



JANDAKOT AIRPORT DIEBACK MANAGEMENT PLAN

CONSERVATION MANAGEMENT PLAN APPENDIX C

Jandakot Airport Holdings Pty Ltd
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Amendment History

Version	Issue Date	Description	Prepared By	Approved By (JAH)	Approved By (DAWE)
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ATTACHMENTS

ATTACHMENT 1	JAH Contractor Dieback Hygiene Policy and Guidelines
ATTACHMENT 2	Jandakot Airport Flora Species Dieback Susceptibility
ATTACHMENT 3	2023 Jandakot Airport Triennial <i>Phytophthora</i> Dieback Occurrence Assessment

1 Background

Jandakot Airport is managed by Jandakot Airport Holdings Pty Ltd (JAH) under a lease agreement with the Commonwealth Government. The airport site contains 119 ha of conservation precinct. JAH is regulated by the Commonwealth *Airports Act 1996* (Airports Act) and the associated *Airports (Environment Protection) Regulations 1997*.

The Airports Act requires JAH to prepare and implement a Master Plan every five years, which includes an Environmental Strategy that outlines environmental management of the airport. Master Plan 2020 was approved in August 2021 and includes a commitment to implement the Dieback Management Plan.

Phytophthora Dieback (dieback) is caused by an introduced soil and water-borne pathogen known as *Phytophthora cinnamomi*, which infects the roots of plants, causing roots and foliage to die off. This often leads to the eventual death of the infected plant. Many local native plants are susceptible to dieback, and their spread can have devastating effects on the ecology of remnant bushland areas. The death of susceptible species in large numbers can lead to increased weed infestation and impact the habitat and feeding sources of fauna. Areas identified as containing dieback cannot be cured once infested; however, appropriate management can minimise the spread of the disease (Dieback Working Group, 2015). Jandakot Airport is adjacent to two other conservation bushland areas, Ken Hurst Park and the Jandakot Regional Park Acourt Road Reserve. Whilst these neighbouring properties are also affected by dieback, it is important that the spread of dieback is minimised.

Four *P. cinnamomi* dieback infestations comprising a total of 22.9 ha have been identified and mapped at Jandakot Airport (Glevan Consulting, 2023), and these are mostly associated with *Melaleuca preissiana*/dampland areas (see Figures 1, 2 and 3). Jandakot Airport contains regionally significant bushland, which includes at least one declared rare flora species (*Caladenia huegelii*), and provides habitat for one rare fauna species (Carnaby's Black-Cockatoo) and other priority species (Western Brush Wallaby and Quenda). JAH is committed to protecting these areas by implementing the actions described in this Dieback Management Plan.

Armillaria luteobubalina (Honey Fungus) has also previously been identified at Jandakot Airport. Honey Fungus is a mushroom-producing fungus that is probably native to Western Australia, but which also infects the roots of many native plants, leading to plant death. Honey Fungus can be spread by soil, water and air, which makes it more difficult to manage than *P. cinnamomi* (Glevan Consulting, 2000).

There are also several other *Phytophthora* species that can lead to dieback; however, *P. cinnamomi* (i.e., *Phytophthora* Dieback) is the most common and virulent species in Western Australia (Dieback Working Group, 2015). These other *Phytophthora* species are detected through the same process (field interpretation and laboratory analysis of soil and plant tissue) used to confirm the presence of *P. cinnamomi*.

The impact of *Phytophthora* species other than *P. cinnamomi* can vary considerably from site to site, but is typically much lower than that of *P. cinnamomi*. Management of other *Phytophthora* species is typically considered on a case-by-case basis and is largely dependent on the level of impact or threat present in each case. If they are to be managed, they are generally managed in the same way as *P. cinnamomi*.

P. nicotianae was identified within a section of highly disturbed remnant vegetation (maintained as an amenity landscaped garden bed) near the JAH Administration building during the 2011 assessment; however, given the already degraded state of the vegetation, the threat posed by the pathogen is thought to be minimal. In 2018, *P. elongata* and *P. palmivora* were detected in a drainage basin adjacent to Mustang Road.

2 Management

As previously stated, dieback-infested areas cannot be cured, and so the main management focus is to minimise its spread. The proposed management measures to be implemented at Jandakot Airport are detailed in the following sections.

Effective management of dieback spread is assisted by identifying areas of high conservation or those that are vulnerable to spread. JAH has identified the following as its priority areas for dieback management;

1. Conservation Precincts 1A and 1B - Areas containing the Endangered / Declared Rare Flora species *Caladenia huegelii*
2. Conservation precincts 2A and 2B
3. Dieback-infested areas within bushland scheduled for clearing and development.

2.1 Dieback Treatment

2.1.1 Phosphite Application

Phosphite (phosphonate) treatment has been identified as successful in boosting the defence mechanisms of dieback susceptible plants and minimising the spread of dieback (Dieback Working Group, 2015). Phosphite can be applied directly to susceptible tree species by injection or by foliar spraying. Phosphite needs to enter a plant's water transport system in order to be effective (Dieback Working Group, 2015).

JAH uses a combination of ground-based spraying (for small understorey species) and trunk injection (for plants with a stem diameter of 10 cm to 14 cm or greater). The exact methodology and concentrations used will be determined by the expert contractor engaged to undertake the treatment in line with the most up-to-date advice issued by relevant dieback organisations, such as the Dieback Working Group or the Department of Biodiversity, Conservation and Attractions (DBCA).

Treatment will take place during dry weather (preferably autumn) at three-year intervals.

JAH has undertaken phosphite treatment of the mapped disease edges in 2012/13, 2015, 2018, 2021, and 2024, following the completion of triennial dieback assessments and mapping. Phosphite treatment undertaken in 2024 followed Glevan Consulting's (2023) revised disease front mapping (Figure 1), including the omission of phosphite treatment along the northeast boundary of Precinct 2A (Attachment 3 – Figure 2).

2.2 Dieback Prevention and Containment

2.2.1 Access

Restricting access to dieback areas, and particularly across dieback category boundaries, is the most effective method to minimise dieback spread. Much of Jandakot Airport is surrounded by a chain mesh security fence, which minimises unauthorised access to bushland areas by trail bikes and the like. In addition, there are numerous internal and airside security fences.

- Precinct 1A is fenced on all boundaries except where it borders Precinct 1B and includes 'wallaby gates' to facilitate fauna corridors.
- Precinct 1B is fenced on all boundaries except where it borders Precinct 1A.
- Precinct 2A is fenced along all boundaries and includes 'wallaby gates' to facilitate fauna corridors.

- Precinct 2B is located within the secured 'Airside' area.

Airside security fences and fences adjoining airside areas are inspected daily. Other fences are inspected at a minimum of once a week.

Limestone and other suitable track hardening materials have been laid over parts of the airport perimeter road to ensure tracks are traversable and provide a barrier across dieback category boundaries. This enables emergency response access and fence inspections to occur without fear of spreading dieback. Access to other sand tracks and firebreaks is restricted to JAH personnel and approved contractors (e.g. weed sprayers and wildlife consultants).

Should dieback monitoring indicate that the dieback front is advancing significantly greater than expected (as defined by the consultant within the triennial assessment report), JAH will consider hardening existing access tracks to act as a barrier across dieback category boundaries. However, as the 2014, 2017, 2020, and 2023 dieback assessments concluded that the disease distribution was almost identical to that of the 2011 survey, it is unlikely that track hardening for dieback containment will be required in the near future. The only exception is the small new infestation within Precinct 1B, an area of approximately 1.8 ha. The track along which the infestation occurs is rarely utilised, so JAH is unsure how or when the infestation could have been introduced (or spread from the infestation 150m to the north). Given that access along the track is not essential (alternative routes are available), JAH has taken the approach of restricting access, except when it is necessary (and only in fine weather when the soils are dry). Should there be a demand to access the track on a regular basis (including in wet weather), JAH will install a limestone 'bridge' to traverse the location.

Dieback-infested areas are signposted as a reminder to vehicles and pedestrians to keep away, unless access into these areas is necessary and undertaken in an approved manner. All vehicle entry and exit points to dieback infested areas, as well as tracks adjacent to infested areas, are appropriately signposted. JAH will inspect signs annually. The 2020 assessment found no evidence of the pathogen being spread by vehicles.

Pedestrian access into Conservation Precincts and dieback-infested areas is restricted to management activities, such as fauna surveys and weed control. This allows for controls to be specified, such as restricting access during wet weather, when the risk of dieback spread from footwear is greatest.

JAH will continue to implement these access restriction measures.

Access across dieback category boundaries by wallabies and other animals is not currently restricted at Jandakot Airport. While macropods are believed to be responsible for spreading the disease in other locations, it is thought that macropods do not represent a significant risk in relation to disease spread within Jandakot Airport. The 2014 assessment found no evidence of the pathogen being spread by wildlife.

2.2.2 Construction/Earthmoving

If not managed correctly, construction or earthmoving activities that necessitate crossing dieback category boundaries can spread dieback through the movement of infested soil or plant material or via infested soil attached to vehicles and machinery.

A Construction Environmental Management Plan (CEMP) is developed for all construction and earthmoving activities. Where dieback management activities are identified as a high risk and not adequately addressed within the CEMP, the JAH EM will require the contractor to develop a project-specific Dieback Management Plan as part of the Works Permit conditions.

CEMPs and/or project-specific DMPs will be consistent with the JAH Contractor Dieback Hygiene Policy and Guidelines (Attachment 1).

2.2.3 Drainage

Water can easily spread dieback via surface or groundwater flows. There is no standing water at Jandakot Airport, although there are a number of areas which have been identified as damplands (see Figure 3). Stormwater flows are minimal due to the highly free-draining and sandy soils present.

Drainage from developed areas is described in detail within Master Plan 2020 and the Jandakot Airport Local Water Management Strategy (Essential Environmental 2015). Most stormwater drainage basins on the airport are located within cleared and developed areas well away from Conservation Precincts. There is one artificial infiltration basin in Conservation Precinct 1B, which receives stormwater from areas within the older airside developments of the airport. Stormwater previously infiltrated across a wide area until the drainage was redesigned in 2005/06, resulting in stormwater being confined to the Precinct 1B Mustang Road verge. Despite the previous basin area being identified as “completely degraded” (as per the Bush Forever scale) in a 2005 vegetation survey (Cardno BSD, 2005), more recent surveys (Ecoscape, 2016) have defined this area as “good” to “very good”. This is due to a significant increase in vegetation biomass within the basin since 2005. The basin has been mapped as dieback uninfested (Glevan Consulting 2021), but it is at high risk of becoming infested in the future as it is directly adjacent to a dieback-infested area.

