

**Phytophthora Dieback Management Plan:
Ravensthorpe Range Exploration Areas,
Medallion Metals
2020-2022**



**Report prepared for
Medallion Metals
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1 SUMMARY

Medallion Metals are proposing to undertake mineral exploration at several locations in the vicinity of the Ravensthorpe Range within Western Australia. Southern Ecology was engaged to map the occurrence of *Phytophthora* species in the vicinity of proposed exploration tracks (the survey area) and to provide hygiene management recommendations to reduce the spread of soil pathogens and weeds. The survey area encompassed a 50 meter (m) wide corridor along approximately 51.2 kilometre (km) of existing or proposed tracks, with the total extent of the survey area encompassing 245 hectares (ha). The survey area includes nine mineral prospect areas: Welcome Stranger, Shintaro, Happy Chappy, NW Ariel, Ariel, Christmas Gift, Mt Stennet are potential gold-copper prospects in the Ravensthorpe Gold Project and Steere River Phase 1 and Bandalup Pools are base metal prospects in the Jerdacuttup Project.

The vegetation within the survey area was composed of six structural formations (Heath, Mallee Heath, Mallee Scrub, Mallet, Drainage Line Woodlands and Shrublands of either *Melaleuca* or She-oak) that encompass approximately 34 regional mapping units. The majority of the vegetation in the survey area was in 'Excellent' condition with disturbance confined mainly to existing tracks, historic exploration and mining areas and areas subject to fire hazard reduction management. Historic mineral exploration has previously occurred throughout the deposit areas and the Hopetoun-Ravensthorpe Railway traverses through several of the sites.

The field interpretation combined with soil and root sampling determined the survey area to be mapped into four disease status categories for the purposes of managing the spread of *Phytophthora cinnamomi*. Mapped categories included Uninterpretable (167.2 ha), Uninfested (50.9 ha), Temporality Uninterpretable (19.6 ha) and Excluded (7.5 ha). All areas were considered as a Protectable Area (245 ha), due to the putative absence of *Phytophthora cinnamomi*. Thirty-eight soil and root samples were collected and analysed; all were negative for *Phytophthora cinnamomi*. However, *P. pseudocryptogea* (two samples), *P. crassamura* and *P. thermophila* were recovered from four samples and *P. boodjera*, *P. boodjera/arenaria*, *P. nicotianae* have previously been recorded within the same catchment. The known or potential presence of *Phytophthora* species other than *cinnamomi* has been mapped as "Other Threats" (20 ha).

A hygiene management plan is provided with recommendations specific to the project aimed at reducing the risk of introducing *Phytophthora cinnamomi* and limiting the local and regional spread of *Phytophthora* species other than *cinnamomi*.

2 INTRODUCTION

2.1 Background

Phytophthora Dieback disease caused primarily by the soil-born pathogen *Phytophthora cinnamomi* is a major threat to the biodiversity of south-western Australia and is recognised as a key threatening process under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (Department of the Environment (DotE) 2014). *Phytophthora* species can be spread in water, soil or plant material that contains the pathogen or its spores and dispersal is often favoured under warm and moist conditions (Shearer and Tippett 1989). It can be carried in surface or sub-surface water flow and by the movement of infested soil or organic material by either anthropogenic or natural vectors. Consequently, knowledge of the pathogens occurrence within the landscape is essential to inform suitable hygiene management practices to mitigate its spread during soil-disturbance activities.

Medallion metals are proposing to undertake mineral exploration at several sites between Ravensthorpe and Hopetoun, Western Australia. The proposed exploration activities will involve the installation of drilling sites that are accessed mainly through existing tracks. Southern Ecology was engaged to assess a project envelope (the survey area) of 245 ha, encompassing a 50 m wide corridor along approximately 51.2 km of existing tracks and the proposed drill sites. The soil disturbance associated with the proposed project is 'diamond' or 'air-core' drilling, therefore will require the use of heavy machinery and vehicles.

2.2 Scope of Works

Southern Ecology was engaged to map the occurrence of *Phytophthora* species within the survey area and to provide hygiene management recommendations to reduce the spread of soil pathogens and weeds during soil disturbance activities.

The scope of works was to undertake the following:

1. Undertake a desktop assessment of known dieback locations, vegetation condition mapping and vegetation community mapping in the study area (5 km radius).
2. Identify areas of native vegetation within the survey area.
3. Undertake a dieback survey in accordance with relevant Department of Biodiversity, Conservation and Attractions (DBCA) guidelines (Department of Parks and Wildlife [DPAW] 2015) to identify the presence (status) of *Phytophthora* species where native vegetation occurs within the survey area.

4. Prepare a Hygiene Management Plan for the project with details of appropriate management controls to prevent the spread of soil pathogens and weeds.

2.3 Physical and Biological Environment

2.3.1 Interim Biogeographic Regionalisation for Australia

The Interim Biogeographic Regionalisation for Australia (IBRA version 7) divides the Australian continent into 89 large geographically distinct bioregions based on common climate, geology, landform, native vegetation and species information. The survey area is located within the Esperance Plains Interim Biogeographic Regionalisation of Australia (IBRA) Region and Fitzgerald Subregion (Department of the Environment and Energy [DotEE] 2019a).

2.3.2 Tenure and Environmentally Sensitive Areas (ESAs)

No conservation reserves occur within the survey area. The nearest conservation reserve is Kundip Nature Reserve, approximately 20 km south of Ravensthorpe (DPIRD 2019b). The tenure of each prospect area (Table 1) consists of either un-managed reserves (Reserve 16119 or 11577) or Unvested Crown Land (UCL). Large areas of the Ravensthorpe Range are formally recognised as Environmental Sensitive Areas (ESAs) and have previously been recommended for inclusion in the conservation estate (proposed nature reserve) by the Environmental Protect Authority, Western Australia (EPA 1993).

Table 1. Tenure and details of each prospect area.

Deposit Name	Tenure	Environmentally Sensitive Area (ESA)	Proposed Nature Reserve
Ariel	Res 16119 C, Res 11577 C	Yes	Yes
Ariel NW	Res 16119 C	Yes	Yes
Bandalup Pools	UCL	Yes	Yes
Christmas Gift	Res 16119 C	Yes	Yes
Happy Chappy	Res 16119 C, UCL	Yes	Yes
Mount Stennet	Res 16119 C, UCL	Yes	Yes
Shintaro	Res 16119 C, UCL	Yes	Yes
Steere River Phase 1	UCL	No	No
Welcome Stranger	Res 16119 C, UCL	Yes	Yes

2.3.3 Vegetation, Flora and Weeds

Broad scale pre-European vegetation mapping (Shepherd *et al.* 2002) indicates that the native vegetation of the area is composed of:

- “Mixed heath with scattered mallee e.g., tallerack *Eucalyptus tetragona*” (Vegetation Association: 47).

- “Eucalypt shrubland *Eucalyptus eremophila*, *E. redunca*, *E. spp.*” (Vegetation Association: 516).
- “Wattle, casuarina and tea tree acacia-alloccasuarina-melaleuca alliance” (Vegetation Association: 691).

The survey area occurs within part of the Ravensthorpe Range where regional vegetation mapping has previously been undertaken (Craig *et al.* 2008), which identifies the occurrence of approximately 34 vegetation units within the survey area.

No weeds listed as a Weed of National Significance (WoNS) (Australian Weed Committee 2012) or as declared pests in Western Australian under the BAM Act (DPIRD 2019a) are known from the survey area. However, Bridal Creeper (WoNS) is known to occur within the same catchment in the Kundip Area.

2.3.4 Land Systems and Soils

Eight soil-landscape units have been mapped within the survey area (DPIRD 2019b):

- Hammersley 10 Subsystem (244Hm10) - Seasonally inundated swamps and closed depressions. Often with deep sand lunettes on the south east side of the depressions. <9m relief.
- Young 3 Subsystem (245Yo_3) - Well drained uniform sands to sandy loams on flat alluvial flood plains.
- Kybulup 1 Subsystem (244Ky_1) - Low rises and undulating plain many head waters tributaries
- Ravensthorpe 2 Subsystem (244Ra_2) - undulation plain and low hills colluvial slopes
- Kybulup 2 Subsystem (244Ky_2) - Remanent lateritic sandplain
- Ravensthorpe 1 Subsystem (244Ra_1) - ridge line and upper slopes
- Hammersley 9 Subsystem (244Hm_9) - Gently Undulating plain with a dominance of deep sand sheets deposited across the land surface.
- Hammersley 8 Subsystem (244Hm_8) - Gently Undulating sandplain. Soils developing on Tertiary marine sediments. Slope <3%. Relief 1-3m

2.3.5 Existing Dieback Information

No previous comprehensive *Phytophthora* Dieback mapping or sampling has been officially registered within the survey area prior to 2019 (Dieback Information Delivery System (DIDMS) (GAIA 2019). *Phytophthora cinnamomi*, *P. pseudocryptogea*, *P. boodjera*, *P. boodjera/arenaria*, *P. nicotianae*, *P. cassamura* and *P. thermophila* have been recovered from multiple soil and root samples within the study area (includes samples collected by Southern Ecology 2019-2022) (Figure 1). The survey area occurs within a separate water catchment to the known *Phytophthora cinnamomi* infestation.

