RECONNAISSANCE FLORA AND VEGETATION ASSESSMENT

Waddi Wind Farm

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SUMMARY

Waddi Wind Farm Pty Ltd (the Proponent), a subsidiary of a portfolio of companies that are trading as Tilt Renewables, is proposing the Waddi Wind Farm (Project), located approximately 15 kilometres (km) north-west of the township of Dandaragan and approximately 150 km north of Perth in the mid-west region of Western Australia's wheatbelt. The Project has Commonwealth, state and local planning and environmental approvals for up to 57 wind turbines for the purpose of generating renewable wind energy (Figure A).

The Project includes approximately 8 km of overhead 132 kV line from the on-site substation into Western Power's existing transmission network, west of the Brand Highway just north of the Cataby substation. Due to refinement of the civil balance of plant design and extensive consultation with Western Power to meet their design specifications for the overhead transmission line (including a continuous access track under the transmission line), additional native vegetation clearing is required. This is in the order of magnitude of the environmental impacts to the flora, vegetation and fauna values when compared to the Commonwealth and state environmental approvals.

RPS AAP Consulting Pty Ltd was commissioned by the Proponent to undertake this reconnaissance flora and vegetation survey, inclusive of a targeted search for conservation significant flora species, to:

- Inform an environmentally responsive infrastructure layout for the wind farm.
- Review an alternative transmission line alignment for connection of the wind farm to the Cataby substation.

The field survey was undertaken across two years (2021 and 2022). Between 29 September and 7 October 2021, experienced botanists Russell Smith (FB6200016) and Colin Spencer (FB62000192) from Ecoedge surveyed a 1,408-hectare (ha) extent (Figure A). Between 07 September and 09 September 2022, experienced botanist Marin Henson (FB62000110-2) from RPS surveyed a 37-ha extent (Figure A). Both field surveys were undertaken in accordance with the Environmental Protection Authority's (EPA) Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016).

Two hundred and ninety-four taxa were recorded from 213 relevés within the survey area. These taxa came from 51 families and 138 genera. The most represented families were the Proteaceae (50 species), followed by the Fabaceae (33) and Myrtaceae (32). This representation shows the dominance of the proteaceous/ myrtaceous heaths in the Kwongan.

Three state and Commonwealth-listed Threatened flora species were recorded:

1. *Hakea megalosperma* (Vulnerable) – four records
2. *Anigozanthos viridis* subsp. *terraspectans* (Vulnerable) – one record
3. *Thelymitra stellata* (Endangered) – 16 records.

Eleven Department of Biodiversity Conservation and Attractions (DBCA) listed Priority flora taxa were recorded:

1. *Stylidium diplotrichum* Priority 2
2. *Isopogon autumnalis* Priority 3
3. *Lepidobolus quadratus* Priority 3
4. *Leucopogon foliosus* Priority 3
5. *Stylidium hymenocraspedum* Priority 3
6. *Synaphea endothrix* Priority 3
7. *Tetratheca angulata* Priority 3
8. *Banksia chamaephyton* Priority 4
9. *Conostephium magnum* Priority 4
10. *Hypolaena robusta* Priority 4
11. *Stylidium aeonioides* Priority 4.

Nine vegetation types were described. Four are representative of the Proteaceous scrub heath of the Kwongan (HL, HLd, HS and HWS), three represent Banksia woodland vegetation (W1, W2 and W3), one represents degraded parts of the landscape (WD), and one represents a revegetated area (RH).

The Banksia Woodland vegetation situated within the Swan Coastal Plain bioregion is considered to represent the Commonwealth-listed Banksia woodlands of the Swan Coastal Plan ecological community due to its location and physical environmental setting. No other state or Commonwealth listed Threatened Ecological Communities or DBCA-listed Priority Ecological Communities were identified.

Most of the survey area was in paddocks or plantations, in “Cleared” or “Completely Degraded” condition, with stands of remnant trees in “Degraded” to “Completely Degraded” condition due to historical grazing. Many small patches of remnant vegetation in the paddocks are in “Good” to “Degraded” condition, while roadside vegetation is largely rated as “Excellent” condition. Vegetation within the alternative transmission line alignment is generally rated as “Excellent” condition.

1 INTRODUCTION

1.1 Project background

The Waddi Wind Farm (Project) is located approximately 15 kilometres (km) north-west of the Dandaragan town site, 150 km north of Perth, in the Shire of Dandaragan (Figure A).

The proposed infrastructure design and configuration of the wind farm has iteratively evolved over time to reflect the ongoing advancements in turbine technologies and respond to the changing dynamic of market demand for renewable energy supply. Design philosophy has been underpinned by the location of infrastructure within already cleared lands (where possible) thereby avoiding stands of remnant native vegetation to reduce potential environmental impacts associated with wind farm construction.

The route for the transmission line alignment which was proposed to connect the wind farm to the Cataby substation was subject to a reconnaissance-level spring flora and vegetation survey and black cockatoo habitat survey (Outback Ecology 2014), with a supplementary spring flora, vegetation and fauna survey also undertaken (Ecologia Environment 2016).

Approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) for the Project, inclusive of the proposed transmission line alignment, was provided by the (then) Commonwealth Department of the Environment and Energy (DEE) on 27 February 2019 (2018/8352). A Purpose Clearing Permit (CPS 8449/1) was also approved by the state Department of Water and Environmental Regulation on 26 August 2019.

Due to refinement of the civil balance of plant design and extensive consultation with Western Power to meet their design specifications for the overhead transmission line (including a continuous access track under the transmission line), additional native vegetation clearing is required in the order of magnitude of the environmental impacts to the flora, vegetation and fauna values when compared to the Commonwealth and state environmental approvals.

RPS AAP Consulting Pty Ltd (RPS) was commissioned by Waddi Wind Farm Pty Ltd (the Proponent) to undertake this reconnaissance flora and vegetation survey, inclusive of a targeted search for conservation significant flora species, to:

- Inform an environmentally responsive infrastructure layout for the wind farm.
- Review an alternative transmission line alignment for connection of the wind farm to the Cataby substation.

1.2 Report objectives

This reconnaissance flora and vegetation survey report presents the findings of a vegetation assessment within an approximate 1,445 ha survey area (Figure A). Approximately 82 ha (or around 6%) of the survey area is comprised of native vegetation, the remainder contains agricultural paddocks, plantations or amenity plantings, cleared areas and roads.

This vegetation assessment includes:

- Desktop review involving:
  - A review of available literature, aerial imagery and spatial datasets to identify records of conservation significant flora and vegetation
  - Searches of the state and Commonwealth government databases to identify records of conservation significant flora and vegetation within the vicinity including:
    - Department of Biodiversity, Conservation and Attractions (DBCA) and Western Australian Museum (WAM) NatureMap database
    - DBCA's Threatened and Priority flora; and Threatened and Priority ecological communities databases
    - Department of Climate Change, Energy, the Environment and Water (DCCEEW) Protected Matters Search Tool database

- Site visit to assess the vegetation type and condition within the survey area, confirm the presence of significant features identified in the database searches, and to produce maps identifying the location of any constraints recorded
- Targeted searches for any Threatened flora (TF) or Priority flora (PF) species known from the area (as recorded in the database searches).

1.3 Guiding principles and legislative framework

Commonwealth and state legislation pertaining to the conservation of native flora and vegetation include the EPBC Act, *Biodiversity Conservation Act 2016* (BC Act) and *Environment Protection Act 1986* (EP Act).

The EP Act is the primary legislation that governs environmental impact assessment and protection in Western Australia. The aim of the EP Act is "to provide for an EPA, for the prevention, control and abatement of pollution and environmental harm, for the conservation, preservation, protection, enhancement and management of the environment and for matters incidental to or connected with foregoing".

The EP Act states that the following principles, applicable to native flora and vegetation should be adhered to for protection of the environment of Western Australia:

1. The precautionary principle – where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.
2. The principle of intergenerational equity – the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.
3. The principle of the conservation of biological diversity and ecological integrity – conservation of biological diversity and ecological integrity should be a fundamental consideration.

1.3.1 Flora of conservation significance defined in the legislative framework

Within Western Australia, TF are listed if they are considered to be in danger of extinction, rare or otherwise in need of special protection. These taxa are legally protected under the BC Act. The removal of these taxa or impact to their surroundings is not permitted without prior Ministerial approval.

The DBCA maintains a list of PF species, which may be rare or threatened, but for which there are either insufficient survey data to determine accurately their status, or which are rare but not currently considered to be threatened. A PF taxon is assigned to one of four priority categories. TF and PF categories are defined in Appendix A, Table A-1.

Many taxa listed as TF under the BC Act have additional protection as they are also listed as TF under one of five threat categories (Extinct, Extinct in the wild, Critically Endangered, Endangered or Vulnerable) under the EPBC Act.

TF taxa are defined as Matters of National Environmental Significance (MNES) under the EPBC Act and penalties apply for any damage to individuals, populations or habitats of these flora.

The EPBC Act conservation category codes are defined in Appendix A, Table A-2.

1.3.2 Vegetation of conservation significance

Under the BC Act and the EP Act, Threatened Ecological Communities (TECs), classified by DBCA in one of the TEC categories (Appendix A, Table A-3) have limited protection. Other ecological communities are classified by DBCA in the category of Priority Ecological Communities (PECs) (Appendix A, Table A-4) pending further survey and/or definition.

A subset of the DBCA-listed TECs is listed and protected as MNES under the EPBC Act. The EPBC Act threat categories for TECs are defined in Appendix A, Table A-5.

1.3.3 Other significant flora and vegetation

Under the Environmental Protection Authority's (EPA) environmental factor guideline, flora and vegetation may be considered significant for a range of reasons, other than listing as a Threatened or Priority species or ecological community, including:

- Flora may be significant for:
  - Local endemism or association with a restricted habitat type (e.g. surface water or groundwater dependent ecosystems)
  - New species or anomalous features that indicate a potential new species
  - Representing the range of a species (particularly at the extremes of range, recently discovered range extensions, or isolated outliers of the main range)
  - Being unusual species, including restricted subspecies, varieties or naturally occurring hybrids
  - Having relictual status, being representative of taxonomic groups that no longer occur widely in the broader landscape.
- Vegetation may be significant for:
  - Having restricted distribution
  - Being subject to a degree of historical impact from threatening processes
  - Having a role as a refuge
  - Providing an important function required to maintain ecological integrity of a significant ecosystem.

1.3.4 Environmentally Sensitive Areas

Under section 51B of the EP Act the Minister for Environment may declare by notice either a specified area of the state or a class of areas of the state to be an Environmentally Sensitive Area (ESA). ESAs are declared in the *Environmental Protection (Environmentally Sensitive Areas) Notice 2005*, which was gazetted on 8 April 2005.

The following areas are declared to be ESAs:

- Declared World Heritage property as defined in section 13 of the EPBC Act
- Area that is included on the Register of the National Estate, because of its natural heritage value, under the *Australian Heritage Council Act 2003*
- Defined wetland and the area within 50 m of the wetland. Defined wetlands include Ramsar wetlands, Conservation Category Wetlands and nationally important wetlands
- Area covered by vegetation within 50 m of rare flora, to the extent to which the vegetation is continuous with the vegetation in which the rare flora is located
- Area covered by a TEC
- Bush Forever site listed in Bush Forever: Volumes 1 and 2 (Government of Western Australia 2000), except to the extent to which the site is approved to be developed by the Western Australian Planning Commission.

1.3.5 Introduced species

Introduced flora (weeds) are plants that require action to reduce their negative effects on the economy, environment and human health or amenity. Weeds can reduce the quality of Australia's agricultural, horticultural and forestry industries. They can affect the structure and function of ecosystems, posing threats to biodiversity and natural values by successfully out-competing native species for available nutrients, water, space and sunlight. Weeds can also increase the biomass of ecosystems, leading to more intense bushfires and changing the composition and structure of native vegetation (Invasive Plants and Animals Committee 2016).

Management of some weed species is required under Commonwealth or state frameworks. Key classifications for significant introduced flora that are relevant to this report are:

- Declared Pest – the *Biosecurity and Agriculture Management Act 2007*, Section 22 makes provision for a plant taxon to be listed as a Declared Pest organism in parts of, or the entire state. Under the Biosecurity and Agriculture Management Regulations 2013, Declared Pests are assigned to one of three control categories that dictate the level of management required (Department of Primary Industries and Regional Development (DPIRD) 2022a)
- Weed of National Significance (WoNS) – high impact, established introduced flora causing major economic, environmental, social and/or cultural impacts in a number of states/territories, and which have strong potential for further spread (Invasive Plants and Animals Committee 2016). Management is required in accordance with DPIRD guidelines for particular WoNS. Not all WoNS are recognised as Declared Pests in WA.

In this report introduced species are indicated with an asterisk.

2 EXISTING ENVIRONMENT

2.1 Interim Biogeographic Regionalisation of Australia

The Interim Biogeographical Regionalisation of Australia (IBRA) currently recognises 89 bioregions and 419 biological subregions within Australia. Most of the survey area lies within the Lesueur Sandplain (GES02) subregion of the Geraldton Sandplains bioregion (Department of Agriculture, Water and the Environment (DAWE) 2021a). A small portion of the survey area, where Cooljaroo Road crosses the Brand Highway, is situated within the Perth (SWA02) subregion of the Swan Coastal Plain bioregion (Figure F – map book index).

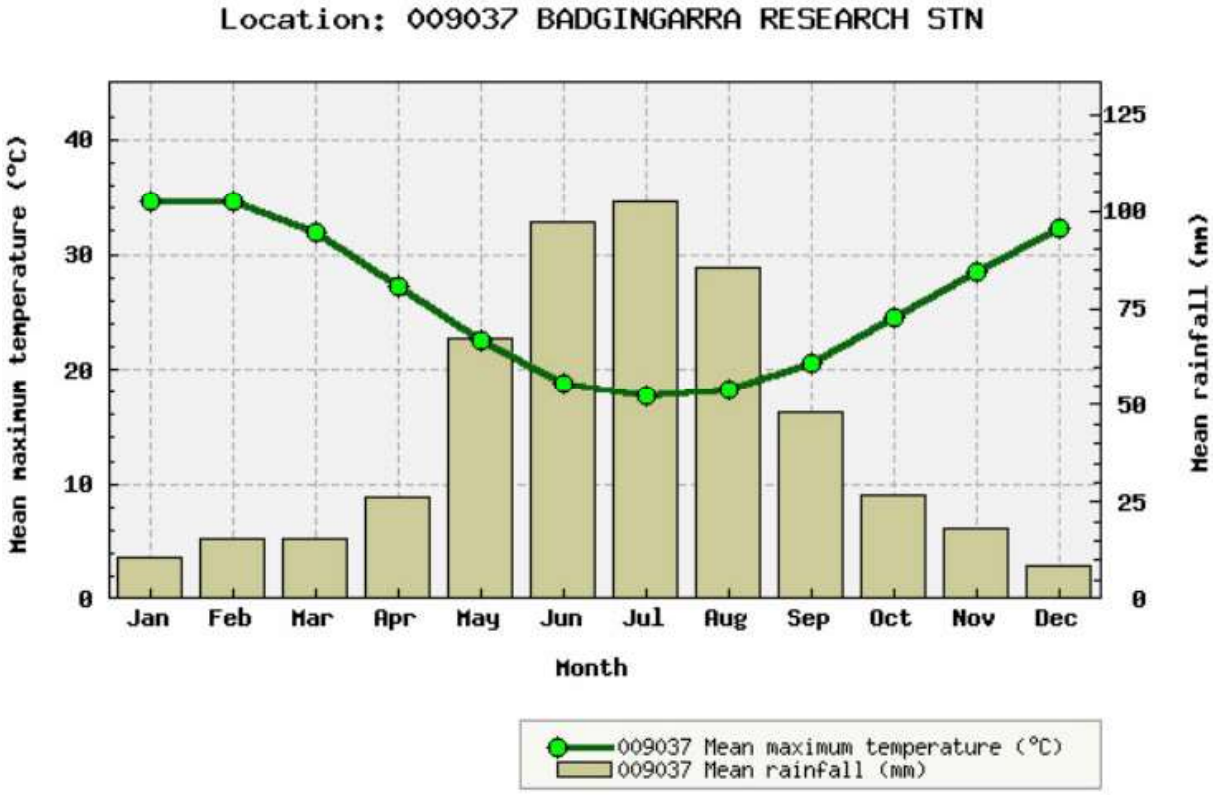
The Lesueur Sandplain subregion is 1,172,152 ha in area and is the southern section of the Geraldton Sandplains bioregion. It is described by Desmond and Chant (2001) as coastal Aeolian and limestones, Jurassic siltstones and sandstones (often heavily laterised) of Perth Central Basin with extensive yellow sandplains. Vegetation is composed of shrub-heaths that are rich in endemics occurring on a mosaic of mesas, sandplains, coastal sands and limestones.

The Perth subregion is 1, 333, 901 ha in area and composed of colluvial and aeolian sands, alluvial river flats and coastal limestone, and Mitchell et al. (2002) describes the vegetation as Heath and/or Tuart woodlands on limestone, Banksia and Jarrah-Banksia woodlands on Quaternary marine dunes of various ages and Marri on colluvial and alluvials.

2.2 Climate and rainfall

The climate of the Geraldton Sandplains bioregion is Mediterranean (Desmond and Chant 2001). The summers are generally short, hot, and dry and the winters cool, with less than 600 millimetres (mm) of rainfall received on average annually (Bureau of Meteorology 2022a).

Badgingarra is the nearest Bureau of Meteorology recording station to record all climatic variables, approximately 16 km north of the survey area (Station no. 009037). Graph 1 below shows the mean temperatures and rainfall for Badgingarra since it opened in 1965. The overall winter rainfall was 19 mm above average in 2021 and 77 mm above the average in 2022 (Bureau of Meteorology 2022b).



(Source: Bureau of Meteorology 2022a)

Graph 1: Mean climate data for Badgingarra weather station (009037) 1969–2022

2.3 Soil landscape mapping

The DPIRD soil landscape mapping shows eight soil units across the survey area ranging from the Yeeramullah Subsystem units of plateau residuals and colluvial slopes in the east and moving towards Bassendean Subsystem units of undulating sandplain in the west. Figure B presents a general overview of the soil mapping, with the detailed description of each subsystem unit provided in Table 1.

Table 1: Soil landscape units mapped for the survey area

Map unit	Name	Description
Ye1	Yeeramullah 1 subsystem	Laterite plateau residual; shallow gravel, shallow sand over duricrust, sandy gravels
Ye2	Yeeramullah 2 Subsystem	Plateau residuals, very gently to gently inclined hillcrest and hillslopes; pale sandy gravels, shallow gravel over duricrust, gravelly pale deep sand, pale and yellow deep sands
Ye3	Yeeramullah 3 Subsystem	Colluvial slopes and some plateau remnants, very gently to gently inclined hillslopes and sand filled minor valleys; pale and yellow deep sands, pale sandy gravels, shallow gravel over duricrust, some sandy duplexes and sandy earths
Ye3a	Yeeramullah 3 slopes Phase	Colluvial slopes; pale and yellow deep sands, pale sandy gravels, shallow gravel over duricrust, some sandy duplexes and sandy earths
Ye4	Yeeramullah 4 Subsystem	Plateau residuals, complex of Ye2 and Ye3; pale sandy gravels, gravelly pale deep sand, shallow gravel over duricrust, pale deep sand, some sandy duplexes, yellow deep sand
Ye6	Yeeramullah 6 Subsystem	Colluvial slopes, very gently to gently inclined mid to lower hillslopes and sand filled minor valleys; pale deep sand, some sandy duplexes and shallow sand over pan or bog iron
Bs1	Bassendean 1 Subsystem	Undulating to flat sandplain and minor swamps; pale to yellow deep sands
Bs2	Bassendean 2 Subsystem	Undulating sandplain (Similar to Bs1, but with ironstone and occasionally poorly drained depressions)

(Source: DPIRD 2022b)

2.4 Conservation reserves

The Lesueur Sandplain subregion has approximately 18% of its surface under some form of conservation tenure (Desmond and Chant 2001). Several DBCA managed lands including National Parks, Nature Reserves and Conservation Parks lie proximate to the survey area. The survey area also intersects Conservation Park R41986. Figure C identifies the location of conservation reserves relative to the survey area.

2.5 Environmentally sensitive areas

An ESA is associated with Conservation Park R41986 and intersects a portion of the survey area (Figure C).

2.6 Regional vegetation mapping

Building on earlier mapping, Beard et al. (2013) published regional vegetation mapping covering Western Australia at the 1:3,000,000 scale. This mapping and associated statistics is updated regularly and was consulted to provide information on the current status of vegetation in the survey area. The vegetation within the survey area is mapped as:

- Vegetation Association 7: Medium woodland; York gum (*Eucalyptus loxophleba*) and wandoo
- Vegetation Association 1031: Mosaic: Shrublands; hakea scrub-heath / Shrublands; dryandra heath.

The remnant extent and reservation status of these vegetation associations within the Lesueur Sandplain subregion is presented in Table 2.

Table 2: Vegetation associations represented within the survey area

Vegetation association	Structural description	Pre-European extent (ha)	Current extent (Ha)	Extent remaining (%)	Current extent in DBCA managed land (%)
7	Medium woodland	4,136.50	1,391	33.63	9.2
1031	Mosaic Shrublands	241,349.97	83,217	34.48	42.7

(Source: DBCA 2019)

2.7 Regional flora

A total of 2,699 vascular flora taxa are known from the Lesueur Sandplains subregion, of which 2,476 are native (Western Australian Herbarium (WAH) 1998-).

3 METHODS

This reconnaissance flora and vegetation survey was undertaken in accordance with the EPA's Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016).

As stated in the guidance, a reconnaissance level survey is undertaken to provide context and gather broad information about a survey area. Generally, a reconnaissance survey is required where flora and vegetation values are well defined, the area is not likely to support significant flora or vegetation and the scale and nature of potential impacts are not likely to be significant. A reconnaissance survey is undertaken to verify the information obtained from the desktop review, characterise the flora and delineate the vegetation units present using low intensity sampling of the flora and vegetation, and identify the potential impacts of the proposed development on local flora and vegetation values particularly flora taxa of conservation significance.

In addition to delineation of vegetation units, the survey area was target searched for conservation significant taxa that were identified in the desktop review.

3.1 Desktop review

3.1.1 Historical regional surveys and mapping

The following regional land surveys and mapping datasets relating to the survey area were reviewed to provide a regional context in which to assess flora and vegetation values:

- Pre-European Vegetation Mapping (Beard 1979)
- Targeted Level 1 Vegetation and Flora Assessment (Outback Ecology 2010)
- Spring Flora and Vegetation Survey and Black Cockatoo Habitat Survey (Outback Ecology 2014)
- Supplementary Flora, Vegetation and Fauna Survey (Ecologia Environment 2016).

3.1.2 Database searches

Database searches were conducted to determine a list of conservation significant flora and ecological communities (i.e. those protected under the BC Act and / or the EPBC Act or considered Priorities by the DBCA) that may occur within the survey area (Table 3). The results of the NatureMap database and Protected Matters Search Tool database for MNES searches are provided in Appendices B and C. The results of the DBCA flora and ecological communities database searches are provided in Figure D.

Table 3: Flora and ecological communities databases searched and corresponding search areas

Database name	Governing organisation	Search area defined
NatureMap database	DBCA and WAM	Circle search within a 40 km radius of a central point
Threatened and Priority Flora database	DBCA	Circle search within a 25 km radius of a central point
Threatened and Priority Ecological Communities database	DBCA	Circle search within a 25 km radius of a central point
Protected Matters Search Tool database for MNES	DCCEEW	Circle search within a 20 km radius of a central point

3.2 Field survey

The field survey was undertaken across two years (2021 and 2022). Between 29 September and 7 October 2021, experienced botanists Russell Smith (FB62000192) and Colin Spencer (FB62000169) from Ecoedge surveyed a 1,408-hectare (ha) extent. Between 07 September and 09 September 2022, experienced botanist Marin Henson (FB62000110-2) from RPS surveyed a 37-ha extent. Both field surveys were undertaken in accordance with EPA (2016).

