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Meelup Regional Park

Dieback Management Review 2021

A report prepared for the City of Busselton

August 2021

THE VISION FOR MEELUP REGIONAL PARK

TO MANAGE THE PARK FOR CONSERVATION AND ENVIRONMENTAL ENHANCEMENT AND ALLOW RECREATION AND OTHER USES OF THE PARK TO OCCUR TO THE EXTENT THAT THEY DO NOT IMPAIR THE CONSERVATION VALUES OF THE PARK.

(COB, 2019)

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1. Introduction

The City of Busselton is seeking to develop Environmental Guidelines to outline the requirements for event organisers' to include in their Event Environmental Management Plans. A component of the guidelines will be on *Phytophthora* (Dieback) Management. The City aims to provide consistent, best practice Dieback management advice and recommendations to manage both trail events and general community trail access to prevent the spread of Dieback in the Meelup Regional Park (the 'Park').

The City of Busselton engaged BARK Environmental Pty Ltd to review and make recommendations for Dieback management within the Park. In addition, the City requested strategic advice on the timing for future Dieback mapping and Dieback treatment to inform decisions for the Parks program of works.

A series of supporting GIS maps and schedule for timing future Dieback mapping and treatment is included herein. This review was undertaken by Bruno Rikli (BSc, DBCA Registered Dieback Interpreter) who has specialised in *Phytophthora* management for over 25 years and was a former government Biosecurity Officer, National Park Ranger and Environmental Officer.

Scope of Work

1. A review/understanding of the following information:

- Previous Dieback mapping, locations of trails in the Park utilised for events, walkers and bikes.
- Review past Dieback advice/recommendations for activities at Meelup Regional Park for events (DTS, 2016).
- Trails with limestone sheeting and the locations of Dieback hygiene stations.
- Trail networks accessed for events in the Park. The City has several run, swim, bike events in the Park each year utilising trails including the X Adventure Bike Race, Cape to Cape Mountain Bike event.

2. Assessment and recommendations for best-practice Dieback management including:

- An assessment of dieback risk through the existing trail network.
- Recommendations on what trails to utilise and / or exclude for events to mitigate Dieback spread.
- Dieback management measures to utilise for events.
- Recommendations on Dieback management for specified walking trails: the Flora Walk trail,
- Lookout trail and Whale Lookout trail.
- Recommendations on trails to install limestone sheeting or other measures.
- Specific dieback management measures and/ or recommended trails to be closed.
- Recommendations on dieback control measures in the mountain bike zone including possible bike cleaning station. This area has been mapped as Infested and there are currently no hygiene measures in place for cleaning bikes on entry or exit.

Background information about Meelup Regional Park and its *Phytophthora* Dieback issue.

Meelup Regional Park (the 'Park') is located in the south-western corner of Western Australia, approximately 250 kilometres south of Perth in the City of Busselton. The 574 hectare A Class Reserve (#12629) vested in the City of Busselton for the purposes of conservation and recreation. In 1993, the Busselton City Council formed the Meelup Regional Park Management Committee (MRPMC) that:

- Assists the Busselton City Council with the management and promotion of the Park.
- Ensures the full range of issues relevant to the making of decisions about the management and promotion of the Park are considered, including environmental, amenity, recreational, community, social, economic, and financial considerations.

The Park has both regional and international significance as a biodiversity hotspot due to its richness in plant and animal species with high endemism that are under pressure from a variety of threats. Its undulating terrain rises to 100 metres above sea level, it has ephemeral waterways, diverse flora and mostly pristine vegetation situated on the Leeuwin-Naturaliste Ridge to Geographe Bay coastline (City of Busselton, 2019). It also has indigenous and European cultural heritage values.

With a total of approximately 2.8 million overnight visitors to the southwest region in the year ending March 2021 (Tourism WA, 2021), the Park is one of the most popular regional tourist destinations with its 11.5 kilometres of coastal edge from Dunsborough to Bunker Bay. In addition, it has become an important area for running and mountain bike trail events, recreation and various tourism operators.

One of the key threats to this Park's integrity is the spread of Dieback primarily through human vectoring especially along tracks and trails. Dieback is the common name given to the devastating widespread plant disease caused by a group of microscopic soil-borne water moulds in the *Phytophthora* genus that can survive and be transported in soil, organic material and water (DPaW, 2015). Once natural areas become infected with this disease, the negative impacts can be severe on ecosystem health, cultural values, biodiversity, fauna habitat and amenity (Commonwealth of Australia, 2018). *Phytophthora cinnamomi* is known to be widespread in the Park. All riparian areas in the Park are infested and Dieback poses a significant threat to the Park especially in the vulnerable upland plant communities where some key species exist such as jarrah, banksia and grass trees. Dieback can impact over 40% of species in the south west of WA and over 25% of the Park is infested with Dieback so this is a significant concern (CoB, 2019).

It is important to note that areas mapped as Infested still have significant natural environment values that need to be preserved. The danger exists that areas mapped as Infested may be perceived as not being worthy of protection, and biological and aesthetic values are compromised. Therefore, overall management of Dieback in this Park should focus on both Uninfested and Infested areas that have significant environmental values within them, such as threatened flora and ecological communities (CoB, 2019).

Current management of Dieback within the Park is undertaken by the City of Busselton in partnership with the MRPMC. This presents an ongoing process and is extremely difficult for any public land manager to balance multiple uses in natural areas without impacting conservation values. Management decisions are guided by the vision and a number of key strategies in the draft Park Management Plan 2019 as follows:

The vision for Meelup Regional Park is:

“To manage the Park for conservation and environmental enhancement and allow recreation and other uses of the park to occur to the extent that they do not impair the conservation values of the park.”

A key strategy for Meelup Regional Park is:

“Develop and maintain integrated and coordinated management arrangements between the City, relevant government agencies and community.”

There are a range of other plant diseases that have the potential to impact the Park's vegetation. These have been documented separately in the Draft Meelup Regional Park Management Plan 2019. Management of them will be complemented by the Dieback management recommendations herein.

It is hoped that this review contributes to the Park's vision and key strategy above because biosecurity is a shared responsibility and the most sustainable and effective means to achieving it for biosecurity (e.g. Dieback management) is through collaboration (DAFWA, 2021).

2. Desktop Review

A series of composite GIS Trail and Dieback information maps have been prepared for this review that show the most recent Dieback occurrence mapping (DTS, 2017) plus types of existing trails (some overlap) as provided by the City in 2020. Other features also shown are boot cleaning station points and historic sample point data where *Phytophthora cinnamomi* has been positively confirmed through laboratory testing (see Figures 1A and 1B).

In respect to the previously mapped distribution of Dieback disease categories, there are large Uninfested areas of vegetation that correlate with Conservation and Protection (marked 'CP') in the draft Meelup Regional Park Management Plan 2019. *CP areas have high conservation significance and are to be closely managed with conservation as priority. Recreation is to be kept to a minimum and public access restricted. No new trails or other access are to be constructed in these areas, and existing access considered to be incongruous may be considered for closure.* (MRPMP, 2019).

Infested areas have been mapped in the north, south, Western firebreak and within central gullies, some trail sections and along Shire Roads that intersect the Park. The previously reported disease impact within the Park ranges from Moderate to Subtle depending on the vulnerability of the vegetation types present. Dieback appears to be spreading slowly downslopes into vegetated gullies based on reviewing contour data. Narrow areas of Uninterpretable vegetation have been mapped along the length of the Coastal Walk trail where plants susceptible to the disease are either absent or too few to enable Dieback interpretation. Observable Dieback impacts to vegetation within the previously mapped Uninterpretable areas have not been previously recorded and may be negligible.

Previous Dieback mapping, locations of trails in the Park utilised for events, walkers and bikes.

It is important to note that all Dieback occurrence maps produced from either re-check assessments or comprehensive assessments all have an expiry date (see Table 1). This is because the pathogen's distribution can change over time, either spreading naturally (autonomously) such as infection via root-root contact and water shed or as a result of human vectoring (anthropocentric) activities such as accidentally carrying infected soil on footwear, vehicles and equipment into natural areas.

The most recent comprehensive type of assessment was in 2007 that was followed by a series of rechecks only, plus subsequent changes in professional Dieback Interpretation methodology renders all assessments invalid for operational use.

A summary of all known previous Dieback interpretation within the Park (and parts of it) between 1994 and 2017 is given in Table 2.

Table 1. Description of Dieback Occurrence Map Validity / Expiry dates (DPaW, 2015).