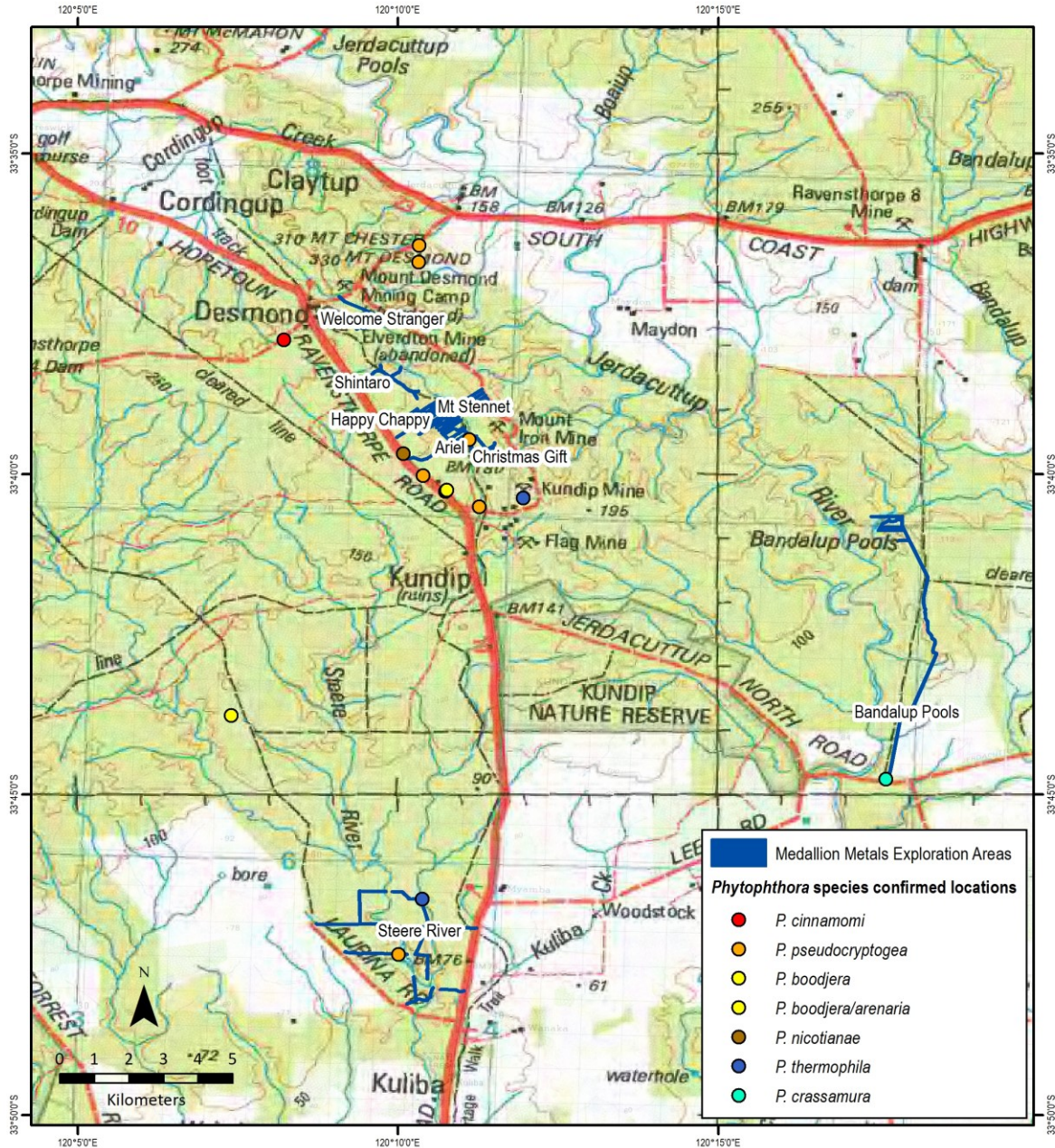


Figure 1. Medallion Metals exploration areas and closest known *Phytophthora* species records derived from the Dieback Information Delivery System (DIDMS) (GAIA 2019) and Southern Ecology (2019-2022).

2.3.6 Weather

Seasonal conditions and the climatic characteristics of a site can influence the perceptibility of disease caused by *Phytophthora* species and pathogen recovery from soil and root samples (Shearer and Tippet 1989). The survey area occurs within a moderate rainfall zone for *Phytophthora* Dieback (Figure 2, Bureau of Meteorology [BOM] 2022). The conditions during and preceding the surveys are considered suitable for the interpretation and sample recovery of *Phytophthora* species from the survey area.

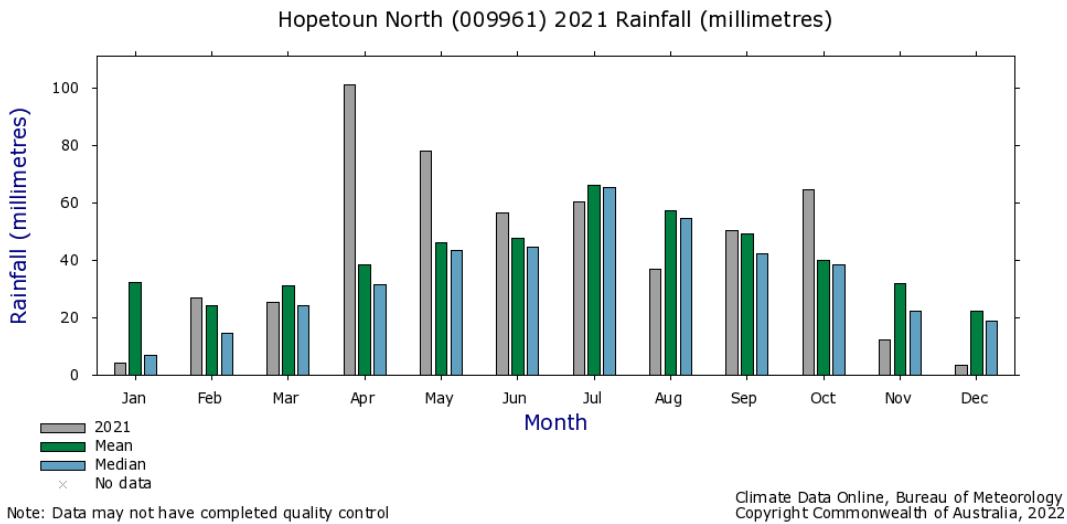
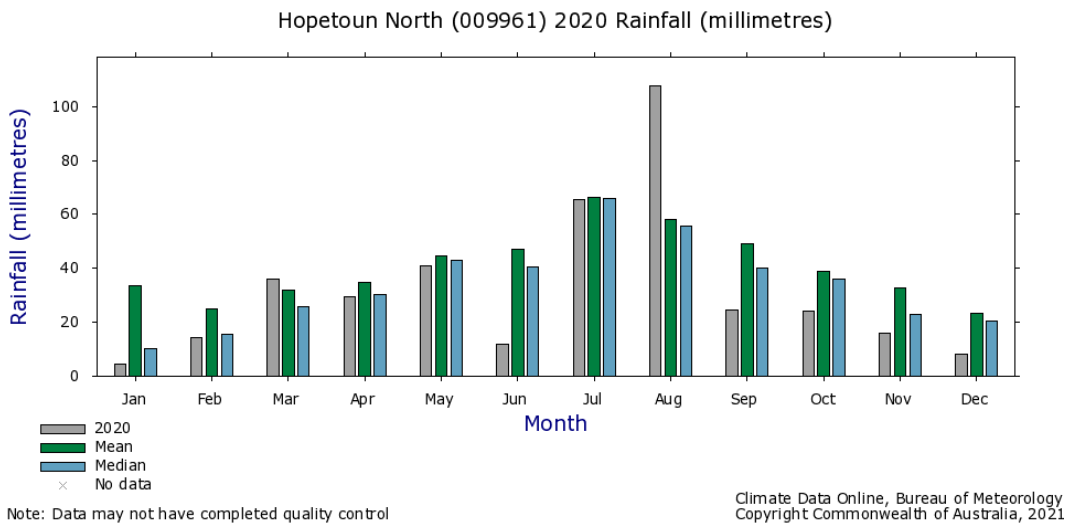
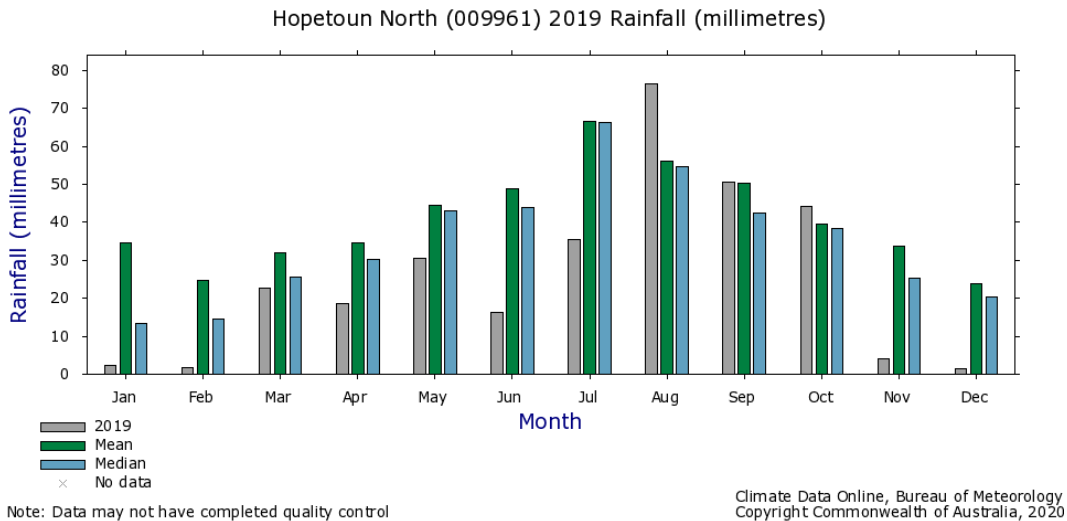