Vegetation composition and structure was assessed at 213 relevé sites, and mapping notes were made at a further 262 locations (Figure E). Vegetation condition was assessed at a further 123 sites. Condition assessments were made using the scale of Keighery (1994) as recommended for the South West botanical province (EPA 2016). The Keighery (1994) scale is provided in Table A-8 of Appendix A.

Transects were walked through areas of intact native vegetation at 10–15 m spacings. Due to access issues some parts of the survey area were inaccessible at the time but most parts of the survey area with vegetation in "Good" or better condition on private property were visited during the survey period.

A comprehensive species list was compiled in the field and updated following field work with reference to pressed specimens and photographs. The species list was taxonomically checked using state herbarium data (DBCA 2021). Vegetation types were described to NVIS Level V (DAWE 2021b) and mapped through interpretation of aerial photography with reference to relevé descriptions and mapping notes taken while in the field.

3.3 Limitations

Practitioners who conduct ecological surveys for environmental impact assessment in Western Australia are obliged to report on the limitations and constraints in such studies. Some potential limitations/constraints on surveys may adversely impact on the scientific rigour, completeness, or validity of the survey results. The EPA (2016) identifies standard limitations which can limit and constrain the validity of surveys. These limitations/constraints and their relevance to this assessment are presented in Table 4.

Table 4: Potential survey limitations

Aspect	Constraint	Comment
Scope	1	The survey scope was designed to comply with EPA requirements.
Proportion of flora identified	3	The survey was carried out in early to mid-spring, which is within the optimal survey time, and most taxa were identifiable. Any unidentified species in the field were later identified with the assistance of the WAH.
Climatic and seasonal effects	2	Rainfall was above average for the survey area in 2021 and 2022 resulting in good flowering in both annual and perennial species.
Availability of contextual information	2	A regional survey of the northern sandplains between Perth and Geraldton (Griffin 1994) covers the survey area and provides a reasonable context to the survey. This is supported by previous surveys in the locality (Outback Ecology 2010, Outback Ecology 2014 and Ecologia Environment 2016).
Completeness of the survey	3	• The survey area vegetation was accessed by either foot or 4WD vehicle, some of the vegetation was surrounded by extensive areas of crop. • Tall crops made detection of small patches of potential native vegetation challenging from road or farm access tracks in 2021 and some could have been missed during survey.
Skill and knowledge of the botanists	1	The senior botanists have a combined over 50 years' experience in flora surveys across the south-west of Western Australia: • Russell Smith (over 30 years) • Martin Henson (over 20 years).
Disturbance (fire, grazing, clearing etc.)	1	Impacts from disturbances such as fire, clearing, grazing at all other survey areas during 2021 and 2022 were not recent and were not regarded as a constraint to the expectations of this survey.

Scale

1-2 = Negligible – constraint does not affect outcomes of the survey.

3-4 = Minor – constraint has minor impact on the outcome of survey

5-6 = Moderate – constraint has a moderate impact on the outcome of survey

7-8 = Major – constraint has a major impact on the outcomes of the survey

4 RESULTS

4.1 Desktop review

4.1.1 Previous studies

4.1.1.1 Targeted Level 1 Vegetation and Flora Assessment (Outback Ecology 2010)

The study was undertaken over two field trips, in November 2008 and January 2009 and focussed on remnant vegetation, a series of sampling points that were potential turbine sites and associated track and cable routes. Twenty-five relevés were described in remnant vegetation, 18 relevés on access track and underground transmission line routes, and twenty-nine sampling points in pasture and remnant vegetation were visited.

A total of 168 taxa were recorded. No state or Commonwealth-listed TF species were recorded and eight DBCA -listed PF species were detected:

- *Hypocalymma* sp. Cataby (GJ Keighery 5151) (P2 – ranked at P1 at time of survey)
- *Acacia plicata* (P3)
- *Banksia fraseri* subsp. *crebra* (P3)
- *Tetratheca angulata* (P3)
- *Conostephium magnum* (P4)
- *Eucalyptus macrocarpa* subsp. *elachantha* (P4)
- *Grevillea saccata* (P4)
- *Regelia megacephala* (P4).

Thirteen vegetation types were described during the study, one of which 'SH2 Open Shrubland of *Banksia attenuata* over Low Closed Shrubland of *Xanthorrhoea preissii* and mixed Proteaceae spp. on gentle slope' was identified as being consistent with Floristic Community Type SCP20a '*Banksia attenuata* woodlands over species rich dense shrublands', a state-listed TEC.

Further discussions with Val English from the (then) Department of Parks and Wildlife's Threatened Species and Communities Branch were undertaken as part of the later Outback Ecology (2014) study. These discussions explained that the physical disjunct (more than 50 km, across bioregions) between the SH2 vegetation and the community with which it has affinities TEC SCP20a (recorded on uplands centred on Bassendean Dunes and the Dandaragan Plateau (Gibson et al. 1994)) suggests that a meaningful floristic comparison and determination of status cannot be made. Hence the SH2 vegetation is not considered a representation of TEC SCP20a.

4.1.1.2 Spring Flora and Vegetation Survey and Black Cockatoo Habitat Survey (Outback Ecology 2014)

Outback Ecology updated the 2010 study to include two substation options and the proposed transmission line route to the Cataby substation, and the Cataby substation itself. The field survey was undertaken between 29 October and 1 November 2013. Targeted flora searches were also conducted to fulfil Condition 8 of a previous clearing permit (4608/2), whilst a significant fauna habitat assessment for black cockatoos was also undertaken.

A total of 191 taxa from 38 families and 98 genera were recorded. No state or Commonwealth-listed TF species were recorded, and six DBCA-listed PF species were detected:

- *Anigozanthos humilis* subsp. Badgingarra (SD Hopper 7114) (P2) (a provisional ID)
- *Arnocrinum gracillimum* (P3 – ranked P2 at time of survey)
- *Lepidobolus quadratus* (P3)
- *Tetratheca angulata* (P3)

- *Conostephium magnum* (P4)
- *Stylidium aeonioides* (P4).

Eight vegetation types were described for the study. None of the vegetation types was considered to be representative of state or Commonwealth-listed TECs or DBCA-listed PECs.

4.1.1.3 Supplementary Flora, Vegetation and Fauna Survey (Ecologia Environment 2016)

This study included a supplementary survey covering 23.4 ha to inform alteration(s) to the transmission line alignment. The field component of the survey was conducted on 6 October 2016 and included quadrat based floristic survey and vegetation mapping, fauna habitat mapping and targeted tall and significant tree mapping.

No state or Commonwealth-listed TF species were recorded and one DBCA-listed PF species, *Conostephium magnum* (P4), was detected.

Five vegetation types were described for the study. The Banksia Woodland vegetation within the portion of the study area that intersected the Swan Coastal Plan IBRA bioregion was considered to represent the Commonwealth-listed Banksia woodlands of the Swan Coastal Plan TEC because it is situated within the Swan Coastal Plain IBRA bioregion.

4.1.2 Database searches

4.1.2.1 NatureMap

A DBCA and WAM NatureMap search was conducted (Ref. 22-0222NM) for the point -30.593233 S, 115.543956 with a 40 km radius of the survey area that returned a list of 202 conservation significant species known from within the search area. Twenty-seven of these are TF species and 175 are PF species. The 40 km search radius will have picked up many species from coastal habitats and further inland, making this a high number of conservation significant species. The Kwongan is known for a high degree of endemism (Pate and Beard 1984). The results of this search are included in Appendix B.

4.1.2.2 Flora and ecological communities

The DBCA's Threatened and Priority flora database search (Ref: 94-0822FL) and Threatened and Priority ecological communities database search (Ref: 63-0822EC) were undertaken from a point -30.630852, 115.529974 with 25 km buffer radius. The results of this search are mapped in Figure D within a 5 km radius and show that:

- Seven TF and 56 PF species have been recorded proximate to the survey area
- Buffered extent of the Banksia woodlands of the Swan Coastal Plain ecological community intersects the survey area.

4.1.2.3 Protected Matters Search Tool

The DCCEEW Protected Matters Search Tool database was interrogated for MNES that may occur within or proximate to the survey area. The point -30.593233, 115.543956 was used with a 20 km buffer radius of the survey area. The results of this search are included in Appendix C.

Two TECs were recorded as MNES likely to occur in the search area:

1. Banksia woodlands of the Swan Coastal Plain ecological community (EN)
2. Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain (CR).

Twenty-nine TF species were recorded in the 20 km buffer area.

4.2 Field survey

4.2.1 Flora

Two hundred and ninety-four taxa were recorded from 213 relevés by this current survey. These taxa came from 51 families and 138 genera. The most represented families were the Proteaceae (50 species), followed by the Fabaceae (33) and Myrtaceae (32). This representation shows the dominance of the proteaceous/ myrtaceous heaths in the Kwongan. A complete species list is included in Appendix D and a selection of representative relevé data has been provided in Appendix E.

4.2.1.1 Conservation significant taxa

Three state and Commonwealth-listed TF species were recorded by this current survey (Figure F). Table 5 lists these species.

Table 5: Threatened flora species recorded within the survey area

Species	Description/habitat	Image
Hakea megalosperma (VU)	• A spreading, lignotuberous shrub to 2 m. Flowers white-cream/pink. On grey sand and loam on lateritic/ rocky hills • Four records within HL vegetation type (Figure F – Sheet 1)	
Anigozanthos viridis subsp. *terraspectans* (VU)	• A rhizomatous perennial herb, flowers green/ yellow–green August–September. Favours winter-wet depressions • One record within W1 vegetation type (Figure F – Sheet 8)	

Species	Description/habitat	Image
Thelymitra stellata (EN)	• A tuberous perennial herb, flowers October–November. Grows on sandplain over gravel/lateritic loam • Sixteen records within HL vegetation type (Figure F – Sheets 2, 3, 6 and 8)	

Description/Habitat information and images from WAH (1998-)

Eleven DBCA-listed PF species were recorded by this current survey (Figure F). These species are listed in Table 6.

Table 6: Priority flora species recorded within the survey area

Species	Rank	No. records
Stylidium diplotrichum	P2	1
Isopogon autumnalis	P3	51
Lepidobolus quadratus	P3	25
Leucopogon foliosus	P3	3
Stylidium hymenocraspedum	P3	52
Synaphea endothrix	P3	11
Tetratheca angulata	P3	6
Banksia chamaephyton	P4	3
Conostephium magnum	P4	462
Hypolaena robusta	P4	83
Stylidium aeonioides	P4	3

Of the PF species recorded, *Stylidium diplotrichum* (P2) was found to be at the southern edge of its known range. Previously recorded from Lesueur and Alexander Morrison national parks, the record of this species during this current survey is approximately 60 km to the south-west of the next closest record (PERTH 02859106 – WAH 2022). While a range extension for a species is generally regarded as 100 km or more, this record is the southernmost record of a PF species, in an isolated location.

4.2.1.1.1 Other significant flora

Thomasia cognata is a multi-stemmed shrub to 0.7 m high growing in white/grey or yellow sand in coastal locations. An individual was recorded approximately 40 km inland from the closest record near Cervantes (Perth 03150364 – WAH 2022) on the coast. The record from this current survey represents an isolated individual and the edge of a range as well as an unusual habitat (non-coastal). One other record, further north on the banks of the Murchison River inland from Kalbarri (Perth 02489198 – WAH 2022) shows that the species' habitat preference does have some variability, however this specimen should be considered as of conservation significance for the reasons outlined.

4.2.1.2 Introduced species

Twenty introduced taxa were recorded by this current survey. Many of these are widespread weeds in the south-west of Western Australia (WAH 1998-). Several tree species, however, have been introduced as shelter belt and plantation plantings. None of these species are Declared Organisms or WoNS. One introduced species, **Malva pseudolavatera* is here recorded at a range extension of approximately 145 km to the north of its currently known range on FloraBase (WAH 1998-). A complete list of introduced species is included in Appendix D.

4.2.2 Vegetation

Nine vegetation types were described by this current survey. Four are representative of the Proteaceous scrub heath of the Kwongan (HL, HLd, HS and HWS), three represent Banksia woodland vegetation (W1, W2 and W3), one represents degraded parts of the landscape (WD), and one represents a revegetated area (RH). The vegetation types are mapped in relation to the survey area in Figure G.

4.2.2.1 Banksia woodlands of the Swan Coastal Plan TEC consideration

A small portion of the survey area, where Cooljaroo Road crosses the Brand Highway, is situated within the Perth (SWA02) subregion of the Swan Coastal Plain bioregion (Figure F – map book index). The Banksia woodland vegetation within this portion of the survey area is considered to represent the Commonwealth-listed Banksia woodlands of the Swan Coastal Plan TEC because it is situated within the Swan Coastal Plain IBRA bioregion (Figure F – Sheet 10).

Location and physical environment are key diagnostic characteristics of the Commonwealth-listed Banksia woodlands of the Swan Coastal Plain TEC. The Commonwealth's approved conservation advice (DEE 2016) for the TEC identifies:

- Banksia Woodlands of the Swan Coastal Plain TEC primarily occurs in the Swan Coastal Plain IBRA bioregion:
  - This covers the coastal plain from around Jurien Bay south, through Perth, to around Dunsborough. It also includes the Dandaragan Plateau subregion
  - Pockets of the Banksia Woodlands ecological community also extend into the adjacent lower parts of the Darling and Whicher escarpments that lie within the Jarrah Forest IBRA bioregion to the immediate east and south of the Swan Coastal Plain IBRA bioregion.

As most of the Banksia woodland vegetation within the survey area does not occur within the Swan Coastal Plain IRBA bioregion (i.e. it is within the Geraldton Sandplains IBRA bioregion), it does not meet the location and physical environment description identified in the Commonwealth's approved conservation advice. Hence it is not considered to be part of the Commonwealth-listed Banksia Woodlands of the Swan Coastal Plain TEC.

4.2.2.2 Vegetation types

Although nominally described at NVIS Level V (Vegetation type), the descriptions have been expanded to cover variation in the vegetation observed during the field survey. Vegetation types are mapped in Figure G. Tables A-6 and A-7 of Appendix A provide NVIS vegetation structure and height classes used to describe the vegetation types.

4.2.2.2.1 Vegetation type HL

Tall open shrubland of *Xanthorrhoea drummondii* (with occasional emergent *Eucalyptus todtiana* low trees) over mid closed heath including *Banksia carlinoides*, *Banksia fraseri* subsp. *crebra*, *B. glaucifolia*, *B. sphaerocarpa* var. *sphaerocarpa*, *B. shuttleworthiana*, *Calothamnus torulosus*, *Daviesia epiphyllum*, *Eremaea pauciflora*, *Gastrolobium oxylobioides*, *Hakea auriculata*, *H. conchifolia*, *H. incrassata*, *H. lissocarpha*, *Lambertia multiflora* var. *multiflora*, *Melaleuca clavifolia*, *M. trichophylla* and *Petrophile shuttleworthiana*, *P. striata* over low open heath of *Babingtonia grandiflora*, *Hibbertia hypericoides* subsp. *hypericoides*, *Stenanthemum reissekii*, *Trymalium ledifolium* over open sedgeland including *Caustis dioica*, *Ecdeiocolea monostachya*, *Lepidosperma pubisquameum*, *Mesomelaena pseudostygia*, *Tetraria octandra*,

open forbland including *Conostylis setigera* subsp. *setigera*, *Haemodorum venosum*, *Orianthera spermacocea*, *Podotheca gnaphalioides*, with isolated grasses of *Austrostipa compressa*, *A. hemipogon*, *Neurachne alopecuroidea* on lateritic gravel and shallow grey sandy loam or loam over laterite (Plates 1 and 2).

Plate 1: Vegetation type HL

Plate 2: Vegetation type HL

4.2.2.2.2 Vegetation type HLd

Hakea auriculata, *H. lissocarpha*, *Petrophile shuttleworthiana*, *Xanthorrhoea drummondii* mid open/sparse heathland over **Avena barbata*, **Briza maxima*, *Neurachne alopecuroidea*, *Rytidosperma setaceum* open grassland, *Haemodorum venosum*, *Opercularia vaginata*, *Podotheca gnaphalioides*, *Ptilotus polystachyus*, **Ursinia anthemoides* forbland and *Caustis dioica*, *Lepidosperma tenue*, *Mesomelaena pseudostygia*, *Schoenus caespititius* sparse sedgeland on exposed laterite (a variable unit, depending on the degree of degradation) (Plates 3 and 4).

Plate 3: Vegetation type HLd

Plate 4: Vegetation type HLd

4.2.2.2.3 Vegetation type HS

Allocasuarina humilis, *Banksia candolleana*, *B. shuttleworthiana*, *Conospermum stoechadis*, *Hakea conchifolia*, *H. flabellifolia*, *H. ruscifolia*, *Eremaea pauciflora*, *Jacksonia floribunda*, *Leptospermum erubescens*, *Melaleuca clavifolia* mid open shrubland over low heathland including *Acacia stenoptera*, *Banksia sphaerocarpa*, *Calytrix leschenaultii*, *Dampiera spicigera*, *Daviesia nudiflora*, *Hibbertia hypericoides*, *Petrophile macrostachya*, very open sedgeland of *Alexgeorgea nitens*, *Caustis dioica*, *Lepidobolus preissianus*, *Mesomelaena pseudostygia*, *Tetraria octandra* and open forbland including *Anigozanthos humilis* subsp. *humilis*, *Conostylis setigera*, *Drosera porrecta*, *Patersonia occidentalis*, *Stylidium crossocephalum*, *S. purpureum*, and isolated grasses including *Neurachne alopecuroidea* on yellow-grey loamy sand. (May contain isolated *Eucalyptus todtiana*, *Banksia attenuata* or *B. menziesii* low trees) (Plates 5 and 6).

Plate 5: Vegetation type HS

Plate 6: Vegetation type HS

4.2.2.2.4 Vegetation type HWS

Banksia attenuata, *B. menziesii* (*Eucalyptus todtiana*) very low open woodland/low woodland over *Allocasuarina humilis*, *Banksia candolleana*, *B. shuttleworthiana*, *Conospermum stoechadis*, *Hakea conchifolia*, *H. flabellifolia*, *H. ruscifolia*, *Eremaea pauciflora*, *Jacksonia floribunda*, *Leptospermum erubescens, Melaleuca clavifolia* mid open shrubland over low heathland including *Acacia stenoptera*, *Banksia sphaerocarpa*, *Calothamnus sanguineus*, *Calytrix leschenaultii*, *Dampiera spicigera*, *Daviesia nudiflora* subsp. *hirtella*, *Grevillea eriostachya*, *Hibbertia hypericoides*, *Petrophile macrostachya*, very open sedgeland of *Alexgeorgea nitens*, *Caustis dioica*, *Lepidobolus preissianus, Mesomelaena pseudostygia*, *Tetraria octandra* and open forbland including *Anigozanthos humilis*, *Conostylis setigera* subsp. *setigera*, *Drosera porrecta, Patersonia occidentalis*, *Stylidium crossocephalum*, *S. purpureum*, and isolated grasses including *Austrostipa elegantissima, Neurachne alopecuroidea* on yellow-grey loamy sand (Plates 7 and 8).

Plate 7: Vegetation type HWS

Plate 8: Vegetation type HWS

4.2.2.2.5 Vegetation type W1

Eucalyptus todtiana, Banksia attenuata, *B. menziesii*, *Nuytsia floribunda* low open woodland over *Adenanthos cygnorum* subsp. *cygnorum* tall sparse shrubland over open mid heathland of *Banksia shuttleworthiana*, *Eremaea pauciflora*, *Conospermum stoechadis*, *Conostephium magnum* (P4), *C. preissii*, *Hakea ruscifolia*, *Jacksonia nutans, Lysinema pentapetalum*, *Pimelea sulphurea, Stirlingia latifolia* over low open heathland of *Babingtonia grandiflora*, *Bossiaea eriocarpa*, *Darwinia sanguinea*, *Hibbertia hypericoides* subsp. *hypericoides*, *Petrophile linearis*, *Synaphea spinulosa* subsp. *spinulosa* over sparse/open forbland including *Anigozanthos humilis* subsp. *humilis*, *Blancoa canescens*, *Burchardia congesta*, *Dasypogon obliquifolius*, *Patersonia occidentalis*, *Stylidium purpureum, Trachymene pilosa, Xanthosia huegelii* and open sedgeland including *Alexgeorgea nitens*, *Lepidobolus preissianus* and *Lyginia barbata* on grey sandy loam or loamy sand. A variable unit, with one or more of the overstorey species often not present (Plates 9 and 10).

Plate 9: Vegetation type W1

Plate 10: Vegetation type W1

4.2.2.2.6 Vegetation type W2

Banksia menziesii, *B. attenuata*, *Eucalyptus todtiana* low woodland over mid shrubland of *Conospermum crassinervium*, *Conostephium magnum* (P4), *Eremaea pauciflora, Leptospermum erubescens*, *Melaleuca ciliosa*, *Verticordia ovalifolia* over low open shrubland of *Hibbertia subvaginata*, *Petrophile linearis* and open forbland of *Dasypogon obliquifolius*, *Opercularia vaginata*, *Lagenophora huegelii*, *Stylidium* spp. on grey sand in swales (Plates 11 and 12).

Plate 11: Vegetation type W2

Plate 12: Vegetation type W2

4.2.2.2.7 Vegetation type W3

Banksia attenuata or *Eucalyptus todtiana* low open woodland/isolated trees over *Allocasuarina humilis*, *Calothamnus quadrifidus* subsp. *quadrifidus*, *Leptospermum erubescens*, *Xanthorrhoea preissii* tall open shrubland over mid shrubland that may include *Babingtonia grandiflora*, *Banksia shuttleworthiana*, *Calothamnus sanguineus*, *Conospermum stoechadis*, *Hakea ruscifolia*, *Hibbertia hypericoides*, *Lambertia multiflora* var. *multiflora*, *Petrophile shuttleworthiana* over *Waitzia suaveolens*, *Anigozanthos humilis*, *Conostylis setigera* open forbland and *Mesomelaena pseudostygia* open sedgeland on grey sandy clay loam (Plates 13 and 14).

Plate 13: Vegetation type W3

Plate 14: Vegetation type W3

4.2.2.2.8 Vegetation type Wd

Eucalyptus todtiana woodland/open woodland over pasture species including **Bromus diandrus*, **Hordeum leporinum*, **Malva pseudolavatera* and **Raphanus raphanistrum* (Plate 15).

Plate 15: Vegetation type Wd

4.2.2.2.9 Vegetation type RH

Eremaea pauciflora rehabilitation monoculture (Plate 16).

Plate 16: Vegetation type RH

4.2.2.3 Vegetation condition

Most of the survey area was in paddocks or plantations, and these are given a condition rating of “Cleared” or “Completely Degraded”, with stands of remnant trees in “Degraded” to “Completely Degraded” condition due to historical grazing. Many small patches of remnant vegetation in the paddocks are in “Good” to “Degraded” condition, while roadside vegetation is largely rated as “Excellent” condition, although this rating can depend on the size of the patch and its proximity to cropped areas.

Vegetation within the alternative transmission line alignment is generally rated as “Excellent” condition, with a small section at the eastern end rated as “Very Good” condition and the most western section rated as “Good” to “Excellent” condition, depending on proximity to disturbance.

Figure H maps the vegetation condition recorded within the survey area, with the physical extent of the relevant condition ratings presented in Table 7.

Table 7: Mapped areas of each condition rating

Condition	Code	Total area (ha)	Total area (%)
Excellent	E	66	4.6
Very Good	VG	8	0.5
Good	G	5	0.4
Degraded	D	3	0.2
Completely Degraded (inc. Cleared)	CD	1,363	94.3
Total		**1,445**	**100**

5 DISCUSSION

The field survey was undertaken at an appropriate time of year to capture the greatest number of taxa in flower or bud, therefore aiding in the identification of species recorded. Rainfall was above average for the survey area in 2021 and 2022 resulting in good flowering in both annual and perennial species.