<p>*Dieback Occurrence Map Validity:</p> <ul style="list-style-type: none"> All <i>Phytophthora</i> Dieback Occurrence Maps expire for use during disturbance activities after 1 year due to <i>Phytophthora</i> disease having the ability to spread autonomously and through vectors such as machinery, vehicles, animals and water. Maps can be re-checked annually for up to 3 years after the initial assessment. After 3 years a Comprehensive Dieback Assessment should be undertaken to provide accurate and valid mapping to guide disturbance activities and develop Dieback Management Plans. <p>*Based on current best-practice Dieback Interpretation methodology in DPaW (2015).</p>
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Table 2. Reserve names, locations and historic *Phytophthora* mapping and treatment data.

Year of Assessment	Type of Assessment	Reported Comments	Review comment (Expiry Date)
1994 – CALM	Unknown? (Comprehensive)	<ul style="list-style-type: none"> 28% of Park Infected with <i>P. cinnamomi</i> and 13% at risk of infection. (noted in MRP MP, 2010) 	<u>Expired</u>
2004 – CALM? (February)	Unknown? (Comprehensive)	<ul style="list-style-type: none"> Referred to in 2007-DEC letter report, see below. 	<u>Expired</u>
2007 - DEC	GRIM method (Comprehensive)	<ul style="list-style-type: none"> Areas covered was north of Meelup Brook up to Eagle Bay (i.e. not full extent of current Park) Little spread since 2004, some patches of drought deaths (Banksia and Xanthorrhoea). Total area mapped as Infested increased from 28% to 34%. (noted in MRP MP, 2010). 	<u>Expired</u>
2009 – DTS (May)	Re-checks Of previously mapped boundaries and vectors.	<ul style="list-style-type: none"> Disease expression was mainly cryptic. Greatest spread observed on NW boundary. <i>Armillaria luteobubalina</i>, a naturally occurring fungal plant disease observed in small sites throughout, not mapped. Plus rechecks along coastline between Bunker Bay and access off Eagle Bay Road known as the Wildlife Corridor. 	<u>Expired</u>
2012 – DTS (April)	Re-check Of Linear Car Rally track section only.	<ul style="list-style-type: none"> Northern linear track section previously mapped as Uninfested was reduced in length during this assessment with part marked as Infested due to one positive <i>P. cinnamomi</i> sample result. 	<u>Expired</u>

	Assessment of coastal trail between Eagle Bay and Bunker Bay, plus Wildlife Corridor.	<ul style="list-style-type: none"> • Result was one Uninfested area between Bunker Bay and Eagle Bay, remainder Uninterpretable. One area outside but adjacent to Park north of Bunker Bay road mapped as Infested. 	
*2017 – DTS (February)	<p>Re-check</p> <p>Of boundaries and track vectors only.</p>	<ul style="list-style-type: none"> • Disease expression was mainly cryptic. • <i>P. cinnamomi</i> distribution was predominantly unchanged from 2013. • Some small sections of previously mapped Infested areas were made possible due to increased interpreter confidence. 	<p><u>Expired in 2018</u></p> <p>(2017 Dieback map should <u>not</u> to be used to guide soil / vegetation moving operations that occur within any Uninfested areas of the Park (DTS, 2017).</p>

* = Most recent Dieback Assessment.

Comprehensive = Assumed Dieback assessment method based on review of wording in historic Dieback reports.

[Review of past Dieback advice/recommendations for activities around Meelup Regional Park for events \(DTS, 2016\).](#)

Table 3 summarises previous advice for events given in DTS (2016) and provides a review comment on their current validity in 2021.

Table 3. Summary review of 2016 advice and validity for events in Meelup Regional Park.

Aspect	Advice/Recommendation (DTS, 2016)	Review Comment	Validity at 2021
Disease Spread.	a. Eliminate risk by designing routes so they do not pass through Uninfested vegetation. e.g. Lookout Loop.	Lookout Loop is not suitable for use in any event that will funnel large numbers of walkers/runners under all weather conditions due to the risk of disease introduction (even with foot baths).	a. <u>Valid</u>
Re-routing running section for X-Adventure Long Run Course and other similar events.	b. Direct route from coastal track between Gannet Rock and Point Picquet onto a traffic controlled Eagle Bay Meelup Road in a southerly direction (steep incline), to the Castle Rock Road Intersection, down steep decline of Castle Rock Road to enter back onto the Coastal Track.	This alternate route is hygienically sound as runners would be on bitumen from Meelup Beach to Castle Rock. •	b. <u>Valid</u>
Alternative running trail section.	c. Meelup Track that is entirely infested with <i>Phytophthora</i> may also be used in preference to the Lookout Loop.	• This alternate route is hygienically sound.	c. <u>Valid</u>
General event guidelines.	d. Insist all equipment brought into the Park is free of soil, mud and plant material. e. Coordinate all activities that have the potential to impact on native vegetation within the park to coincide with dry soil conditions. f. Plan routes to avoid areas of Uninfested vegetation rather than rely on boot cleaning stations which will in turn simplify event management. g. If the event occurs under moist soil conditions utilise hygiene stations to ensure Infested material is not moved or taken off-site at the end of the event. This is also an excellent opportunity for community engagement and education.	• These recommendations are largely still valid. • Scheduling activities around rainfall is always unreliable so contingencies for hygiene should be detailed within event applications.	d. <u>Valid</u> e. Review f. <u>Valid</u> g. <u>Valid</u>

Trails with limestone sheeting and the locations of Dieback hygiene stations.

Trails (or trail sections) with limestone sheeting in the Park are shown on Figure 1A and listed below.

- Coastal Trail;
- Eastern Firebreak;
- Car Rally Walk; and
- Wildlife Corridor.

Various literature suggests that *P. cinnamomi*'s impact is lower in calcareous high pH soils. This is based on field observations, but no data supporting this was found in the public domain during this review. BARK Environmental has detected other *Phytophthora* spp. within soil/plant sample results collected from calcareous soils on the Swan Coastal Plain through laboratory testing such as *P. multivora*. Limestone is commonly used to form hard surfaces on many southwest coastal parks as its readily available, visually appealing, a cheaper and assumed lesser disease risk alternative compared to gravel. But it can degrade over time in higher rainfall areas, especially if not compacted and stabilised with a mix of cement/road base. Importation of any untreated raw material presents a risk of introducing pathogens and weeds, deleterious insects, fungi other foreign materials into the Park, which may impact native vegetation and fauna (CoB, 2019). Caution is advised to minimise these risks.

Locations of Dieback hygiene stations (boot cleaners) (see Figure 1A).

Currently there are 7 boot cleaners present and all are the dry-type with no spray option. Site observations by Bruno Rikli in 2020 identified most of the existing boot-cleaners are appropriately located, with the exception of No. 6 at the start of the Floral Walk trail. It has been suggested herein that this trail is closed due to potential impact to vegetation if *Phytophthora* disease is introduced along it (see Section >>>>). As a result of any closure to walking traffic, boot-cleaner #6 could be re-located to the western entrance to the Whale Lookout Walk trail, to help reduce the risk of spread from visitors entering the trail from the west with unclean footwear.

Boot cleaner are a useful hygiene tool in reducing the spread of soil carried on footwear only and they also help to raise visitor awareness of the need to apply hygiene (BARK, 2021). However, during wet soil conditions when sand and mud sticks to footwear the efficacy of these dry-type of boot cleaners is likely to be significantly reduced.

In addition, if there is no means to maintain pump spray boot-cleaners, or if the Park is subject to high vandalism, one alternative strategy to reduce risk could be to solely use specific high-risk tracks for pedestrian traffic only and exclude public bikes/trail bikes/vehicles.

Recommendation:

Instal gated access and large informative signage at key entrance points that state positive messages for acceptable activities in these areas. This has been done effectively in some other south west regional parks (see Plate 1), but low risk alternatives for bikes/events should be identified within multiple use areas. Regardless of the type of boot cleaner, all require regular checks for damage and ongoing maintenance.



Plate 1. Effective access controls enable pedestrians & Park managers access, e.g. Manea Regional Park, Bunbury. Images by: Bruno Rikli ©

Trail networks accessed for events in the Park. The City has several run, swim, bike events in the Park each year utilising trails including the X Adventure Bike Race, Cape to Cape Mountain Bike event.