Figure 2. Climate statistics for 2019-2021 compared with historic averages (all years available) from the nearest weather station (Hopetoun North) (BOM 2022).

3 METHODS

3.1 Personnel

The assessment (desktop and field assessment) was primarily conducted by Damien Rathbone (BScHons Plant Science, Scientific License FB2000229). Damien has over 14 years of experience conducting biological surveys in southern Western Australia. Within the south coast region, he has previously undertaken DBCA regional surveys (Albany Regional Vegetation Survey, Fitzgerald River National Park Flora Survey, Ravensthorpe Range Flora Survey), threatened species survey and recovery implementation. Damien is also an accredited interpreter for dieback assessments on DBCA estate (Accreditation PDI-032).

3.2 Desktop Assessment

A desktop assessment of existing *Phytophthora* occurrence information and contextual vegetation and flora values within the study area (approximately 5 km radius of the survey area) was undertaken using the following sources:

- Dieback Information Delivery System (DIDMS) (GAIA 2019).
- NatureMap (Department of Biodiversity Conservations and Attractions [DBCA] 2007-).
- Unpublished reports and management documents (Craig et al. 2008, Rathbone 2020a, 2020b, 2021, ACH Minerals 2019, Gleven 2006, NRG 2011, Terratree 2013, Craig 2004 and Hickman 2011, Great Southern Bio Logic 2021).

3.3 Field Assessment

3.3.1 Schedule

The field assessment was undertaken in March 2020 and June and September 2021 (traverse of the survey area and soil and root sample collection) (Table 2).

Table 2. Field Survey Schedule

Field Dates	Location
28 th & 29 th March 2020	Ariel
8 th - 11 th June 2021	Steere River Phase 1
27 th - 29 th June 2021	Bandalup Pools, Mt Stennet
7 th & 8 th , 13 th - 17 th September 2021	NW Ariel, Happy Chappy, Shintaro and Welcome Stranger

3.3.2 Interpretation (*Phytophthora cinnamomi*)

Field interpretation was conducted following the standard operating procedures for linear assessments as described in the “*Phytophthora Dieback Interpreters Manual for Lands Managed by the Department*”

(DPAW 2015). Most of the area was interpreted by foot or vehicle traverse, with particular emphasis on sites where pathogen vector pathways were present. The condition of the remnant vegetation was also considered using categories defined for Environmental Impact Assessments in Western Australia (Table 3, Environmental Protection Authority [EPA] 2016).

The potential occurrence of *Phytophthora* species was determined through observation of the symptomatic evidence of disease and supported by sampling of soil and roots of recently dead susceptible host plants. Areas were defined into six potential disease status categories relevant to *Phytophthora cinnamomi*:

- *Infested* (disease symptoms present).
- *Uninfested* (disease symptoms absent).
- *Uninterpretable* (undisturbed areas where susceptible host plants are absent, or sparse).
- *Temporarily Uninterpretable* (indeterminate due to disturbance with anticipated short to medium term recovery e.g. fire or rehabilitation).
- *Not yet resolved* (indeterminate due to inconsistent or incomplete evidence in low interpretability climatic zones (400mm to 600mm rainfall range).
- *Excluded* (sealed roads and cleared area devoid of native vegetation)

3.3.3 Interpretation (*Phytophthora* species other than *cinnamomi*)

Mapping the occurrence of *Phytophthora* species other than *P. cinnamomi* is not covered within the regulatory guidelines (DPAW 2015a). Within this report, point sample data indicates the location of soil and roots samples where *Phytophthora* species other than *cinnamomi* have been recovered (Appendix A). Surrounding areas at risk of these *Phytophthora* species through water mediated dispersal are mapped as 'Other threats' and are represented as a hatched overlay.

3.3.4 Soil and Root Sampling

Soil and root samples associated with dead or dying susceptible host plants were collected to confirm the presence of *Phytophthora* species. Diagnostic baiting of the samples was conducted by the Department of Biodiversity Conservation and Attractions (DBCA) Vegetation Health Service (VHS), Kensington, Perth, which determined the potential presence and species identity of any *Phytophthora* isolated.

3.3.5 Protectable Areas

Protectable Areas are generally defined as areas that will not be invaded by *Phytophthora* (relating specifically to *Phytophthora cinnamomi*) via autonomous spread in the short term (10 to 20 years) and anthropogenic spread can be mitigated by soil hygiene management (DPAW 2015). Regulatory guidance indicates the minimum patch size threshold for Protectable Areas is > 4 ha. However, where other high conservation or social values are present this threshold may be reduced.

3.3.6 Demarcation

Protectable Areas and risk areas are demarcated with management Clean on Entry (CoE) points to guide construction activities. Buffers applied to Infested areas are located 15 m upslope or 25 m (or greater) downslope from the active disease edge. The Clean on Entry management points, disease status boundaries (including buffers), soil and root samples and field observations were recorded with a non-differential, hand-held global positioning system (GPS) (Garmin Oregon 7000, ± 5 m accuracy) (MGA zone 51, GDA94).

Table 3. Vegetation condition scale (EPA 2016).

Condition	Description
Pristine	Pristine or nearly so, no obvious signs of disturbance or damage caused by human activities since European settlement.
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.
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.
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.
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.
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.

3.3.7 Survey Limitations

To aid in the identification of potential survey limitations, guidelines in the EPA document *Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016) were adopted (Table 4). No avoidable limitations were identified that can be expected to have affected the reliability of the results of the field survey.

Table 4. Assessment of potential survey limitations (EPA 2016).

Potential for Limitation	Assessment
Availability of contextual information	Very few positive root and soil samples have previously been collected within the vicinity of the survey area. However, it was assumed that <i>Phytophthora</i> species would be more widespread than records indicated. Regional vegetation mapping was available to allow for an appropriate level of contextual information prior to the field survey.
Personnel experience	Personnel undertaking the survey have in excess of 10 years' experience within southern bioregions of WA.
Extent of survey and site access	The area of survey was adequately covered with sufficient intensity over multiple field days.
Seasonal conditions	Whilst below average rainfall has occurred for the year to date, this was counteracted by close to average rainfall preceding the survey in spring such that the seasonal conditions were considered ideal for dieback expression and interpretation (Figure 2).
Disturbances	A large proportion of the survey area is long unburnt vegetation dominated by Myrtaceous species therefore is difficult to detect pathogen expression.