5.1 Flora

Two hundred and ninety-four taxa were recorded by this current survey, with the Proteaceae dominant followed by the Fabaceae and Myrtaceae. These families are known to be dominant in the Kwongan, and the floristic representation can be considered to be what would be expected in a survey of this nature in the Geraldton Sandplains IBRA bioregion. Previous studies in the area that were reviewed for background to this current survey show similar floristic assemblages.

5.1.1 Conservation significant species

Three state and Commonwealth-listed TF species were recorded:

1. *Hakea megalosperma* (VU): Four records were made of this species (three of which are just outside of the survey area). The plant itself is a spreading lignotuberous shrub to 2 m, growing in gravelly/rocky locations on slopes.
2. *Anigozanthos viridis* subsp. *terraspectans* (VU): One record of this species was recorded within Banksia woodland vegetation.
3. *Thelymitra stellata* (EN): Sixteen individuals of this species were recorded. The presence of orchid species can be under recorded as they are cryptic in the context that not all individuals flower in any given year.

Eleven DBCA-listed PF species were recorded. One of these, *Stylidium diplotrichum* (P2) is a record representing the edge of the species' range, placing it in an isolated position in remnant vegetation. While this species has conservation significance due to the PF ranking, its isolation and range extension may support and even enhance its significance.

A second species, without a conservation ranking, can also be considered to have significance for the same reasons. *Thomasia cognata* is a multi-stemmed shrub to 0.7 m from the Malvaceae family. Known primarily from coastal locations south of Perth, this record is in an isolated location representative of its range and in an uncommon habitat. One record to the north of this current survey is located on the banks of the Murchison River east of Kalbarri, which shows that the species does have some variation in its habitat choices rather than just coastal locations. Nevertheless, this record is significant for its location and isolation.

5.1.2 Introduced species

Twenty introduced taxa were recorded by this current survey, most of which are widespread weeds in the south-west of Western Australia while some are native tree species planted as shelter belt and plantation trees. None of these species are Declared Organisms or WoNS.

The record of **Malva pseudolavatera* represents a range extension of approximately 145 km to the north of its currently known range on FloraBase. This range extension may be significant in the context of understanding the distribution behaviour of the weed, with implications for its control in the state.

5.2 Vegetation

5.2.1 Vegetation types

Nine vegetation types were described by this current survey. Four are representative of the Proteaceous scrub heath of the Kwongan (HL, HLd, HS and HWS), three represent Banksia woodland vegetation (W1, W2 and W3), one represents degraded parts of the landscape (WD), and one represents a revegetated area (RH).

A small portion of the survey area, where Cooljaroo Road crosses the Brand Highway, is situated within the Perth (SWA02) subregion of the Swan Coastal Plain bioregion. The Banksia Woodland vegetation within this portion of the survey area is considered to represent the Commonwealth-listed Banksia woodlands of the Swan Coastal Plan TEC because it is situated within the Swan Coastal Plain IBRA bioregion.

No other state or Commonwealth-listed TECs or DBCA listed PECs were identified within the survey area.

5.2.2 Vegetation condition

Most of the survey area was in paddocks or plantations, and these are given a condition rating of “Cleared” or “Completely Degraded” condition, with stands of remnant trees in “Degraded” to “Completely Degraded” condition due to historical grazing. Many small patches of remnant vegetation in the paddocks are in “Good” to “Degraded” condition, while roadside vegetation is largely rated as “Excellent” condition, although this rating can depend on the size of the patch and its proximity to cropped areas.

Vegetation within the alternative transmission line alignment is generally rated as “Excellent” condition, with a small section at the eastern end rated as “Very Good” condition and the most western section rated as “Good” to “Excellent” condition, depending o**n** proximity to disturbance.

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Figures

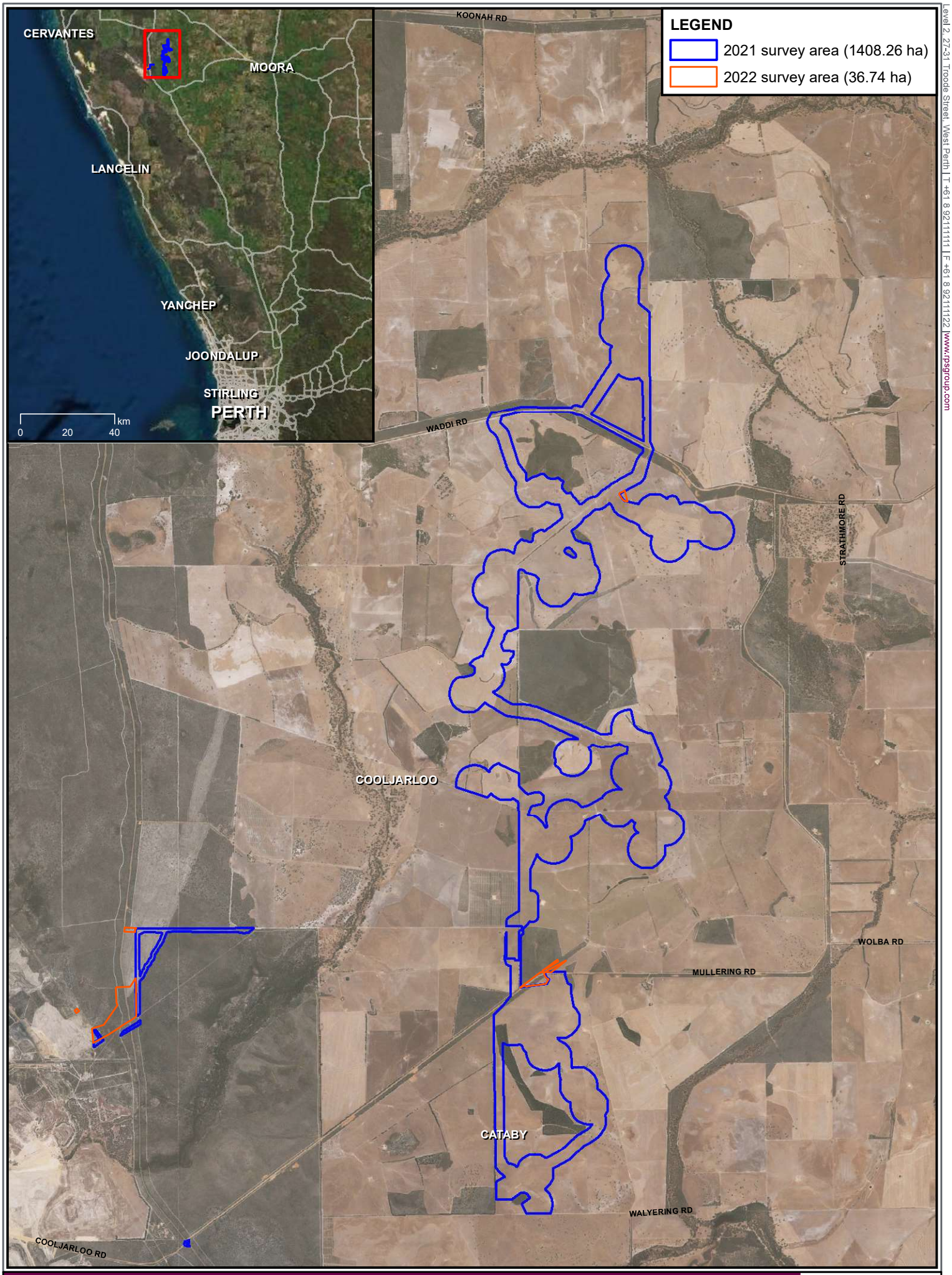

Figure A

Site location

GDA 1994 MGA Zone 50

0 0.5 1 2 km

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Date: 28.09.22
Scale: Map 1:75,000 Overview 1:2,000,000 @ A4
Created by: QS
Source: Imagery - Landgate

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Document Path: \\rpsperfs02\cartography\Jobs\L_Jobs\L18167 - Tip Height Waddi Wind Farm\Figures EP1749-001 Flora and Fauna FF\EP1749-001_FV_FigA_Site Location_220928.mxd

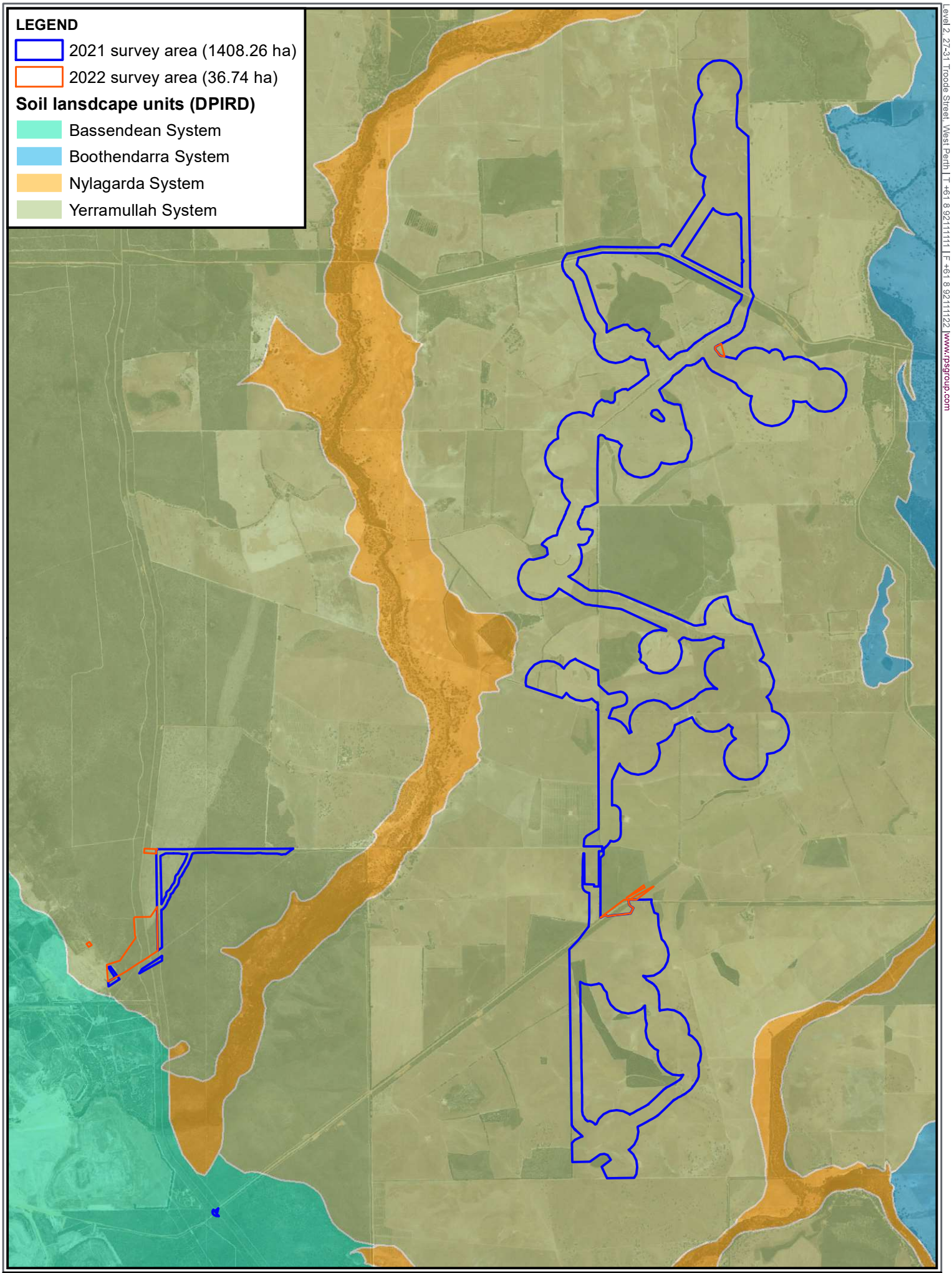

Figure B

Soil landscape units

GDA2020 MGA Zone 50

0 500 1,000 2,000 m

Job Number: EP1749-001 FF (L18167)
Date: 28.09.22
Scale: Map 1:65,000 @ A4
Created by: QS
Source: Imagery - Landgate

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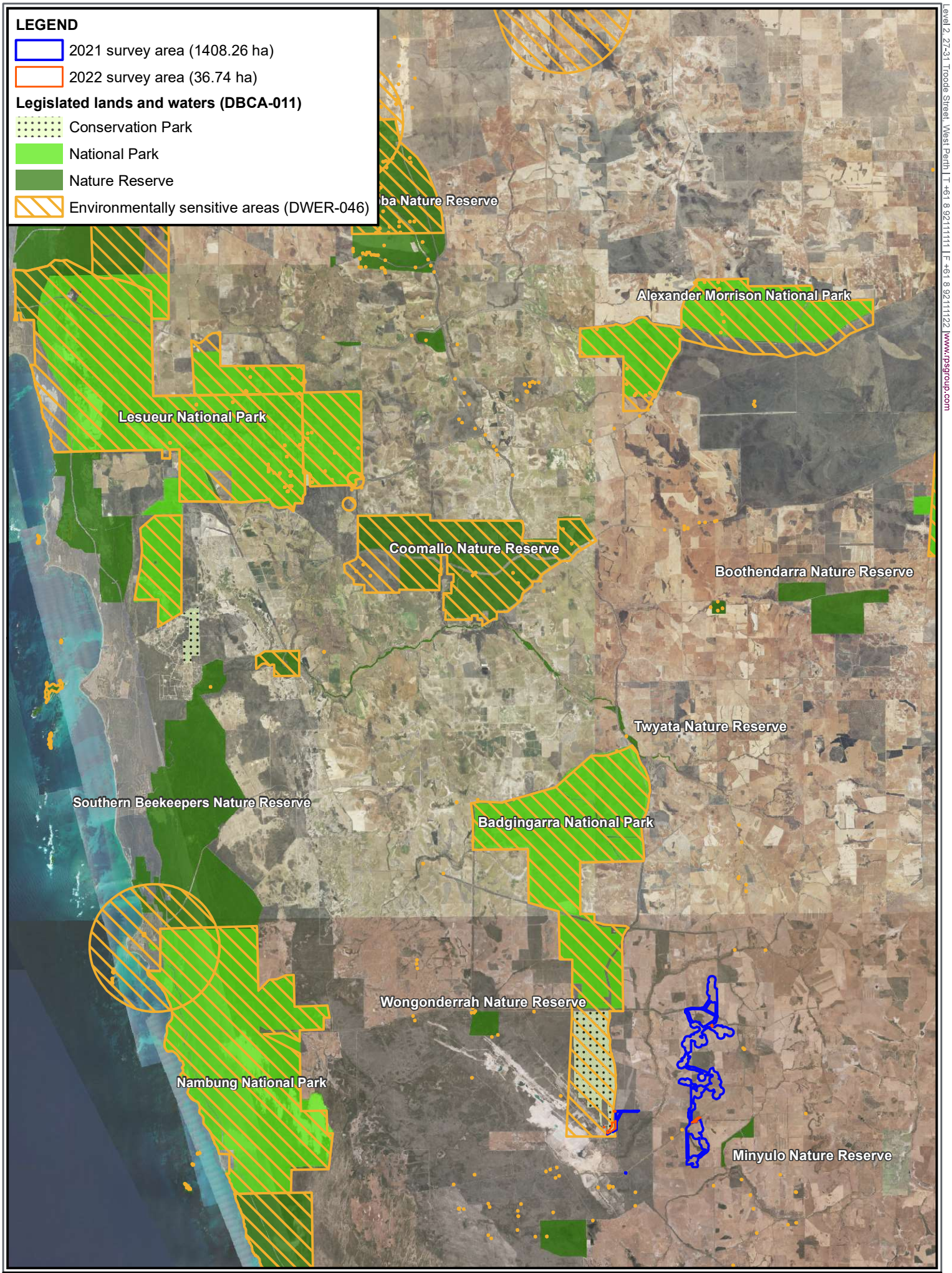

Figure C
Regional conservation reserves and environmentally sensitive areas

GDA2020 MGA Zone 50

0 3 6 12 km

Job Number: EP1749-001 FF (L18167-002)
Date: 28.09.22
Scale: Map 1:380,000 @ A4
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Source: Imagery - Landgate 2021

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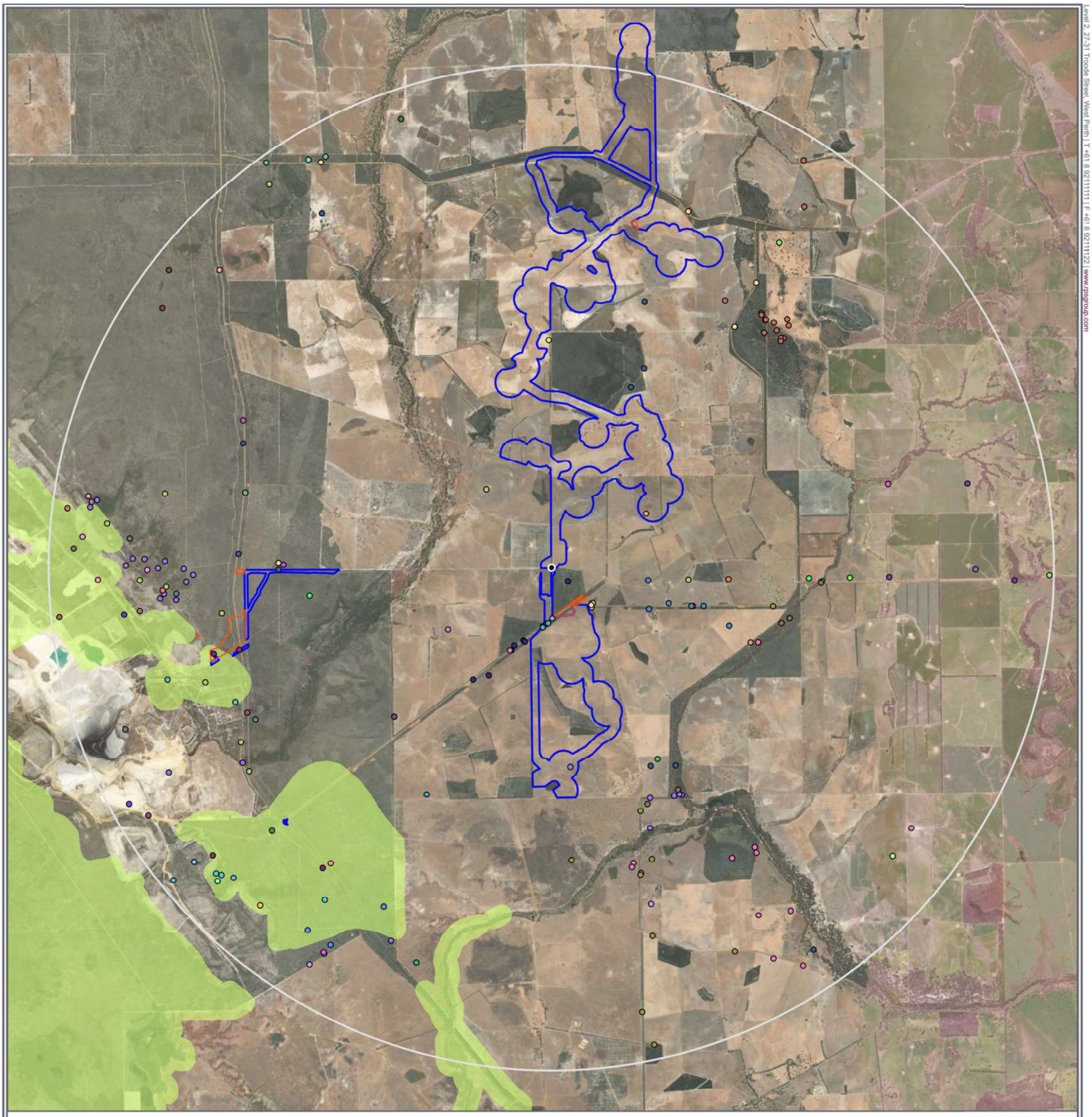

LEGEND

- 2021 survey area (1408.26 ha)
- 2022 survey area (36.74 ha)
- Central point
- 10km within central point

DBCA Threatened and Priority Ecological Community data

- Banksia Woodlands of the Swan Coastal Plain ecological community

DBCA Threatened and Priority flora data

- *Acacia forrestiana*(T)
- *Acacia splendens*(T)
- *Andersonia gracilis*(T)
- *Anigozanthos viridis* subsp. *terraspectans*(T)
- *Grevillea calliantha*(T)
- *Hakea megalosperma*(T)
- *Thelymitra stellata*(T)
- *Babingtonia delicata*(P1)
- *Baeckea sp. Dandaragan* (G. Paczkowska s.n. PERTH 08245606)(P1)
- *Drosera leioblastus*(P1)
- *Drosera leucostigma*(P1)
- *Grevillea synapheae* subsp. A Flora of Australia (S.D. Hopper 6333)(P1)
- *Grevillea synapheae* subsp. *minyulo*(P1)
- *Lasiopetalum rupicola*(P1)
- *Anigozanthos humilis* subsp. *Badgingarra* (S.D. Hopper 7114)(P2)
- *Cristonia biloba* subsp. *pubescens*(P2)
- *Chordifex reseminans*(P2)
- *Eucalyptus abdita*(P2)
- *Hypocalymma serrulatum*(P2)
- *Lyginia excelsa*(P2)
- *Petrophile clavata*(P2)
- *Thelymitra pulcherrima*(P2)
- *Acacia epacantha*(P3)
- *Angianthus micropodioides*(P3)
- *Arnocrinum gracillimum*(P3)
- *Babingtonia urbana*(P3)
- *Banksia nana*(P3)
- *Beaufortia bicolor*(P3)
- *Beyeria gardneri*(P3)
- *Dampiera tephrea*(P3)
- *Desmocladus biformis*(P3)
- *Desmocladus nodatus*(P3)
- *Drosera prophylla*(P3)
- *Gompholobium gairdnerianum*(P3)
- *Grevillea thyrsoides subsp. thyrsoides*(P3)
- *Guichenotia alba*(P3)
- *Hopkinsia anoectocolea*(P3)
- *Hypocalymma tetrapterum*(P3)
- *Isopogon autumnalis*(P3)
- *Isopogon panduratus* subsp. *palustris*(P3)
- *Jacksonia carduacea*(P3)
- *Lepidobolus quadratus*(P3)
- *Leucopogon foliosus*(P3)
- *Persoonia rudis*(P3)
- *Schoenus pennisetis*(P3)
- *Stylidium hymenocraspedum*(P3)
- *Synaphea endothrix*(P3)
- *Tetratheca angulata*(P3)
- *Anigozanthos humilis* subsp. *chrysanthus*(P4)
- *Conostephium magnum*(P4)
- *Cyanothamnus tenuis*(P4)
- *Desmocladus elongatus*(P4)
- *Eucalyptus macrocarpa* subsp.*elachantha*(P4
- *Eucalyptus pendens*(P4)
- *Eucalyptus x carnabyi*(P4)
- *Grevillea saccata*(P4)
- *Hibbertia helianthemoides*(P4)
- *Hypolaena robusta*(P4)
- *Schoenus griffinianus*(P4)
- *Stylidium aeonioides*(P4)
- *Thelymitra apiculata*(P4)
- *Thysanotus glaucus*(P4)
- *Verticordia lindleyi* subsp. *lindleyi*(P4)