The Park is increasingly popular for large public trail events (i.e. running, mountain bikes and triathlons). The majority of these events utilise parts of the Coastal Walk trail and some diverge westwards into the Park along a number of internal trails. Events typically comprise of high volumes of trail users over short periods of time. Despite attempts to mitigate Dieback spread during such events, the efficacy of such measures has not been gauged and is considered unreliable. Consistent application of adequate biosecurity hygiene by Park users is extremely difficult to maintain in any situation and this is supported by recent monitoring of human behaviour associated with boot cleaner compliance (see Plates 2a, 2b), BARK Environmental (2021). Hygiene compliance within the Park is poorly understood and could be further investigated to make informed investment decisions on what works and what doesn't. Furthermore, as the existing trail routes are advertised publicly, they may appear as being available for 'open' usage during all weather conditions with little information connected to the need for Dieback hygiene.

Importantly, participants of trail events often train in the event location well before the actual day when additional biosecurity-hygiene measures may not be in place. The risk is that participants may not be aware of the need to apply Dieback hygiene at all times in the Park and they may not have the tools needed to apply a clean down effectively. Together these pre, during and post event activities raise further challenges for the local government and event businesses to mitigate Dieback spread at all times.

The 2016 Dieback advice for the Park was: “The easiest (and most effective) way to eliminate the risk of disease introduction into uninfested vegetation is to design routes for these events that ensure that they do not pass through uninfested vegetation” (DTS, 2016).

Recommendation:

Considering the trail event routes traverse bushland trails, re-routing some sections of them remains the most effective and immediate Dieback risk reduction strategy. It also aligns with the Parks vision to maintain the Park’s conservation integrity and vision. Employing this approach will demonstrate how well proponents genuinely adopt sustainable low impact strategies in their event applications and management plans.



Plates 2a, 2b. Monitoring hygiene compliance provides valuable data for investment decisions (Images: BARK, 2021 ©).

3. Assessment and Recommendations for Best-Practice Dieback Management

An assessment of Dieback risk through the existing trail network.

A Dieback risk assessment has been undertaken for both large volumes of pedestrian and bike traffic through the existing trail network. The current DBCA risk template was applied (Appendix A). Consideration was given to the vulnerability of site vegetation, likely timing of most events during drier seasons (dry-soil conditions) and the potential for sporadic rainfall (moist soil conditions) to determine risk ratings. In addition, examination of contour data was undertaken to assess potential downslope areas where disease could spread by human vectors and autonomously.

Results of Dieback risk assessment:

- All trail and events within the Meelup Regional Park scored a MODERATE – HIGH risk rating for introducing/spreading Dieback.
- For events scheduled in summer months in dry soil the risk rating is MODERATE.
- If soil moisture increases such as during unexpected rainfall the risk rating becomes HIGH.

Table 4 lists the total areas (hectares) for the ultimate potential disease spread if *Phytophthora* is introduced by human vectoring along trails and subsequently spreads into vulnerable vegetation. The combined total area of vegetation at risk downslope of four existing key trails is 70.3 hectares shown on Figure 2. Note: this assessment was based on expired Dieback occurrence data (DTS, 2017) so further Dieback field assessment would be necessary to ascertain the current extent of Infested areas and at-risk areas.

Table 4. Potential ultimate vegetated areas at risk of Dieback spread downslope of existing trails and walks.

Trail Name	Estimated Area at Risk (hectares)
Floral Walk Trail	21.93 ha
Lookout Walk	18.06 ha
Whale Lookout Walk	23.5 ha
Costal Walk	6.81 ha

Recommendations on what trails to utilise and / or exclude for events to mitigate Dieback spread.

To identify the most significant at-risk trails in the Park, a GIS map has been prepared that incorporates the most recent Dieback occurrence data (DTS, 2017), contour data and trail data (see Figure 2). The anticipated disease movements (by human vectoring and natural spread) were then determined in areas downslope of existing trails based on methods used by the Department of Biodiversity, Conservation and Attractions (DBCA) for Registered Dieback Interpreters (DPaW, 2015).

Recommendation:

The resulting map (Figure 2) and previous advice (DTS, 2016) highlights the need to consider not utilising the Lookout Walk Trail for any event; plus it falls within Conservation Protection Zone 16 where threatened flora and a Threatened Ecological Community exists.

Recommendation:

No new trails should be developed within CP Zone 16 as it is the largest Uninfested area with very high conservation values.

Recommendation:

This assessment also highlights the need to consider not utilising the Floral and Whale Lookout Walks for any event due to large downslope areas at risk of Dieback spread, if the disease was accidentally introduced and spread along trail sections during high usage events.

A fourth area potentially at risk if Dieback was introduced is a northern section of the Coastal Walk (6.81 ha downslope is at risk). However there is a dry type of boot cleaner at each end and the volume of pedestrian traffic along this trail will be difficult to prevent, so strategic Dieback treatment may be one option to offer some protection along this trails adjoining susceptible vegetation.

Recommendation:

Evaluate whether a compromise is needed to retain event access along the Coastal Walk to satisfy the Park’s multiple user groups and consider strategic Dieback treatment along it.

Recommendation:

Inform event proponents to re-route proposed trail route sections so as to avoid the three highest-risk trails (Floral Walk Trail, Lookout Walk and Whale Lookout Walk) and provide them with alternatives (see Table 5).

Table 5 lists a number of events identified by the City as well as trails to avoid and alternative route options based on this assessment and advice in DTS (2016). Traffic management safety will be needed as applicable.

Table 5. Events, trails to avoid and alternatives to significantly reduce risk of Dieback spread.

Trail Event Route Name	Trail section <u>to avoid</u> where significant downslope areas are at risk of Dieback spread.	Recommended Alternative Route Options to reduce risk of introducing Dieback within the Park.
<ul style="list-style-type: none"> • X Adventure Long Run Course • X Adventure Long Course; and • Half Course 	Lookout Walk	Re-route from Coastal Walk between Gannet Rock and Point Piquet on to Meelup Beach Road in a southerly direction (steep incline) to Castle Rock Road intersection (decline) to re-enter Coastal Track. *Traffic control is needed for above.
<ul style="list-style-type: none"> • Adventure Bike Trail 	Northernmost point of Trail Start (outward direction). Downslope of this area there is Uninfested vegetation at risk (see Figure 3 annotation).	Utilise trails or create a new link section approximately 150m to the south on the southern aspect of the hill top that drains into the Infested area – Must remain within the Mountain Bike Zone.
<ul style="list-style-type: none"> • Trans Cape Swim Run 	Car Rally Walk Meelup Brook Walk	Utilise Meelup Beach Road and Castle Rock Road for the inland trail section. *Traffic control is needed for above.

Dieback management measures to utilise for events 2021.

Recommendations:

- Continue to apply the event advice in Table 3 of DTS (2016).
- Review point e) Coordinate all activities that have the potential to impact on native vegetation within the park **to coincide with dry soil conditions**. It's not realistic to expect dry soil conditions when events are planned months ahead of available weather forecasts so it is suggested that event applicants are required to provide the City with a contingency-plan in their EMP as to how they propose to manage Dieback clean down in unexpected rainfall because it often occurs in the south west region.
- The City could include a condition in its event approval that all events with social media and websites must add information and links about Dieback, how and where to clean-down pre, during and post event.
- The City could require proponents who utilise the Park for paid events to complete *Green Card Training*, as this is the accepted best-practice Dieback awareness training available for all stakeholders and it has been approved by the Department of Biodiversity, Conservation and Attractions. This training will assist proponents in making event management decisions and their skills in effectively managing biosecurity hygiene for large numbers of participants.
- It is recommended the City and MRPMC update all online trail maps to reflect any changes to alternative event route options as suggested herein. Preparing a map that only shows proponents what trails are available for events is strongly suggested, to avoid applications that propose alternatives that are not congruent with the Parks Management Plan and Dieback risk-reduction strategies.

Recommendations on Dieback management for specified walking trails: the Floral Walk trail, Whale Lookout trail and Lookout trail.

Floral Walk Trail

Site observations by BARK in 2020 identified most of the existing boot-cleaners are appropriately located, with the exception of No. 6 at the start of the Floral Walk trail.

Recommendations:

- Consider closing this trail due to potential large area impact to vegetation if *Phytophthora* disease is introduced along it within CP Zone 16.
- As a result of any closure to this trail, boot-cleaner #6 could be re-located (see below) with its Dieback signage.
- Additional gating to limit access to pedestrians and Park management would also assist in reducing potential risk of spread along the Floral Walk.

Whale Lookout Trail

Recommendations:

- Install boot-cleaner #6 at the western entrance to this trail with Dieback signage - to help reduce the risk of spread from visitors entering the trail from the west with unclean footwear (see Figure 3). Currently there is no boot cleaner at that point.
- Install kissing-gates at both ends of this trail before you reach the boot-cleaners if possible (see Plate 3, Figure 3) to reduce bike access and direct pedestrians into boot cleaners placed behind the gates.