4 RESULTS & DISCUSSION

4.1 Vegetation Condition

The majority of the vegetation in the survey area was in 'Excellent' condition. Vegetation and previous soil disturbance was confined to existing tracks and historic exploration and mining areas. Extensive vegetation slashing has occurred in several linear strips adjacent to road and tracks for fire hazard reduction. Historic mineral exploration has previously occurred throughout the deposit areas and the Hopetoun-Ravensthorpe Railway traverses through several of the sites.

4.2 Vegetation Type and Susceptibility

The vegetation within the survey area was composed primarily of five broad vegetation types that encompass several regional mapping units (Craig *et al.* 2008):

1. Heath and Mallee Heath
 - *Banksia cirsioides* (Bcir)
 - *Eucalyptus pleurocarpa*/ *Banksia media* (Eple/Bmed)
2. Mallet Woodland
 - *Eucalyptus clivicola* (Ecli)
 - *Eucalyptus platypus* (Epla)
 - *Eucalyptus platypus*/ *Melaleuca cucullata* (Epla/Mcuc)
 - *Eucalyptus platypus*/ *Melaleuca haplantha* (Epla/Mhap)
3. Mallee Scrub
 - *Eucalyptus falcata*/ *E. pleurocarpa* (Efal/Eple)
 - *Eucalyptus falcata*/ *E. preissiana* (Efal/Epre)
 - *Eucalyptus falcata* (Efal)
 - *Eucalyptus falcata*/ *Allocasuarina campestris* (Efal/Alca)
 - *Eucalyptus flocktoniae*/ *E. phenax* (Eflo/Ephe)
 - *Eucalyptus flocktoniae*/ *Eucalyptus* species (Eflo/Espp)
 - *Eucalyptus uncinata*/ *Eucalyptus incrassata* (Eunc/Einc)
 - *Eucalyptus* species/ *Melaleuca* species (Mallee/Mspp)
 - *Eucalyptus* species/ *Melaleuca undulata* (Mallee/Mund)
 - *Eucalyptus pileata* (Epil)
 - *Eucalyptus cernua* (Ecer)
 - *Eucalyptus oleosa* subsp. *corvina* (Eole)
 - *Eucalyptus flocktoniae*/ *Melaleuca* sp. Gorse (Eflo/Mgor)
 - *Eucalyptus desmondensis*/ *Allocasuarina campestris* (Edes/Alca)
 - *Eucalyptus proxima* (Epro)
 - *Eucalyptus proxima*/ *Melaleuca* species (Epro/Mspp)

- *Eucalyptus suggrandis*/ *Melaleuca* species (Esug/Mspp)
 - *Eucalyptus* sp. Ravensthorpe (ASG 616)/ *Melaleuca cliffortioides* (EspR/Mcli)
 - *Eucalyptus flocktoniae*/ *Melaleuca cucullata* (Eflo/Mcuc)
 - *Eucalyptus leptocalyx*/ *Melaleuca rigidifolia* (Elep/Mrig)
4. Drainage Line Woodland
- *Eucalyptus occidentalis* (Eocc)
 - *Eucalyptus sporadica* (Espo)
5. Melaleuca Shrublands
- *Melaleuca hamata* (Mham)
 - *Melaleuca elliptica* (Mell)
 - *Melaleuca pulchella* (Mpul)
 - *Melaleuca stramentosa* (Mstr)
 - *Melaleuca acuminata* (Macu)
6. She-oak Shrublands
- *Allocasuarina campestris* (Alca)

The Mallet, Mallee Scrub, Melaleuca/She-oak Shrublands occurred on hill slopes and ridges and were composed mainly of plant species from the Myrtaceae and Cyperaceae that are unsusceptible to *Phytophthora* (will not exhibit disease symptoms), therefore these vegetation types are generally considered Uninterpretable (Plate 1 and 2). Drainage Line Woodlands were confined to the riparian zone within the valley floor and was composed of various shrub species with an emergent canopy of *Eucalyptus sporadica* (Plate 3). This vegetation was considered Uninterpretable despite containing occasional susceptible species (*Hakea laurina*) that were sampled at isolated locations. Heath and Mallee Heath occurred on upper slopes and was mainly confined to the access track off Hopetoun - Ravensthorpe Road. Susceptible *Banksia* species formed a dominant or sub-dominant shrub layer within this vegetation type that would be anticipated to show symptomatic evidence of disease if *Phytophthora* species were present (Plate 4).

A list of susceptible host species in the vegetation types described above is provided (Table 5). The incidence and pattern of disease symptoms in these taxa was considered an indication of the potential presence of *Phytophthora* species.



Plate 1. Mallet Woodland. *Eucalyptus clivicola* (Ecli).



Plate 2. Mallee Scrub. *Eucalyptus pileata* (Epil), with other units interspersed.



Plate 3. Drainage Line Woodland. *Eucalyptus sporadica* (Espo). Composed of various tall shrubs with emergent *Eucalyptus sporadica*.



Plate 4. Mallee Heath. *Banksia cirsioides* (Bcir).

Table 5. Susceptible species from the survey area considered useful indicators (likely to show disease symptoms) for the presence of *Phytophthora* species.

Family	Taxon
Ericaceae	<i>Leucopogon pendulus</i>
Ericaceae	<i>Leucopogon infuscatus</i>
Ericaceae	<i>Styphelia intertexta</i>
Fabaceae	<i>Daviesia teretifolia</i>
Iridaceae	<i>Patersonia limbata</i>
Iridaceae	<i>Patersonia occidentalis</i>
Proteaceae	<i>Banksia cirsioides</i>
Proteaceae	<i>Banksia lemanniana</i>
Proteaceae	<i>Banksia media</i>
Proteaceae	<i>Banksia tenuifolia</i>
Proteaceae	<i>Hakea laurina</i>
Proteaceae	<i>Hakea nitida</i>
Proteaceae	<i>Hakea lissocarpa</i>
Proteaceae	<i>Isopogon</i> sp. <i>Fitzgerald</i>
Proteaceae	<i>Petrophile squamata</i>
Proteaceae	<i>Petrophile fastigiata</i>
Proteaceae	<i>Isopogon trilobus</i>
Proteaceae	<i>Synaphea petiolaris</i>
Xanthorrhoeaceae	<i>Xanthorrhoea platyphylla</i>

4.3 Soil and Root Sampling

Soil and root samples were collected to provide empirical evidence to support the disease interpretation of the survey area. Samples were taken from recently dead or dying susceptible plant species at 38 locations (Table 6., mapped in Appendix A).

Thirty-eight soil and root samples were collected and analysed; all were negative for *Phytophthora cinnamomi*. However, *P. pseudocryptogea* was recovered from two samples and *P. crassamura* and *P. thermophila* were recovered from one sample each. The recovery of *Phytophthora* species other than *cinnamomi* were all associated with water gaining sites where scattered deaths of indicator species were observed. *Phytophthora cinnamomi*, *P. boodjera*, *P. boodjera/arenaria* and *P. nicotianae* have also been previously recovered in close vicinity to the survey area and were considered in mapping disease and pathogen risk.

Table 6. Results of soil and root samples from Vegetation Health Service (VHS). Sample locations are mapped in Appendix A.