Most of the dieback-infested sites at Jandakot Airport are in areas associated with damplands or low points across the airport. This means that stormwater runoff would tend to run towards these areas, thereby minimising dieback spread away from these areas. JAH will ensure that there is no managed stormwater discharge from dieback-infested or uninterpretable areas into uninfested areas.

The groundwater at Jandakot Airport flows in an approximately north to north-westerly direction. This means that areas north of the north-west of the dieback-infested areas are high-risk areas, which may be subject to natural dieback spread via the groundwater. These dieback ‘fronts’ are routinely targeted during triennial phosphite treatments.

2.2.4 Landscaping and Revegetation

JAH regularly undertakes landscaping in development areas and occasionally undertakes revegetation projects in Conservation Precincts. These need to be managed carefully to minimise dieback spread and ensure the successful growth of plants.

The need to undertake rehabilitation or revegetation within the Conservation Precincts of Jandakot Airport can be triggered by:

- Bushfires
- Impacts of weeds on vegetation condition are not successfully managed by weed control
- Impacts of dieback on vegetation condition are not successfully managed by phosphite and other dieback management measures
- The closure of surplus or non-essential firebreaks and access tracks and
- Verge impacts from the construction of new roads as detailed in the Master Plan 2020.

No areas within the Jandakot Airport Conservation Precincts are currently identified as requiring rehabilitation or revegetation. However, if revegetation is required at some future point, the Rehabilitation and Revegetation Guidelines (CMP Appendix D) have been developed to assist in planning.

Sourcing Seed and Plants

It is JAH policy that all revegetation in Conservation Area utilise only provenance seeds where possible and plant species indigenous to the site.

All landscaping in developed areas should be consistent with the Jandakot Airport Landscape Design Guidelines. Landscaping works should consist primarily of species indigenous to the area, with other water-efficient native species allowed to supplement.

JAH has limited capacity to propagate plants from seed or cuttings on-site, and the majority of plants used in landscaping and revegetation will be propagated off-site. Plants grown off-site must be purchased from NIASA (Nursery Industry Accreditation Scheme Australia) or other appropriately accredited nurseries, to ensure that appropriate dieback hygiene measures have been implemented and to minimise the risk of introducing further dieback infections onto Jandakot Airport.

Transplants should not be collected from dieback-infested areas, as the risk of spreading dieback into uninfested areas is too great. Seed can be collected from dieback-infested areas, provided that appropriate dieback clean-down procedures are implemented for all shoes, vehicles, and tools.

Revegetation in Dieback and High Risk Areas

In dieback areas, only dieback-resistant species (See Attachment 2) should be planted. In areas adjacent to dieback infestations or high-risk areas for dieback spread (e.g. areas subject to significant earthmoving), dieback-resistant species should be planted.

When the condition of dieback-infested areas has declined to the point of requiring revegetation, it can be difficult to maintain the area's original vegetation type. Shearer and Hill (1989) observed that in Banksia woodlands of the Bassendean Dune system of the Swan Coastal Plain, most of the dominants and many understorey species are susceptible to *P. cinnamomi*. *Banksia attenuata*, *B. ilicifolia* and *B. menziesii* are commonly lost from communities, leaving scattered trees of *Eucalyptus todtiana* (Prickly bark) and *Nuytsia floribunda* (W.A. Christmas tree), both of which are largely resistant to infection. These species, along with strains of dieback-resistant jarrah identified from areas in the state's southwest, will be considered where there has been a significant decline in the overstorey.

Seedlings are known to be particularly susceptible to death from dieback, even if they are not of a dieback-susceptible species. In dieback-infested areas, it may be appropriate to revegetate using direct seeding instead of planting seedlings.

Topsoil and Mulch

Topsoil and mulch may be collected from cleared areas for reuse in landscaping, provided that materials from dieback-infested areas are kept within the infestation boundaries.

2.2.5 Bushfire Management

JAH has in place a Bushfire Management Plan which outlines the planning for and response to fire incidents at Jandakot Airport. Fire access is provided as described in Section 2.2.1. Current dieback mapping is included in the Bushfire Management Plan, along with the following guidelines to address dieback spread during fire response and recovery:

- Try to keep all machinery operations in one area, either in dieback-infested or uninfested areas
- Minimise the entry of machinery or vehicles into bushland areas, or keep to marked access tracks
- During earthworks, take care not to push dieback-infested soil into uninfested areas
- Avoid areas where soil can be picked up e.g. muddy or wet areas, or clean soil off vehicles.

3 Research and Industry Consultation

JAH recognises that research is an important part in improving dieback identification and management measures. In previous years, JAH has supported a number of dieback-related projects undertaken by Murdoch University students and has been involved with the Dieback Working Group (DWG). JAH will, wherever practicably possible, support future dieback research proposals by facilitating access to dieback-infested areas on Jandakot Airport.

In addition to DBCA, there are several Phytophthora dieback organisations in Western Australia, including the DWG and the Centre for Phytophthora Science & Management (CPSM). JAH will generally seek expert advice directly from dieback consultants. However, where necessary, JAH will consult with these organisations and dieback professionals to ensure that the most appropriate prevention and treatment methods are being applied at Jandakot Airport.

4 Identification & Monitoring

Dieback infestation is typically identified through two methods: visual interpretation and laboratory testing. During dieback surveys, all bushland areas are assigned one of the following categories:

- Dieback infested – dieback is present
- Dieback uninfested – dieback does not appear to be present at the time of the survey
- Dieback uninterpretable – the presence or absence of dieback cannot be determined as the bushland is too degraded or does not contain plant species that are susceptible to dieback.

These categories are used to determine appropriate management measures in each area.

4.1 Interpretation

Dieback interpretation is undertaken by a DBCA-registered interpreter in accordance with the standards and procedures defined in FEM047 Chapter 6 (DPAW, 2015). Reassessment is recommended every three years.

Dieback interpretation involves a visual assessment of the plant species present in a given area. Deaths of susceptible species and their approximate age are noted, as well as the general health of non-susceptible species. The deaths of various susceptible species of different ages may indicate the presence of dieback. Deaths of non-susceptible species may indicate an alternative cause of death such as drought, fire or other disturbance (Glevan Consulting 2005, 2012, 2015, 2018, 2021, 2023).

A combination of interpretation and laboratory testing methods give the most reliable method of dieback identification.

The first dieback interpretation undertaken at Jandakot Airport was completed in November 2000 (Glevan Consulting 2000). Reassessments were undertaken in November 2005 (Glevan Consulting 2005), 2011 (Glevan Consulting 2012), 2014 (Glevan Consulting 2015), 2017 (Glevan Consulting 2018), 2020 (Glevan Consulting 2021) and most recently in 2023 (Glevan Consulting 2023). The results of the 2023 assessment are shown in Figure 1. Areas shown in red are dieback-infested, and all other bushland areas are considered to be dieback-uninfested.

The 2023 assessment revealed a very minor change in disease front over the three-year period between monitoring in 2020 and 2023. Only minor adjustments to the dieback infestation boundaries were required, with the total dieback-infested area remaining at 22.9 ha (Glevan Consulting, 2023).

Dieback status was excluded from assessment in 13.1 ha where weed infestation was too high, or indicator species were too sparse to confidently determine status, reducing the total uninfested area recorded. It is likely that these areas retain uninfested status (Glevan Consulting 2023).

Areas of increased vegetation decline were sampled for the presence of *Phytophthora* (and returned negative results, in line with Glevan Consulting's interpretation that the decline was not consistent with the presence of *Phytophthora* dieback).

The lack of disease expression and presence of healthy yet highly susceptible species in areas previously mapped as infested (2020), coupled with negative sample results, suggests possible overrepresentation of the disease in the north side of Precinct 2A. It was therefore recommended by Glevan Consulting (2023) to omit phosphite treatment along the disease front boundary to the northeast of Precinct 2A (Figure 1). This approach will enable the ready expression of the disease if present and facilitate confident adjustments to infestation boundaries if negative results persist (Glevan Consulting, 2023).

4.2 Laboratory Testing

JAH will undertake the dieback reassessment at Jandakot Airport every three years. The next dieback survey is scheduled to be conducted in 2026. Laboratory testing is typically conducted in conjunction with dieback interpretation and may involve the collection of soil and/or plant tissue samples from areas identified as dieback-infested. There are two primary methods of laboratory testing in use: baiting and DNA analysis. Soil and tissue samples taken during assessments are to be tested to the standards and prescriptions defined in FEM047 (PDAW 2015). Taking a soil and tissue sample from dead and dying plants is an integral part of assessment and can provide evidence to support field diagnostic decisions, although in some cases it is not essential (PDAW 2015).

Soil and tissue samples were collected in both the 2000 and 2005 surveys, and sampling was conducted using the baiting method. Five of twelve samples collected in 2000 were confirmed to contain *P. cinnamomi*, while only one of thirteen samples collected in 2005 tested positive for the presence of *P. cinnamomi*.

During the 2011 assessment, 22 samples were taken. Twenty-one of the samples were taken outside of the known infestations, and all tested negative for the presence of *P. cinnamomi*. The other sample was taken purely as a 'control' from a known infestation where the presence of *P. cinnamomi* was confirmed during the 2005 assessment. Sampling of known infestations is not a common practice, but in areas where pathogen dormancy may be a factor, it helps confirm that the pathogen is being detected by the laboratory process and that 'false negative' results are not being recorded. *P. cinnamomi* was recovered from the control sample, providing evidence that the pathogen will be recovered if present, and that false-negative sample results are not being recorded.

During the 2014 assessment, 18 samples were taken outside of the 2011 dieback boundaries and one control sample was taken from a dieback area. No new *Phytophthora* Dieback infestations were identified, and only minor adjustments were made to the boundaries of the five existing infestations. Minimal disease expression was evident during the assessment, and the lack of expression is most likely the result of ongoing phosphite treatment.

During the 2017 assessment, eight samples were initially taken, with only one sample, associated with the new Precinct 1B infestation, testing positive for *P. cinnamomi*. An additional two samples taken after the initial assessment, in response to suspicious tree deaths in the Mustang Road drainage basin reported by JAH staff, tested positive for *P. elongata* and *P. palmivora*.

During the 2020 assessment, nine samples were taken, and all tested negative for the presence of *Phytophthora*.

During the 2023 assessment, eight samples were taken, all of which tested negative for the presence of *Phytophthora* (Figure 1).