Lookout Trail

Recommendations:

- Install boot-cleaner #6 at the western entrance to this trail - to help reduce the risk of spread from visitors.
- Install kissing-gates at both ends of this trail before you reach the boot-cleaners if possible (see Figure 3) to reduce bike access and direct pedestrians into the boot cleaners.



**Plate 3. A kissing-gate to enable pedestrian access and limit non-permitted access.
Image by: Bruno Rikli ©**

Recommendations on trails to install limestone sheeting or other measures.

Importing limestone to within the perimeters of the park such as the Western Firebreak is considered a lesser risk than importing more to within the Park. Any importation of Basic Raw Materials to the Park should be carefully managed and it should ideally be sourced from a quarry where the *Phytophthora* disease status has been confirmed as Uninfested by a DBCA Registered Interpreter and the source area has been operating with a Dieback Hygiene Management Plan since opening for assurance of the materials disease free (and weed free) status. This is very difficult as there is currently no certification process for clean basic raw material so alternatives need to be considered such as road base and clean crushed brick to create green bridges over wet soil areas.

Recommendations:

- Standard hygiene protocols must be applied during all earthworks and vegetation clearing within this Park.
- Apply hygiene and walk relevant trails following rainfall to record wet areas and parts needing maintenance then calculate the minimum volume of raw material required. Consider importing inert Dieback and weed free alternatives such as crushed brick, rubble and road base to remediate track sections.
- The Parks Perimeter tracks / firebreaks have are suitable for importing raw materials with lesser risk of autonomous Dieback spread. Whereas additional consideration should be given to any importation of raw materials internally. More options provided by DBCA to reduce Dieback risk when importing raw materials are shown below (Table 6).

Table 6. Options to reduce Dieback risk associated with importing raw materials (DBCA, 2020).

Low likelihood infested	<ul style="list-style-type: none"> • Source 'uninfested raw materials' • Source freshly mulched material from the vicinity of the activity and ensure that it is not contaminated with soil • Source seedlings from a nursery accredited with the Nursery Industry Accreditation Scheme Australia (NIASA)
Swap	<p>Revegetate using seeds rather than seedlings</p> <p>Use raw material from within the same landscape unit and disease category rather than importing it</p>
Avoid	<p>Find a way to do the activity without introducing raw materials to the site. This is highly advisable at sites where the consequences of dieback spread are significant or severe.</p>

Note: other pathogens such as Armillaria and marri and banksia cankers can be spread in mulch.

Specific dieback management measures and/ or recommended trails to be closed.

Recommendation:

- The only trail closure recommended is the Floral Walk.

Recommendation:

- It is suggested that any new Dieback signage within the Park is increased in size (larger font) and a QR code sticker is placed on it to link visitors to relevant Dieback information. Consider installing customised Stop-Sign styles of Dieback signage at boot cleaning stations that visitors are familiar with to potentially increase positive behaviour change for clean down compliance (See Plate 4).

Recommendation:

Review the potential to install (and maintain pump handle boot-cleaners with spray) at the following trails:

- Lookout Walk;
- Whale Lookout Walk; and
- Floral Walk (if retained).

Recommendation:

- Check the need for repairs/maintenance of Dieback infrastructure in the Park on a quarterly basis and opportunistically to ensure it remains available and effective for Park visitors.



Plate 4. Stop sign style of Dieback signage mounted on a Phytofighter pump-handled boot cleaner. Image by: Bruno Rikli 2021©

[Recommendations on dieback control measures in the mountain bike zone \(MTB\) including possible bike cleaning station. This area has been mapped as Infested and there are currently no hygiene measures in place for cleaning bikes on entry or exit.](#)

The MTB zone has been previously mapped as Infested. It is important to note that areas mapped as Infested still have significant natural environment values that need to be preserved. The danger exists that areas mapped as Infested may be perceived as not being worthy of protection, and biological, cultural and aesthetic values are compromised. Part of the MTB experience is the amenity natural areas provide and in some Shires in the Perth hills area Phosphite has been applied along MTB trails to protect the adjacent vegetation.

Review of the MTB zone revealed the northern most track section presents a risk of spreading Dieback as it traverses the downslope side of a hill top that drains towards a large previously mapped Uninfested area. Currently there are no hygiene measures in place for bikes on entry; and exiting this site presents a significant issue where dirty bikes could carry and spread infected soil material to other natural areas in the region.

Recommendation:

- It is recommended that a minor section of the most northern MTB track is closed and rehabilitated to reduce the risk of Dieback spread downslope. It could be re-routed on the southern side of the hill to drain south into the existing Infested MTB zone. This would reduce the future risk of Dieback spreading northeast and outside of the MTB zone as a result of continued all-weather and increasing bike traffic over time. This area is shown below on Plate 5 and annotated on Figure 3.

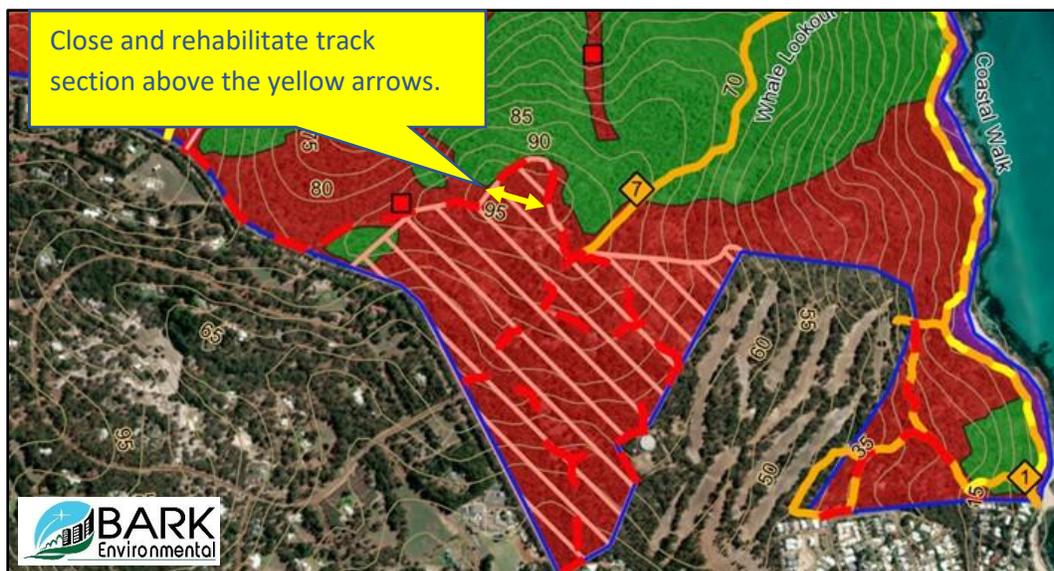


Plate 5. Minor track section that drains into Uninfested area at risk.

Recommendation:

- i) Consider customising a boot-cleaner suitable for mountain bikes (Plate 6). This could either be permanently installed within the Park towards the end of Endicott Loop with a hardened access track around it extending up to the sealed Endicott Loop road; OR
- ii) Design a portable ride-on unit mounted on a trailer, that could be hired during major events with the revenue applied to its operation, maintenance and/or the City's Park management. Either option will also require boot-cleaning and is likely gain a lot of attention in the region as very little has been developed to cater for the MTB community to clean down bikes effectively in natural areas.



Plate 6. A proto-type of fixed site mountain bike cleaning station.
Image by: G. Muir

4. Timing for future Dieback mapping and Dieback treatment

BARK's Dieback risk review based on Dieback occurrence mapping data of 2017 indicates that a total of 52.25 ha of vegetation downslope from Infested areas is at risk of autonomous (natural) disease spread (Figure 4). Because all mapping has expired, the total area at risk may now be less due to extensions to the Infested areas. Further site Dieback interpretation would be necessary to more accurately quantify the current total area of vegetation Infested and at risk.

Dieback treatment applying phosphite has been repeated in parts of the Park for a number of years. There is no known cure for *Phytophthora* dieback. However, the DBCA and many local government agencies and land managers have adopted the use of the biodegradable fungicide called phosphite to protect susceptible plants against *Phytophthora* infection. Phosphite works by boosting a plant's natural defences, allowing some susceptible plants to survive in Infested areas. It is applied through stem injecting trees and spraying susceptible understorey plants, particularly to help protect vulnerable areas from infection or to reduce disease impact.