Figure D

DBCA flora and ecological community database searches

GDA 1994 MGA Zone 50

0 0.5 1 2 km

Job Number: EP1749-001 FF (L18167-005)
Date: 28.09.22
Scale: 1:75,000 @ A3
Created by: QS
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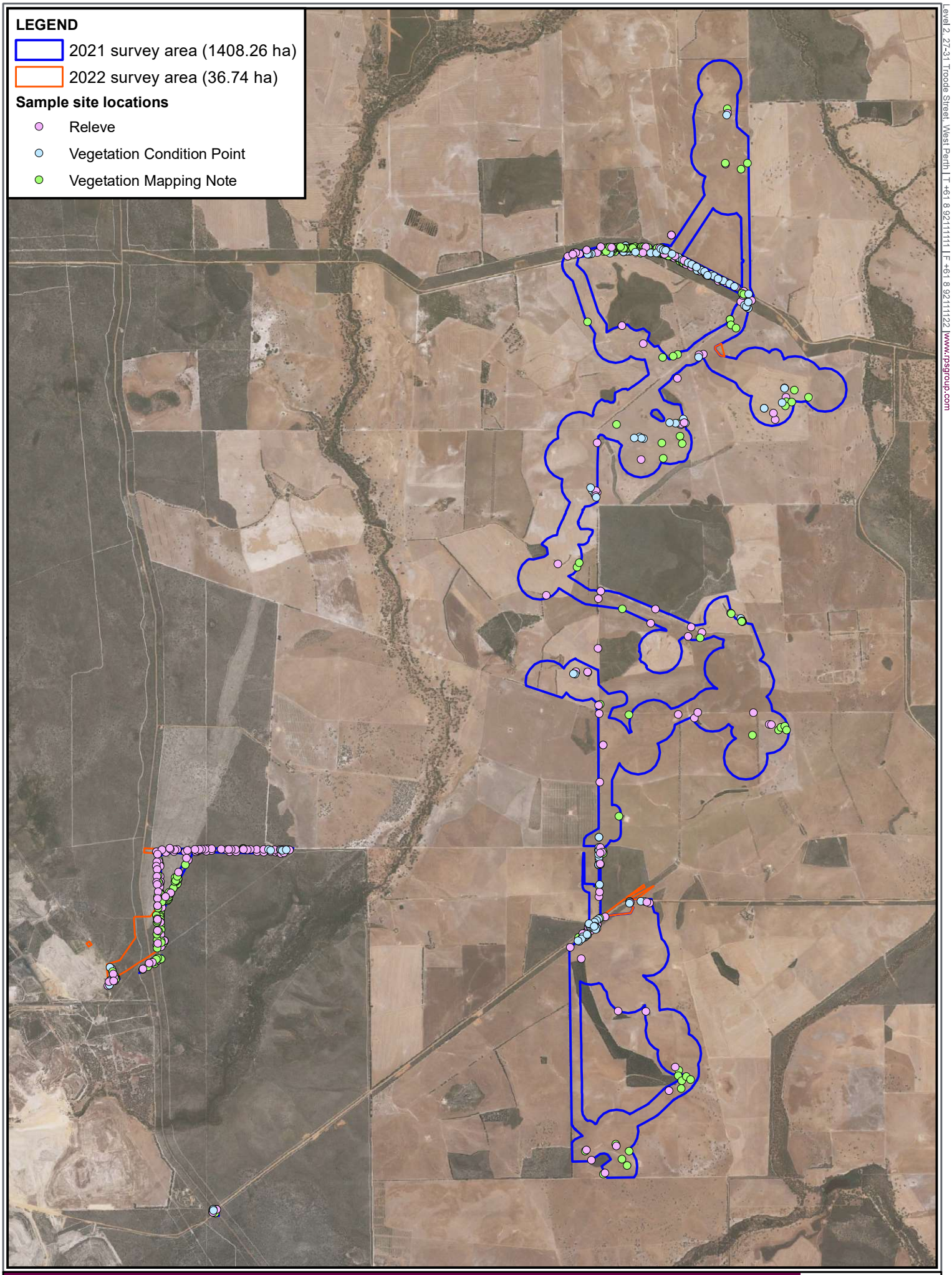

Figure E

Sample site locations

GDA2020 MGA Zone 50

0 500 1,000 2,000 m

Job Number: EP1749-001 FF (L18167)
Date: 28.09.22
Scale: Map 1:65,000 @ A4
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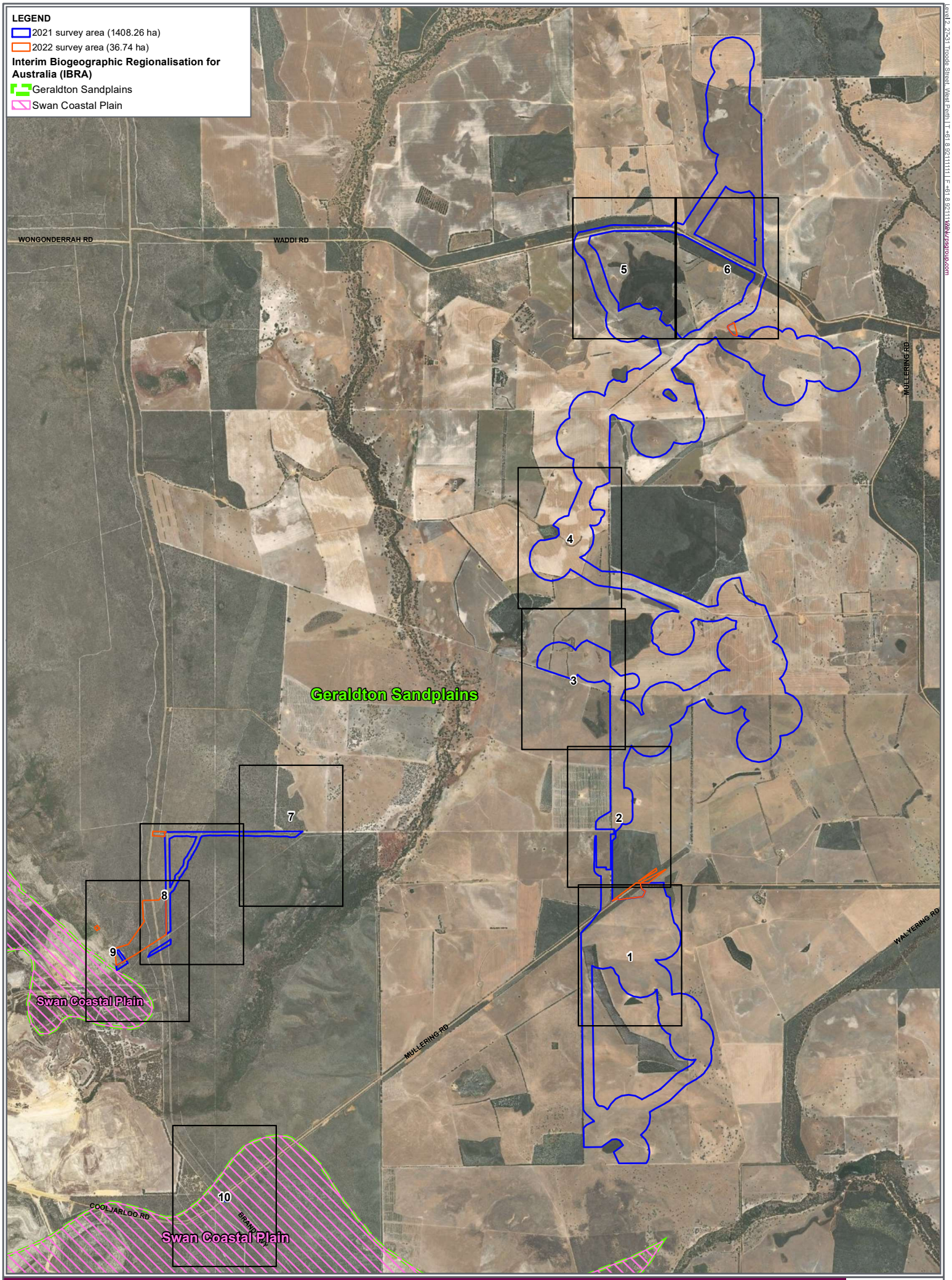

Figure F
Conservation significant flora and ecological community records

GDA 1994 MGA Zone 50
0 0.5 1 2 km

Job Number: EP1749-001 FV (L18167-005)
Date: 28.09.22
Scale: 1:45,000 @ A3
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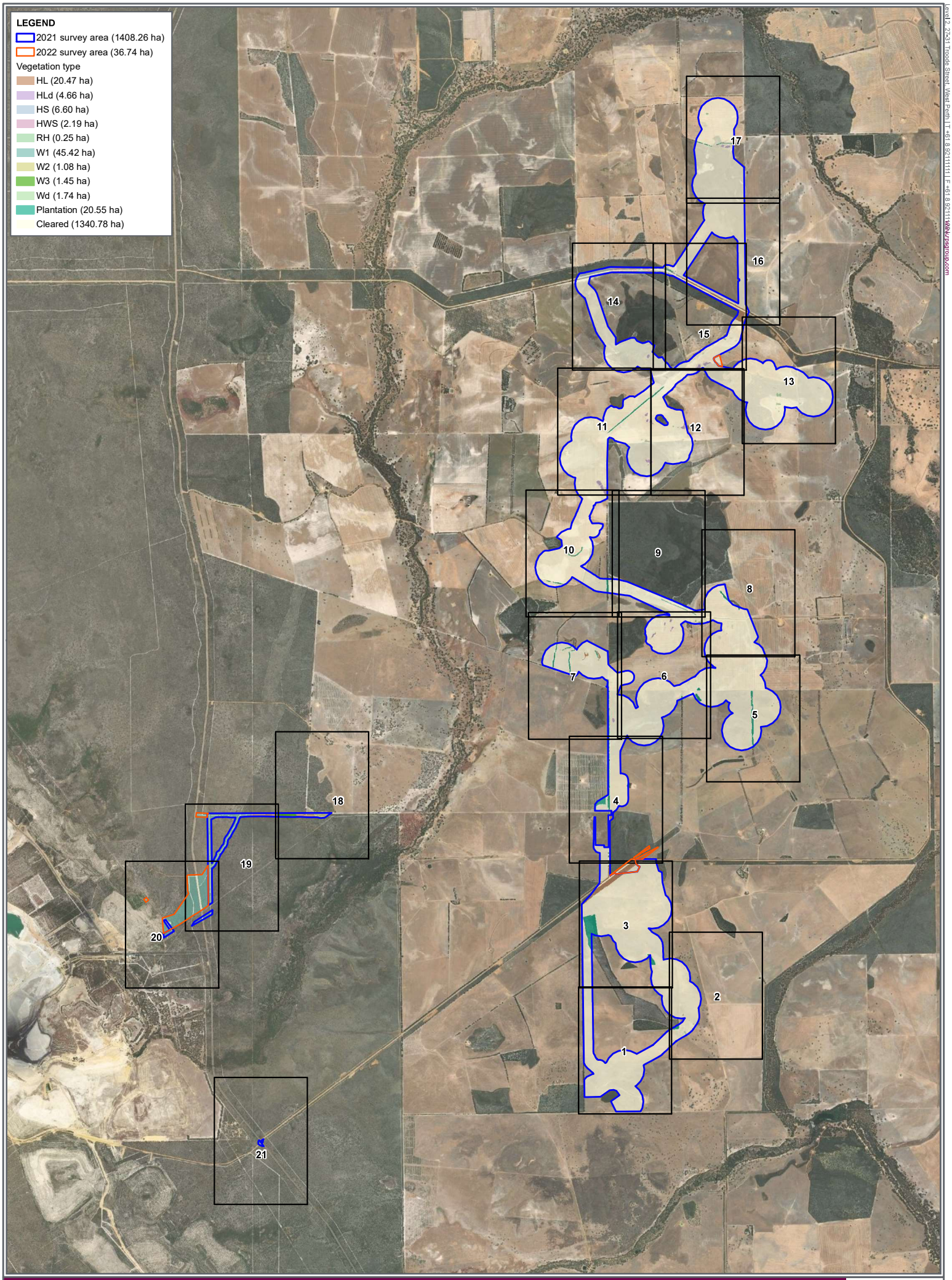

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Figure G

Vegetation type – map book index

GDA 1994 MGA Zone 50

0 0.5 1 2 km

Job Number: EP1749-001 FV (L18167-005)
Date: 12.01.23
Scale: 1:50,000 @ A3
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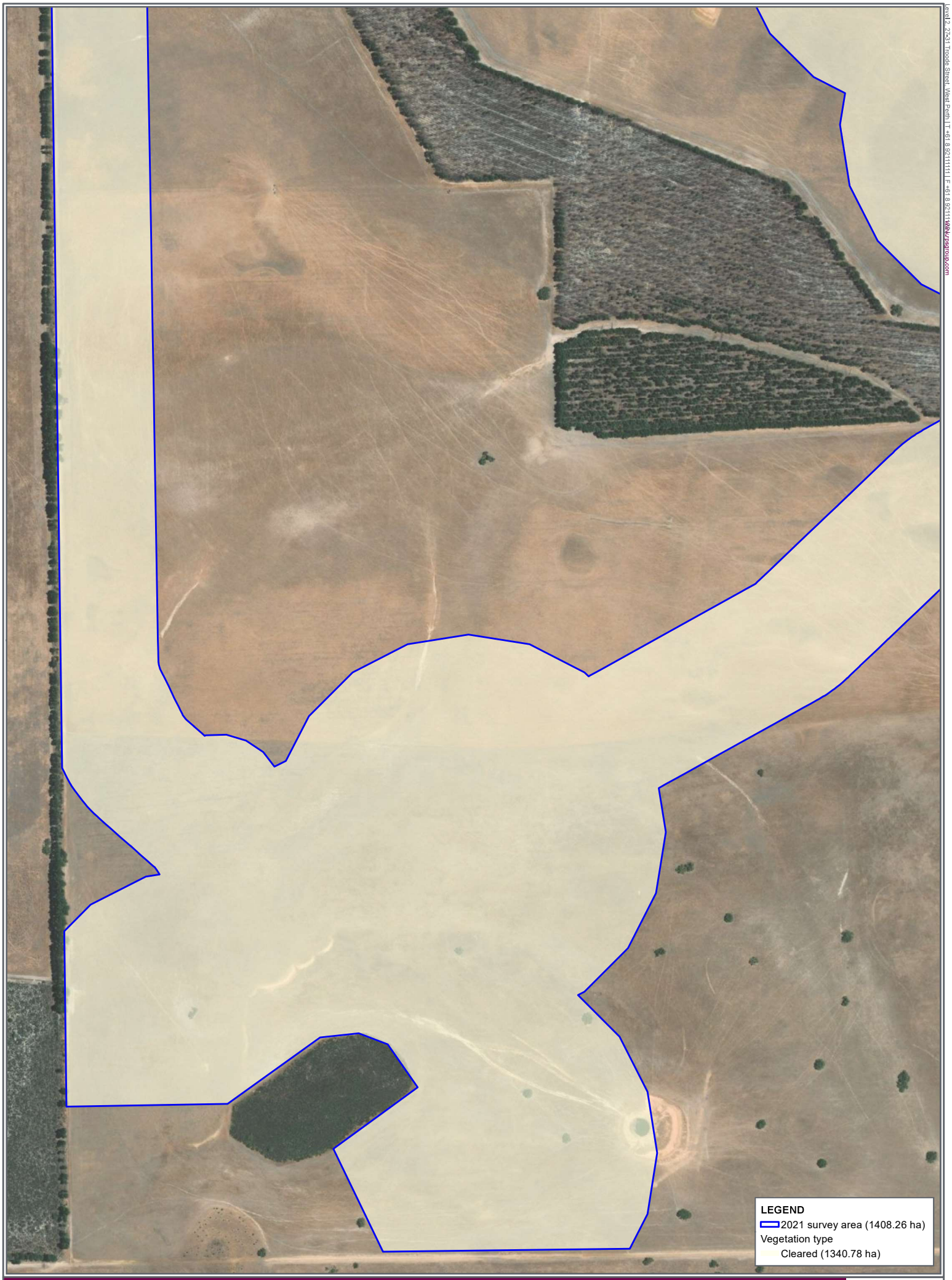

Figure G
Sheet 1 of 21
Vegetation type – map book

GDA 1994 MGA Zone 50

0 50 100 200 m

Job Number: EP1749-001 FV (L18167-005)
Date: 12.01.23
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Figure G
Sheet 2 of 21
Vegetation type – map book

GDA 1994 MGA Zone 50
0 50 100 200 m

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Date: 12.01.23
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Figure G
Sheet 3 of 21
Vegetation type – map book

GDA 1994 MGA Zone 50

0 50 100 200 m

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Date: 12.01.23
Scale: 1:5,000 @ A3
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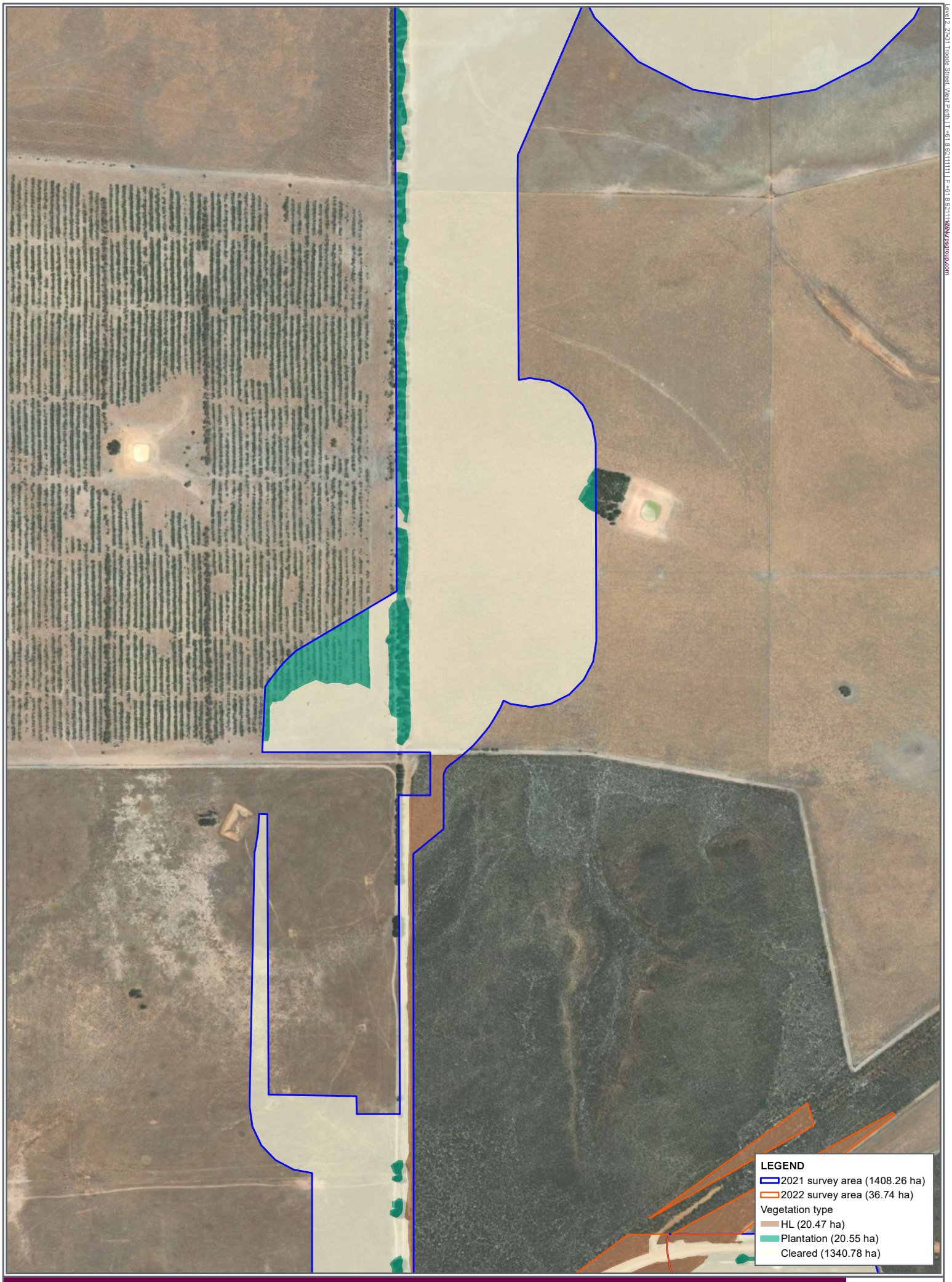

Figure G
Sheet 4 of 21
Vegetation type – map book

GDA 1994 MGA Zone 50

0 50 100 200 m

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Figure G
Sheet 5 of 21
Vegetation type – map book

GDA 1994 MGA Zone 50

0 50 100 200 m

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Figure G
Sheet 6 of 21
Vegetation type – map book

GDA 1994 MGA Zone 50

0 50 100 200 m

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Figure G
Sheet 7 of 21
Vegetation type – map book

GDA 1994 MGA Zone 50

0 50 100 200 m

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Figure G
Sheet 8 of 21
Vegetation type – map book

GDA 1994 MGA Zone 50

0 50 100 200 m

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Figure G
Sheet 9 of 21
Vegetation type – map book

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Figure G
Sheet 10 of 21
Vegetation type – map book

GDA 1994 MGA Zone 50

0 50 100 200 m

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Figure G
Sheet 11 of 21
Vegetation type – map book

GDA 1994 MGA Zone 50

0 50 100 200 m

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Figure G
Sheet 12 of 21
Vegetation type – map book

GDA 1994 MGA Zone 50

0 50 100 200 m

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Figure G
Sheet 13 of 21
Vegetation type – map book

GDA 1994 MGA Zone 50
0 50 100 200 m

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Figure G
Sheet 14 of 21
Vegetation type – map book

GDA 1994 MGA Zone 50

0 50 100 200 m

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Figure G
Sheet 15 of 21
Vegetation type – map book

GDA 1994 MGA Zone 50

0 50 100 200 m

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Figure G
Sheet 16 of 21
Vegetation type – map book

GDA 1994 MGA Zone 50
0 50 100 200 m

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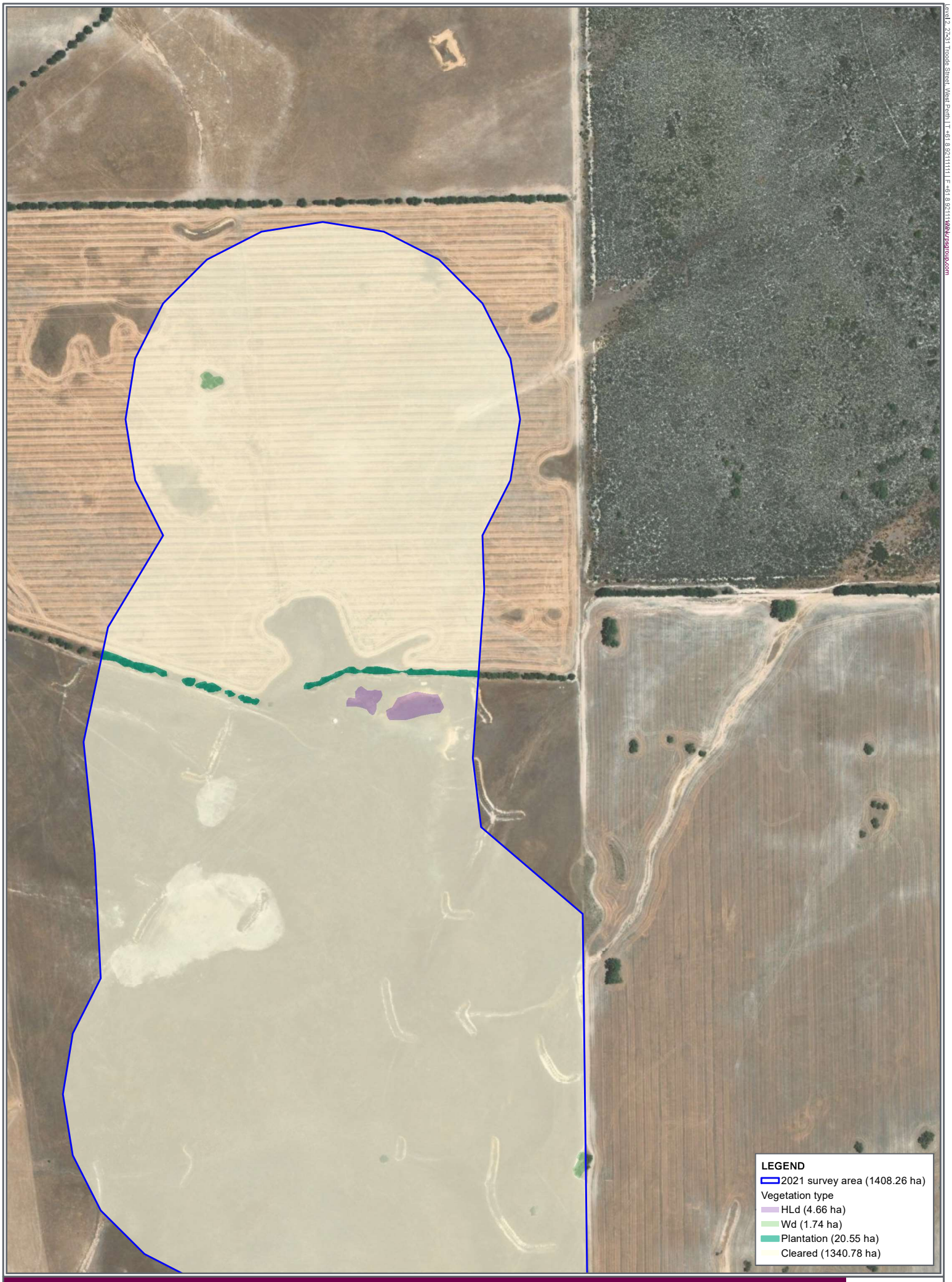