In addition to the scheduled site-wide dieback assessments, specific investigations have been conducted as required in response to dieback concerns. In December 2006, Murdoch University's Centre for Phytophthora Science and Management conducted DNA analysis on ten soil and one plant tissue samples collected from an uninterpretable area within the Stage 1 commercial area. The plant tissue sample tested positive, but all the soil samples tested negative for *P. cinnamomi*. In 2008, Glevan Consulting collected five soil and tissue samples from the Compass Road development area. *P. cinnamomi* was not recovered from the vegetation assessed.

4.3 Bushland Condition

There appears to be a relatively strong correlation between bushland condition ratings (Ecoscape 2011, 2017) and the presence of *P. cinnamomi*. While the bushland condition within some of the infested sites is not markedly different from the uninfested areas, the vegetation associated with the infestations in Precinct 2A exhibited slightly higher levels of disturbance than the surrounding uninfested areas, as seen in Figure 4 (Ecoscape, 2022). Bushland Condition thresholds for triggering further management intervention (including rehabilitation and revegetation) are addressed in the Weed Management Plan (Appendix B).

4.4 Ongoing Monitoring

JAH will monitor the effectiveness of this Dieback Management Plan in minimising the spread of dieback via the proposed triennial surveys, utilising interpretation and/or laboratory assessment. The methods used (including laboratory testing) will be based on the advice of the expert consultant contracted to undertake the dieback interpretation.

Ongoing bushland condition monitoring results will also be compared with dieback mapping as part of the triennial dieback interpretation to determine any correlation between the two.

In addition, opportunistic observations can be made on a regular basis throughout the conservation precincts by the JAH Environment Manager and other staff while undertaking works within or adjacent to the conservation precincts. Suspected new infestations or suspected rapid spread of existing infestations will be entered into the JAH Safety Management System database as an Environment Incident and actioned accordingly. It was via this method that *P. elongata* and *P. palmivora* were identified in the Mustang Road drainage basin in 2018.

5 Communication

JAH communicates the contents of this Dieback Management Plan to its stakeholders via the following methods:

- Dieback-infested areas are identified via signage (see Table 1, DMP4).
- Publication of the DMP on the JAH website, where it is accessible to all staff, tenants, contractors and members of the public.
- Inclusion of relevant dieback management information within CEMP templates and Operational Environmental Management Plan (OEMP) templates.
- Inclusion of dieback management information in relevant site inductions.

6 Reporting Requirements

Reporting against actions described in this plan will be included within the Jandakot Airport Annual Environment Report (AER). In line with the *Airports (Environment Protection) Regulations 1997*, the AER will be submitted to the DITRDCA (DITRDCA) by 28th October each year. A copy of the report will be provided to the Department of Climate Change, Energy, the Environment, and Water (DCCEEW) by October 28th each year.

Reporting relevant to the DMP will also be included in an annual compliance report, as required under Condition 16 of EPBC 2009/4796, and published on the JAH website by 28th October each year.

7 Review and Amendment of Dieback Management Plan

As with the overarching Conservation Management Plan, the Dieback Management Plan will require regular review and amendment in order to meet practical requirements on site as changing circumstances demand.

Once amended, the Dieback Management Plan will be submitted to DAWE for the Minister's approval (ref Conditions 6 and 12 of EPBC 2009/4796 approval). The approved management plan will be implemented.

The JAH Environment Manager will review this Dieback Management Plan every three years to ensure that it is up to date and its control measures are effective. This review is planned to occur following the triennial dieback assessment, which will determine whether existing management measures have been effective in halting, or at least slowing, the spread of the disease. If required, new or amended management measures will be identified and included within the Dieback Management Plan. The next review of the Dieback Management Plan is due in 2027.

However, if new relevant information comes to light before the three-yearly review is undertaken (e.g., a new infestation is identified, new or improved treatment methods are discovered, etc.), the Dieback Management Plan will be reviewed before the scheduled action.

8 Summary of Actions

The Table below contains a list of summary actions relating to the Jandakot Airport Dieback Management Plan.

Table 1. Dieback Management Plan Summary of Actions.			
Action		Responsibility	Timing
Dieback Treatment			
DMP1	Undertake phosphite (or other appropriate) treatment of dieback infested areas utilising methods recommended by dieback experts (refer to DMP14).	JAH EM	Triennially (next due 2026).
Dieback Management – Prevention and Containment			
Access			
DMP2	Inspect airside security fencing daily (other fences weekly) and repair immediately if necessary.	JAH ASOs (airside) and JAH Senior Groundsman (landside).	Daily/weekly (dependent on location).
DMP3	Investigate the feasibility of hardening existing access tracks to act as a barrier across the relevant dieback category boundaries, where the dieback front is advancing significantly* and additional control actions are required (as determined via triennial assessments). <small>*Significantly, as defined by the dieback consultant undertaking assessment.</small>	JAH EM in consultation with JAH Operations Manager and JAH Facilities Manager.	Feasibility investigation to be completed within 6 months of the triennial assessment that initially identified the issue.
DMP4	Plan and implement works recommended within the feasibility investigation (DMP3).	JAH EM in consultation with JAH Operations Manager and JAH Facilities Manager.	Timing as recommended within feasibility investigation.
DMP5	Install (or if appropriate, relocate) dieback awareness/warning signs at all entry/exit tracks to infested areas and along adjacent tracks when a new dieback infestation is detected or an existing dieback infestation boundary has increased beyond the existing signage.	JAH EM.	Within 3 months of a new infestation being detected or an existing dieback front assessed as having increased beyond the existing signage.
DMP6	Inspect dieback signage and replaced/update if required.	JAH EM.	Annually (July each year).
Construction and Earthmoving			
DMP7	Prepare a JAH-approved CEMP or project-specific DMP for all construction and earthmoving activities. CEMPs and project-specific DMPs will be consistent with the JAH Contractor Dieback Hygiene Policy and Guidelines (Attachment 1).	JAH EM in liaison with contractors.	Prior to works commencing.
DMP8	Implement the JAH-approved CEMP or project-specific DMP for all construction and earthmoving activities prepared	Construction and earthmoving contractors	During construction and earthmoving works.

Table 1. Dieback Management Plan Summary of Actions.			
Action		Responsibility	Timing
	under DMP7.		
<i>Drainage</i>			
DMP9	Design new developments/drainage works to avoid stormwater discharge from dieback infested or uninterpretable areas or uninfested bushland areas.	JAH EM in consultation with contractors and JAH staff.	Where relevant, to be included in CEMP prior to works commencing.
<i>Landscaping and Revegetation</i>			
DMP10	Revegetation shall be consistent with CMP Appendix D Bushland Rehabilitation and Revegetation Guidelines.	JAH EM	At all times
DMP11	Landscaping in developed areas shall be consistent with the Jandakot Airport Landscape Design Guidelines.	JAH EM	At all times
<i>Research and Industry Consultation</i>			
DMP12	Assess research proposals requesting access to Jandakot Airport dieback infestations in regard to feasibility, safety, relevance, impact on JAH resources, etc.	JAH EM	Timing of assessment to be agreed upon between JAH and the relevant research institution requesting access.
DMP13	Facilitate access by researchers to Jandakot Airport dieback infestations (subject to assessment and approval as described in DMP12).	JAH EM	Following receipt of a request from a research institution or government agency.
DMP14	Consult with dieback organisations and/or professionals to ensure that the most appropriate prevention and treatment methods are being applied at Jandakot Airport.	JAH EM	Prior to undertaking phosphite (or other appropriate) treatment and during triennial review of the DMP.
<i>Monitoring and Contingency Requirements</i>			
DMP15	Undertake dieback reassessment.	JAH EM.	Triennially (next due 2026).
DMP16	Enter suspected new infestations or suspected rapid spread of existing infestations observed between triennial dieback assessments into the JAH Safety Management System database as an Environment Incident.	JAH EM	Within 7 days of a suspected new infestation or rapid spread of an existing infestation being reported.
DMP17	Implement actions identified from the Environment Incident investigation process commenced under DMP16	JAH EM	In accordance with the timing identified under the Environment Incident investigation process.
<i>Communication</i>			

Table 1. Dieback Management Plan Summary of Actions.			
Action		Responsibility	Timing
DMP18	Publish the amended DMP on the JAH website.	JAH EM	Within 4 weeks of DMP review completion (or, if applicable, within one month of endorsement by relevant government regulator).
DMP19	Update the JAH CEMP and tenant OEMP templates with relevant dieback management information (only required if information within the current CEMP and OEMP templates is not consistent with the current DMP).	JAH EM	Within 3 months of DMP review completion (or, if applicable, within one month of endorsement by the relevant government regulator).
DMP20	Ensure all CEMPs and OEMPs submitted to JAH for review and endorsement adequately address dieback management, relevant to the activities proposed to be undertaken.	JAH EM	Prior to endorsing CEMP or OEMP.
DMP21	Include relevant dieback management information within inductions or written instructions for contractors working across dieback boundaries (e.g. weed spraying contractors).	JAH EM	Ongoing – Inductions to be completed before works commence.
Reporting Requirements			
DMP22	Report against actions of the DMP within the Jandakot Airport Annual Environment Report (AER) and provide copies to DITRDC and DAWE.	JAH EM	28 October Annually.
DMP23	Report against actions of the DMP within an Annual Compliance Report (ref Condition 16 of EPBC 2009/4796) and publish on the JAH website.	JAH EM	28 October Annually.
Review and Amendment of DMP			
DMP24	Review and update (if required) DMP following triennial dieback survey.	JAH EM	June 2024, then Triennially.