Figure 4 shows the location of the most recent (2019) phosphite re-application areas that include:

- Wildlife Corridor;
- Western Firebreak; and
- Car Rally Walk (2 separate sections)

Table 6 is provided as a guide to timing for future Dieback mapping and treatment to assist decisions for the Park’s program of works. Importantly, it is highly recommended to update Dieback mapping over the entire Park first, to inform any further Dieback treatment. This will assist in targeting the most vulnerable and conservation significant areas of vegetation at risk based on current Dieback mapping data. Without this, further phosphite applications may miss the actual disease front and not be effective. As an indicator of additional areas to target for Dieback treatment to reduce disease impact and spread, please refer to Figure 4 that shows arrow markers pointing to the interface of 2017 Infested/Uninfested boundaries where phosphite applications may be warranted depending on accessibility and current disease status.

Recommendation:
Utilise the “Dieback mapping and Dieback treatment timing guide” for future planning of these activities within the Park. Adjust as needed to accommodate any relevant new science, best-practice or associated regulations.

Recommendation:
For any new proposed disturbance activities in the Park (e.g. new or realigned tracks, rehabilitation, firebreak clearing, signage installation, drainage modifications) specific area Dieback assessments should be completed and Dieback Management Plans prepared to mitigate Dieback introduction and spread.

Table 6. Dieback mapping and Dieback treatment timing guide.

Year	Activity Description	Area	Timing
YEAR 1	<ul style="list-style-type: none"> Complete Comprehensive Dieback Occurrence Assessment. Confirm locations of hygiene stations and signage is correct. 	Entire Park	Spring-Summer
YEAR 2	<ul style="list-style-type: none"> Identify treatment areas using Year 1 Dieback Occurrence Map and consider vegetation types, drainage, access and threatened spp./TEC data. Dieback Treatment - complete Dieback treatments. 	Target Areas	Spring-Early Summer
YEAR 3	<ul style="list-style-type: none"> Maintain Dieback Management infrastructure. 	Entire Park	Quarterly
YEAR 4	<ul style="list-style-type: none"> Repeat YEAR 1 (Only need to do a Re-check assessment. Year 1 mapping will fully expire in the following year and will require a new Comprehensive Dieback Occurrence Assessment thereafter). 	Entire Park	Spring-Summer
YEAR 5	<ul style="list-style-type: none"> Repeat YEAR 2 	Target Areas	Spring-Early Summer
YEAR 6	<ul style="list-style-type: none"> Maintain Dieback Management infrastructure. 	Entire Park	Quarterly
YEAR 7	<ul style="list-style-type: none"> Repeat YEAR 1 – Comprehensive. 	Entire Park	Spring-Summer
YEAR 8	<ul style="list-style-type: none"> Repeat YEAR 2 	Target Areas	Spring-Early Summer

*DWG, 2015. Managing *Phytophthora* in Bushland states:

- Injecting trees with phosphite provides 3-5 years of protection; and
- Spraying with phosphite provides protection for 1-2 years.

About this Plan

*Recommended re-treatment frequency in table 6 is a guide only based on DWG (2015) and a typical 2-3 year re-treatment cycle as adopted by a number of Local Government agencies in Western Australia. Before undertaking any phosphite applications, please check for any relevant changes to Dieback treatment science and recommended methodology, legislation and any other relevant best-practice information that could change the advice given here.

Disclaimer

BARK Environmental Pty Ltd (BARK) accepts no responsibility, liability, loss, damages or claims for the use of, interpretation of, or application of this information by any individual, association, business or other party. BARK only recommends the use of Western Australia Department of Health Licensed Pesticide Businesses and Dieback Technicians, as well as DBCA Registered Dieback Interpreters who all operate under relevant legislation.

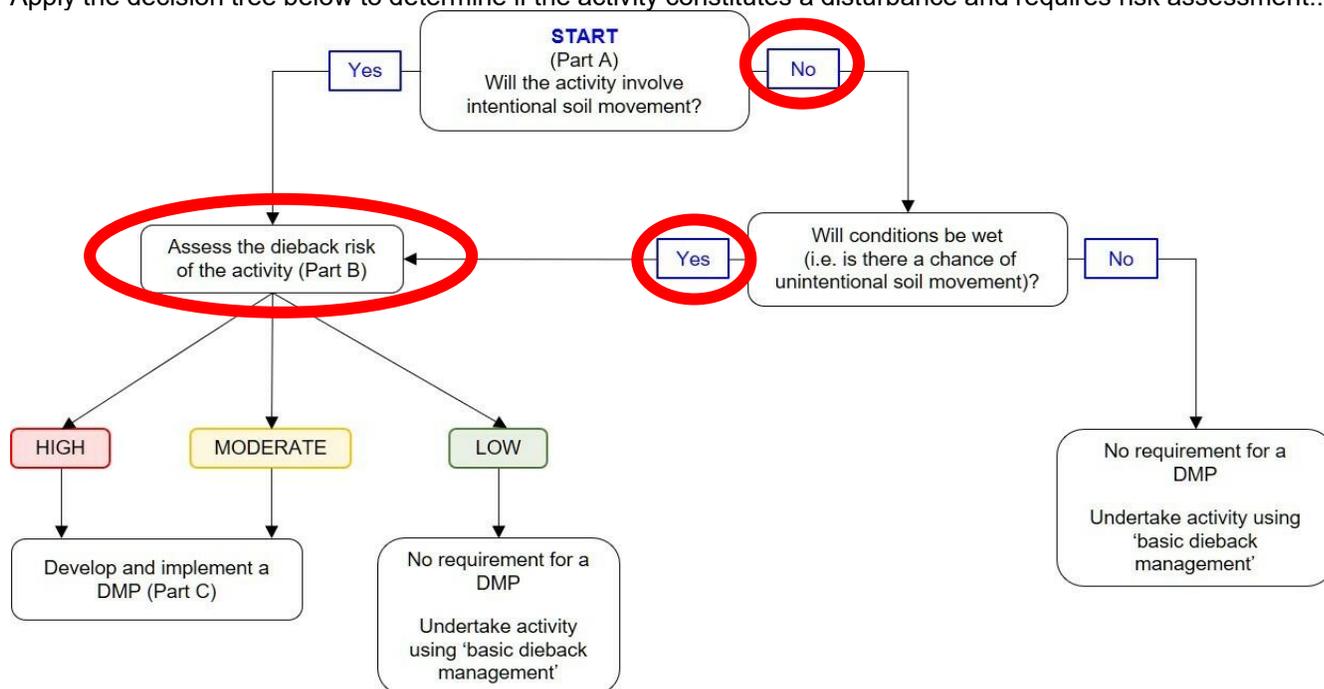
5. References

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- WJ Landscape Architects. 2013. Coastal Nodes Master Plan for the Meelup Regional Park Management Committee.

6. Appendix A – Risk Assessment 2021 – Meelup Regional Park

PART A: DISTURBANCE ACTIVITY

Apply the decision tree below to determine if the activity constitutes a disturbance and requires risk assessment..



Details of disturbance activity

Region/District of activity:	Busselton – Meelup Regional Park	Date of events: (give date range if a prolonged activity)	Various, typically in dryer months. <i>Note: Sporadic rainfall may occur throughout the year.</i>
Location of site of activity: (Forest Block, Reserve or coordinates)	A Class Reserve #12629	Disease Risk Area: (yes or no)	No
Vegetation type/complex:	Principal vegetation communities include: 1. <i>Low open woodland to open forest of E. marginata, C. calophylla, A fraseriana.</i> 2. <i>Shrublands & Peppermint (A. flexuosa) heaths dominated by Hakea trifurcata.</i> 3. <i>Wetland vegetation along seasonal watercourses, sumps/seeps.</i> <i>Source: Hart, Simpson and Associates (1997) in Meelup Regional Park Management Plan (2010).</i>		
Description of the activity: (timber harvesting, road upgrade etc.)	Trail running/mountain bike events ranging from 50 to ~500+ participants over 800m-12.5km within the Park over a small number of days each year. Plus pre-event training and smaller walking/hiking groups and organised adventure type of businesses, and general public visitation throughout the year. The carrying capacity, measured only by the vegetation damage caused by people and cars, is greatly exceeded. Pre-event training sessions may also occur. For the remainder of the year the Park is well under its carrying capacity. <i>Source: WJ. Architects (2013).</i>		
Proponent of the activity:	Private commercial event businesses.		
Departmental objective for dieback management:	<ul style="list-style-type: none"> To minimise the potential for the introduction or spread of dieback associated with planned disturbance activities. 		

