plan.	If any plants identified during site inspections, record location and follow recommended control measures.

Weed Species	Optimum Timing of Control	Recommended Control Measures	Comments	Photograph Reference	Pre-Clearing Control	Clearing Control	Post-Clearing Control
Species: *Leptospermum laevigatum* **Common Name:** Victorian Tea Tree **Status**: Weed	July – September	Hand weeding and felling mature trees is the recommended control method. Where resprouting has been observed, apply 250 ml Access in 15 L of diesel to bottom 50 cm of trunk (basal bark).	If left it will rapidly spread over bushland and impact on plant communities. This major bushland weed is spreading rapidly along road verges and invading coastal heath and woodlands.		No pre-clearing control.	Plants must be separated from native mulch and disposed in accordance with Management Plan.	If any plants identified during site inspections, record location and follow recommended control measures.
Species: *Solanum nigrum* **Common Name:** Blackberry Nightshade **Status**: Weed	July - December	1 L/ha Starane® (20 ml/10 L) applied when actively growing in summer, will provide reasonably selective control.	This weed is a common agricultural and bushland weed. It competes vigorously for space and nutrients.		Spray with herbicide prior to clearing.	Pre-control required prior to clearing. If identified during clearing, cease operations, and follow recommended control measures. Ensure weeds are excluded from topsoil and mulch.	If any plants identified during site inspections, record location and follow recommended control measures.
Species: *Typha orientalis* **Common Name:** Bulrush **Status**: Invasive	November -January	Apply Roundup Biactive® (360 g/L) at 13 ml/L when actively growing through wiping, backpack/handheld spray or high volume spray.	Bulrush is a particularly aggressive coloniser of disturbed wetlands on the Swan Coastal Plain and it is particularly hard to eradicate because they form dense mats of rhizomes and roots. Seedlings can flower after 6 months.		No pre-clearing control.	Plants must be separated from native mulch and disposed in accordance with Management Plan.	If any plants identified during site inspections, record location and follow recommended control measures.
Species: *Arundo donax* **Common Name:** Giant Reed **Status**: Weed	February – March	Use foliar or cut-stump applications of aquatic approved herbicide (Round-up Biactive®). Chemical control is most effective in late summer and early autumn.	This reed can form thick thickets and can cause major structural changes to the plant communities that it invades. An aggressive competitor with rapid growth rates, it forms thick homogenous stands that can displace native riparian vegetation. Provides poor habitat for terrestrial insects and wildlife. Traps sediments and narrows flood channels leading to erosion and flooding. Highly adapted to extreme fire events and can increase fire intensity. It grows aggressively in wetlands, wastelands and in older settlements.		No pre-clearing control.	Plants must be separated from native mulch and disposed in accordance with Management Plan.	If any plants identified during site inspections, record location and follow recommended control measures.
Species: *Erythrina indica* **Common Name:** Indian Coral Tree **Status**: Weed	October - May	Cut trunks or stems and apply Glyphosate 360 herbicide to the stump within 15 seconds of cutting. Dispose of cut sections or check regularly for sprouting.	Will dominate waterways and floodplains where they outcompete native vegetation, reduce food and habitat for native animals, have major negative effects on soil stability and nutrient levels.		No pre-clearing control.	Plants must be separated from native mulch and disposed in accordance with Management Plan.	If any plants identified during site inspections, record location and follow recommended control measures.

Weed Species	Optimum Timing of Control	Recommended Control Measures	Comments	Photograph Reference	Pre-Clearing Control	Clearing Control	Post-Clearing Control
Species: *Crassula ovata* **Common Name:** Money Plant **Status**: Weed	July - December	1 L/ha Starane® (20 ml/10 L) applied when actively growing in summer, will provide reasonably selective control.	It has the potential to spread rapidly and easily from leaves and pieces of stems that break off, root and grow.		No pre-clearing control.	Plants must be separated from native mulch and disposed in accordance with Management Plan.	If any plants identified during site inspections, record location and follow recommended control measures.
Species: *Morus alba* **Common Name:** White Mulberry **Status**: Weed	December – March	Cut stump and remove weed.	Can be invasive if left unchecked.		No pre-clearing control.	Plants must be separated from native mulch and disposed in accordance with Management Plan.	If any plants identified during site inspections, record location and follow recommended control measures.
Species: *Chamaecytisus palmensis* **Common Name:** Tagasaste **Status**: Weed	March – December	For mature plants apply 250 ml Access® in 15 L of diesel to basal 50 cm of trunk (basal bark). Foliar spray with 0.5 g/10 L metsulfuron methyl + Pulse® Read the manufacturers' labels and material safety data sheets before using herbicides.	Tagasaste is a serious invader of disturbed bushland on lateritic soils in higher rainfall areas. It has naturalised in almost all areas where it has been planted. The plant germinates readily after soil disturbance, forming dense infestations that can smother native vegetation and prevent regeneration. It also increases soil nitrogen, encouraging other weeds to colonise sites.		No pre-clearing control.	Plants must be separated from native mulch and disposed in accordance with Management Plan.	If any plants identified during site inspections, record location and follow recommended control measures.
Species: *Nicotiana glauca* **Common Name:** Tree Tobacco **Status**: Weed	March – November	On the cut stump apply an application of 50% Glyphosate or apply 250 ml Access® in 15 L of diesel to basal 50 cm of stem (basal bark). Read the manufacturers' labels and material safety data sheets before using herbicides.	If left it may spread over bushland and impact on ecological processes and plant communities		No pre-clearing control.	Plants must be separated from native mulch and disposed in accordance with Management Plan.	If any plants identified during site inspections, record location and follow recommended control measures.
Species: *Vitis vinifera* **Common Name:** Grape Vine **Status**: Weed	March - May	Cut vines at beginning of stems and treat ends with Glyphosate 360.	If left will spread over bushland and may impact on plant communities. It can smother vegetation and increases fire risk during summer die-off phase.		Use recommended control measures prior to clearing.	If observed during clearing, use recommend control measures and ensure plants are excluded from topsoil and mulch.	If any plants identified during site inspections, record location and follow recommended control measures.