9 Glossary

AER	Annual Environment Report
ASO	Airport Services Officer
CEMP	Construction Environmental Management Plan
CMP	Conservation Management Plan
DBCA	Department of Biodiversity, Conservation and Attractions (formerly DPAW, DEC and CALM).
DCCEEW	Department of Climate Change, Energy, the Environment and Water (formerly DOEE, DOE, DOEE, DSEWPaC and DEWHA, now DCCEEW).
DITRDC	Department of Infrastructure, Transport, Regional Development and Communications
DITRDCA	Department of Infrastructure, Transport, Regional Development, Communications, Sport and the Arts (formerly DIT, DIRD and DIRDC, now DITRDCA)
DMP	Dieback Management Plan
DPAW	Department of Parks and Wildlife (formerly DEC). On 1 July 2017 DPAW was merged with three other Departments to become DBCA.
DPIRD	Department of Primary Industries and Regional Development
EPBC	<i>Environmental Protection and Biodiversity Conservation Act 1999</i>
JAH	Jandakot Airport Holdings
JAH EM	Jandakot Airport Holdings Environment Manager
OEMP	Operational Environmental Management Plan
OM	Operations Manager
SMS	Safety Management System (an access database used by JAH to record all Incidents).
WMP	Weed Management Plan

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FIGURE 1. JANDAKOT AIRPORT *PHYTOPHTHORA CINNAMOMI* OCCURRENCE 2023

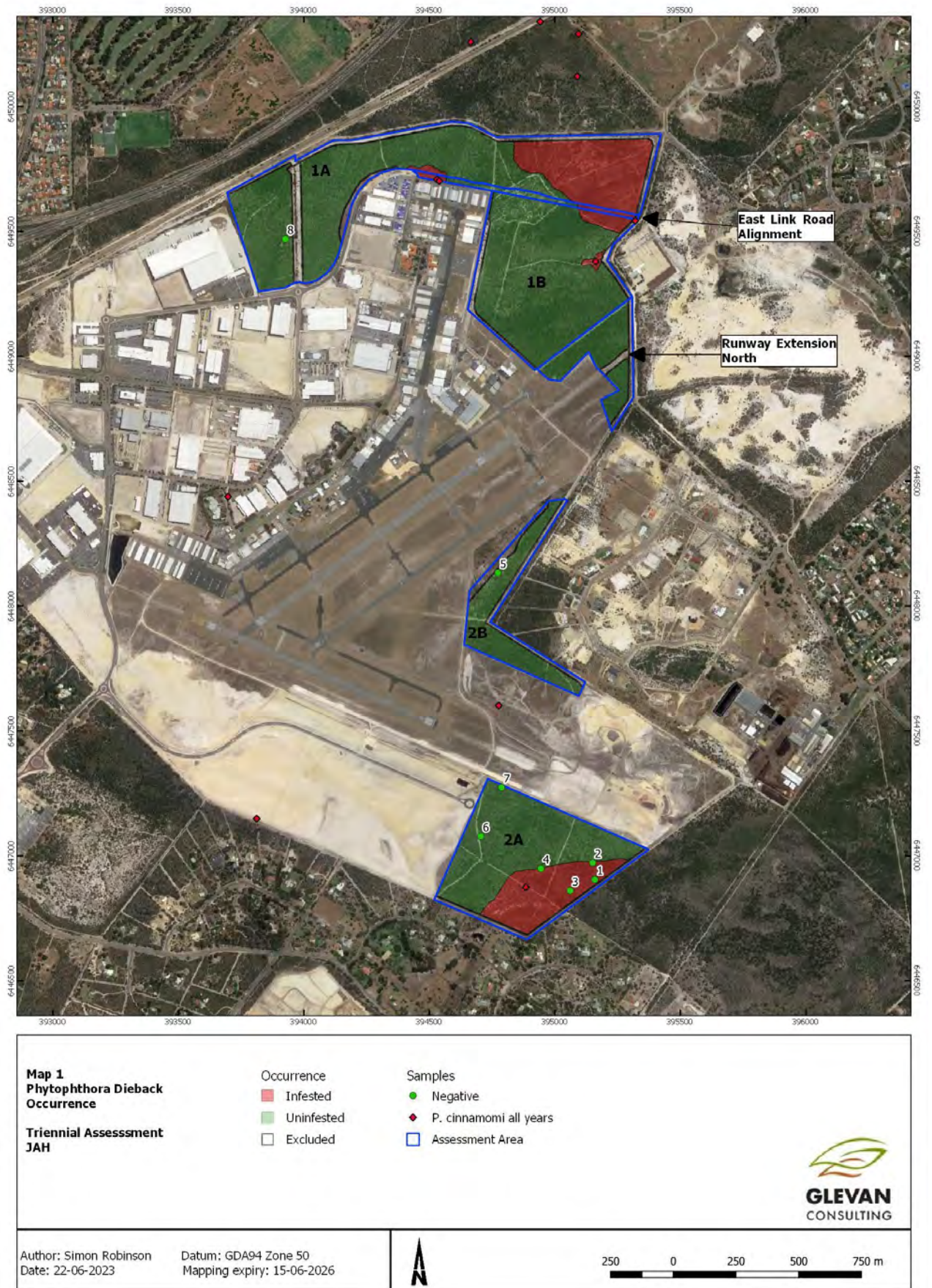


FIGURE 2. VEGETATION COMMUNITIES MAPPING 2016

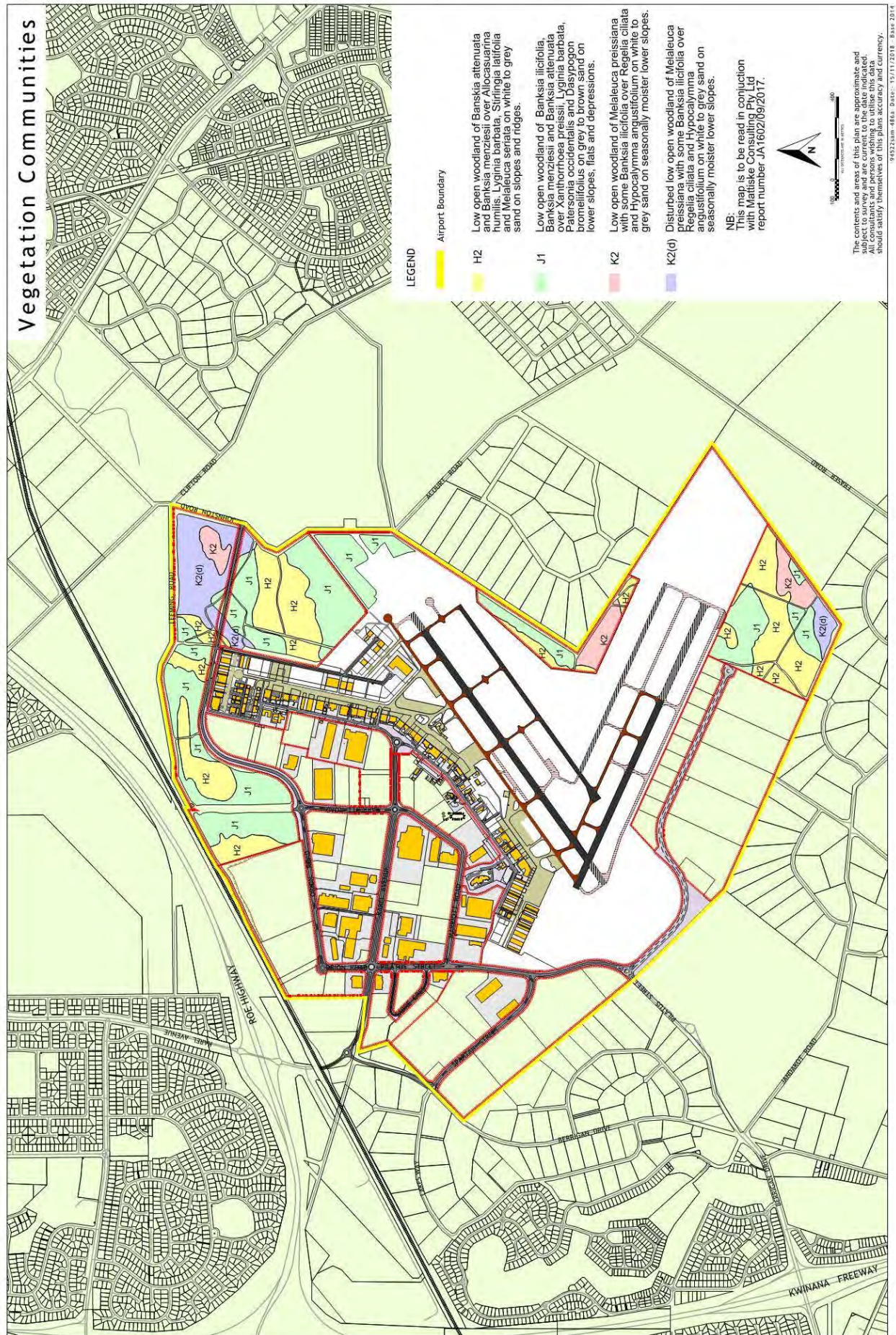
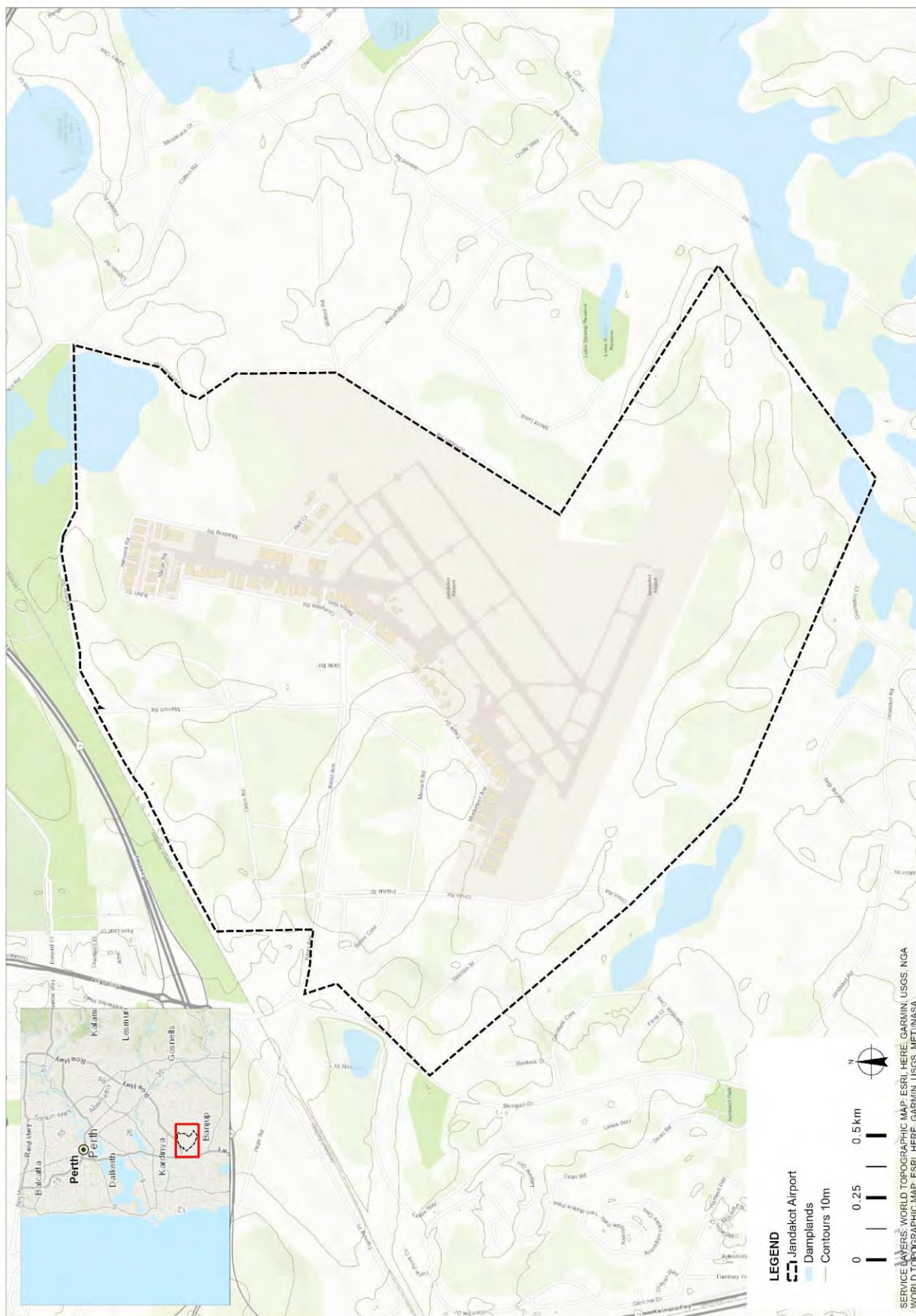