Dieack Management Strategy in the draft Meelup RP Management Plan 2019, p.48.

Management of *Phytophthora* dieback will aim to:

- 1. Implement practices which mitigate the damaging effects of *P. cinnamomi* where it has already established.
- 2. Contain or prevent further autonomous spread at the boundaries of existing infestations. This may include the realignment or re-surfacing of firebreaks and trails, as well as phosphite application.
- 3. Reduce the rate of vectored spread and establishment of new infestations within uninfested protectable areas by:
 - a. ensuring hygiene management is implemented for new developments where appropriate (e.g. recreational facilities and upgrades, realignments of trails and fire-breaks);
 - b. restricting operations to dry soil conditions;
 - c. applying phosphite in priority areas, and) minimising or prohibiting access into these areas.

Emphasis of management will be on reduction of vectored spread and human-assisted establishment of new areas of infestation within protectable areas.

PART B: RISK ASSESSMENT

Step 1: MOISTURE conditions

Higher moisture during a disturbance activity increases the likelihood that soil will stick to a carrier (e.g. vehicles, equipment and/or footwear). Tick the box adjacent to the moisture conditions that are forecast for the period of the activity. If the activity will continue for an extended period, planning should consider the highest possible risk (wettest) conditions that may occur. **If the activity is planned for dry conditions but the conditions change to become wetter prior to or during the activity, a contingency plan is required.**

Dry soil	where dust forms when exposed soil is disturbed	X
Moist soil	where soil is damp but does not stick to tyres, equipment and/or footwear	X
Wet soil	where soil and moisture combine so that soil sticks to tyres, equipment and/or footwear	X

Step 2: Determine the LIKELIHOOD of introducing or spreading dieback

Circle the description in each column that best describes the activity.

Disturbance type (e.g. action)	Introduction of raw material	Access	Complexity of activity	Extent of activity	Duration of activity	Drainage	Unmanaged access	Likelihood rating
Heavy earth moving, tracked vehicles	Infested or unknown raw material	Access crosses water (irrespective of frequency)			Activity area disturbed & map expired so impossible to revalidate boundaries		Increased public access in area of high public use	Very likely
Soil disturbance over a distance		Activity requires frequent access to site	Highly complex	Vehicle traverses several mini-catchments	Activity extends over several wet seasons	Surface water increased		Likely
Soil disturbance at single points	Crushed rock with no organic fraction		Complex	Runners and bikes traverse several mini-catchments	Activity occurs during a single wet season		Increased public access, but access restricted and/or site remote	Possible

Disturbance type (e.g. action)	Introduction of raw material	Access	Complexity of activity	Extent of activity	Duration of activity	Drainage	Unmanaged access	Likelihood rating
Rubber tyred vehicle, bicycle	'High confidence' uninfested raw material	Activity requires infrequent access to site	Not complex	Single mini-catchment	Annual 1 day events, PLUS upto 3 training sessions weekly pre-event.	Minimal increase in surface water	Activity does alter frequency of access to site e.g. Pre-event training (possibly in after rain)	Unlikely
Human, traffic during event and pre-event training				Trail running for 800m-12.5km	Entry in short timeframe under dry conditions	Minimal increase in surface water	Activity does not alter frequency of access to site	Very unlikely

Step 3: Determine the CONSEQUENCE of introducing or spreading dieback

Determine the potential CONSEQUENCE that introducing or spreading dieback may cause by going through the table below systematically and circling the description in each column that best estimates the consequence.

The overall consequence rating is determined by the criteria with the highest rating.

Area put at risk	Predicted impact	Biodiversity and sensitive areas at risk	Consequence rating
Ongoing potential ¹ to completely infest all protectable areas in activity landscape unit ²	Predicted very high impact: (majority of species at the activity area are susceptible and/or introducing dieback will result in extinction of species or populations) or Wet areas which contain any <i>Banksia</i> species or jarrah	>1 threatened/priority plant or animal species, critical habitat, TEC and/or Ramsar wetlands that is susceptible to dieback and/or Old-growth jarrah forest	Severe
Potential to infest all protectable areas in activity landscape unit ¹	Predicted high impact: (many susceptible species and/or introducing the pathogen will result in loss of populations or localised extinction of species) or Where predicted impact cannot be determined, jarrah forest on upland areas	At least one threatened/priority plant or animal species, critical habitat, TEC and/or Ramsar wetlands that is susceptible to dieback and/or Sensitive neighbouring property	Significant
Potential to infest more than 5% of any protectable area or 4 ha's (whichever is greater – assessor may set a lower minimum protectable area where appropriate)	Predicted moderate impact: (moderate numbers of susceptible species and/or introducing the pathogen will result in a reduction in species/populations)		Intermediate
	Predicted low impact (low numbers of susceptible species)	Fauna Habitat Zones	Minor
No protectable areas estimated within any related landscape unit and/or The area is already infested ³	No susceptible species and/or the activity area is in the 'excluded' category. or Introducing dieback will have no impact discernible outside natural variation ³	No threatened/priority plant or animal species; critical habitat; TEC; and/or Ramsar wetlands that are susceptible to dieback. or As the activity area is already infested there will be no increased risk to threatened species and communities present ³	Insignificant

¹ Ongoing potential for an area to become infested occurs when the disturbance activity involves construction of permanent infrastructure e.g. roads or camp sites especially high in the landscape

² Landscape unit is an area bounded by features such as creeks, ridges, saddles, open roads and/or freehold land

³ Provide a map showing evidence that area is infested and attach to the risk assessment – Refer figures 1A & 1B in BARK Environmental Report

Step 4: Determine the overall dieback RISK rating

a) Refer to the table below that corresponds to the soil MOISTURE conditions (Step 1)

b) Circle where the LIKELIHOOD rating (Step 2) intersects the CONSEQUENCE rating (Step 3)
This is the overall dieback RISK rating for the activity.

DRY SOIL		CONSEQUENCE				
LIKELIHOOD	Disturbance examples	Insignificant	Minor	Intermediate	Significant	Severe
Very likely	tracked machines ripping, pushing soil	Low	Moderate	High	High	High
Likely	snigging/light surface skim over distance	Low	Moderate	Moderate	High	High
Possible	installing posts, exploration drilling	Low	Low	Moderate	Moderate	High
Unlikely	driving with rubber tyres	Low	Low	Low	Moderate	Moderate
Very unlikely	walking	Low	Low	Low	Low	Low

MOIST SOIL		CONSEQUENCE				
LIKELIHOOD	Disturbance examples	Insignificant	Minor	Intermediate	Significant	Severe
Very likely	tracked machines ripping, pushing soil	Low	High	High	High	High
Likely	snigging/light surface skim over distance	Low	Moderate	High	High	High
Possible	installing posts, exploration drilling	Low	Moderate	Moderate	High	High
Unlikely	driving with rubber tyres	Low	Low	Low	Moderate	High
Very unlikely	walking	Low	Low	Low	Moderate	Moderate

WET SOIL		CONSEQUENCE				
LIKELIHOOD	Disturbance examples	Insignificant	Minor	Intermediate	Significant	Severe
Very likely	tracked machines ripping, pushing soil	Low	High	High	High	High
Likely	snigging/light surface skim over distance	Low	High	High	High	High
Possible	installing posts, exploration drilling	Low	Moderate	High	High	High
Unlikely	driving with rubber tyres	Low	Moderate	Moderate	High	High
Very unlikely	walking	Low	Low	Low	Moderate	Moderate

Step 5: Can the RISK be reduced by altering the activity or conditions?

If the risk rating is 'High' consideration should be given to:

- Cancelling the activity which avoids the risk; or
- Postponing the activity until conditions are dry for activities scheduled during moist or wet conditions.

If cancelling or postponing is not possible the activity should be re-assessed to determine if the risk can be reduced by altering some of the parameters of the activity. For example, re-routing trail events into Infested areas, applying Dieback hygiene, raising awareness amongst participants for any pre-training sessions and during the event.

Step 6: Determine requirements based on RISK rating

Tick the box adjacent to the RISK rating of the activity as determined by the risk table.

High	<ul style="list-style-type: none"> Complete Part C based on valid comprehensive dieback interpretation with Regional Manager (or delegate) approval before implementation, and sign-off after close-out i.e <u>Requires a Dieback Management Plan.</u> <u>Green Card training</u>¹ for all proponents and contractors involved in activity 	... ✓
Moderate	<ul style="list-style-type: none"> Complete Part C based on valid comprehensive dieback interpretation OR conditional dieback occurrence information with Regional Manager (or delegate) approval before implementation, and sign-off after close-out. i.e <u>Requires a Dieback Management Plan.</u> <u>Green Card training</u>¹ for proponent and contractors involved in activity 	... ✓
Low	<ul style="list-style-type: none"> Part C not required. Activity can proceed using basic dieback management Green Card tcheck□raining¹ for all proponents and contractors involved in activity 	N/A

¹ Green Card training is the current training approved by DBCA for all stakeholders and industries operating in South Western Australia's vulnerable natural areas.