Figure G
Sheet 17 of 21
Vegetation type – map book

GDA 1994 MGA Zone 50

0 50 100 200 m

Job Number: EP1749-001 FV (L18167-005)
Date: 12.01.23
Scale: 1:5,000 @ A3
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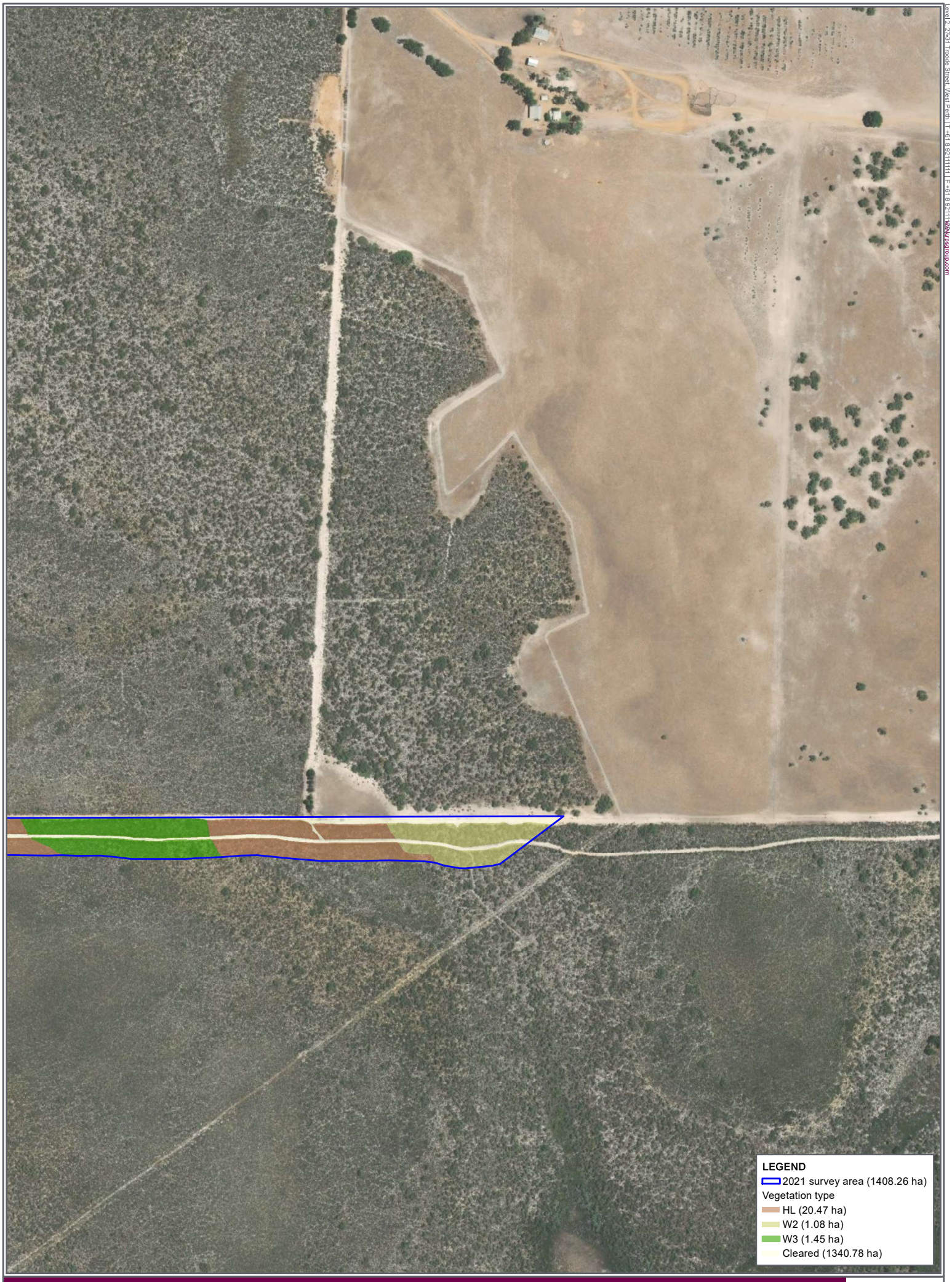

Figure G
Sheet 18 of 21
Vegetation type – map book

GDA 1994 MGA Zone 50
0 50 100 200 m

Job Number: EP1749-001 FV (L18167-005)
Date: 12.01.23
Scale: 1:5,000 @ A3
Created by: QS
Source: Orthophoto - Esri World Imagery 2022

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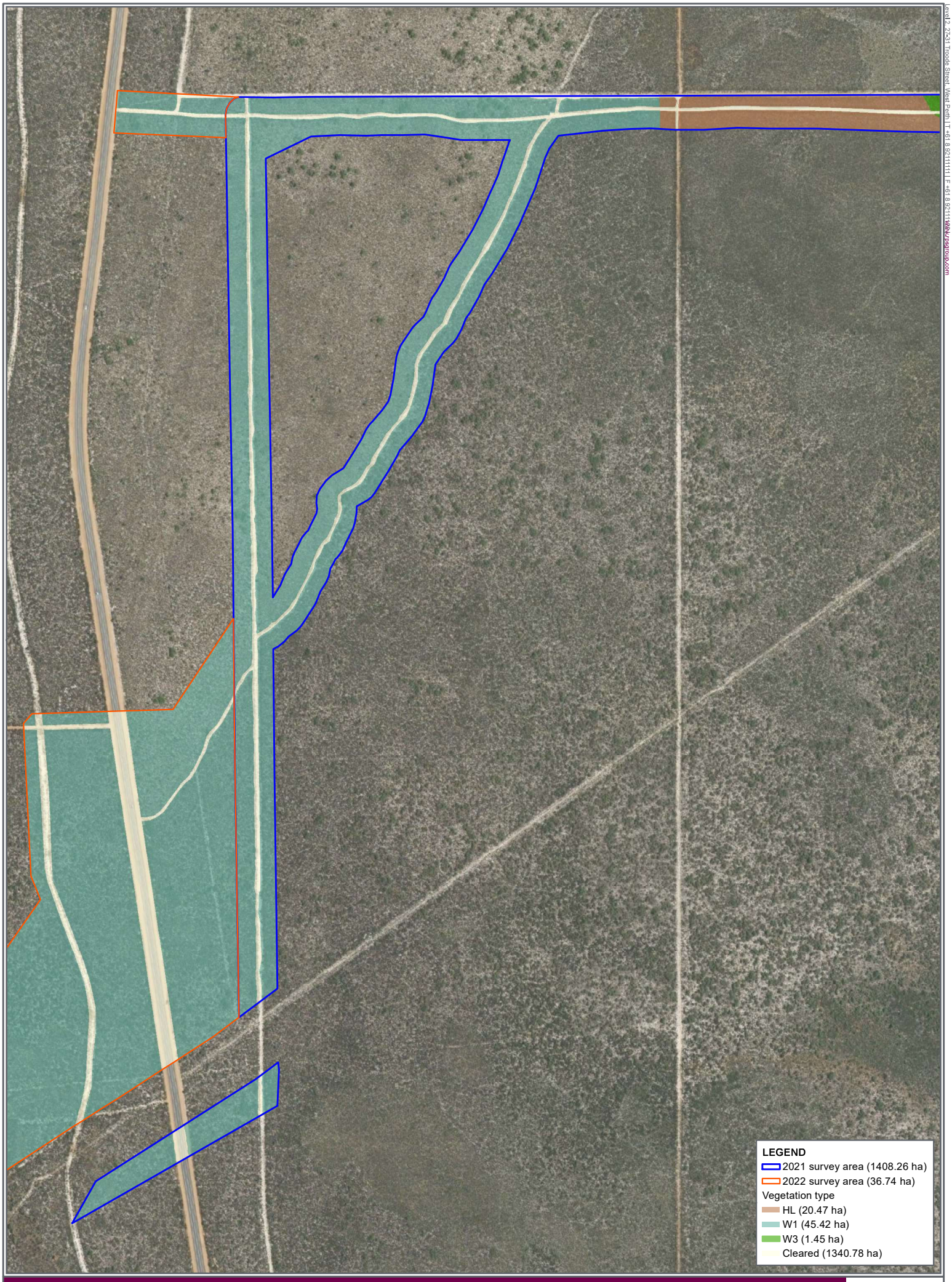

Figure G
Sheet 19 of 21
Vegetation type – map book

GDA 1994 MGA Zone 50
0 50 100 200 m

Job Number: EP1749-001 FV (L18167-005)
Date: 12.01.23
Scale: 1:5,000 @ A3
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Source: Orthophoto - Esri World Imagery 2022

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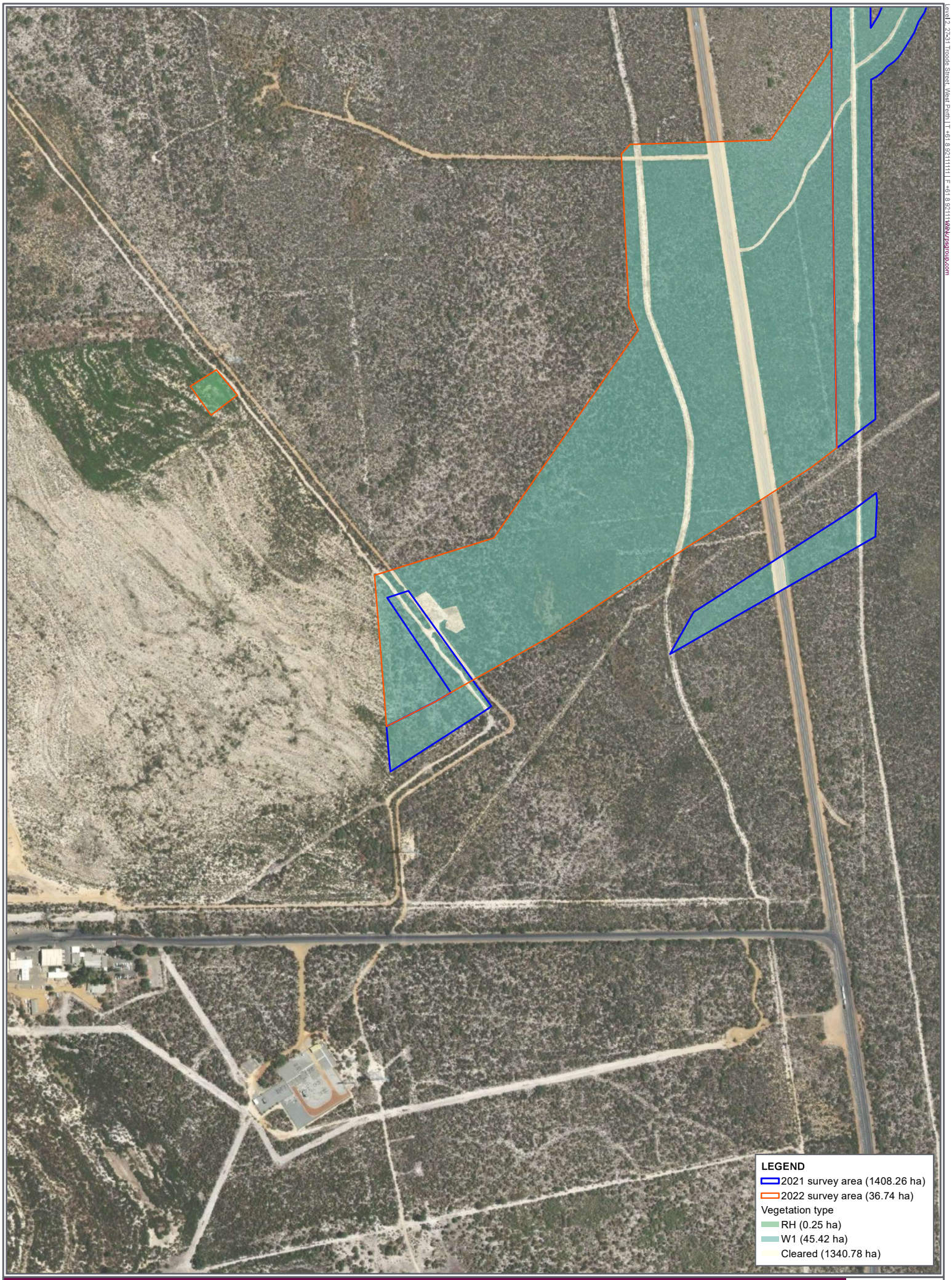

Figure G
Sheet 20 of 21
Vegetation type – map book

GDA 1994 MGA Zone 50
0 50 100 200 m

Job Number: EP1749-001 FV (L18167-005)
Date: 12.01.23
Scale: 1:5,000 @ A3
Created by: QS
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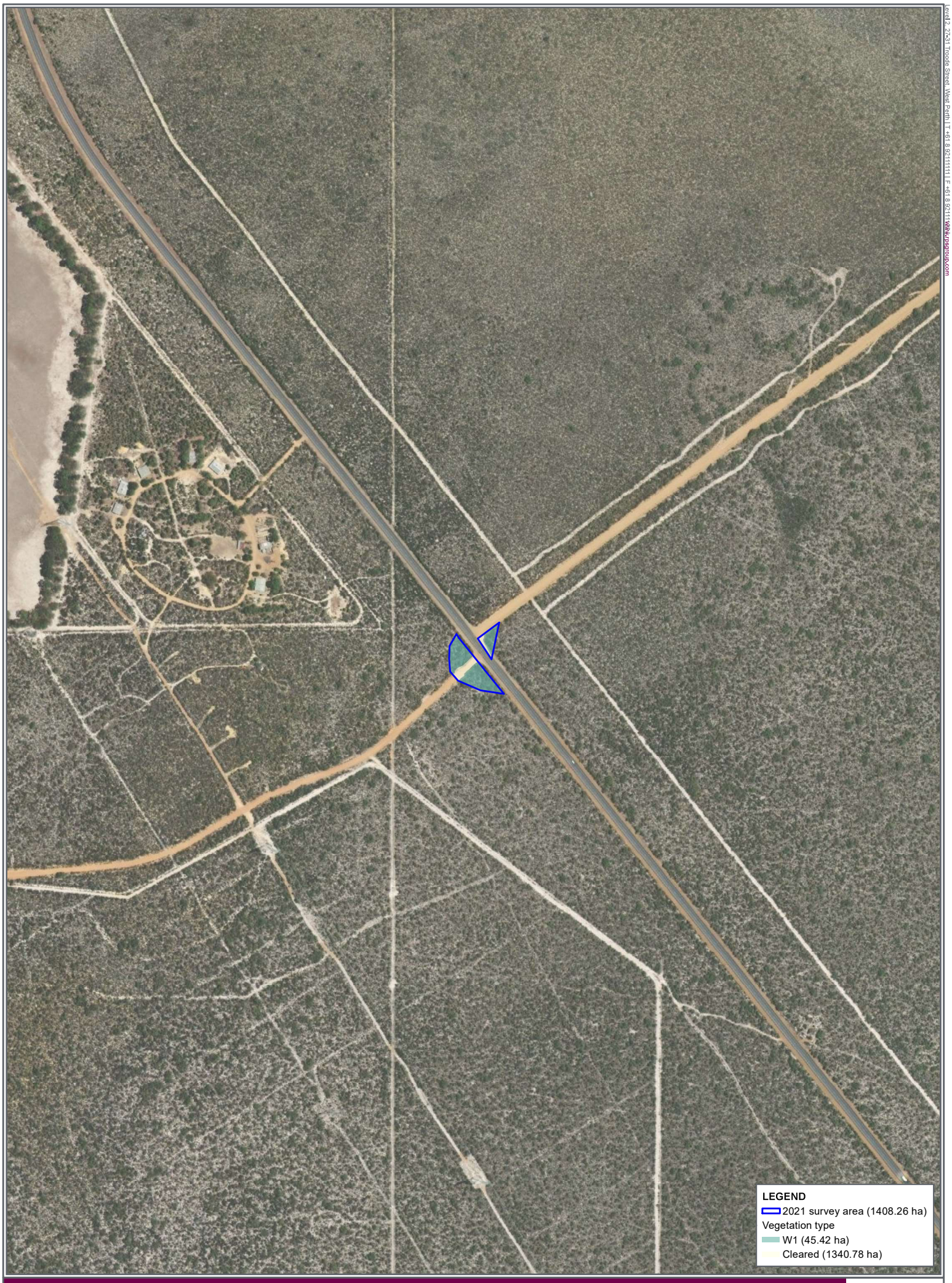

Figure G
Sheet 21 of 21
Vegetation type – map book

GDA 1994 MGA Zone 50
0 50 100 200 m

Job Number: EP1749-001 FV (L18167-005)
Date: 12.01.23
Scale: 1:5,000 @ A3
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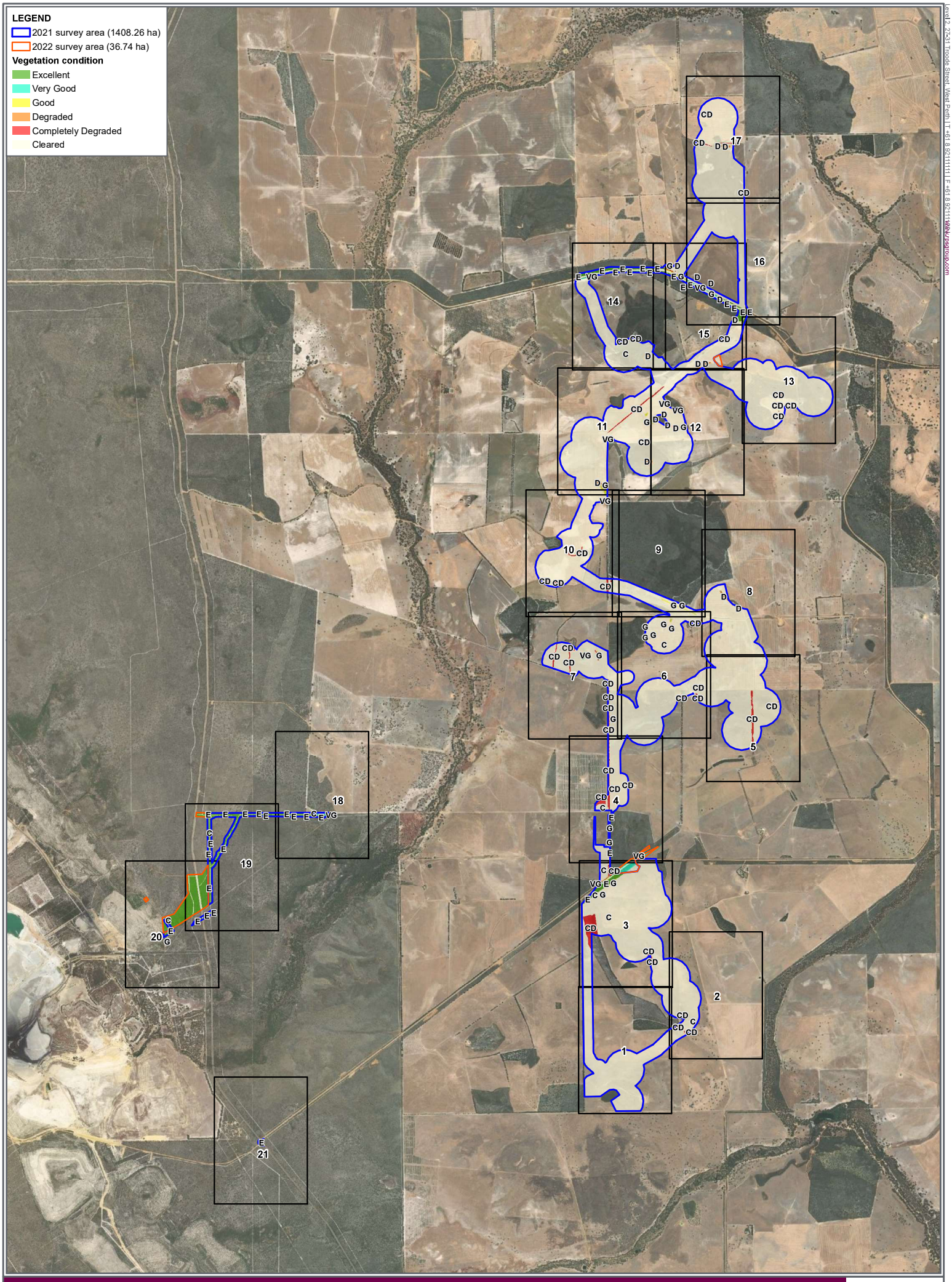

Figure H

Vegetation condition – map book index

GDA 1994 MGA Zone 50

0 0.5 1 2 km

Job Number: EP1749-001 FV (L18167-005)
Date: 31.10.22
Scale: 1:50,000 @ A3
Created by: QS
Source: Orthophoto - Esri World Imagery 2021

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Figure H
Sheet 1 of 21
Vegetation condition – map book

GDA 1994 MGA Zone 50
0 50 100 200 m

Job Number: EP1749-001 FV (L18167-005)
Date: 31.10.22
Scale: 1:5,000 @ A3
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Figure H
Sheet 2 of 21
Vegetation condition – map book

GDA 1994 MGA Zone 50
0 50 100 200 m

Job Number: EP1749-001 FV (L18167-005)
Date: 31.10.22
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Figure H
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GDA 1994 MGA Zone 50
0 50 100 200 m