FIGURE 3. DAMPLANDS



Source: WA Atlas, Landgate 2023.

Attachment 1. JAH Contractor Dieback Hygiene Policy and Guidelines

DIEBACK HYGIENE POLICY

The objective of dieback management is to protect all vegetation within Jandakot Airport by minimizing the risk of introducing and spreading *Phytophthora cinnamomi*.

BACKGROUND

Phytophthora cinnamomi, also known as 'dieback' or 'jarrah dieback', is a soil-borne pathogen that kills a wide range of plant species in the southwest of WA by destroying their root systems. *P. cinnamomi* causes disease in a range of vegetation communities and affects a diverse range of plants. Native plant communities particularly at risk from *P. cinnamomi* include those dominated with Banksia species – such as the vegetation at Jandakot Airport.

A number of known dieback infested areas exist at Jandakot Airport. These areas have been mapped and Jandakot Airport Holdings aims to ensure that dieback is not spread via unhygienic practices from these areas into uninfested areas either elsewhere on the Airport estate or offsite.

Similarly, Jandakot Airport Holdings aims to ensure that unhygienic practices do not result in new dieback infestations being introduced to the airport from off-site sources.

SPREAD

Dieback can spread:

- by water (drainage, irrigation or groundwater flow)
- in soil (transported by bulk soil deliveries, containers, shoes, tools, vehicles and other equipment)
- by the movement of infected plants and plant materials.

Natural spread dieback is generally slow and is achieved through movement of the pathogen along plant root systems or, on a faster scale, through the movement of microscopic spores in surface and sub-surface water flows, and by animals.

Human-related vectors can disperse the pathogen much more quickly and are believed to be the primary reason for the widespread distribution of dieback in WA. Any activity that transfers soil and plant material (either intentionally or non-intentionally) from one location to another is a potential vector. Examples of activities that can contribute to the spread of the pathogen include:

- road construction and civil works
- earth moving
- vegetation clearing
- revegetation activities
- off-road/four-wheel driving.

CONTRACTOR CONSTRUCTION/DIEBACK MANAGEMENT PLANS

In order to ensure that appropriate hygiene controls are in place to prevent dieback spread, contractors undertaking activities that can contribute to the spread of dieback will need to address dieback management within a project-specific Construction Environment Management Plan (CEMP) or Dieback Management Plan (DMP).

BASIC DIEBACK HYGIENE MANAGEMENT MEASURES AND GUIDELINES

- Where possible, schedule activities that involve soil disturbance for dry summer months (November – March) or dry conditions.
- Minimise soil disturbance – consider mowing, slashing or use herbicide, rather than ploughing and grading, whenever possible.
- When undertaking works across dieback category boundaries (i.e. in areas that include both infested and uninfested), where possible complete activities in the uninfested part of the bushland, before moving to the infested part of the bushland.
- In the uninfested parts of the estate/bushland:
 - Do not bring in soil/sand/gravel. If it is required, it should be obtained from certified phytophthora-free sources.
 - Landscape supplies should be sourced from either certified phytophthora-free sources or accredited Nursery Industry Association suppliers.
 - Prevent vehicles and machinery entering bushland. If they must enter, they must be free of soil and mud, and restricted to a hard, dry surface wherever possible.
 - Vehicles are to be cleaned off-site prior to initially accessing the airport for works. If vehicles temporarily leave site, they must be re-cleaned before returning unless they have remained on sealed roads in low-risk areas (e.g. trucks that make multiple daily journeys to cart sand from Jandakot airport development areas to off-site storage facilities).
 - Footwear to be free of mud and soil when entering bushland.
 - Any water used in earthworks etc. must be from approved sources (e.g. mains supply, approved bores etc.)
- In the infested parts of the estate/bushland
 - Prevent vehicles and machinery entering. If they must enter, restrict them to hard, dry surfaces and vehicles are to be free of soil and mud when exiting the infested bushland.
 - Do not remove soil/sand/gravel from the infested part of the bushland. If it must be removed, it must be placed at a site that is also infested with *P. cinnamomi* or managed in accordance with the approved CEMP or project-specific DMP.
 - Footwear must be free of mud and soil when exiting the bushland.

GUIDELINES FOR CLEANING EQUIPMENT AND VEHICLES

Cleaning will be easier and more effective if completed at a depot or designated cleaning area prior to accessing the airport. In instances where on-site cleaning must occur (e.g. prior to exiting dieback infested areas), the below guidelines are provided to assist in the development of a CEMP or project-specific DMP.

Field-based cleaning requires:

- A hard, well-drained surface (e.g. road or ramp) that is well away from native vegetation. Any wash-down effluent (water, mud and slurry) must be collected on-site and must not be allowed to drain into uninfested bushland.
- Minimise water use to remove soil and mud from equipment/vehicles. This can be achieved by preferentially dry cleaning techniques e.g. stiff brushes.

- Pay particular attention to mudflaps and tyres.
- Do not drive through effluent generated from cleaning when exiting the washdown facility.



Guidelines for cleaning footwear

- Try to remove mud and soil when it is dry. Remove as much mud and soil as possible with a stiff brush or stick and minimise the amount of water used.
- Collect all mud and soil removed and dispose of at a site that is infested with *P. cinnamomi*.



Guidelines for sterilising

Sterilisation of equipment, footwear and vehicle tyres can be used as an extra precaution. Sterilisation of nursery equipment using steam is common practice; however the use of steam is not practical in the field. The following sterilisation methods can be used in the field.

- Spray 70% methylated spirits on small hand tools and footwear covering all surfaces and allowing a few minutes for it to soak into all soil material.
- Spray diluted bleach (sodium hypochlorite) onto equipment and footwear allowing a few minutes before rinsing the bleach off using water. Dilute bleach so that solution contains 1% active ingredient sodium hypochlorite. Be sure to follow any of the manufacturer's safety instructions provided on the bleach container.
- Phytoclean® or other effective disinfectants can be used in footbaths, washdown facilities and during the cleaning of equipment. See the manufacturer's details for directions.