Step 7: Risk Assessment sign-off

	Representing	Position	Date
Risk Assessment conducted by:	BARK Environmental Pty Ltd	DBCA Registered Dieback Interpreter (B. Rikli)	26 July 2021
Risk Assessment checked by:	City of Busselton	Meelup / Environmental Management Officer (K. Leehman)	27 July 2021

Results and comments:

This *Phytophthora* Dieback risk assessment resulted in:

- MODERATE – HIGH risk ratings for trail events within Park.
- MODERATE risk rating for trail events scheduled in summer months because dry soil is expected.
- HIGH risk rating if soil moisture increases such as after summer rainfall.

7. Appendix B – Figures:

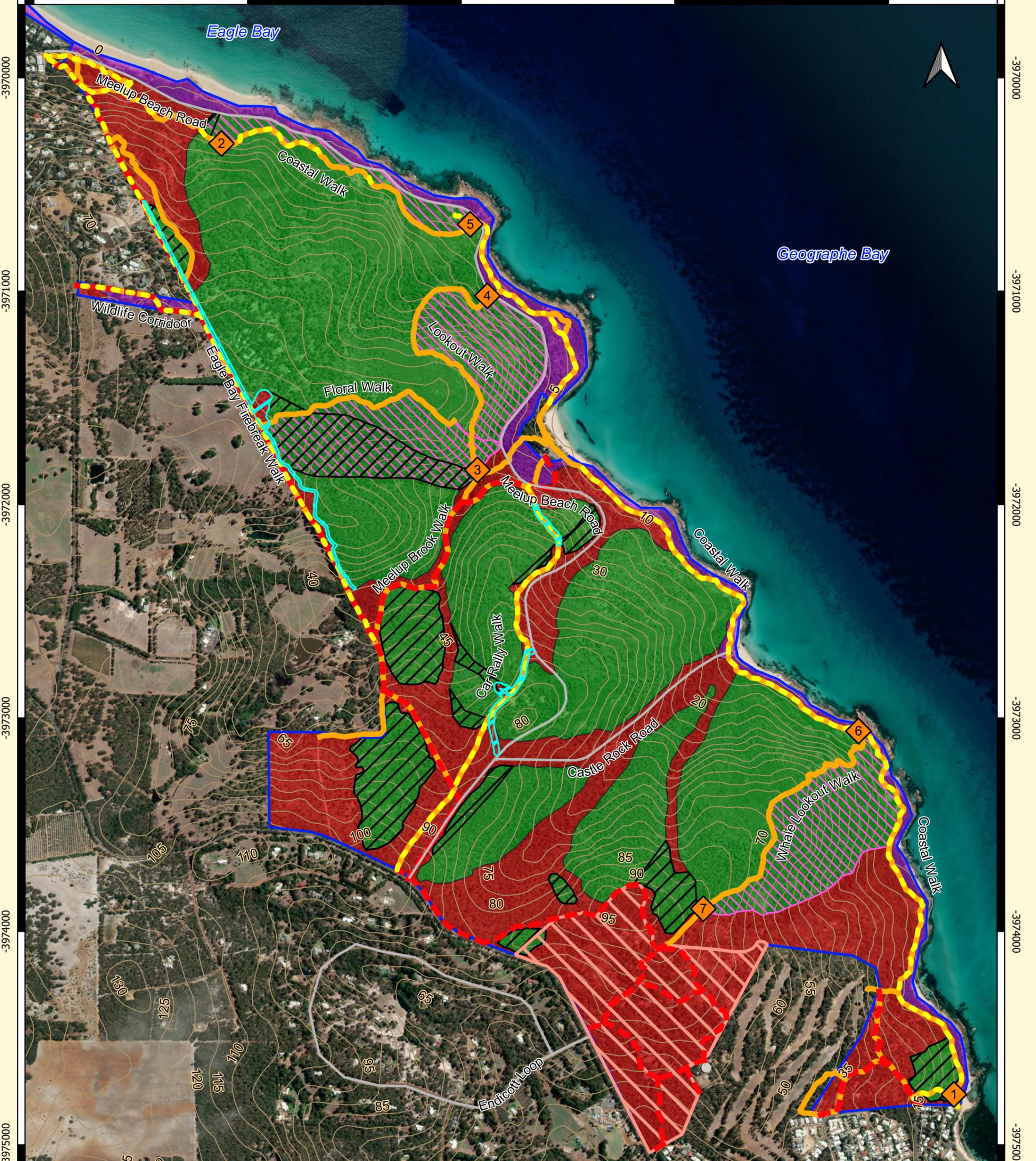
1.A – Dieback occurrence 2017 and trails (South)

1.B – Dieback occurrence 2017 and trails (North)

2. – Dieback Risk of Spread

3. – Dieback Risk and Management

4. – Existing and Potential Dieback Treatment Areas

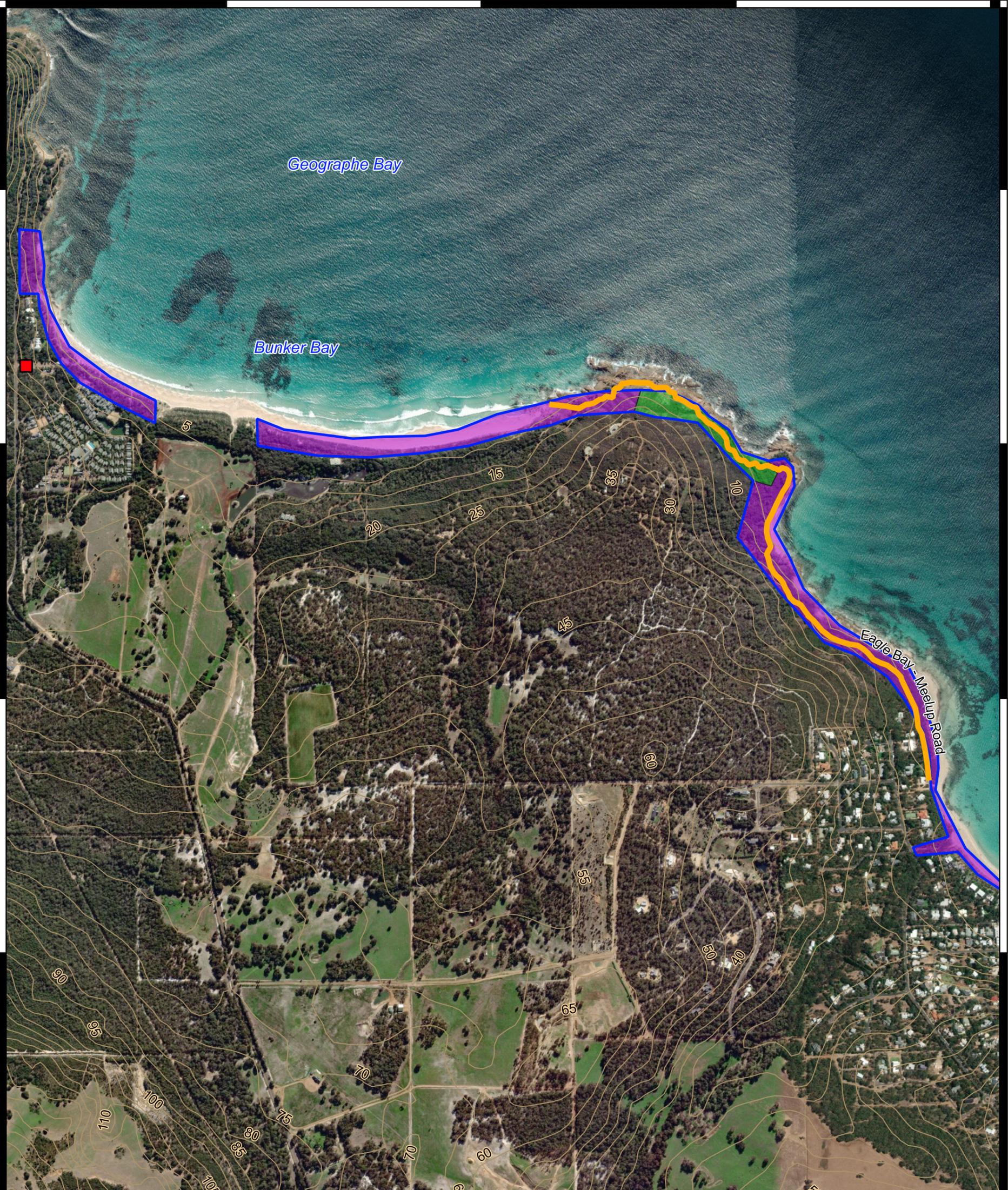


Legend

- P. cinnamomi (DIDMS June2019)
- Meelup Regional Park
- Hygeine Management Stations
- Limestone Sheeting
- Mountain Bike Trails
- Dieback Occurrence
- Uninfested
- Uninterpretable
- Unprotectable
- Roads
- Walking Trails
- Mountain Bike Zone
- Contours (5m)