Coll_No	Date	Host	Result	Year	Project	Easting	Northing
DAR173	29/03/2020	<i>Styphelia intertexta</i>	Negative	2020	Ariel	6272110	239017
DAR175	29/03/2020	<i>Hakea laurina</i>	Negative	2020	Ariel	6272460	238910
DAR176	29/03/2020	<i>Banksia tenuifolia</i>	Negative	2020	Ariel	6272030	238457
DAR177	29/03/2020	<i>Banksia obtusa</i>	Negative	2020	Ariel	6271930	238323
DAR178	29/03/2020	<i>Banksia circioides</i>	Negative	2020	Ariel	6271810	238160
DAR179	29/03/2020	<i>Patersonia lanata</i>	Negative	2020	Ariel	6271650	237985
DAR180	29/03/2020	<i>Patersonia lanata</i>	Negative	2020	Ariel	6271660	237699
DAR174	29/03/2020	<i>Hakea laurina</i>	<i>P. pseudocryptogea</i>	2020	Ariel	6272250	238982
DAR258	8/06/2021	<i>Banksia media</i>	Negative	2021	Steer River Phase 1	6256350	239282
DAR261	9/06/2021	<i>Banksia media</i>	<i>P. pseudocryptogea</i>	2021	Steer River Phase 1	6257350	237683
DAR262	9/06/2021	<i>Isopogon sp Fitzgerald River</i>	Negative	2021	Steer River Phase 1	6257320	236943
DAR260	9/06/2021	<i>Banksia media</i>	Negative	2021	Steer River Phase 1	6258480	236726
DAR259	9/06/2021	<i>Petrophile fastigiata</i>	Negative	2021	Steer River Phase 1	6258930	236715
DAR263	10/06/2021	<i>Acacia patagiata</i>	Negative	2021	Steer River Phase 1	6256630	238425
DAR264	10/06/2021	<i>Banksia media</i>	Negative	2021	Steer River Phase 1	6257430	238129
DAR265	10/06/2021	<i>Hakea lissocarpha</i>	Negative	2021	Steer River Phase 1	6258150	237652
DAR266	10/06/2021	Soil Only	Negative	2021	Steer River Phase 1	6258140	237930
DAR267	10/06/2021	Soil Only	Negative	2021	Steer River Phase 1	6258170	238562
DAR268	11/06/2021	<i>Banksia media</i>	Negative	2021	Welcome Stranger	6276230	235664
DAR269	11/06/2021	<i>Banksia media</i>	Negative	2021	Welcome Stranger	6276120	235888
DAR270	11/06/2021	<i>Xanthorrhoea platyphylla</i>	Negative	2021	Welcome Stranger	6275890	236412
DAR271	11/06/2021	<i>Banksia media</i>	Negative	2021	Welcome Stranger	6275640	236945
DAR272	11/06/2021	<i>Petrophile fastigiata</i>	Negative	2021	Shintaro	6273710	237388
DAR273	27/06/2021	<i>Banksia media</i>	Negative	2021	Bandalup Pools	6270790	250032
DAR274	27/06/2021	<i>Hakea nitida</i>	Negative	2021	Bandalup Pools	6270190	249328
DAR275	27/06/2021	<i>Banksia heliantha</i>	Negative	2021	Bandalup Pools	6267430	250076
DAR276	28/06/2021	<i>Banksia lemniiana</i>	Negative	2021	Kundip Gold	6269130	240678
DAR277	28/06/2021	<i>Banksia heliantha</i>	Negative	2021	Mt Stennet	6273540	239217
DAR278	28/06/2021	<i>Hakea laurina</i>	Negative	2021	Mt Stennet	6273310	239469
DAR279	29/06/2021	Soil Only	<i>P. crassamura</i>	2021	Bandalup Pools	6262700	249335
DAR280	9/09/2021	Soil Only	Negative	2021	Steer River Phase 1	6259100	237604
DAR281	9/09/2021	Soil Only	<i>P. thermophila</i>	2021	Steer River Phase 1	6258960	238212
DAR282	17/09/2021	<i>Patersonia limbata</i>	Negative	2021	NW Ariel	6273400	238247
DAR283	17/09/2021	<i>Banksia media</i>	Negative	2021	Happy Chappy	6272480	237003

4.4 Disease Status and Protectability

The field interpretation combined with the soil and root sampling determined the survey area to be mapped into four disease status categories for the purposes of managing the spread of *Phytophthora* species (Table 7).

The majority of the survey area was determined to be Uninterpretable (167.2 ha) due to a low natural incidence of indicator species. No obvious evidence of *Phytophthora cinnamomi* was detected in indicator species present in Mallee Heath on mid to upper slopes (Plate 5) and therefore was determined to be Uninfested (50.6 ha). All Uninfested and Uninterpretable vegetation was included as a Protectable Area due to a lack of evidence of *Phytophthora cinnamomi* and the putative absence of infestations upslope of the survey area. Areas mapped as Excluded (7.5 ha) or Temporarily Uninterpretable (19.6 ha) were generally hydrologically contiguous with the surrounding Uninfested areas, therefore were also included within the Protectable Areas. However, areas of standing water within these cleared areas remain a high risk for incipient pathogens; therefore CoE points have been recommended in consideration of this risk.

Phytophthora pseudocryptogea, *P. crassamura*, *P. thermophila*, *P. boodjera*, *P. boodjera/arenaria* and *P. nicotianae* have been recorded within the survey area or within the greater catchment area. The known or potential presence of “*Phytophthora* species other than *cinnamomi*” has subsequently been mapped as “Other Threat” (total of 20 ha) at several sites through either symptomatic evidence or the extrapolation of water mediated dispersal from positive soil and roots sample locations.

Table 7. Extent of disease status categories and Protectability (from introduction of *P. cinnamomi*) within the survey area. A proportion of the survey area was also mapped as an overlay of “Other Threats” due to the known or potential presence of *Phytophthora* species other than *cinnamomi* (20 ha).

Status	Area (ha)	
	Unprotectable	Protectable
Uninterpretable	0	167.2
Uninfested	0	50.9
Temporarily Uninterpretable	0	19.6
Excluded	0	7.5
Total:	0	245.2



Plate 5. Uninfested Mallee Heath with healthy indicators species adjacent to access track within the survey area.



Plate 6. Standing water within disused quarry (Excluded area). No evidence of *Phytophthora cinnmomi* therefore is included as protectable, however it remains a high risk location for incipient pathogens.



Plate 7. Location of *Phytophthora pseudocryptogea* recovery (DAR174) in a water gaining site.



Plate 8. Location of *Phytophthora pseudocryptogea* recovery (DAR 261) in a flood plain on the Steere River.

4.5 Hygiene Management Plan

4.5.1 Risk Assessment

A risk assessment for the proposed activities that determines the 'Likelihood' and 'Consequence' of introducing or spreading *Phytophthora* was undertaken in accordance with the *Phytophthora Dieback Management Manual* (DBCA 2017). The proposed soil disturbance activities associated with drilling are considered to be complex and will require the use of vehicles and heavy machinery. The 'Likelihood' of introducing or spreading *Phytophthora* without hygiene strategies during these activities is considered 'Almost Certain'. The potential 'Consequence' of introducing or spreading *Phytophthora* is dependent on the values of the biodiversity that may potentially be impacted. The 'Consequence' for the proposed activities is considered 'Significant' due to the presence of large areas of Uninfested vegetation. The combined overall risk rating for the activities are considered 'High'.

The risk of introducing or spreading *Phytophthora* can be partially mitigated by operating in low soil moisture conditions and through implementing soil hygiene management strategies.

4.5.2 Hygiene Management Strategies

The aim of hygiene management is to minimise the anthropogenic spread of *Phytophthora* species through the movement of contaminated soil or plant tissue. Best management principals include; demarcation of disease boundaries, minimising entry points; ensuring Clean on Entry (CoE) is applied to plant, equipment, vehicles and footwear and allowing only uninfested basic raw materials to enter Protectable Areas (Department of Conservation and Land Management [CALM] 2003).

The proposed activities occur within an area where *Phytophthora cinnamomi* was determined to be absent. However, other species of *Phytophthora* were confirmed to be present. Subsequently, the aim of the hygiene management recommendations are to reduce the risk of introducing *Phytophthora cinnamomi* (requires clean on entry - CoE) and to reduce the potential localised and regional spread of *Phytophthora* species other than *cinnamomi* (requires clean on exit - CoEx). All disease boundaries and management points are presented in Appendix 6, Maps 1-6.

Project Planning

1. Ensure all *Phytophthora* dieback occurrence information is valid/up-to-date for the period of project operation.
2. Ensure all staff and contractors working within the project area have undertaken appropriate awareness training of *Phytophthora* (i.e. Green Cards).
3. Timing of all operations and construction must be conducted in dry soil conditions to reduce the adhesion of soil material during construction (generally between November and April).
4. Engaging contactors with demonstrated experience in *Phytophthora* management should be preferentially weighted.

5. Contractors are required to demonstrate record keeping and standard operating procedures for hygiene relevant to all plant, equipment and vehicles (i.e., this includes a washdown checklist specific to each vehicle and plant).
6. Basic biosecurity hygiene management procedures are required for all operations and include consideration of weeds and other potential pathogens (including other isolates and species of *Phytophthora*) as follows:
 - a) All plant, equipment, vehicles and footwear should be free of soil and weed seeds prior to entering the survey area.
 - b) Strategies to further reduce the risk of spreading weeds and other pathogens is to operate from areas of high to low elevation and to operate from areas of high to low vegetation condition.
7. The client will be responsible for supervision and evaluation of any environmental or hygiene breaches and non-compliance with this Management Plan by contractors.
8. After completion of operations a follow-up environmental audit is recommended, to ensure no clearing occurred outside the project envelope and to undertake a follow-up weed assessment (and weed control, if required).