Attachment 2. Jandakot Airport Flora Species Dieback Susceptibility

S = Dieback Susceptible; R = Dieback Resistant

<i>Acacia applanata</i>		<i>Caladenia discoidea</i>		<i>Desmocladius asciculatus</i>	
<i>Acacia huegelii</i>	R	<i>Caladenia flava</i>		<i>Desmocladius fasciculatus</i>	R
<i>Acacia pulchella</i>	R	<i>Caladenia huegelii</i>		<i>Desmocladius flexuosus</i>	R
<i>Acacia saligna</i>	R	<i>Caladenia longicauda</i>		<i>Dianella revoluta</i>	S
<i>Acacia stenoptera</i>	S	<i>Caladenia paludosa</i>		<i>Dielsia stenostachya</i>	
<i>Acacia willdenowiana</i>		<i>Calectasia narragara</i>		<i>Diuris corymbosa</i>	
<i>Actinotus glomeratus</i>		<i>Calytrix angulata</i>		<i>Diuris emarginata</i>	
<i>Adenanthos cygnorum</i>	S	<i>Calytrix flavescens</i>	R	<i>Diuris laxiflora</i>	
<i>Adenanthos obovatus</i>	S	<i>Calytrix fraseri</i>	S	<i>Diuris longifolia</i>	
<i>Allocasuarina fraseriana</i>	S	<i>Calytrix strigosa</i>		<i>Drosera erythrorhiza</i>	R
<i>Allocasuarina humilis</i>	S	<i>Cassytha flava</i>	R	<i>Drosera glanduligera</i>	
<i>Amphipogon laguroides</i>		<i>Cassytha glabella</i>	R	<i>Drosera macrantha</i>	R
<i>Amphipogon turbinates</i>		<i>Cassytha racemosa</i>		<i>Drosera menziesii</i>	
<i>Anigozanthos humilis</i>		<i>Centrolepis aristata</i>		<i>Drosera paleacea</i>	
<i>Anigozanthos manglesii</i>	R	<i>Centrolepis drummondiana</i>		<i>Drosera pulchella</i>	
<i>Aotus sp. procumbent</i>		<i>Centrolepis humillima</i>		<i>Eremaea asterocarpa</i>	
<i>Arnocrinum preissii</i>		<i>Chamaescilla corymbosa</i>	R	<i>Eremaea pauciflora</i>	
<i>Astartea fascicularis</i>	R	<i>Chordifex microcodon</i>		<i>Eriachne sp.</i>	
<i>Astartea scoparia</i>		<i>Comesperma calymega</i>	R	<i>Eucalyptus gomphocephala</i>	R
<i>Asteraceae sp.</i>		<i>Conospermum stoechadis</i>	S	<i>Eucalyptus marginata</i>	S
<i>Astroloma pallidum</i>		<i>Conospermum triplinervium</i>	S	<i>Eucalyptus rudis</i>	R
<i>Astroloma xerophyllum</i>	S	<i>Conostephium minus</i>		<i>Eucalyptus todtiana</i>	S
<i>Austrodanthonia occidentalis</i>		<i>Conostephium pendulum</i>	S	<i>Euchilopsis linearis</i>	
<i>Austrodanthonia pilosa</i>		<i>Conostephium preisii</i>		<i>Euchiton sphaericus</i>	
<i>Austrostipa compressa</i>		<i>Conostylis aculeata</i>	R	<i>Eutaxia virgata</i>	
<i>Austrostipa elegantissima</i>	?	<i>Conostylis aurea</i>		<i>Gastrolobium capitatum</i>	
<i>Baeckea camphorosmae</i>	R	<i>Conostylis caricina</i>		<i>Gompholobium capitatum</i>	R
<i>Banksia attenuata</i>	S	<i>Conostylis juncea</i>		<i>Gompholobium confertum</i>	
<i>Banksia dallanneyi</i>	S	<i>Conostylis serrulata</i>	?	<i>Gompholobium scabrum</i>	
<i>Banksia grandis</i>	S	<i>Conostylis setigera</i>	R	<i>Gompholobium tomentosum</i>	R
<i>Banksia ilicifolia</i>	S	<i>Crassula colorata</i>		<i>Gonocarpus pithyoides</i>	
<i>Banksia littoralis</i>	S	<i>Croninia kingiana</i>		<i>Goodenia pulchella</i>	
<i>Banksia menziesii</i>	S	<i>Cryptostylis ovata</i>	R	<i>Haemodorum paniculatum</i>	R
<i>Banksia nivea</i>	S	<i>Cyanicula gemmata</i>		<i>Haemodorum spicatum</i>	
<i>Baumea articulata</i>		<i>Cyanicula sericea</i>		<i>Hardenbergia comptoniana</i>	R
<i>Beaufortia elegans</i>		<i>Cyathochaeta avenacea</i>	R	<i>Helichrysum leucopsidium</i>	
<i>Beaufortia squarrosa</i>		<i>Dampiera linearis</i>	R	<i>Hemiandra pungens</i>	R
<i>Boronia busselliana</i>		<i>Danthonia pilosa</i>		<i>Hensmania turbinata</i>	
<i>Boronia crenulata</i>	R	<i>Dasypogon bromeliifolius</i>	S	<i>Hibbertia aurea</i>	
<i>Boronia fastigiata</i>		<i>Daviesia gracilis</i>		<i>Hibbertia huegelii</i>	S
<i>Boronia ramosa</i>		<i>Daviesia incrassata</i>	S	<i>Hibbertia hypericoides</i>	S
<i>Bossiaea eriocarpa</i>	S	<i>Daviesia juncea</i>		<i>Hibbertia racemosa</i>	R
<i>Brachyloma preissii</i>		<i>Daviesia nudiflora</i>		<i>Hibbertia sericosepala</i>	
<i>Burchardia congesta</i>	R	<i>Daviesia physodes</i>	S	<i>Hibbertia subvaginata</i>	
<i>Burchardia umbellata</i>		<i>Daviesia triflora</i>		<i>Homalosciadium homalocarpum</i>	
<i>Hovea trisperma</i>	R	<i>Lomandra micrantha</i>		<i>Podotheca chrysantha</i>	

<i>Hyalosperma cotula</i>	
<i>Hypocalymma angustifolium</i>	R
<i>Hypocalymma robustum</i>	S
<i>Hypolaena exsulca</i>	
<i>Hypolaena pubescens</i>	
<i>Isolepis marginata</i>	
<i>Jacksonia furcellata</i>	S
<i>Jacksonia sternbergiana</i>	S
<i>Juncus kraussii</i>	
<i>Kennedia prostrata</i>	R
<i>Kunzea ericifolia</i>	S
<i>Kunzea glabrescens</i>	
<i>Lagenophora huegelii</i>	R
<i>Laxmannia ramosa</i>	
<i>Laxmannia squarrosa</i>	
<i>Lechenaultia biloba</i>	R
<i>Lechenaultia expansa</i>	
<i>Lechenaultia floribunda</i>	
<i>Lepidosperma angustatum</i>	
<i>Lepidosperma effusum</i>	
<i>Lepidosperma longitudinale</i>	
<i>Lepidosperma pubisquameum</i>	
<i>Lepidosperma scabrum</i>	R
<i>Lepidosperma squamatum</i>	R
<i>Lepidosperma tenue</i>	R
<i>Leporella fimbriata</i>	R
<i>Leptocarpus canus</i>	
<i>Leptocarpus tenax</i>	R
<i>Leptomeria empetriformis</i>	
<i>Leptospermum erubescens</i>	R
<i>Lepyrodia muirii</i>	
<i>Leucopogon australis</i>	S
<i>Leucopogon conostephioides</i>	S
<i>Leucopogon insularis</i>	
<i>Leucopogon nutans</i>	S
<i>Leucopogon oxycedrus</i>	S
<i>Leucopogon pendulus</i>	R
<i>Leucopogon polymorphus</i>	S
<i>Leucopogon propinquus</i>	S
<i>Leucopogon pulchellus</i>	S
<i>Leucopogon racemulosus</i>	
<i>Leucopogon sprengelioides</i>	
<i>Leucopogon strictus</i>	
<i>Levenhookia pusilla</i>	
<i>Levenhookia stipitata</i>	
<i>Lobelia tenuior</i>	
<i>Lomandra caespitosa</i>	
<i>Lomandra endlicheri</i>	
<i>Lomandra hermaphrodita</i>	
<i>Thysanotus thyrsoideus</i>	S

<i>Lomandra nigricans</i>	R
<i>Lomandra odora</i>	S
<i>Lomandra preissii</i>	R
<i>Lomandra purpurea</i>	
<i>Lomandra suaveolans</i>	
<i>Lomandra sp.</i>	
<i>Lotus sp.</i>	
<i>Loxocarya cinerea</i>	S
<i>Lyginia barbata</i>	
<i>Lyginia imberbis</i>	
<i>Lysinema ciliatum</i>	S
<i>Lysinema elegans</i>	
<i>Macrozamia fraseri</i>	
<i>Macrozamia riedlei</i>	S
<i>Medicago sp.</i>	
<i>Melaleuca incana</i>	
<i>Melaleuca preissiana</i>	R
<i>Melaleuca scabra</i>	S
<i>Melaleuca seriata</i>	
<i>Melaleuca systema</i>	
<i>Melaleuca thymoides</i>	S
<i>Melaleuca viminea</i>	
<i>Mesomelaena pseudostygia</i>	
<i>Mesomelaena stygia</i>	R
<i>Mesomelaena tetragona</i>	R
<i>Microtis media</i>	
<i>Microtis sp.</i>	
<i>Millotia tenuifolia</i>	R
<i>Monotaxis grandiflora</i>	
<i>Neurachne alopecuroidea</i>	
<i>Nuytsia floribunda</i>	R
<i>Opercularia vaginata</i>	S
<i>Patersonia occidentalis</i>	S
<i>Pericalymma ellipticum</i>	S
<i>Persoonia saccata</i>	R
<i>Petrophile linearis</i>	S
<i>Philotheca spicata</i>	
<i>Phlebocarya ciliata</i>	R
<i>Phlebocarya filifolia</i>	
<i>Phyllangium divergens</i>	
<i>Phyllangium paradoxum</i>	
<i>Pimelea angustifolia</i>	
<i>Pimelea imbricata</i>	
<i>Pimelea rosea</i>	
<i>Pimelea sulphurea</i>	
<i>Pithocarpa pulchella</i>	
<i>Platysace compressa</i>	S
<i>Platytheca galioides</i>	
<i>Podotheca angustifolia</i>	
<i>Tricoryne tenalla</i>	

<i>Poranthera microphylla</i>	
<i>Prasophyllum parvifolium</i>	
<i>Prasophyllum sp.</i>	
<i>Pterostylis pyramidalis</i>	
<i>Pterostylis recurva</i>	
<i>Pterostylis vittata</i>	
<i>Pterostylis sp.</i>	
<i>Pultenaea reticulata</i>	
<i>Pyrorchis nigricans</i>	
<i>Quinetia urvillei</i>	
<i>Regelia ciliata</i>	
<i>Regleia inops</i>	
<i>Restio microcodon</i>	
<i>Rhodanthe sp</i>	
<i>Ricinocarpus glaucus</i>	
<i>Scaevola paludosa</i>	
<i>Scaevola repens</i>	
<i>Schoenus brevisetis</i>	
<i>Schoenus caespititius</i>	
<i>Schoenus curvifolius</i>	R
<i>Schoenus efoliatus</i>	
<i>Schoenus globifer</i>	
<i>Schoenus sp.</i>	
<i>Scholtzia involucrata</i>	S
<i>Senecio pinnatifolius</i>	
<i>Siloxerus humifusus</i>	
<i>Sowerbaea laxiflora</i>	
<i>Stackhousia monogyna</i>	
<i>Stirlingia latifolia</i>	S
<i>Stylidium brunonianum</i>	R
<i>Stylidium carnosum</i>	
<i>Stylidium guttatum</i>	
<i>Stylidium junceum</i>	S
<i>Stylidium piliferum</i>	R
<i>Stylidium repens</i>	
<i>Stylidium schoenoides</i>	S
<i>Stylidium sp.</i>	
<i>Synaphea spinulosa</i>	
<i>Synaphea sp.</i>	
<i>Tetratea setigera</i>	S
<i>Thelymitra campanulata</i>	
<i>Thelymitra crinita</i>	
<i>Thelymitra fuscolutea</i>	
<i>Thelymitra sp.</i>	
<i>Thysanotus arbuscula</i>	
<i>Thysanotus manglesianus</i>	
<i>Thysanotus multiflorus</i>	
<i>Thysanotus patersonii</i>	
<i>Thysanotus sparteus</i>	
<i>Xanthorrhoea gracilis</i>	S

<i>Thysanotus triandrus</i>	
<i>Thysanotus sp.</i>	
<i>Trachymene pilosa</i>	
<i>Tricoryne elatior</i>	R

<i>Tripterococcus brunonis</i>	
<i>Verticordia drummondii</i>	
<i>Wahlenbergia preissii</i>	
<i>Waitzia suaveolens</i>	

<i>Xanthorrhoea preissii</i>	S
<i>Xanthosia huegelii</i>	R

Taken from information compiled by E.Groves, G.Hardy and J.McComb, Murdoch University. Species list reviewed by Mark Brundrett, 2011 and the Jandakot Airport floristic surveys 2001-2017 (Mattiske).