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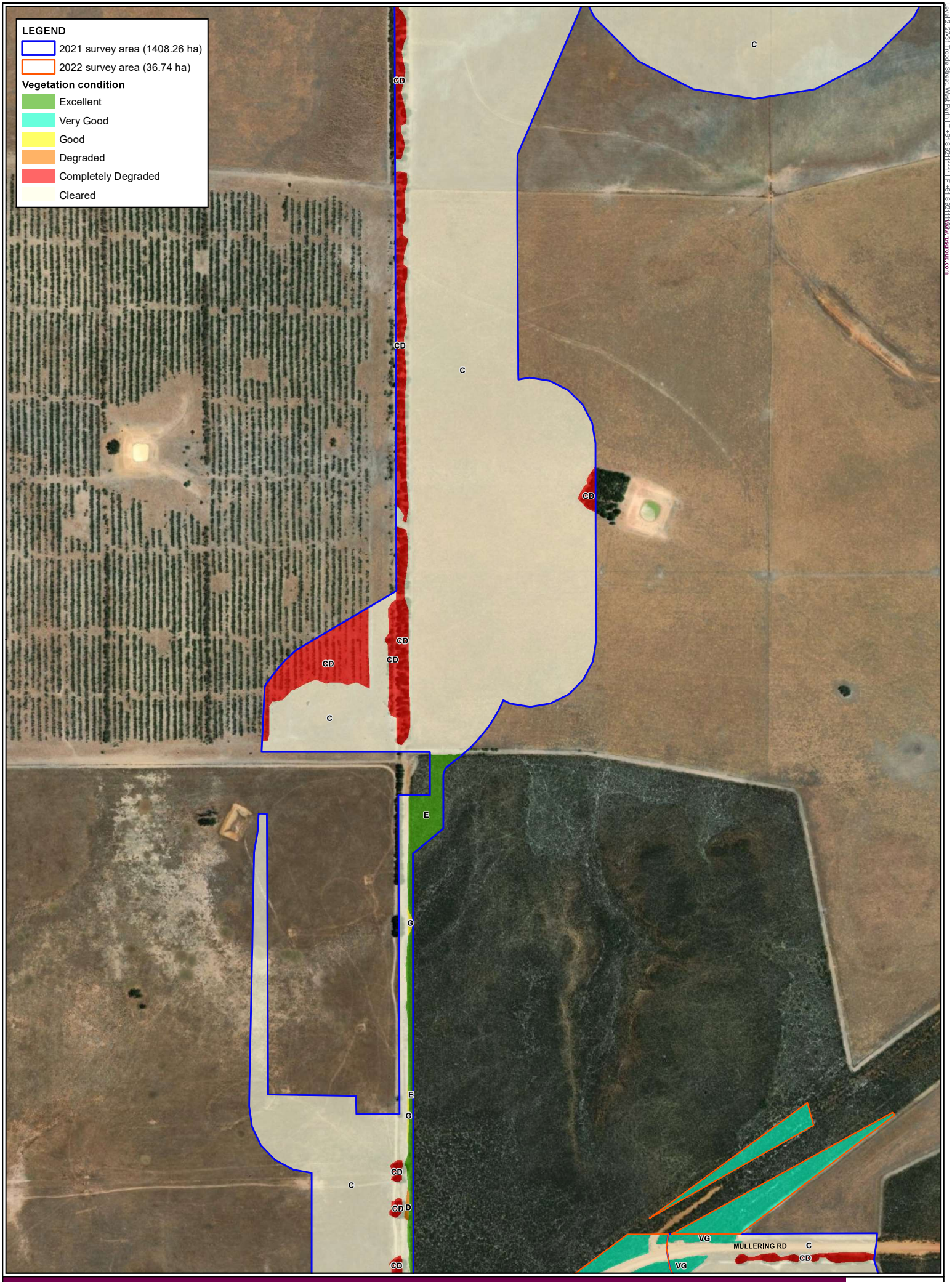

Figure H
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GDA 1994 MGA Zone 50
0 50 100 200 m

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Date: 31.10.22
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GDA 1994 MGA Zone 50
0 50 100 200 m

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Date: 31.10.22
Scale: 1:5,000 @ A3
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GDA 1994 MGA Zone 50
0 50 100 200 m

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GDA 1994 MGA Zone 50
0 50 100 200 m

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GDA 1994 MGA Zone 50
0 50 100 200 m

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GDA 1994 MGA Zone 50
0 50 100 200 m

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GDA 1994 MGA Zone 50
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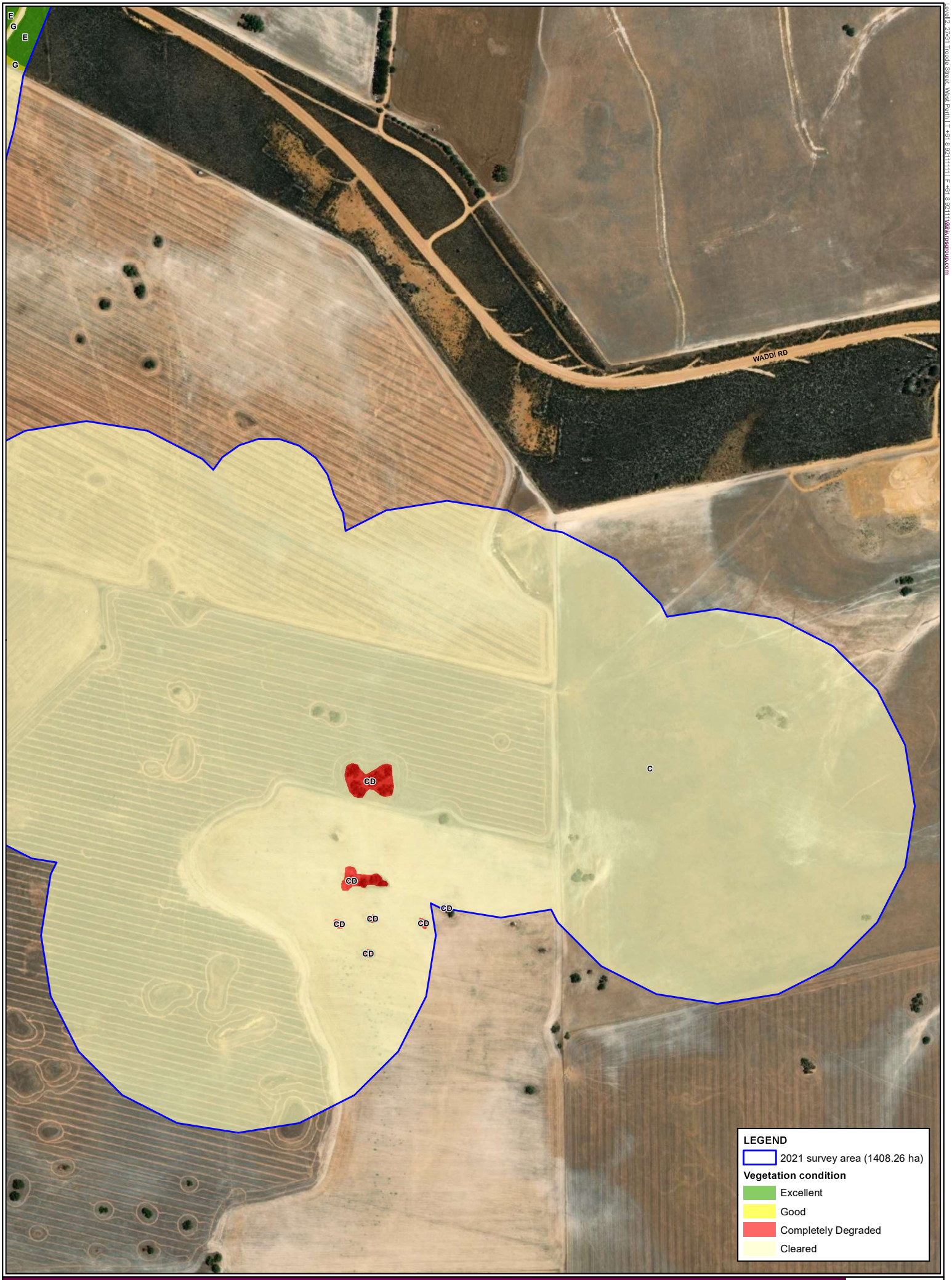

Figure H
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Vegetation condition – map book

GDA 1994 MGA Zone 50
0 50 100 200 m

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0 50 100 200 m

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GDA 1994 MGA Zone 50
0 50 100 200 m

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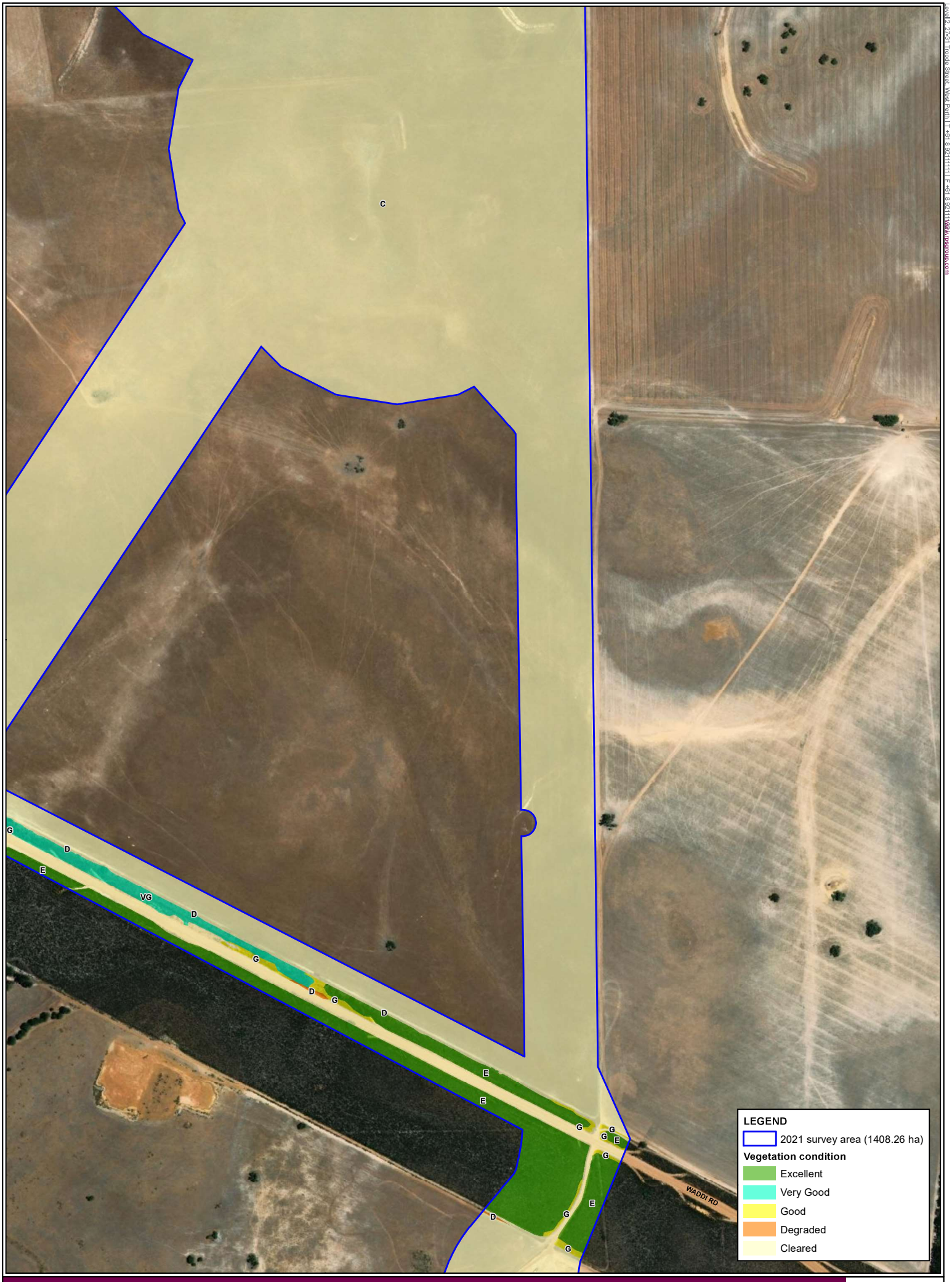

Figure H
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Vegetation condition – map book

GDA 1994 MGA Zone 50
0 50 100 200 m

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0 50 100 200 m

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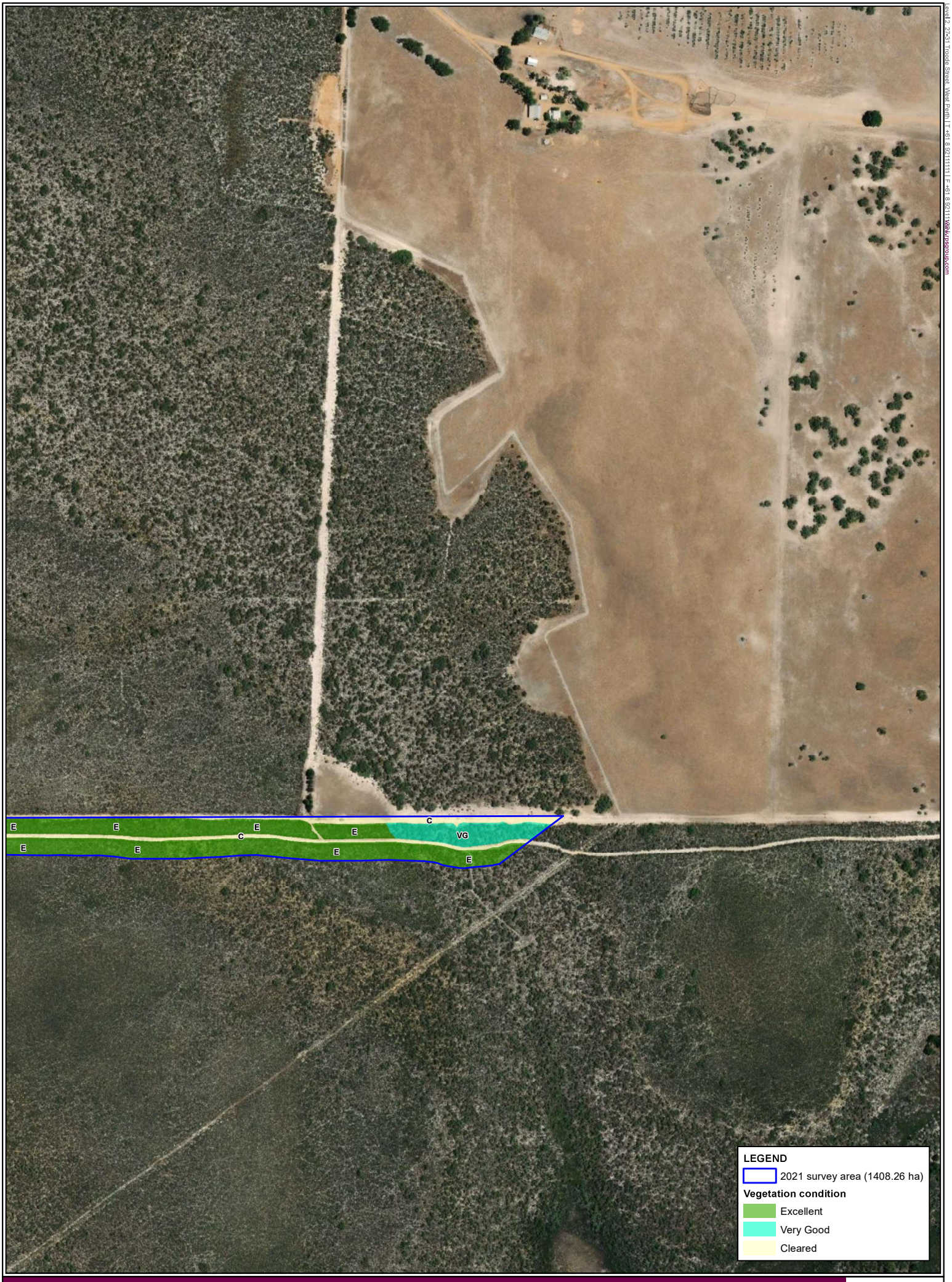

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GDA 1994 MGA Zone 50
0 50 100 200 m

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0 50 100 200 m

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GDA 1994 MGA Zone 50
0 50 100 200 m

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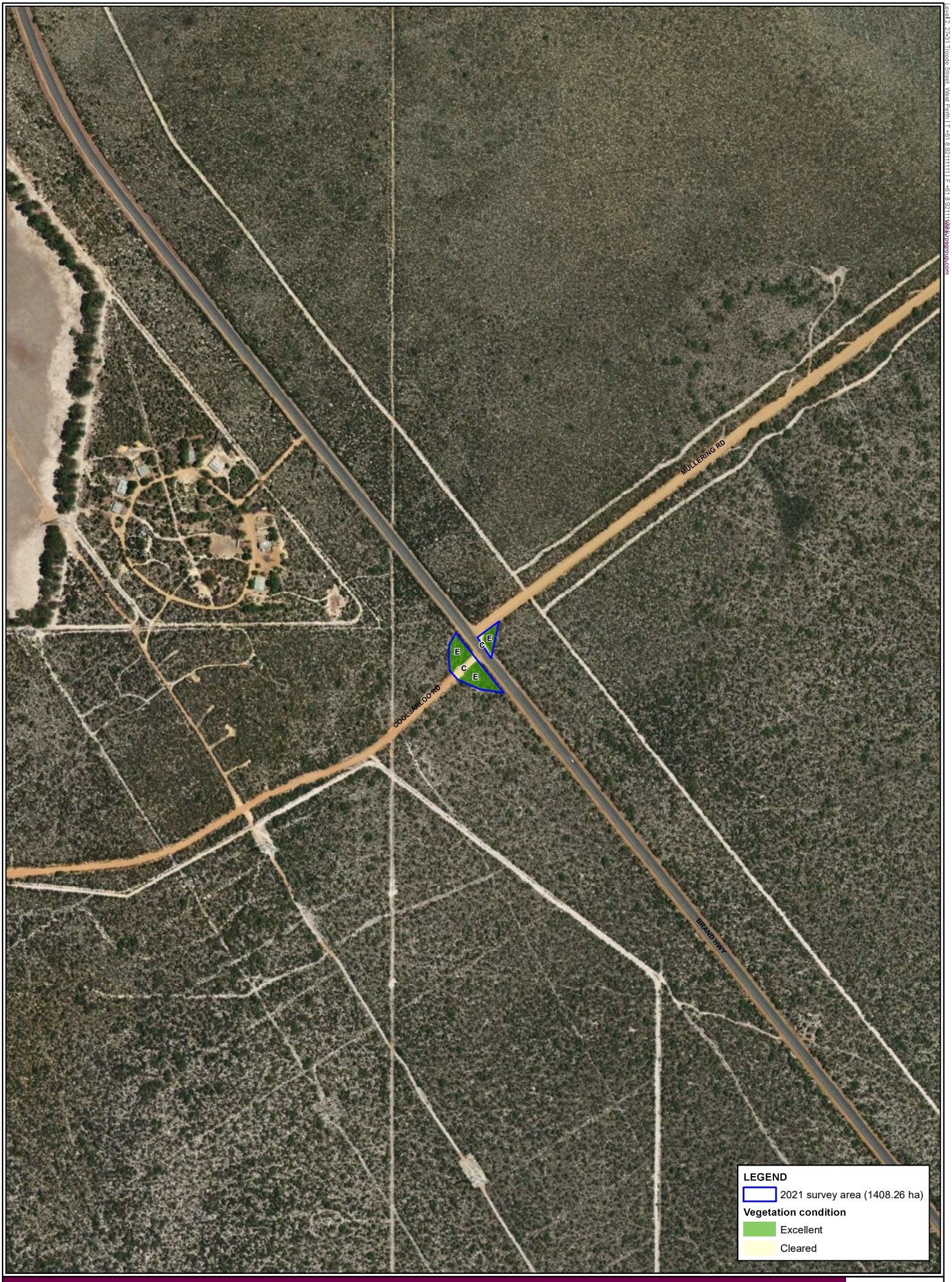

Figure H
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GDA 1994 MGA Zone 50
0 50 100 200 m

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Appendix A
Conservation category definitions

APPENDIX A: CONSERVATION CATEGORY DEFINITIONS

Table A-1: Conservation codes for Western Australian flora

Category	Definition
Threatened species	
T	**Threatened species** Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the *Biodiversity Conservation Act 2016* (BC Act). **Threatened flora** is the species of flora that are listed as critically endangered, endangered or vulnerable threatened species.
CR	**Critically endangered species** Threatened species considered to be "facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines".
EN	**Endangered species** Threatened species considered to be "facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines".
VU	**Vulnerable species** Threatened species considered to be "facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines".
Extinct species	
Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild.	
EX	**Extinct species** Species where "there is no reasonable doubt that the last member of the species has died".
EW	**Extinct in the wild species** Species that "is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form".
Priority species	
P	Species that may possibly be threatened species that do not meet the criteria for listing under the BC Act because of insufficient survey or are otherwise data deficient, are added to the Priority Flora list under Priorities 1, 2 or 3. These three categories are ranked in order of prioritisation for survey and evaluation of conservation status so that consideration can be given to potential listing as threatened. Species that are adequately known, meet criteria for near threatened, or are rare but not threatened, or that have been recently removed from the threatened species list for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.
P1	**Priority 1: Poorly-known species – known from few locations, none on conservation lands** Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements for threatened listing and appear to be under immediate threat from known threatening processes. These species are in urgent need of further survey.
P2	**Priority 2: Poorly-known species – known from few locations, some on conservation lands** Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.

Category	Definition
P3	**Priority 3: Poorly known species – known from several locations** Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. These species need further survey.
P4	**Priority 4: Rare, near threatened and other species in need of monitoring** a. Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. b. Near threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as a conservation dependent specially protected species. c. Species that have been removed from the list of threatened species or lists of conservation dependent or other specially protected species, during the past five years for reasons other than taxonomy. d. Other species in need of monitoring.

(Source: DBCA 2020)

Table A-2: EPBC Act conservation codes

Category	Definition
EX	**Extinct** A taxon is Extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual) throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.
EW	**Extinct in the Wild** A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalised population (or populations) well outside the past range. A taxon is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual) throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.
CR	**Critically Endangered** A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria for Critically Endangered, and it is therefore considered to be facing an extremely high risk of extinction in the wild.
EN	**Endangered** A taxon is Endangered when the best available evidence indicates that it meets any of the criteria for Endangered, and it is therefore considered to be facing a very high risk of extinction in the wild.
VU	**Vulnerable** A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria for Vulnerable, and it is therefore considered to be facing a high risk of extinction in the wild.

(Source: IUCN Species Survival Commission 2020)

Table A-3: Threatened ecological communities category of threat

Category	Definition
Presumed Totally Destroyed (PD)	An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant and either of the following applies: a. Records within the last 50 years have not been confirmed despite thorough searches or known or likely habitats or b. All occurrences recorded within the last 50 years have since been destroyed.
Critically Endangered (CR)	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated. An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future. This will be determined on the basis of the best available information, by it meeting any one or more of the following criteria (a, b or c): a. The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 90% and either or both of the following apply (i or ii): i. Geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is imminent (within approximately ten years) ii. Modification throughout its range is continuing such that in the immediate future (within approximately ten years) the community is unlikely to be capable of being substantially rehabilitated. b. Current distribution is limited, and one or more of the following apply (i, ii or iii): i. Geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the immediate future (within approximately ten years) ii. There are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes iii. There may be many occurrences, but total area is very small, and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes. c. The ecological community exists only as highly modified occurrences that may be capable of being rehabilitated if such work begins in the immediate future (within approximately ten years).
Endangered (EN)	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future. An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (a, b, or c): a. The geographic range, and/or total area occupied, and/or number of discrete occurrences have been reduced by at least 70% since European settlement and either or both of the following apply (i or ii): i. The estimated geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short-term future (within approximately 20 years) ii. Modification throughout its range is continuing such that in the short-term future (within approximately 20 years) the community is unlikely to be capable of being substantially restored or rehabilitated. b. Current distribution is limited, and one or more of the following apply (i, ii or iii): i. Geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short-term future (within approximately 20 years) ii. There are few occurrences, each of which is small and/or isolated and all or most occurrences are very vulnerable to known threatening processes; iii) there may be many occurrences, but total area is small and all or most occurrences are small and/or isolated and very vulnerable to known threatening processes. c. The ecological community exists only as very modified occurrences that may be capable of being substantially restored or rehabilitated if such work begins in the short-term future (within approximately 20 years).

Category	Definition
Vulnerable (VU)	An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range. An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction or significant modification in the medium (within approximately 50 years) to long-term future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (a, b or c): a. The ecological community exists largely as modified occurrences that are likely to be capable of being substantially restored or rehabilitated. b. The ecological community may already be modified and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations. c. The ecological community may be still widespread but is believed likely to move into a category of higher threat in the medium to long-term future because of existing or impending threatening processes.