Clean on Entry/Exit (CoE, CoEx) Specifications for Protectable Areas

1. Demarcation of Protectable Areas should be checked/retaped if required after the approval of this Management Plan and shortly prior to construction.
2. Work in Protectable Areas should be scheduled for dry soil conditions only.
3. All basic raw material imported into Protectable areas should be low risk for *Phytophthora* contamination.
4. Clean on Entry points are key locations where inspection/clean down of vehicles or plant may be required prior to gaining access into Protectable Areas (i.e., access to site is off sealed Hopetoun Ravensthorpe Road) or cross relevant disease status boundaries.
5. Clean on Exit points are locations where inspection/clean down after completion of activities may be required within a site. Clean down effluent must either be confined within the Infested/Risk area or at an appropriate facility if it is possible transport equipment without dislodging contaminated soil and plant material.
6. Inspections of all plant, equipment, vehicles and footwear at the CoE/CoEx points must be undertaken and recorded. It is recommended that inspections (routine and/or random) of contractors at CoE points are undertaken by an independent party (i.e., internal staff/ external consultant).
7. Effective clean down prior to accessing all sites should be conducted at an appropriate facility or site to remove all soil and plant material (including weed seeds). The key components of a suitable washdown are:
 - a) All effluent is captured during washdown i.e., sump, for later transport and disposal, or diverted into Infested areas.
 - b) Cleaned objects exit washdown area without becoming re-contaminated; and

- c) Safe entry, departure of vehicles by operators is maintained.
- 8. In some instances, a dry brush-down can be used to clean down (i.e., using brush and compressed air). Generally, this can only be undertaken in low soil moisture conditions where there is low adhesion of soil.
- 9. Transportation of cleaned plant, equipment and vehicles to Protectable Areas should be undertaken via sealed roads where possible.
- 10. Site access through Excluded areas poses a potential risk of spreading incipient pathogens, therefore should be managed by access in dry soil condition only and avoiding any areas with standing water or moist soils.

Management of Phytophthora species other than cinnamomi

Methods for detecting and mapping the occurrence of *Phytophthora* species other than *cinnamomi* are not covered within the regulatory guidelines (DPAW 2015a) primarily due to their infrequent recovery in the Perth region and a paucity of information on their impacts and expression in host species. However, in accordance with DBCA policy 3 (DPaW 2015b) introduced *Phytophthora* species should be managed similarly to *P. cinnamomi*.

Soil disturbance activities and movement through areas at risk of *Phytophthora* species other than *cinnamomi* should be avoided; Clean on Exit (CoEx) will be required for plant, equipment, vehicles and footwear exiting areas known or potentially invaded by other *Phytophthora* species.

4.6 Assessment Validity

Phytophthora species can spread autonomously or by animals, bushwalkers and unauthorised vehicles, therefore the assessed boundaries within this report should be revalidated after one year. If continuing or new disturbance activities occur within the survey area, a full re-interpretation should be undertaken after three years. The *Phytophthora* occurrence information in this report is valid as of the 17th September 2021 (with the exception of Ariel, which was valid as of 29th March 2020).

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6 APPENDIX A – DIEBACK OCCURRENCE AND MANAGEMENT MAPS

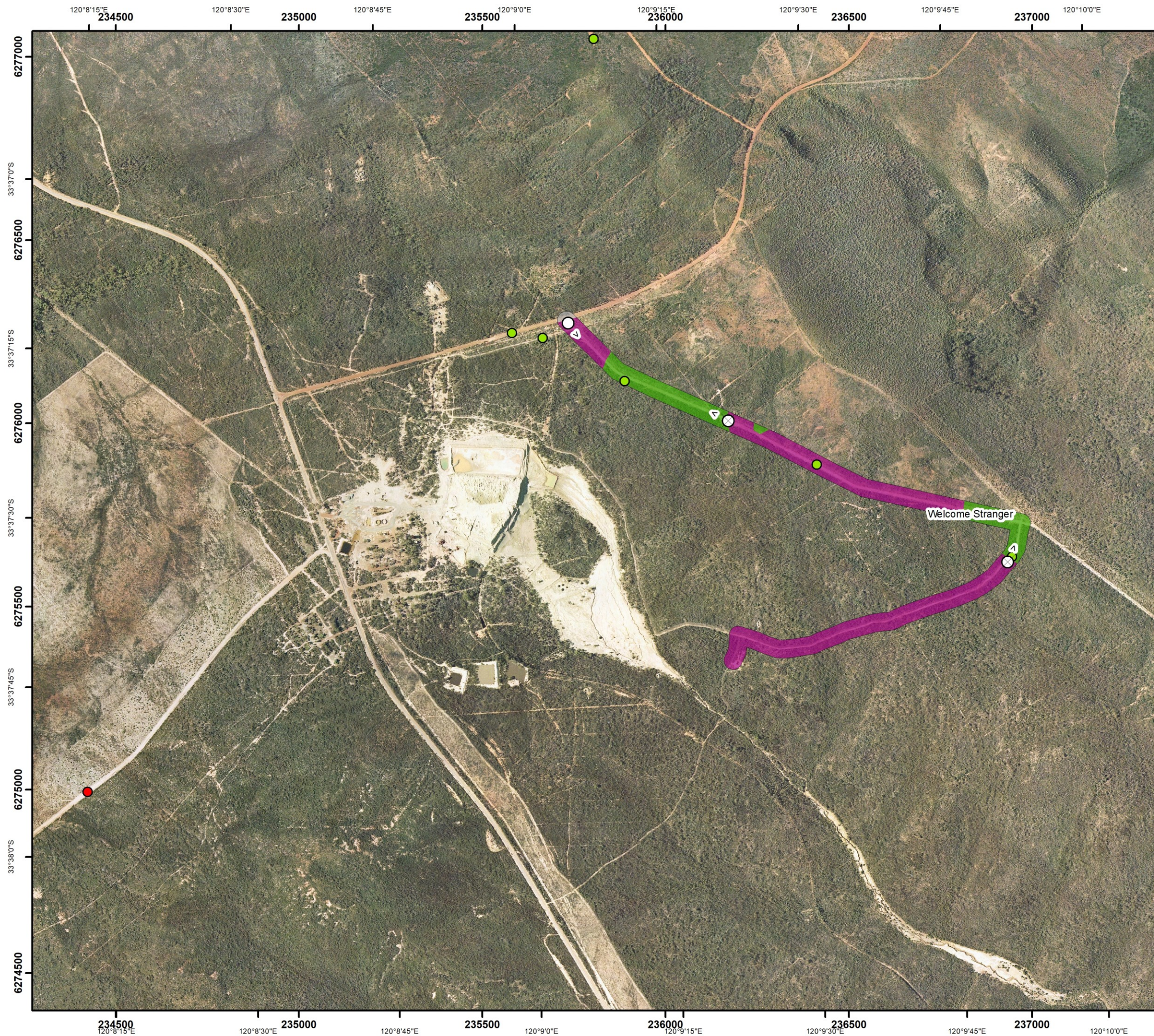
MAP 1 - Welcome Stranger (E74/653)

MAP 2 - Shintaro (E74/560 and E74/639)

MAP 3 - Happy Chappy, NW Ariel, Ariel, Christmas Gift and Mt Stennet (E74/486, E74/311 and E74/683)

MAP 4 - Steere River Phase 1 (E74/630 and E74/486)

MAP 5 - Bandalup Pools (E74/578)



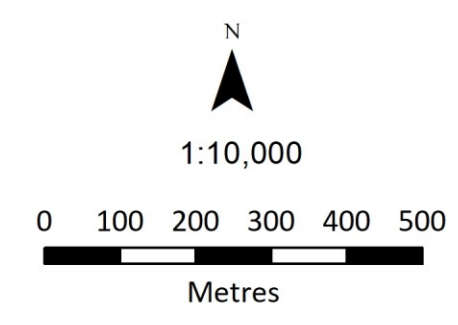
Map 1: Dieback Occurrence and Management: Welcome Stranger (E74/653)