Attachment 3. 2023 *Phytophthora cinnamomi* Occurrence Assessment

JAH

2023 Jandakot Airport Triennial Assessment

Phytophthora Dieback occurrence assessment – Version 2.0



Client	JAH
Report name	2023 Jandakot Airport Triennial Assessment

This report has been prepared in accordance with the scope of work agreed between PTA and Glevan Consulting and contains results and recommendations specific to the agreement. Results and recommendations in this report should not be referenced for other projects without the written consent of Glevan Consulting.

Procedures and guidelines stipulated in various manuals, particularly Phytophthora Dieback Interpreters Manual for lands managed by the Department (DBCA), are applied as the base methodology used by Glevan Consulting in the delivery of the services and products required by this scope of work. These guidelines, along with overarching peer review and quality standards ensure that all results are presented to the highest standard.

Glevan Consulting has assessed areas based on existing evidence presented at the time of assessment. The Phytophthora pathogen may exist in the soil as incipient disease. Methods have been devised and utilised that compensate for this phenomenon; however, very new centres of infestation, that do not present any visible evidence, may remain undetected during the assessment.

Executive Summary

Glevan Consulting conducted an assessment of the conservation areas within the Jandakot Airport Study Area for the presence of *Phytophthora Dieback*. The assessment was conducted from 06-06-2023 to 15-06-2023 by Simon Robinson and Willow Feeley-Ray.

The study area has been assessed previously by Glevan Consulting on several occasions, and most recently in 2020, as part of Jandakot Airport Holdings' (JAH) commitment to undertaking *Phytophthora Dieback* assessments on a triennial basis. The study area is comprised of Conservation Precincts 1A, 1B, 2A and 2B, plus areas reserved for a future runway extension and a proposed link road. The total study area comprises 129.7 ha.

Four infestations, comprising 22.9 ha (Table 4) were mapped during the assessment. No new infestations were identified. The Dieback boundaries were rechecked and adjusted as required. Only very minor disease front movement was detected and the boundaries were not significantly altered, resulting in the total infested area remaining the same as that mapped in 2020. The total uninfested area has decreased from 95.4 ha to 93.7 ha due to an increase in the amount of vegetation that was excluded from assessment, primarily relating to a single section of Precinct 2B, where levels of weed infestation are too high to confidently determine the Dieback status.

Minimal disease expression was evident during the assessment, and the lack of expression is most likely the result of periodic phosphite treatment which has occurred several times during the last 18 years. As observed during previous assessments, a significant amount of vegetation decline not related to *Phytophthora Dieback* was observed during the assessment, and several soil and tissue samples were taken to assist with the diagnosis of these areas. A total of eight soil and tissue samples were taken, all of which tested negative for the presence of *Phytophthora*.

The Dieback mapping performed during this assessment is valid for 3 years and will expire in June 2026. It is recommended however, where clearing and development works are still occurring beyond 12 months that any Dieback boundaries associated with the works be reassessed.

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1 Introduction

1.1 Background.

Glevan Consulting was commissioned by JAH to conduct an assessment of the conservation areas within the Jandakot Airport Study Area for the presence of Phytophthora Dieback. Under the EPBC Conditions of Approval and JAH's Dieback Management Plan, it is a requirement that Phytophthora Dieback occurrence mapping is conducted at Jandakot Airport every three years. The updated occurrence mapping will also provide boundaries for the upcoming phosphite treatment program, and proposed clearing activities that may occur in the next three years.

1.2 Location of Study Area.

Jandakot Airport is located within the suburb of Jandakot, approximately 15 km south of Perth CBD. The study area for the assessment is comprised of the Conservation Precincts (121.2 ha) plus an additional 8.5 ha of remnant vegetation surrounding the airport facilities (Figure 1).

1.3 Study team

The assessment was conducted by Simon Robinson and Willow Feeley-Ray of Glevan Consulting in June of 2023. Mr Robinson is accredited by the Department of Biodiversity, Conservation and Attractions (DBCA) in the detection, diagnosis and mapping of Dieback disease. This accreditation recognises the skills and experience of Mr Robinson.

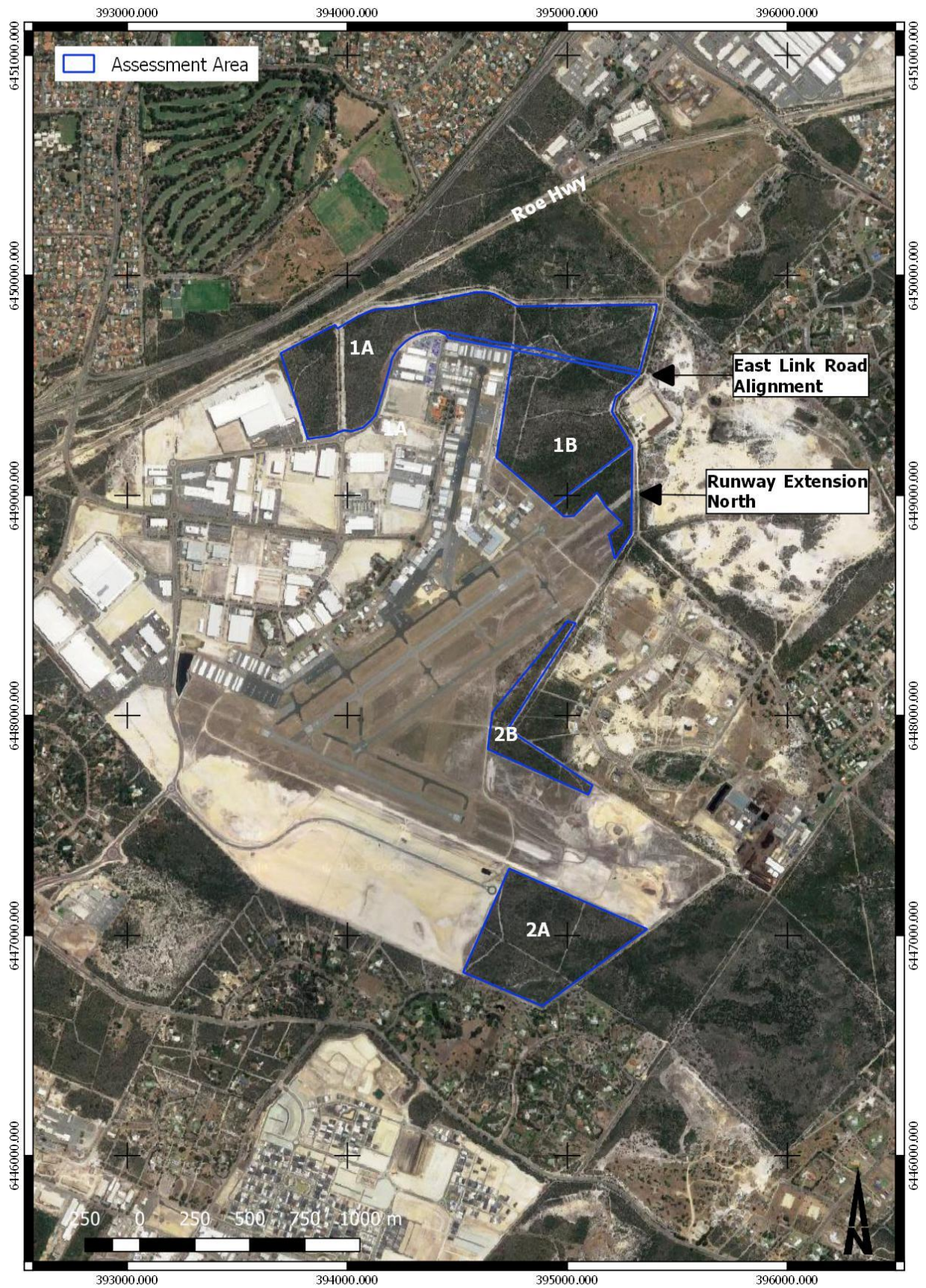


Figure 1 - Study area location

2 Background

Thousands of Australian native plant species are susceptible to Phytophthora dieback—a destructive disease caused by the pathogen *Phytophthora cinnamomi* and other Phytophthora species. This disease is a major threat to Australia’s biodiversity, placing important plant species at risk of death, local extirpation or even extinction. Its dramatic impact on plant communities can also result in major declines in some insect, bird and animal species due to the loss of shelter, nesting sites and food sources. Phytophthora dieback can cause permanent damage to ecosystems. Once an area is infested with the pathogen, eradication is usually impossible. Awareness that human activity can easily spread the pathogen will help prevent an increase in the extent of this disease (Commonwealth of Australia, 2018)

Phytophthora spp. are a group of microscopic water moulds that belong to the class Oomycetes. Oomycetes organisms are filamentous and absorptive and reproduce both sexually and asexually. *Phytophthora* spp. are considered parasitic. The species behave largely as a necrotrophic pathogen causing damage to the host plant’s root tissues because of infection and invasion. (Department of Parks and Wildlife, 2015) The pathogen infects a host when it enters at a cellular level and damages the cell structure.

Phytophthora Dieback is the result of interaction between three physical components forming a ‘disease triangle’: the pathogen (*Phytophthora* spp.), the environment and the host. All three components are needed for the disease to develop over time. The relationship between the presence of *Phytophthora* spp. and the development of Phytophthora Dieback disease is variable and based on the susceptibility of native plant species and the different environmental characteristics, landform types and rainfall zones across bioregions.

Armillaria Rot Disease (ARD) is a pathogen frequently encountered during Phytophthora Dieback assessments. It is caused by an indigenous fungus which is endemic to the south-west of Western Australia, occasionally presenting symptoms consistent with Phytophthora Dieback presence. The impact of the fungus on the vegetation may range from single dead plants to complete devastation of understorey and overstorey species.

3 Materials and methods

3.1 The assessment area

As per Department of Parks and Wildlife (DPAW) (2015), areas within the study area are excluded from assessment if the vegetation is suffering from significant disturbance. This disturbance (Table 1) is based on Vegetation Condition Scales (Keighery, 1994). The remaining area, including the area outside of the development envelope if necessary, will be categorised post-assessment into Phytophthora Dieback occurrence categories (Table 2, Map 1).

Table 1 - Keighery Vegetation Condition Scale

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

Table 2 - Phytophthora Dieback assessment for vegetation condition

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

3.2 The assessment method

All Phytophthora Dieback detection, diagnosis and mapping was performed to standards and procedures defined in FEM047 Chapter 6 (DPAW 2015). These procedures are grounded on the presence in the vegetation of Indicator Species, and the observance of deaths in these plants. An indicator species is a plant species that is reliably susceptible to *Phytophthora cinnamomi*. Indicator species deaths (ISDs) alone do not necessarily indicate disease presence and it is necessary to consider all environmental and ecological factors that may be present.