(Source: Department of Environment and Conservation 2013)

Table A-4: Priority ecological communities category of threat

Category	Definition
P1	**Priority one: Poorly known ecological communities** Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤5 occurrences or a total area of ≤100 ha). Occurrences are believed to be under threat either due to limited extent or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.
P2	**Priority two: Poorly known ecological communities** Communities that are known from few occurrences with a restricted distribution (generally ≤10 occurrences or a total area of ≤200 ha). At least some occurrences are not believed to be under immediate threat (within approximately ten years) of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.
P3	**Priority three: Poorly known ecological communities** Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or: Communities known from a few widespread occurrences, which are either large or with significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat (within approximately ten years), or Communities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, inappropriate fire regimes, clearing, hydrological change, etc. Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.
P4	**Priority four: Ecological communities that are adequately known, rare but not threatened or meet criteria for near threatened or that have been recently removed from the threatened list. These communities require regular monitoring** Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These communities are usually represented on conservation lands. Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for a higher threat category. Ecological communities that have been removed from the list of threatened communities during the past five years.
P5	**Priority five: Conservation dependent ecological communities** Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

(Source: Department of Environment and Conservation 2013)

Table A-5: EPBC Act listed threatened ecological communities category of threat

Category	Definition
CE	**Critically endangered** Extremely high risk of extinction in the next ten years, or three generations of any long-lived or key species believed to play a major role in sustaining the community (whichever is the longer), up to a maximum of 60 years.
E	**Endangered** Extremely high risk of extinction the next 20 years, or five generations of any long-lived or key species believed to play a major role in sustaining the community (whichever is the longer), up to a maximum of 100 years.
V	**Vulnerable** Extremely high risk of extinction in the next 50 years, or within ten generations of any long-lived or key species believed to play a major role in sustaining the community (whichever is the longer), up to a maximum of 100 years.

(Source: DAWE 2017)

Table A-6: NVIS vegetation structure classes

Growth form	Height	Structural formation classes (% cover)					
		80–100	50–80	20–50	0.25–20	0–0.25	Unknown
Tree, palm	Tall; Mid; Low	Closed forest	Open forest	Woodland	Open woodland	Isolated trees	Isolated clumps of trees
Tree mallee	Tall; Mid; Low	Closed mallee forest	Open mallee forest	Mallee woodland	Open mallee woodland	Isolated mallee trees	Isolated clumps of mallee trees
Shrub, cycad, grass-tree, tree-fern	Tall; Mid; Low	Closed shrubland	Shrubland	Open shrubland	Sparse shrubland	Isolated shrubs	Isolated clumps of shrubs
Mallee shrub	Tall; Mid; Low	Closed mallee shrubland	Mallee shrubland	Open mallee shrubland	Sparse mallee shrubland	Isolated mallee shrubs	Isolated clumps of mallee shrubs
Heath shrub	Tall; Mid; Low	Closed heathland	Heathland	Open heathland	Sparse heathland	Isolated heath shrubs	Isolated clumps of heath shrubs
Chenopod shrub	Tall; Mid; Low	Closed chenopod shrubland	Chenopod shrubland	Open chenopod shrubland	Sparse chenopod shrubland	Isolated chenopod shrubs	Isolated clumps of chenopod shrubs
Samphire shrub	Mid; Low	Closed samphire shrubland	Samphire shrubland	Open samphire shrubland	Sparse samphire shrubland	Isolated samphire shrubs	Isolated clumps of samphire shrubs
Hummock grass	Mid; Low	Closed hummock grassland	Hummock grassland	Open hummock grassland	Sparse hummock grassland	Isolated hummock grasses	Isolated clumps of hummock grasses
Tussock grass	Mid; Low	Closed tussock grassland	Tussock grassland	Open tussock grassland	Sparse tussock grassland	Isolated tussock grasses	Isolated clumps of tussock grasses
Other grass	Mid; Low	Closed grassland	Grassland	Open grassland	Sparse grassland	Isolated grasses	Isolated clumps of grasses
Sedge	Mid; Low	Closed sedgeland	Sedgeland	Open sedgeland	Sparse sedgeland	Isolated sedges	Isolated clumps of sedges
Rush	Mid; Low	Closed rushland	Rushland	Open rushland	Sparse rushland	Isolated rushes	Isolated clumps of rushes
Forb (herb)	Mid; Low	Closed forbland	Forbland	Open forbland	Sparse forbland	Isolated forbs	Isolated clumps of forbs
Fern		Closed fernland	Fernland	Open fernland	Sparse fernland	Isolated ferns	Isolated clumps of ferns

(Source: NVIS Technical Working Group 2017)

Table A-7: NVIS vegetation height classes

Height		Growth form			
Height class	Height range (m)	Tree, vine (m and u), palm (single-stemmed)	Shrub, heath shrub, chenopod shrub, ferns, samphire shrub, cycad, tree-fern, grass-tree, palm (multi-stemmed)	Tree mallee, mallee shrub	Tussock grass, hummock grass, other grass, sedge, rush, forbs, vine (g)
8	>30	Tall			
7	10–30	Mid		Tall	
6	<10	Low		Mid	
5				Low	
4	>2		Tall		Tall
3	1–2		Mid		Tall
2	0.5–1		Low		Mid
1	<0.5		Low		Low

(Source: NVIS Technical Working Group 2017)

Table A-8: Vegetation condition scale

Condition		South West and Interzone Botanical provinces	Eremaean and Northern Botanical provinces
P	Pristine	Pristine or nearly so, no obvious signs of disturbance or damage caused by human activities since European settlement.	NA
E	Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species. Damage to trees caused by fire, the presence of non-aggressive weeds and occasional vehicle tracks.	Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement.
V	Very Good	Vegetation structure altered, obvious signs of disturbance. Disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.	Some relatively slight signs of damage caused by human activities since European settlement. For example, some signs of damage to tree trunks caused by repeated fire, the presence of some relatively non-aggressive weeds, or occasional vehicle tracks.
G	Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.	More obvious signs of damage caused by human activity since European settlement, including some obvious impact on the vegetation structure such as that caused by low levels of grazing or slightly aggressive weeds.
	Poor	NA	Still retains basic vegetation structure or ability to regenerate it after very obvious impacts of human activities since European settlement, such as grazing, partial clearing, frequent fires or aggressive weeds.
D	Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds at high density, partial clearing, dieback and grazing.	Severely impacted by grazing, very frequent fires, clearing or a combination of these activities. Scope for some regeneration but not to a state approaching good condition without intensive management. Usually with a number of weed species present including very aggressive species.
C	Completely Degraded	The structure of the vegetation is no longer intact, and the area is completely or almost 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.	Areas that are completely or almost completely without native species in the structure of their vegetation; i.e. areas that are cleared or 'parkland cleared' with their flora comprising weed or crop species with isolated native trees or shrubs.

(Source: EPA 2016)

Appendix B
NatureMap database search

APPENDIX B: NATUREMAP DATABASE SEARCH

Taxon	Cons status	WA rank
Acacia cummingiana	3	
Acacia benthamii	2	
Acacia epacantha	3	
Acacia flabellifolia	3	
Acacia forrestiana	T	VU
Acacia plicata	3	
Acacia retrorsa	2	
Acacia splendens	T	CR
Acacia wilsonii	T	EN
Allocasuarina grevilleoides	3	
Allocasuarina ramosissima	3	
Andersonia gracilis	T	VU
Angianthus micropodioides	3	
Anigozanthos humilis subsp. *Badgingarra* (S.D. Hopper 7114)	2	
Anigozanthos humilis subsp. *chrysanthus*	4	
Anigozanthos viridis subsp. *terraspectans*	T	VU
Arnocrinum gracillimum	3	
Asterolasia drummondii	4	
Austrostipa sp. Cairn Hill (M.E. Trudgen 21176)	3	
Babingtonia delicata	1	
Babingtonia urbana	3	
Baeckea sp. Dandaragan (G. Paczkowska s.n. PERTH 08245606)	1	
Banksia chamaephyton	4	
Banksia cypholoba	3	
Banksia dallanneyi subsp. *pollosta*	3	
Banksia elegans	4	
Banksia fraseri var. *crebra*	3	
Banksia kippistiana var. *paenepeccata*	3	
Banksia nana	3	
Banksia nobilis subsp. *fragrans*	3	
Banksia prionophylla	1	
Banksia pteridifolia subsp. *vernalis*	3	
Banksia serratuloides subsp. *perissa*	T	CR
Banksia splendida subsp. *macrocarpa*	3	
Banksia subulata	3	
Beaufortia bicolor	3	
Beaufortia eriocephala	3	
Beyeria cinerea subsp. *cinerea*	3	
Beyeria gardneri	3	
Boronia ericifolia	2	
Boronia scabra subsp. *condensata*	2	
Boronia tenuis	4	
Byblis gigantea	3	
Caladenia denticulata subsp. *albicans*	1	
Caladenia speciosa	4	
Calectasia palustris	2	
Calothamnus accedens	4	
Calytrix ecalycata subsp. *brevis*	3	

Taxon	Cons status	WA rank
Calytrix ecalycata subsp. *pubescens*	1	
Catacolea enodis	2	
Chamaescilla gibsonii	3	
Chamelaucium sp. Cataby (G.J. Keighery 11009)	T	VU
Chordifex chaunocoleus	4	
Chordifex reseminans	2	
Comesperma rhadinocarpum	3	
Conospermum scaposum	3	
Conostephium magnum	4	
Cristonia biloba subsp. *pubescens*	2	
Cryptandra stellulata	3	
Dampiera tephrea	2	
Desmocladus biformis	3	
Desmocladus elongatus	4	
Desmocladus microcarpus	2	
Desmocladus nodatus	3	
Drakaea elastica	T	CR
Drosera allantostigma	1	
Drosera leioblastus	1	
Drosera leucostigma	1	
Drosera pedicellaris	1	
Drosera prophylla	3	
Eleocharis keigheryi	T	VU
Eremaea sp. Cairn Hill (B. Morgan 532)	2	
Eremophila glabra subsp. *chlorella*	T	
Eryngium pinnatifidum subsp. Palustre (G.J. Keighery 13459)	3	
Eucalyptus abdita	2	
Eucalyptus absita	T	CR
Eucalyptus absita x *loxophleba*	1	
Eucalyptus annuliformis	1	
Eucalyptus crispata	T	EN
Eucalyptus dolorosa	T	CR
Eucalyptus leprophloia	T	EN
Eucalyptus macrocarpa subsp. *elachantha*	4	
Eucalyptus macrocarpa x *pyriformis*	3	
Eucalyptus pendens	4	
Eucalyptus pruiniramis	T	EN
Eucalyptus suberea	T	VU
Eucalyptus x *balanites*	T	CR
Eucalyptus x *carnabyi*	4	
Eucalyptus x *lateritica*	T	VU
Gastrolobium nudum	2	
Gompholobium gairdnerianum	3	
Gompholobium roseum	2	
Goodenia xanthotricha	2	
Gratiola pedunculata	2	
Grevillea calliantha	T	CR
Grevillea drummondii	4	
Grevillea florida	3	
Grevillea leptopoda	3	
Grevillea olivacea	4	

Taxon	Cons status	WA rank
Grevillea rudis	4	
Grevillea saccata	4	
Grevillea sp. Cooljarloo (B.J. Keighery 28 B)	1	
Grevillea synapheae subsp. A Flora of Australia (S.D. Hopper 6333)	1	
Grevillea synapheae subsp. *minyulo*	1	
Grevillea thyrsoides subsp. *pustulata*	3	
Grevillea thyrsoides subsp. *thyrsoides*	3	
Grevillea uniformis	3	
Guichenotia alba	3	
Haemodorum loratum	3	
Hakea longiflora	3	
Hakea megalosperma	T	VU
Hakea neurophylla	4	
Hemiandra rutilans	T	EX
Hemigenia curvifolia	2	
Hensmania stoniella	3	
Hibbertia helianthemoides	4	
Hibbertia leptotheca	3	
Hopkinsia anoectocolea	3	
Hypocalymma gardneri	3	
Hypocalymma linifolium	1	
Hypocalymma serrulatum	2	
Hypocalymma sp. Cataby (G.J. Keighery 5151)	2	
Hypocalymma sp. Dandaragan (C.A. Gardner 9014)	1	
Hypocalymma tetrapterum	3	
Hypolaena robusta	4	
Isopogon autumnalis	3	
Isopogon panduratus subsp. *palustris*	3	
Isotropis cuneifolia subsp. *glabra*	3	
Jacksonia anthoclada	3	
Jacksonia carduacea	3	
Jacksonia rubra	2	
Lasiopetalum decoratum	2	
Lasiopetalum rupicola	1	
Lechenaultia galactites	3	
Lepidobolus quadratus	3	
Lepyrodia curvescens	2	
Leucopogon foliosus	3	
Leucopogon plumuliflorus	2	
Leucopogon sp. Yanchep (M. Hislop 1986)	3	
Levenhookia preissii	1	
Lyginia excelsa	2	
Macarthuria keigheryi	T	EN
Meionectes tenuifolia	3	
Myriophyllum muelleri	1	
Papistylus grandiflorus	2	
Paracaleana dixonii	T	VU
Patersonia argyrea	3	
Patersonia spirifolia	T	EN
Persoonia filiformis	3	
Persoonia rudis	3	

Taxon	Cons status	WA rank
Petrophile clavata	2	
Petrophile septemfida	3	
Phlebocarya pilosissima subsp. *pilosissima*	3	
Phlebocarya pilosissima subsp. *teretifolia*	2	
Platysace ramosissima	3	
Podotheca pritzelii	3	
Ptychosema pusillum	T	VU
Rhetinocarpha suffruticosa	1	
Schoenus badius	2	
Schoenus griffinianus	4	
Schoenus natans	4	
Schoenus pennisetis	3	
Spirogardnera rubescens	T	VU
Stackhousia sp. Red-blotched corolla (A. Markey 911)	3	
Stenanthemum sublineare	2	
Stylidium aceratum	3	
Stylidium aeonioides	4	
Stylidium carnosum subsp. Narrow leaves (J.A. Wege 490)	1	
Stylidium hymenocraspedum	3	
Stylidium inversiflorum	4	
Stylidium longitubum	4	
Stylidium maritimum	3	
Stylidium nonscandens	3	
Stylidium periscelianthum	3	
Stylidium sacculatum	3	
Stylidium tinkeri	2	
Stylidium torticarpum	3	
Styphelia allittii	3	
Styphelia filamentosa	3	
Styphelia undulata	2	
Synaphea endothrix	3	
Synaphea xela	2	
Tetratheca angulata	3	
Tetratheca remota	2	
Thelymitra apiculata	4	
Thelymitra pulcherrima	2	
Thelymitra stellata	T	EN
Thomasia tenuivestita	3	
Thysanotus anceps	3	
Thysanotus glaucus	4	
Thysanotus sp. Badgingarra (E.A. Griffin 2511)	2	
Thysanotus vernalis	3	
Tripterococcus sp. Brachylobus (A.S. George 14234)	4	
Trithuria australis	4	
Verticordia amphigia	3	
Verticordia fragrans	3	
Verticordia huegelii var. *tridens*	3	
Verticordia insignis subsp. *eomagis*	3	
Verticordia lindleyi subsp. *lindleyi*	4	
Verticordia muelleriana subsp. *muelleriana*	3	
Verticordia rutilastra	3	
Xanthosia tomentosa	4	

Appendix C
EPBC Act Protected Matters Report

Australian Government
Department of Agriculture, Water and the Environment

EPBC Act Protected Matters Report

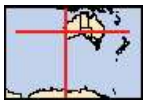
This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 10/02/22 15:02:51

Coordinates
Buffer: 20.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	2
Listed Threatened Species:	37
Listed Migratory Species:	9

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	1
Listed Marine Species:	14
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	6
Regional Forest Agreements:	None
Invasive Species:	22
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered	Community likely to occur within area
Tuart (Eucalyptus gomphocephala) Woodlands and Forests of the Swan Coastal Plain ecological community	Critically Endangered	Community may occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calyptorhynchus latirostris Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Breeding known to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Mammals		
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat may occur within area
Parantechinus apicalis Dibbler [313]	Endangered	Species or species habitat may occur within area
Plants		
Acacia forrestiana Forest's Wattle [17235]	Vulnerable	Species or species habitat known to occur within area
Acacia splendens Splendid Wattle, Dandaragan Wattle [81510]	Endangered	Species or species

Name	Status	Type of Presence
		habitat known to occur within area
Andersonia gracilis Slender Andersonia [14470]	Endangered	Species or species habitat known to occur within area
Anigozanthos viridis subsp. terraspectans Dwarf Green Kangaroo Paw [3435]	Vulnerable	Species or species habitat known to occur within area
Banksia catoglypta [85021]	Vulnerable	Species or species habitat known to occur within area
Banksia serratuloides subsp. perissa Northern Serrate Dryandra [82767]	Critically Endangered	Species or species habitat may occur within area
Chamelaucium sp. Cataby (G.J.Keighery 11009) Griffin's Waxflower [82509]	Vulnerable	Species or species habitat known to occur within area
Chamelaucium sp. Gingin (N.G.Marchant 6) Gingin Wax [88881]	Endangered	Species or species habitat may occur within area
Conospermum densiflorum subsp. unicephalatum One-headed Smokebush [64871]	Endangered	Species or species habitat likely to occur within area
Drakaea elastica Glossy-leafed Hammer Orchid, Glossy-leaved Hammer Orchid, Warty Hammer Orchid [16753]	Endangered	Species or species habitat likely to occur within area
Eleocharis keigheryi Keighery's Eleocharis [64893]	Vulnerable	Species or species habitat known to occur within area
Eremophila scaberula Rough Emu Bush [16729]	Endangered	Species or species habitat may occur within area
Eucalyptus absita Badgingarra Box [24260]	Endangered	Species or species habitat known to occur within area
Eucalyptus crispata Yandanooka Mallee [24268]	Vulnerable	Species or species habitat may occur within area
Eucalyptus dolorosa Dandaragan Mallee, Mount Misery Mallee [56709]	Endangered	Species or species habitat known to occur within area
Eucalyptus impensa Eneabba Mallee [56711]	Endangered	Species or species habitat likely to occur within area
Eucalyptus leprophloia Scaly Butt Mallee, Scaly-butt Mallee [56712]	Endangered	Species or species habitat likely to occur within area
Eucalyptus x balanites Cadda Road Mallee, Cadda Mallee [87816]	Endangered	Species or species habitat may occur within area
Grevillea batrachioides Mt Lesueur Grevillea [21735]	Endangered	Species or species habitat likely to occur within area
Grevillea calliantha Foote's Grevillea, Cataby Grevillea, Black Magic Grevillea [56339]	Endangered	Species or species habitat known to occur

Name	Status	Type of Presence within area
Grevillea christineae Christine's Grevillea [64520]	Endangered	Species or species habitat may occur within area
Hakea megalosperma Lesueur Hakea [10505]	Vulnerable	Species or species habitat known to occur within area
Hemiandra gardneri Red Snakebush [7945]	Endangered	Species or species habitat likely to occur within area
Leucopogon obtectus Hidden Beard-heath [19614]	Endangered	Species or species habitat may occur within area
Macarthuria keigheryi Keighery's Macarthuria [64930]	Endangered	Species or species habitat known to occur within area
Paracaleana dixonii Sandplain Duck Orchid [86882]	Endangered	Species or species habitat likely to occur within area
Ptychosema pusillum Dwarf Pea [11268]	Vulnerable	Species or species habitat may occur within area
Spirogardnera rubescens Spiral Bush [15667]	Endangered	Species or species habitat may occur within area
Thelymitra stellata Star Sun-orchid [7060]	Endangered	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Pandion haliaetus		
Osprey [952]		Species or species habitat may occur within area
Tringa nebularia		
Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Heritage Places		[Resource Information]
Name	State	Status
Natural		
Lancelin Defence Training Area	WA	Listed place

Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Chrysococcyx osculans		
Black-eared Cuckoo [705]		Species or species habitat likely to occur within area
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea		
Grey Wagtail [642]		Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Badgingarra	WA
Minyulo	WA
Unnamed WA27993	WA
Unnamed WA40916	WA
Unnamed WA41986	WA
Wongonderrah	WA

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Mammals		
Canis lupus familiaris Domestic Dog [82654]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Brachiaria mutica Para Grass [5879]		Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Olea europaea Olive, Common Olive [9160]		Species or species habitat may occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-30.59161 115.5459

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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Appendix D
Project species list

APPENDIX D: PROJECT SPECIES LIST

Family	Species	Alien?	Con. code	Comment
Amaranthaceae	*Ptilotus polystachyus*			
Anarthriaceae	*Lyginia barbata*			
	Lyginia excelsa			
Apiaceae	*Actinotus leucocephalus*			
	Xanthosia huegelii			
Araliaceae	*Trachymene pilosa*			
Asparagaceae	*Chamaescilla corymbosa*			
	Laxmannia sessiliflora subsp. *australis*			
	Lomandra preissii			
	Lomandra sericea			
	Thysanotus multiflorus			
	Thysanotus dichotomus			
	Thysanotus patersonii			
Asteraceae	*Arctotheca calendula*	*		
	Asteridea asteroides			
	Hyalosperma cotula			
	Hypochaeris glabra	*		
	Lagenophora huegelii			
	Podotheca angustifolia			
	Podotheca gnaphalioides			
	Pterochaeta paniculata			
	Rhodanthe manglesii			
	Siloxerus filifolius			
	Ursinia anthemoides subsp. *anthemoides*	*		
Brassicaceae	*Raphanus raphanistrum*	*		
Campanulaceae	*Wahlenbergia capensis*	*		
Casuarinaceae	*Allocasuarina humilis*			
	Allocasuarina lehmanniana			
Celastraceae	*Tripterococcus brunonis*			
Centrolepidaceae	*Centrolepis pilosa*			
Colchicaceae	*Burchardia congesta*			
Cupressaceae	*Callitris pyramidalis*			
Cyperaceae	*Caustis dioica*			
	Chaetospora curvifolia			
	Lepidosperma scabrum			
	Lepidosperma apricola			
	Mesomelaena pseudostygia			
	Schoenus caespititius			
	Schoenus clandestinus			
	Schoenus unispiculatus			
	Schoenus brevisetis			
	Tetraria octandra			
Dasypogonaceae	*Calectasia narragara*			
	Dasypogon obliquifolius			
Dilleniaceae	*Hibbertia huegelii*			
	Hibbertia polystachya			
	Hibbertia subvaginata			
	Hibbertia hypericoides subsp. *hypericoides*			
Droseraceae	*Drosera barbigera*			
	Drosera erythrorhiza			
	Drosera pallida			
	Drosera porrecta			
	Drosera spilos			
	Drosera stolonifera			
Ecdeiocoleaceae	*Ecdeiocolea monostachya*			