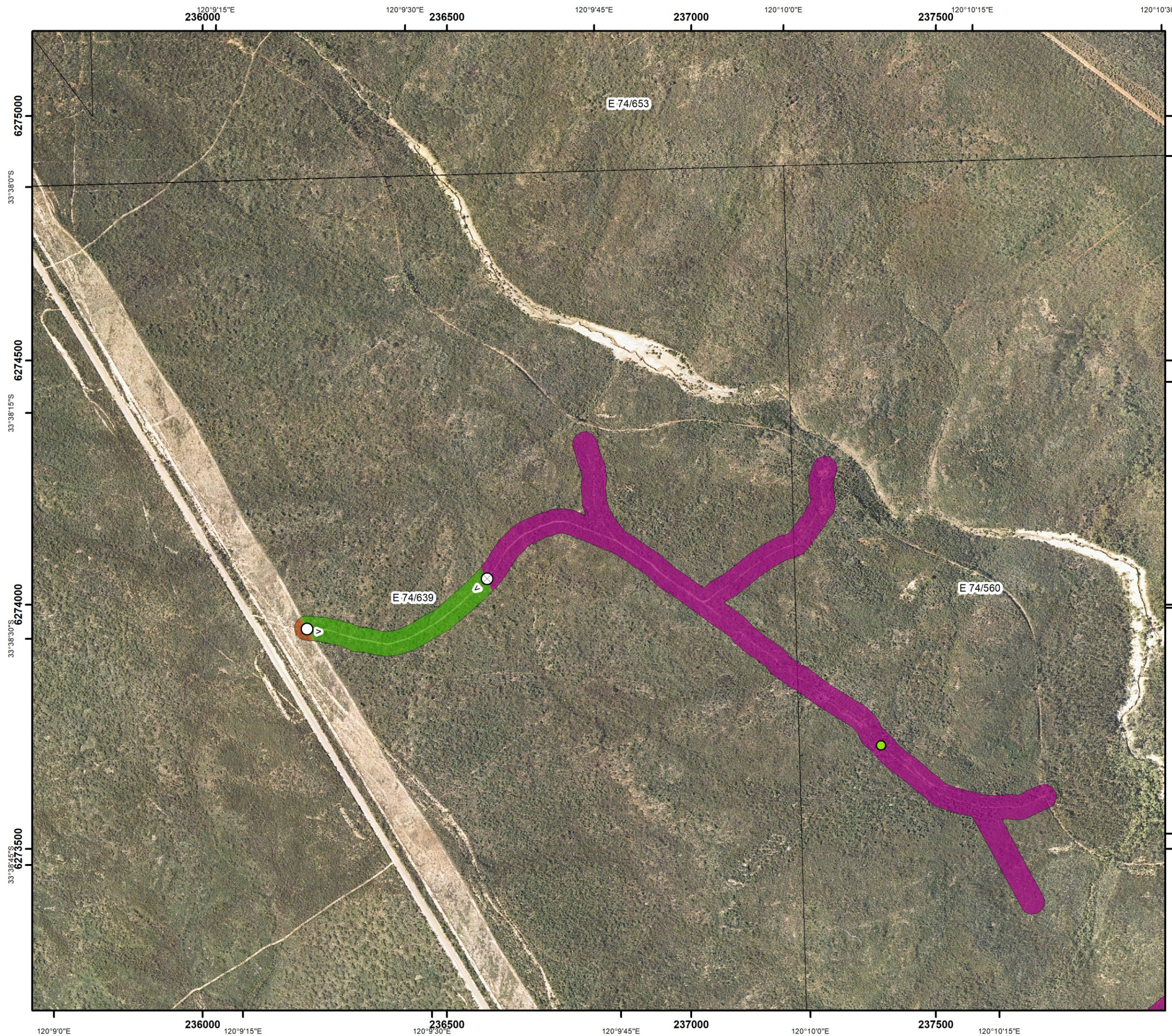
See report for validity of data: Rathbone, DA (2022). Phytophthora Dieback Management Plan: Ravenshorpe Range Exploration Areas, Medallion Metals 2020-2022. Unpublished report by Southern Ecology for Medallion Metals (SE2106).
Map produced by Damien Rathbone on 14/07/2022.

Map Projection: Transverse Mercator Horizontal Datum GDA 1994
Grid: MGA Zone 51 Map Size: A3

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- Dieback**
- Uninfested (Protectable)
 - Uninterpretable
 - Excluded
 - Survey
- Soil and Root Sample**
- P. cinnamomi*
 - Negative
- Management Point (Type and**
- CoE - Clean on Entry
 - CoEx - Clean on Exit





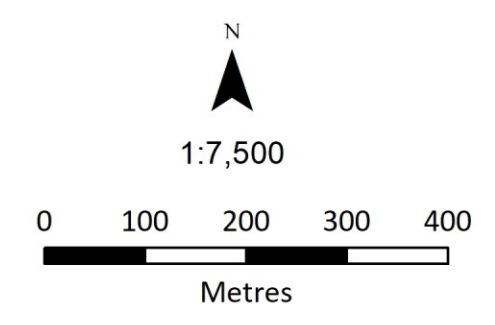
Map 2: Dieback Occurrence and Management: Shintaro (E74/560 and E74/639)

See report for validity of data: Rathbone, DA (2022). Phytophthora Dieback Management Plan: Ravenshorpe Range Exploration Areas, Medallion Metals 2020-2022. Unpublished report by Southern Ecology for Medallion Metals (SE2106).
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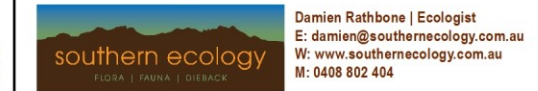
- Dieback Status**
- Uninfested (Protectable)
 - Uninterpretable (Protectable)
 - Temporarily Uninterpretable
 - Survey
- Soil and Root Sample Result**
- Negative
- Management Points (Type and Direction)**
- CoE - Clean on Entry
 - CoEx - Clean on Exit



**Map 3: Dieback Occurrence and Management:
Happy Chappy, NW Ariel, Ariel, Christmas Gift
and Mt Stennet (E74/486, E74/311 and E74/683)**

See report for validity of data: Rathbone, DA (2022). Phytophthora Dieback Management Plan: Ravensthorpe Range Exploration Areas, Medallion Metals 2020-2022. Unpublished report by Southern Ecology for Medallion Metals (SE2106).
Map produced by Damien Rathbone on 14/07/2022.

Map Projection: Transverse Mercator Horizontal Datum GDA 1994
Grid: MGA Zone 51 Map Size: A3



Dieback Status

- Uninfested (Protectable)
- Uninterpretable (Protectable)
- Temporarily Uninterpretable
- Excluded
- Survey Area