Weed Species	Optimum Timing of Control	Recommended Control Measures	Comments	Photograph Reference	Pre-Clearing Control	Clearing Control	Post-Clearing Control
Species: *Olea europaea subsp. europaea* **Common Name:** Olive **Status**: Weed	March – May / October – December	For mature plants cut to base and paint 50% Glyphosate or apply 250 ml Access in 15 L of diesel to base 50 cm of trunk (basal bark). Monitor sites for seedling recruitment.	It is a serious bushland weed that forms mixed age thickets that can virtually preclude native plant recruitment.		No pre-clearing control.	Plants must be separated from native mulch and disposed in accordance with Management Plan.	If any plants identified during site inspections, record location and follow recommended control measures.
Species: *Watsonia bulbillifera* **Common Name:** Wattsonia **Status**: Weed	September	Spray dense infestations with 2,2-DPA 10 g/L + Pulse. Apply just as flower spikes emerge at corm exhaustion. 2,2-DPA at 5 g/L+ Pulse is also quite effective and is appropriate to use when particularly concerned about off-target damage.	If left will spread in bushland and readily out competes native plant communities.		Spray with herbicide prior to clearing.	Pre-control required prior to clearing. If identified during clearing, cease operations, and follow recommended control measures. Ensure weeds are excluded from topsoil and mulch.	If any plants identified during site inspections, record location and follow recommended control measures.
Species: *Melia azedarach* **Common Name:** Cape Lilac **Status**: Weed	December – February	Stem inject older plants using 50% Glyphosate, or basal bark with 250 ml Access® in 15 L of diesel to base 50 cm of trunk. Avoid root disturbance until trees are confirmed dead.	If left it may spread over bushland and impact on ecological processes and plant communities		No pre-clearing control.	Plants must be separated from native mulch and disposed in accordance with Management Plan.	If any plants identified during site inspections, record location and follow recommended control measures.
Species: *Cortaderia selloana* **Common Name:** Pampas Grass **Status**: Weed	July – November	Treat young plants with 13ml/L Fusilade Forte + spray oil or for generic fluazifop-p (212g/L active ingredient) 8mL/L + spray oil and may require more than one application. Alternatively foliar spray glyphosate at 4%.	This weed is a serious weed of wetlands and is capable of altering vegetation structure and decreasing diversity of invertebrate and vertebrate fauna. Often found in open sunny sites which receive additional moisture.		Spray with herbicide prior to clearing.	Pre-control required prior to clearing. If identified during clearing, cease operations, and follow recommended control measures. Ensure weeds are excluded from topsoil and mulch.	If any plants identified during site inspections, record location and follow recommended control measures.
Species: *Phytolacca octandra* **Common Name:** Inkweed **Status**: Weed	March – December	Apply Roundup Biactive® (360 g/L) at 13 ml/L when actively growing through wiping, backpack/handheld spray or high volume spray.	Competes for space and nutrients in pioneer plant communities, and can temporarily inhibit the establishment of seedlings of native plant species. Normally followed by native species, but can also be followed by vines or other weeds.		Spray with herbicide prior to clearing.	Pre-control required prior to clearing. If identified during clearing, cease operations, and follow recommended control measures. Ensure weeds are excluded from topsoil and mulch.	If any plants identified during site inspections, record location and follow recommended control measures.

Weed Species	Optimum Timing of Control	Recommended Control Measures	Comments	Photograph Reference	Pre-Clearing Control	Clearing Control	Post-Clearing Control
Species: *Rubus anglocandicans* **Common Name:** Blackberry **Status**: WoNS and Declared Pest	December – May	Spray with metsulfuron methyl 1 g/10 L + the wetting agent Endose® at 30 ml/10 L, in summer-autumn. Will require follow up for a number of years. For larger plants cut and paint with 20-50% Glyphosate. Spray regrowth at 50cm with metsulfuron methyl 1 g/10 L + the wetting agent Endose® at 30 ml/10 L, in summer-autumn.	Blackberry is a major threat to conservation values anywhere it has taken hold. The impact on ecological processes and plant communities is acute.		Spray with herbicide prior to clearing activities.	If specimens identified during mulch or topsoil works, spray with herbicide and ensure specimen isn't included in mulch or topsoil	If any plants identified during site inspections, record location and follow recommended control measures.
Species: *Ficus carica* **Common Name:** Common Fig **Status**: Weed	December – February	Stem inject with 50% Glyphosate and foliar spray regrowth with 10% Glyphosate. For stems less than 30 cm diameter apply 250 ml Access® in 15 L of diesel to basal 50 cm of trunk (basal bark).	Figs have a long lag time in the invasion process but once the correct conditions are met it can expand exponentially at a landscape scale. Eradication of small populations is therefore recommended.		No pre-clearing control.	Plants must be separated from native mulch and disposed in accordance with Management Plan.	If any plants identified during site inspections, record location and follow recommended control measures.