These other factors (as listed in FEM047) include:

- Chronology of deaths;
- Pattern of deaths;
- Topographical position;
- Vectoring – causal agencies, and;
- Biomass and biological diversity reduction.

Other causes of plant deaths need to be considered when determining the presence of Phytophthora Dieback, including (from FEM047):

- *Armillaria luteobubalina*;
- various cankers;
- insects;
- drought, wind scorch and frost;
- salinity and waterlogging;
- fire and lightning;
- senescence and competition;
- physical damage, and;
- herbicides and chemical spills.

The assessment was performed using the comprehensive (featuring transect lines) assessment type and performed to standards defined by Chapter 8, FEM047. Prior to assessment, all information relevant to the project was assembled to assist the interpretation process (as defined in Chapter 7, FEM047). This information included previous assessments of the area, history of burning and possible other disturbances.

3.3 Other *Phytophthora* species

Phytophthora species other than *P. cinnamomi* are identified using DNA analysis by the Centre for Phytophthora Science and Management (CPSM) at Murdoch University following the identification of the presence of a *Phytophthora* species in baiting analysis performed by Vegetation Health Service (VHS) at the Department of Biodiversity, Conservation and Attractions (DBCA).

3.4 Collection of evidence of Phytophthora Dieback

During the assessment process, the collection of evidence to support the field diagnosis is recorded using a tablet running the ESRI Collector application. Waypoints are recorded at locations to show evidence of:

- where field diagnosis is certain or almost certain of Phytophthora Dieback infestation;

- healthy indicator species where field diagnosis is almost certain of the site being uninfested;
- sites with too few or devoid of indicator species, thus supporting uninterpretable classification, or
- areas of disturbance, which are temporarily uninterpretable or excluded from assessment.

Additional waypoints recorded include:

- points requiring soil and tissue sampling;
- points located where samples have been taken;
- points located at ISDs, and
- points that need to be revisited for further examination.

3.5 Soil and Tissue Samples

Soil and tissue samples taken during the assessment were to standards and prescriptions defined in Chapter 11 of FEM047. All samples were analysed in the Vegetation Health Services (DBCA) laboratory using best-practice techniques.

Taking a soil and tissue sample from dead and dying plants is an integral part of assessment – although in some cases sampling is not essential. Sample results provide evidence to support field diagnostic decisions. The following table (Table 3) shows the need for sampling to assist the disease diagnosis process (Department of Parks and Wildlife, 2015).

Table 3 - Determination of requirement for sampling

Observable factors indicating likelihood of <i>Phytophthora cinnamomi</i> presence				
ISD type	Multiple	Cluster	Scattered	Isolated
Species	Some or most indicator species	Any indicator plant	Any indicator plant	Any indicator plant
Pattern development	Obvious			Not obvious
Chronology	Obvious			Not obvious
Topographic situation	Gully/flat	Lower to mid slope	Mid slope to upper slope	Ridge
Causal agent	Obvious			Not obvious
Requirement for soil and tissue sample	Low	High	High	Low

4 Results

4.1 *Phytophthora* Dieback Occurrence

Four infestations, comprising 22.9 ha (Table 4) were mapped during the assessment. No new infestations were identified. The Dieback boundaries were rechecked and adjusted as required. Only very minor disease front movement was detected and the boundaries were not significantly altered, resulting in the total infested area remaining the same as that mapped in 2020. The total uninfested area has decreased from 95.4 ha to 93.7 ha due to an increase in the amount of vegetation that was excluded from assessment, primarily relating to a single section of Precinct 2B where levels of weed infestation are too high to confidently determine the Dieback status.

Table 4 - Area Summary

Category	Area (ha)	% of assessed total area
Infested (with <i>Phytophthora</i>)	22.9	20
Uninfested	93.7	80
TOTAL AREA ASSESSED	116.6	100.0
Excluded Area	13.1	
TOTAL AREA	129.7	

4.2 Disease symptoms and expression

Disease expression was subtle throughout most of the infested area, with minimal recent ISDs observed. The lack of expression is most likely the result of periodic phosphite treatment which has occurred several times during the last 18 years. The infested areas are however still obvious due to the reduced biomass and changes in vegetation structure.

4.3 Other *Phytophthora* species

No other *Phytophthora* spp. were identified during the assessment.

4.4 Armillaria Root Disease

No infestations associated with ARD were observed during the assessment.

4.5 Sample results

Eight soil and tissue samples were taken during the assessment. The results are presented in section 7.1.

5 Discussion

A total of four infestations comprising a total of 22.9 ha were observed and mapped during the assessment. Although minor adjustments were made to some sections of the Dieback boundaries, there was no change to the overall size of the infested area, which remains at 22.9 ha.

A number of areas exhibited evidence of vegetation decline, including several ISDs. However, the pattern of decline was not consistent with the presence of *Phytophthora dieback* and samples were taken to assist in confirming the presence / absence of the disease in these areas. All of the samples taken produced a negative result, supporting the view that the decline is related to factors other than *Phytophthora Dieback*.

During mapping of the disease front in Precinct 2A, it was noted that there was distinct lack of disease expression, particularly in the section north of the historical (2000) positive sample result, leading the Interpreters to question whether the infestation is as large as previously thought. There are scattered *X. preissii* deaths throughout the area and these have been used as evidence of disease presence during previous surveys. However, there are also significant numbers of healthy *Banksia attenuata* and *Banksia menziesii* trees, which are highly susceptible and normally a reliable indicator of *Phytophthora Dieback* presence. Several samples were taken within the area, all of which returned a negative result.

It is possible that the lack of disease expression within this area is a result of the phosphite treatment that occurs every three years. It is therefore recommended that phosphite treatment is not conducted along the previously accepted disease front (see Figure 2) in this area during the 2023 treatment program. This will allow the disease, if present in the area being questioned, to express more readily. If, during the 2026 assessment, there is still no obvious disease front in this section, and more negative samples are recorded, the infested area will be revised.



Figure 2 - Yellow dotted line depicts section not to be treated in 2023.

The areas excluded from assessment were primarily perimeter tracks/firebreaks that were largely devoid of vegetation. A section previously mapped as uninfested on the western edge of Precinct 2B was also excluded due to the condition of the vegetation. The area is still likely to be uninfested, however the levels of weed infestation and relatively large spaces between reliable indicator species mean that it is difficult to confidently assess this section for the presence / absence of *Phytophthora Dieback*. It should be noted that there has not been a significant decline in the condition of this section, it was very close to be excluded from the 2020 assessment for the same reasons.

Existing dieback management strategies appear to be effective and should be maintained. No new infestations have been created and there is no evidence of disease spread associated with human activities.

6 Bibliography

Commonwealth of Australia. (2018). *Threat abatement plan for disease in natural ecosystems caused by Phytophthora cinnamomi*.

Department of Parks and Wildlife. (2015). *FEM047 Phytophthora Dieback Interpreter's Manual for lands managed by the department*. Unpublished.

Glevan Consulting (2017) *Jandakot Airport Phytophthora Dieback Assessment 2017*. Unpublished report for JAH.

Keighery, B. (1994). *Bushland Plant Survey: a Guide to Plant Community Survey for the Community*. Wildflower Society of WA (Inc.).

7 Appendices

7.1 Sample Summary

Eight soil and tissue sample were taken during the assessment, all of which tested negative for the presence of *Phytophthora* (Table 5).

Table 5 Sample Results

Sample no	Plant Sampled	Easting	Northing	Result
01	<i>Xanthorrhoea gracilis</i>	395160	6446904	Negative
02	<i>Xanthorrhoea preissii</i>	395151	6446971	Negative
03	<i>Xanthorrhoea preissii</i>	395061	6446859	Negative
04	<i>Banksia menziesii</i>	394944	6446947	Negative
05	<i>Xanthorrhoea preissii</i>	394773	6448132	Negative
06	<i>Banksia attenuata</i>	394705	6447077	Negative
07	<i>Xanthorrhoea preissii</i>	394778	6447232	Negative
08	<i>Banksia attenuata</i>	393926	6449469	Negative

7.2 Phytophthora Dieback Occurrence map

The provided map is the Phytophthora Dieback occurrence map. The study area is displayed as a blue boundary line. The following categories are also shown (if present in the project area):

- Excluded (shown as uncoloured). Areas of high disturbance where natural vegetation has been cleared and is unlikely to recover to a level that is interpretable.
- Infested (shown as red). Determined from the assessment to have the plant disease caused by *Phytophthora cinnamomi*. Phytophthora Dieback caused by other *Phytophthora* species will be displayed as other colours, typically shades of orange and yellow.
- Uninfested (shown as green). Determined from the assessment to be free of plant disease Phytophthora Dieback.

- Uninterpretable (shown as purple). Undisturbed areas where susceptible plants are absent, or too few to decide the presence or absence of Phytophthora Dieback.
- Temporarily Uninterpretable (shown as grey). Areas of disturbance where natural vegetation is likely to recover.

Additional spatial data that may be shown include:

- Sample location

7.3 Mapping Metadata

DATASET DESCRIPTION	
Title	Jandakot Airport Triennial Assessment
Data Created	15-06-2023
Date Last Updated	23-06-2023
Abstract	Phytophthora Dieback Occurrence and sample location shapefiles for the Jandakot Airport Triennial assessment
Purpose	Dieback category boundary mapping
Document Number	GC-23-1540
Contact Organisation	Glevan Consulting
Contact Name	Simon Robinson
Contact Position	Phytophthora Dieback Interpreter
Contact Phone	0427 113 336
Contact Email	simon.robinson@glevan.com.au
Lineage	All field data recorded using ESRI Collector on a GPS enabled tablet.
Datum / Coordinate System	GDA94 Zone 50
Geographic Description	Jandakot Airport Conservation Areas
Restrictions	None

7.4 Shapefile spatial data

Spatial data is contained in the attached file named Jandakot_Airport_Triennial_Assessment_Shapefiles.zip.



**Map 1
Phytophthora Dieback
Occurrence**

**Triennial Assessment
JAH**

Occurrence

- Infested
- Uninfested
- Excluded

Samples

- Negative
- ◆ *P. cinnamomi* all years
- Assessment Area



Author: Simon Robinson
Date: 22-06-2023

Datum: GDA94 Zone 50
Mapping expiry: 15-06-2026



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