Other Threats

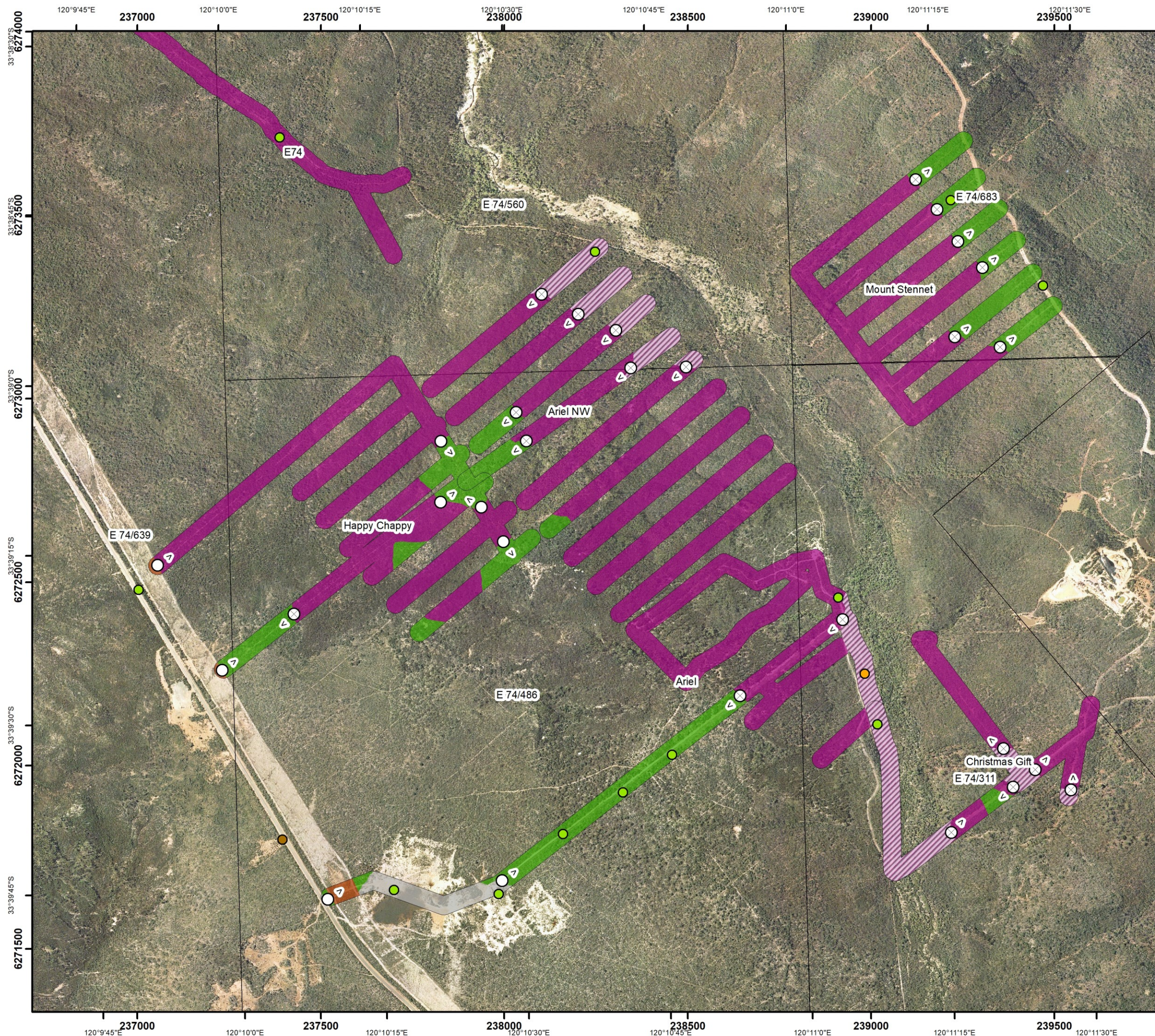
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Soil and Root Sample Result

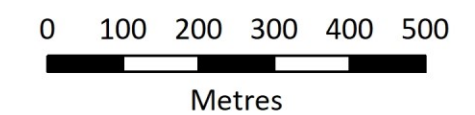
- P. pseudocryptogea*
- P. nicotianae*
- Negative

Management Points (Type and Direction)

- CoE - Clean on Entry
- ↖
 CoEx - Clean on Exit



1:10,000



Map 4: Dieback Occurrence and Management: Steere River Phase 1 (E74/630 and E74/486)

See report for validity of data: Rathbone, DA (2022). Phytophthora Dieback Management Plan: Ravensthorpe Range Exploration Areas, Medallion Metals 2020-2022. Unpublished report by Southern Ecology for Medallion Metals (SE2106).
Map produced by Damien Rathbone on 14/07/2022.

Map Projection: Transverse Mercator Horizontal Datum GDA 1994
Grid: MGA Zone 51 Map Size: A3

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Dieback Status

- Uninfested (Protectable)
- Uninterpretable (Protectable)
- Temporarily Uninterpretable
- Excluded
- Survey Area

Other Threats

- Phytophthora* species other than *cinnamomi*

Soil and Root Sample Result

- P. pseudocryptogea*
- P. thermophila*
- Negative

Management Points (Type and Direction)

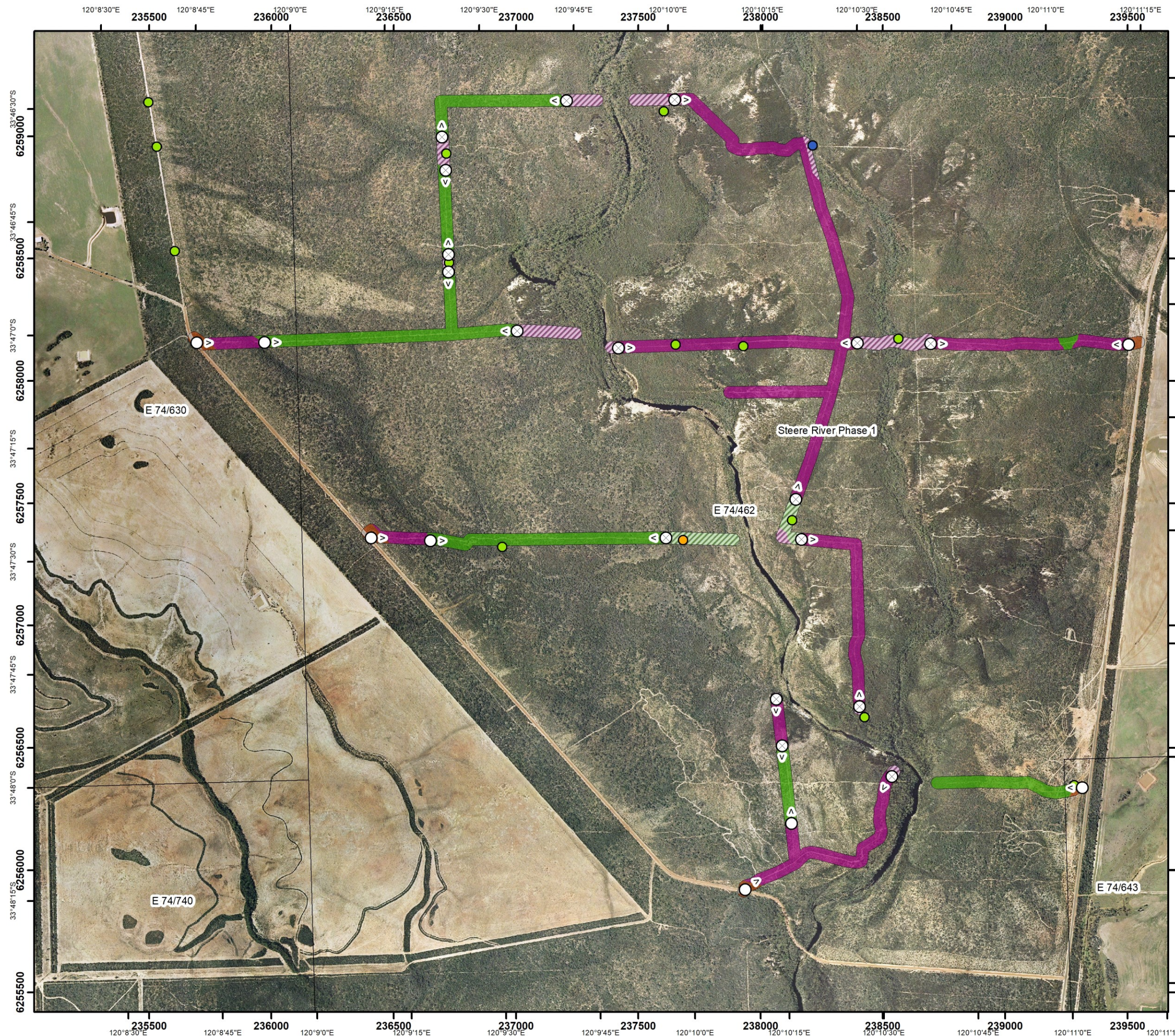
- CoE - Clean on Entry
- CoEx - Clean on Exit



1:15,000




Metres



Map 5: Dieback Occurrence and Management: Bandalup Pools (E74/578)

See report for validity of data: Rathbone, DA (2022). Phytophthora Dieback Management Plan: Ravensthorpe Range Exploration Areas, Medallion Metals 2020-2022. Unpublished report by Southern Ecology for Medallion Metals (SE2106).
Map produced by Damien Rathbone on 14/07/2022.

Map Projection: Transverse Mercator Horizontal Datum GDA 1994
Grid: MGA Zone 51 | Map Size: A3



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Dieback Status

- Uninfested (Protectable)
- Uninterpretable (Protectable)
- Temporarily Uninterpretable
- Excluded
- Survey

Other Threats

- Phytophthora* species other than *cinnamomi*

Soil and Root Sample Result

- P. cinnamomi*
- P. pseudocryptogea*
- P. boodjera*
- P. boodjera/arenaria*
- P. nicotianae*
- P. thermophila*
- P. crassamura*
- Negative
- Phytophthium* sp.

Management Points (Type and Direction)

- CoE - Clean on Entry
- CoEx - Clean on Exit



1:15,000



Metres