Family	Species	Alien?	Con. code	Comment
Elaeocarpaceae	*Tetratheca angulata*		3	
Elaeocarpaceae	*Tetratheca confertifolia*			
Ericaceae	*Andersonia heterophylla*			
	Andersonia lehmanniana			
	Conostephium preissii			
	Conostephium magnum			
	Leucopogon oldfieldii			
	Leucopogon sp. Newdegate (M. Hislop 3585)			
	Leucopogon foliosus		3	
	Leucopogon stenophyllus			
	Lysinema pentapetalum			
	Styphelia kingiana			
	Styphelia microdonta			
	Styphelia xerophylla			
Euphorbiaceae	*Monotaxis grandiflora*			
	Ricinocarpos undulatus			
Fabaceae	*Acacia lullfitziorum*			
	Acacia pulchella var. *reflexa*			
	Acacia sphacelata subsp. *verticillata*			
	Acacia stenoptera			
	Acacia saligna subsp. Wheatbelt (B.R. Maslin 8602)			
	Bossiaea eriocarpa			
	Daviesia angulata			
	Daviesia decurrens subsp. *decurrens*			
	Daviesia divaricata subsp. *divaricata*			
	Daviesia epiphyllum			
	Daviesia incrassata subsp. *incrassata*			
	Daviesia nudiflora subsp. *hirtella*			
	Daviesia pedunculata			
	Daviesia podophylla			
	Gastrolobium oxylobioides			
	Gastrolobium polystachyum			
	Gastrolobium spinosum			
	Gompholobium knightianum			
	Gompholobium polymorphum			
	Gompholobium tomentosum			
	Hovea stricta			
	Jacksonia floribunda			
	Jacksonia furcellata			
	Jacksonia nutans			
	Jacksonia restioides			
	Jacksonia sternbergiana			
	Jacksonia furcellata			
	Labichea punctata			
	Mirbelia spinosa			
	Sphaerolobium drummondii			
	Sphaerolobium pulchellum			
	Trifolium arvense	*		
	Trifolium campestre	*		
	Trifolium hirtum	*		
Goodeniaceae	*Dampiera linearis*			
	Dampiera spicigera			
	Goodenia coerulea			
	Goodenia reinwardtii			
	Lechenaultia biloba			
	Lechenaultia expansa			
	Lechenaultia linarioides			

Family	Species	Alien?	Con. code	Comment
	Scaevola canescens			
	Scaevola glandulifera			
	Scaevola phlebopetala			
	Scaevola repens var. repens			
	Velleia trinervis			
	Verreauxia reinwardtii			
Gyrostemonaceae	*Gyrostemon racemiger*			
Haemodoraceae	*Anigozanthos humilis* subsp. *humilis*			
	Anigozanthos viridis subsp. *terraspectans*		T	
	Blancoa canescens			
	Conostylis aculeata			
	Conostylis androstemma			
	Conostylis angustifolia			
	Conostylis aurea			
	Conostylis setigera subsp. *setigera*			
	Conostylis teretifolia subsp. *teretifolia*			
	Haemodorum paniculatum			
	Haemodorum spicatum			
	Haemodorum laxum			
	Haemodorum venosum			
	Phlebocarya ciliata			
Haloragaceae	*Glischrocaryon aureum*			
Hemerocallidaceae	*Johnsonia pubescens* subsp. *pubescens*			
	Tricoryne elatior			
	Tricoryne humilis			
Iridaceae	*Patersonia juncea*			
	Patersonia occidentalis			
Lamiaceae	*Hemiandra linearis*			
	Hemiandra pungens			
	Hemigenia rigida		1	
	Hemiphora bartlingii			
	Lachnostachys verbascifolia			
	Lachnostachys eriobotrya			
Lauraceae	*Cassytha glabella*			
Linaceae	*Linum marginale*			
Loganiaceae	*Orianthera spermacocea*			
Loranthaceae	*Nuytsia floribunda*			
Malvaceae	*Guichenotia ledifolia*			
	Guichenotia micrantha			
	Thomasia cognata			
Myrtaceae	*Babingtonia grandiflora*			
	Calothamnus quadrifidus subsp. *quadrifidus*			
	Calothamnus sanguineus			
	Calothamnus torulosus			
	Calytrix leschenaultii			
	Cassytha pomiformis			
	Darwinia neildiana			
	Darwinia sanguinea			
	Eremaea asterocarpa			
	Eremaea pauciflora			
	Eucalyptus astringens			Planted
	Eucalyptus camaldulensis			
	Eucalyptus gomphocephala			Planted
	Eucalyptus leucoxylon "rosea"			Planted
	Eucalyptus maculata			Planted
	Eucalyptus opimiflora			
	Eucalyptus rudis subsp. *rudis*			

Family	Species	Alien?	Con. code	Comment
	Eucalyptus todtiana			
	Hypocalymma angustifolium			
	Kunzea micrantha			
	Leptospermum erubescens			
	Leptospermum spinescens			
	Melaleuca ciliosa			
	Melaleuca clavifolia			
	Regelia ciliata			
	Scholtzia involucrata			
	Thryptomene mucronulata			
	Verticordia grandis			
	Verticordia nobilis			
	Verticordia ovalifolia			
	Verticordia pennigera			
Orchidaceae	*Microtis media*			
	Thelymitra stellata		T	
Pinaceae	*Pinus pinaster*	*		Planted
Poaceae	*Austrostipa compressa*			
	Austrostipa hemipogon			
	Austrostipa elegantissima			
	Austrostipa variabilis			
	Avena barbata	*		
	Briza maxima	*		
	Bromus diandrus	*		
	Ehrharta calycina	*		
	Ehrharta longiflora	*		
	Eragrostis curvula	*		
	Neurachne alopecuroidea			
	Rytidosperma caespitosum			
	Rytidosperma setaceum			
Polygalaceae	*Comesperma virgatum*			
Portulacaceae	*Calandrinia corrigioloides*			
Primulaceae	*Lysimachia arvensis*			
Proteaceae	*Adenanthos cygnorum* subsp. *cygnorum*			
	Banksia attenuata			
	Banksia bipinnatifida			
	Banksia candolleana			
	Banksia carlinoides			
	Banksia chamaephyton		4	
	Banksia dallanneyi subsp. *dallanneyi* var. *dallanneyi*			
	Banksia fraseri var. fraseri			
	Banksia glaucifolia			
	Banksia hewardiana			
	Banksia menziesii			
	Banksia prionotes			
	Banksia sclerophylla			
	Banksia shuttleworthiana			
	Banksia sphaerocarpa var. *sphaerocarpa*			
	Banksia tortifolia			
	Banksia vestita			
	Conospermum acerosum			
	Conospermum crassinervium			
	Conospermum nervosum			
	Conospermum stoechadis			
	Grevillea eriostachya			
	Hakea auriculata			
	Hakea conchifolia			
	Hakea costata			
	Hakea flabellifolia			
	Hakea incrassata			

Family	Species	Alien?	Con. code	Comment
	Hakea lissocarpha			
	Hakea megalosperma		T	
	Hakea obliqua subsp. *parviflora*			
	Hakea prostrata			
	Hakea ruscifolia			
	Hakea stenocarpa			
	Hakea trifurcata			
	Hakea undulata			
	Isopogon divergens			
	Isopogon teretifolius			
	Isopogon autumnalis		3	
	Lambertia multiflora var. *multiflora*			
	Petrophile axillaris			
	Petrophile brevifolia			
	Petrophile chrysantha			
	Petrophile linearis			
	Petrophile macrostachya			
	Petrophile recurva			
	Petrophile shuttleworthiana			
	Petrophile striata			
	Stirlingia latifolia			
	Synaphea endothrix		3	
	Synaphea spinulosa subsp. *spinulosa*			
Restionaceae	*Alexgeorgea nitens*			
	Hypolaena robusta		4	
	Lepidobolus preissianus			
	Lepidobolus quadratus		3	
Rhamnaceae	*Cryptandra myriantha*			
	Cryptandra pungens			
	Stenanthemum humile			
	Stenanthemum reissekii			
	Trymalium ledifolium			
	Trymalium angustifolium			
Rubiaceae	*Opercularia vaginata*			
Rutaceae	*Cyanothamnus ramosus* subsp. *anethifolius*			
	Philotheca spicata			
Santalaceae	*Leptomeria cunninghamii*			
Stylidiaceae	*Levenhookia pusilla*			
	Levenhookia stipitata			
	Stylidium aeonioides		4	
	Stylidium brunonianum			
	Stylidium bulbiferum			
	Stylidium crossocephalum			
	Stylidium cygnorum			
	Stylidium diplotrichum		2	
	Stylidium diuroides			
	Stylidium hymenocraspedum		3	
	Stylidium maitlandianum			
	Stylidium neurophyllum			
	Stylidium piliferum			
	Stylidium purpureum			
	Stylidium pycnostachyum			
	Stylidium repens			
	Stylidium rigidulum			
	Stylidium stenosepalum			
Thymelaeaceae	*Pimelea imbricata* var. *piligera*			
	Pimelea sulphurea			
Xanthorrhoeaceae	*Xanthorrhoea drummondii*			
	Xanthorrhoea preissii			
Zamiaceae	*Macrozamia fraseri*			

Appendix E
Selected relevé data

APPENDIX E: SELECTED RELEVÉ DATA

Relevé No.: W331	Soil: grey sandy loam	Veg. Unit: HL	Rock Type: Laterite
Latitude	-30.6332	Longitude	115.5301
Condition:	Excellent	Date:	30/09/2021
Species List		*Ptilotus polystachyus*	
Acacia pulchella var. *reflexa*		**Ursinia anthemoides* subsp. *anthemoides*	
Allocasuarina humilis		*Xanthorrhoea drummondii*	
Austrostipa compressa			
Austrostipa elegantissima			
Banksia dallanneyi			
Banksia shuttleworthiana			
Banksia sphaerocarpa var. *sphaerocarpa*			
Calectasia narragara			
Calothamnus hirsuta			
Caustis dioica			
Conospermum stoechadis			
**Ehrharta calycina*			
Gastrolobium oxylobioides			
Hakea conchifolia			
Hakea ruscifolia			
Hibbertia hypericoides			
Lambertia multiflora var. *multiflora*			
Lyginia imberbis			
Mesomelaena stygia			
Neurachne alopecuroidea			
Nuytsia floribunda			

Relevé No.: W338	Soil: gravel	Veg. Unit: HL	Rock Type: Laterite
Latitude	-30.6410	Longitude	115.5282
Condition:	Excellent	Date:	30/09/2021

Species List
Adenanthos cygnorum subsp. *cygnorum*
Babingtonia grandiflora
Banksia shuttleworthiana
Calectasia narragara
Caustis dioica
Daviesia epiphyllum
Drosera porrecta
Gastrolobium oxylobioides
Gastrolobium spinosum
Glischrocaryon aureum
Hakea auriculata
Hakea lissocarpha
Hibbertia hypericoides subsp. *hypericoides*
Jacksonia restioides
Lambertia multiflora var. *multiflora*
Leptospermum spinescens
Petrophile shuttleworthiana
Ricinocarpos undulatus
Stenanthemum reissekii

Relevé No.: W389	Soil: gravel	Veg. Unit: HLd	Rock Type: Laterite
Latitude	-30.6184	Longitude	115.5307
Condition:	Degraded	Date:	1/10/2021

Species List
Austrostipa compressa
Daviesia podophylla
Hakea auriculata
Hakea lissocarpha
Hibbertia hypericoides subsp. *hypericoides*
Neurachne alopecuroidea
Petrophile shuttleworthiana
Ptilotus polystachyus
Rytidosperma setaceum

Relevé No.: W425	Soil: grey sand	Veg. Unit: W2	Rock Type:
Latitude	-30.6308	Longitude	115.4841
Condition:	Excellent	Date:	2/10/2021

Species List	
Amphipogon turbinatus	*Verticordia ovalifolia*
Banksia attenuata	*Xanthorrhoea preissii*
Banksia menziesii	
Cassytha glabella	
Chaetospora curvifolia	
Conospermum crassinervium	
Conostephium magnum	
Dasypogon obliquifolius	
Drosera pallida	
Eremaea pauciflora var. *lonchophylla*	
Eucalyptus todtiana	
Goodenia trinervis	
Hibbertia subvaginata	
Leucopogon sp. Newdegate (M. Hislop 3585)	
Melaleuca leuropoma	
Opercularia vaginata	
Patersonia occidentalis	
Petrophile linearis	
Stylidium hymenocraspedum	

Relevé No.: W450	Soil: grey sandy loam	Veg. Unit: W3	Rock Type:
Latitude	-30.6308	Longitude	115.4777
Condition:	Excellent	Date:	2/10/2021

Species List
Babingtonia grandiflora
Banksia bipinnatifida
Banksia shuttleworthiana
Calothamnus sanguineus
Conospermum stoechadis
Eucalyptus todtiana
Gastrolobium oxylobioides
Hibbertia hypericoides subsp. *hypericoides*
Lambertia multiflora var. *multiflora*
Lechenaultia linarioides
Mesomelaena pseudostygia
Petrophile shuttleworthiana
Xanthorrhoea drummondii
Xanthorrhoea preissii

Relevé No.: W458	Soil: gravel	Veg. Unit: HL	Rock Type: laterite
Latitude	-30.6308	Longitude	115.4764
Condition:	Excellent	Date:	2/10/2021

Species List
Babingtonia grandiflora
Banksia bipinnatifida
Banksia carlinoides
Banksia shuttleworthiana
Burchardia congesta
Calothamnus sanguineus
Caustis dioica
Daviesia epiphyllum
Gastrolobium oxylobioides
Glischrocaryon aureum
Gompholobium knightianum
Haemodorum venosum
Hakea conchifolia
Hakea stenocarpa
Lambertia multiflora var. *multiflora*
Neurachne alopecuroidea
Petrophile shuttleworthiana
Xanthorrhoea drummondii

Relevé No.: W469	Soil: grey sandy loam	Veg. Unit: W1	Rock Type:
Latitude	-30.6307	Longitude	115.4719
Condition:	Excellent	Date:	4/10/2021

Species List	
Adenanthos cygnorum subsp. *cygnorum*	*Patersonia occidentalis*
Anigozanthos humilis subsp. *humilis*	*Petrophile linearis*
Babingtonia grandiflora	*Pimelea sulphurea*
Banksia attenuata	*Stirlingia latifolia*
Banksia shuttleworthiana	*Synaphea endothrix*
Bossiaea eriocarpa	*Trachymene pilosa*
Burchardia congesta	*Xanthosia huegelii*
Conospermum stoechadis	
Conostephium preissii	
Dampiera spicigera	
Darwinia sanguinea	
Dasypogon obliquifolius	
Eremaea pauciflora var. *lonchophylla*	
Hakea ruscifolia	
Hibbertia hypericoides subsp. *hypericoides*	
Jacksonia furcellata	
Leptospermum erubescens	
Lysinema pentapetalum	
Mesomelaena pseudostygia	
Orianthera spermacocea	

Relevé No.: W501	Soil: grey sand	Veg. Unit: W1	Rock Type:
Latitude	-30.6331	Longitude	115.4664
Condition:	Excellent	Date:	4/10/2021

Species List	
Acacia stenoptera	*Pterochaeta paniculata*
Adenanthos cygnorum subsp. *cygnorum*	*Scaevola repens* var. *repens*
Anigozanthos viridis subsp. *terraspectans* (T)	*Stylidium piliferum*
Styphelia microdonta	*Synaphea endothrix*
Styphelia xerophylla	*Xanthorrhoea drummondii*
Babingtonia grandiflora	
Banksia chamaephyton	
Caustis dioica	
Conospermum stoechadis	
Conostephium preissii	
Daviesia decurrens subsp. *decurrens*	
Gastrolobium oxylobioides	
Hakea conchifolia	
Hakea incrassata	
Hibbertia hypericoides subsp. *hypericoides*	
Lambertia multiflora var. *multiflora*	

Relevé No.: W582	Soil: yellow sand	Veg. Unit: W1	Rock Type:
Latitude	-30.6470	Longitude	115.4592
Condition:	Excellent	Date:	5/10/2021

Species List
Adenanthos cygnorum subsp. *cygnorum*
Allocasuarina humilis
Anigozanthos humilis subsp. *humilis*
Banksia attenuata
Banksia menziesii
Conospermum stoechadis
Dasypogon obliquifolius
Eremaea pauciflora var. *lonchophylla*
Goodenia reinwardtii
Hibbertia hypericoides subsp. *hypericoides*
Lepidobolus preissianus
Leptospermum erubescens
Melaleuca sp. indet.
Mesomelaena pseudostygia
Petrophile chrysantha
Verticordia nobilis

Relevé No.: W596	Soil: grey sand	Veg. Unit: W1	Rock Type:
Latitude	-30.6755	Longitude	115.4743
Condition:	Excellent	Date:	5/10/2021

Species List	
Amphipogon turbinatus	*Trachymene pilosa*
Anigozanthos humilis subsp. *humilis*	
Austrostipa elegantissima	
Banksia attenuata	
Banksia menziesii	
Conostephium magnum	
Conostephium preissii	
Dasypogon obliquifolius	
Desmocladus sp.	
Eremaea pauciflora var. *lonchophylla*	
Hemiphora bartlingii	
Hibbertia hypericoides subsp. *hypericoides*	
Jacksonia floribunda	
Mesomelaena pseudostygia	
Petrophile shuttleworthiana	
Pterochaeta paniculata	
Stylidium crossocephalum	
Stylidium neurophyllum	
Synaphea spinulosa subsp. *spinulosa*	

Relevé No.: W1013	Soil: grey sand	Veg. Unit: HL	Rock Type: Laterite
Latitude	-30.5621817	Longitude	115.5518163
Condition:	Excellent	Date	7/10/2021

Species List
Allocasuarina humilis
Banksia attenuata
Banksia shuttleworthiana
Banksia tortifolia
Darwinia neildiana
Daviesia pedunculata
Glischrocaryon aureum
Haemodorum venosum
Hakea auriculata
Hakea stenocarpa
Hibbertia hypericoides subsp. *hypericoides*
**Hypochaeris glabra*
Labichea punctata
Lysimachia arvensis var *caerulea*
Neurachne alopecuroidea
Pterochaeta paniculata
Schoenus clandestinus
Stenanthemum reissekii
Stylidium pycnostachyum
Thysanotus multiflorus
Trachymene pilosa
**Ursinia anthemoides* subsp. *anthemoides*
Xanthosia huegelii

Relevé No.: W1012	Soil: grey loamy sand	Veg. Unit: HL	Rock Type: Laterite
Latitude	-30.5608859	Longitude	115.5481935
Condition:	Excellent	Date	7/10/2021
Species List			
Acacia pulchella var. *reflexa*		*Schoenus clandestinus*	
Allocasuarina humilis		*Tetraria octandra*	
Austrostipa elegantissima		*Trachymene pilosa*	
Banksia attenuata			
Banksia bipinnatifida			
Banksia dallanneyi subsp. *dallanneyi* var. *dallanneyi*			
Banksia shuttleworthiana			
Calothamnus sanguineus			
Caustis dioica			
Conospermum stoechadis			
Conostylis setigera subsp. *setigera*			
Daviesia nudiflora			
Eremaea pauciflora			
Hakea prostrata			
Hibbertia hypericoides subsp. *hypericoides*			
Isopogon autumnalis			
Lambertia multiflora var. *multiflora*			
Leptospermum erubescens			
Levenhookia stipitata			
Lyginia barbata			
Mesomelaena pseudostygia			
Neurachne alopecuroidea			
Orianthera spermacocea			

Relevé No.: W917	Soil: yellow orange loamy sand	Veg. Unit: HWS	Rock Type: Laterite
Latitude	-30.556676011	Longitude	1115.534947033
Condition:	Excellent	Date	6/10/2021

Species List
**Aira caryophyllea*
Allocasuarina humilis
Banksia attenuata
Banksia dallanneyi subsp. *dallanneyi var. dallanneyi*
Banksia menziesii
Conospermum stoechadis
Eremaea pauciflora
Hakea costata
Hibbertia hypericoides subsp. *hypericoides*
Lepidobolus preissianus
Pterochaeta paniculata
Schoenus clandestinus
Trachymene pilosa

Relevé No.: W960	Soil: yellow orange loamy sand	Veg. Unit: HWS	Rock Type: Nil
Latitude	-30.556691994	Longitude	115.538141993
Condition:	Excellent	Date	6/10/2021

Species List
Allocasuarina humilis
Anigozanthos humilis subsp. *humilis*
Babingtonia grandiflora
Banksia candolleana
Banksia sphaerocarpa var. *sphaerocarpa*
Calothamnus sanguineus
Conostephium magnum
Conostylis aculeata
Eremaea pauciflora
Hakea flabellifolia
Lyginia barbata
Mesomelaena pseudostygia
Stirlingia latifolia
Stylidium hymenocraspedum

Relevé No.: W903	Soil: Orange yellow sand	Veg. Unit: HS	Rock Type: Laterite
Latitude	-30.5575491	Longitude	115.5265798
Condition:	Excellent	Date	5/10/2021
Species List			
Acacia stenoptera			
Alexgeorgea nitens			
Allocasuarina humilis			
Banksia attenuata			
Banksia candolleana			
Banksia shuttleworthiana			
Banksia sphaerocarpa var. *sphaerocarpa*			
Caustis dioica			
Dampiera spicigera			
Dasypogon obliquifolius			
Daviesia nudiflora			
Eremaea pauciflora			
Glischrocaryon aureum			
Grevillea eriostachya			
Hakea incrassata			
Hibbertia hypericoides subsp. *hypericoides*			
Jacksonia floribunda			
Leptospermum erubescens			
Mesomelaena pseudostygia			
Petrophile shuttleworthiana			

Relevé No.: W967	Soil: Orange grey loamy sand	Veg. Unit: HS	Rock Type:
Latitude	-30.5572091	Longitude	115.5399586
Condition:	Excellent	Date	6/10/2021

Species List
Acacia pulchella var. *reflexa*
Babingtonia grandiflora
Banksia attenuata
Banksia menziesii
Eremaea pauciflora
Hakea prostrata
Leptospermum erubescens
Melaleuca ciliosa
Synaphea spinulosa subsp. spinulosa
Verticordia pennigera?

Relevé No.: W106	Soil: Yellow brown loamy sand	Veg. Unit: HLd	Rock Type:
Latitude	-30.5567216	Longitude	115.5394093
Condition:	Excellent	Date	7/10/2021

Species List
Allocasuarina humilis
Banksia shuttleworthiana
Banksia sphaerocarpa var. *sphaerocarpa*
Calothamnus sanguineus
Caustis dioica
Conostephium magnum
Conostylis aculeata
Conostylis setigera subsp. setigera
Hakea conchifolia
Hibbertia hypericoides
Hibbertia hypericoides subsp. *hypericoides*
Lambertia multiflora var. *multiflora*
Leptospermum erubescens
Leucopogon oldfieldii
Lyginia barbata
Mesomelaena pseudostygia
Orianthera spermacocea
Philotheca spicata
Schoenus clandestinus
Stenanthemum reissekii
Stylidium neurophyllum

Relevé No.: W898	Soil: Grey brown loamy sand	Veg. Unit: HLd	Rock Type: Laterite
Latitude	-30.5785603	Longitude	115.5423032
Condition:	Good	Date	6/10/2021

Species List
**Arctotheca calendula*
Austrostipa variabilis
**Avena barbata*
**Briza maxima*
Daviesia decurrens subsp. *decurrens*
**Ehrharta longiflora*
Hakea auriculata
Lepidosperma scabrum
Mesomelaena pseudostygia
Neurachne alopecuroidea
Tetraria octandra
**Trifolium hirtum*
**Ursinia anthemoides subsp. anthemoides*
Xanthorrhoea drummondii

Relevé No.: W757	Soil: grey shallow sand	Veg. Unit: HLd	Rock Type: Laterite, ferricrete
Latitude	-30.5869835	Longitude	115.5303354
Condition:	Good	Date	1/10/2021
Species List			
Babingtonia grandiflora			
Caustis dioica			
Daviesia angulata			
Daviesia podophylla			
Gastrolobium spinosum			
Glischrocaryon aureum			
Hakea auriculata			
Labichea punctata			
Lechenaultia biloba			
Rhodanthe manglesii			
Schoenus clandestinus			
Schoenus curvifolius			
Schoenus unispiculatus			
Stylidium pycnostachyum			
Tetraria octandra			
Thysanotus multiflorus			
Tricoryne humilis			
Xanthorrhoea drummondii			

Relevé No.: W876	Soil: White sand	Veg. Unit: Wd	Rock Type:
Latitude	-30.5754336	Longitude	115.557702
Condition:	Completely degraded	Date	6/10/2021
Species List			
**Arctotheca calendula*			
**Avena barbata*			
**Briza maxima*			
**Bromus diandrus*			
Eucalyptus todtiana			
**Trifolium hirtum*			