Figure 1. A
Dieback Occurrence and Trail Locations
Meelup Regional Park (South)

Datum: GDA 1994 Projection: MGA Zone 50	Bark Job: BARK 53 Date: 25/06/2021
Scale @ A3: 1:17500	Revision 1
0 200 400 600 800 m 	
Phytophthora Occurrence combined data (BARK 2020 & DTS, 2017)	



Legend

- P. cinnamomi (DIDMS June2019)
 - ◆ Hygeine Management Stations
 - Meelup Regional Park
 - Limestone Sheeting
 - Mountain Bike Trails
 - Road_Icon
 - Walking Trails
 - Mountain Bike Zone
 - Contours (5m)
- Dieback Occurrence
- Infested
 - Uninfested
 - Uninterpretable
 - Unprotectable

Figure 1. B
Dieback Occurrence and Trail Locations
Meelup Regional Park (North)

Datum: GDA 1994
 Projection: MGA Zone 50

Bark Job: BARK 53
 Date: 25/06/2021

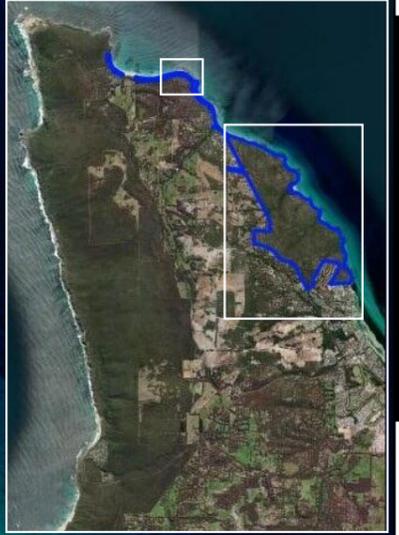
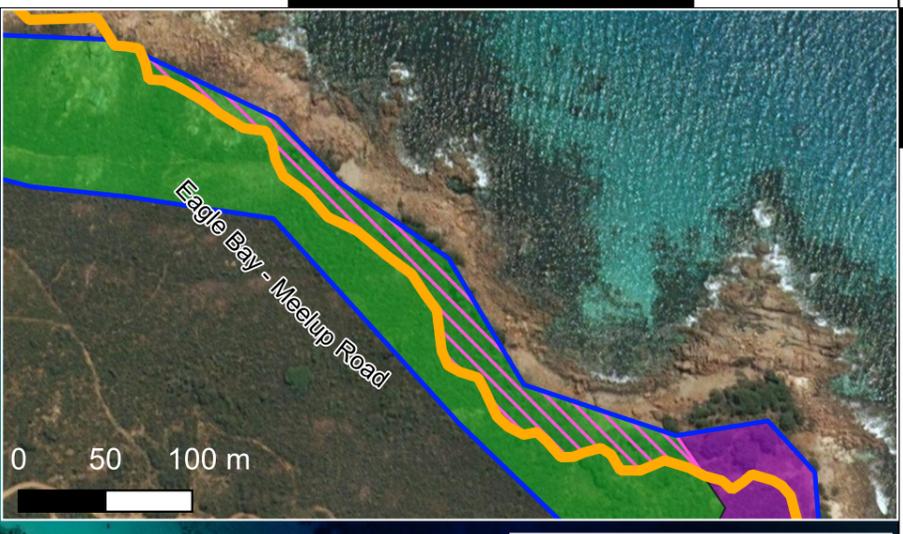
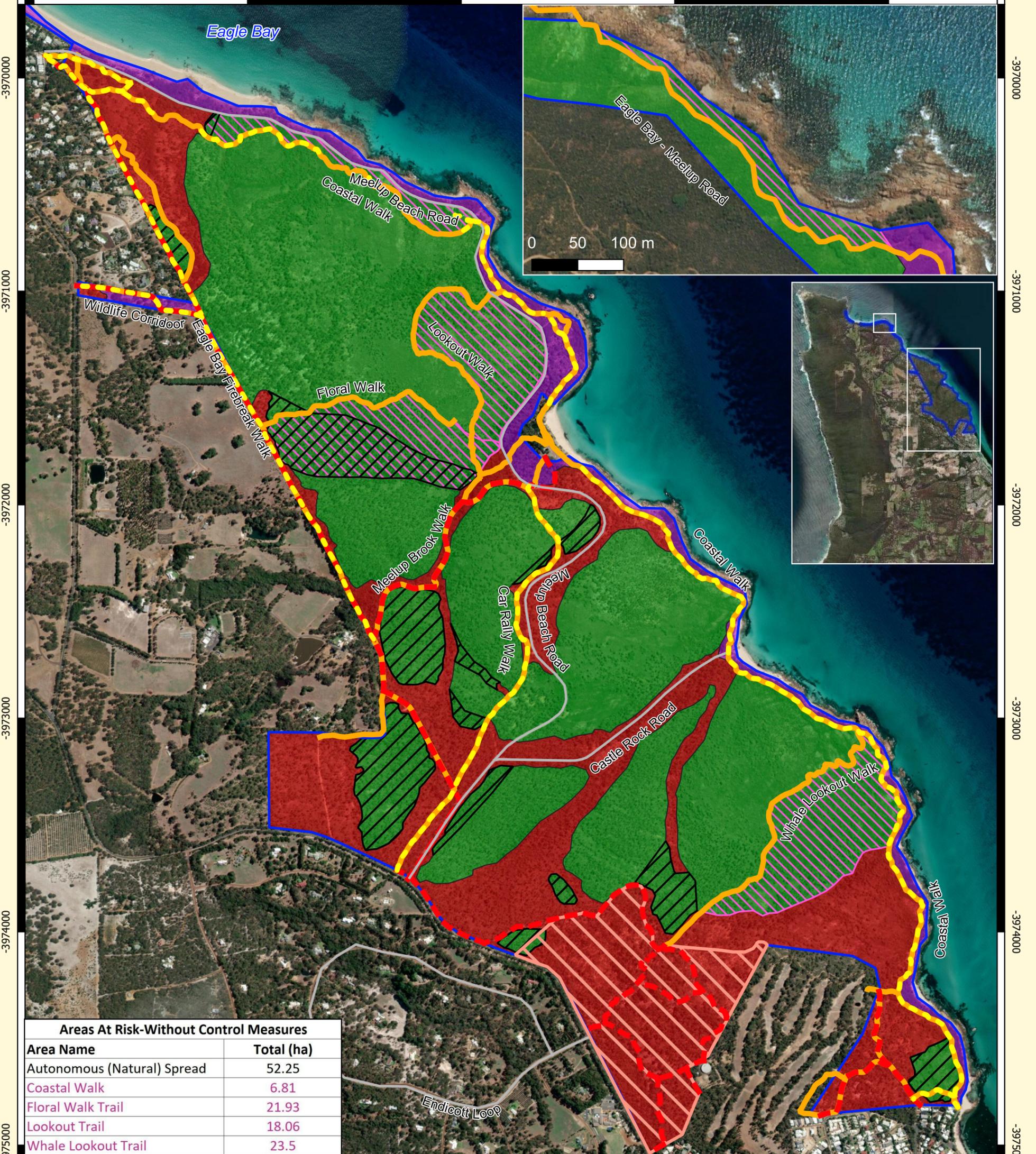
Scale @ A3: 1:15000

Revision 1

0 200 400 600 m

Phytophthora Occurrence combined data (BARK 2020 & DTS, 2017)





Legend

Areas at risk of Dieback Spread without Control Measures

- If Introduced Along Tracks (*~1-5yr estimated)
- Autonomous (Natural) spread (*~50-100yr estimated)

*Timeframes are Estimates only based on field observations of phytophthora disease

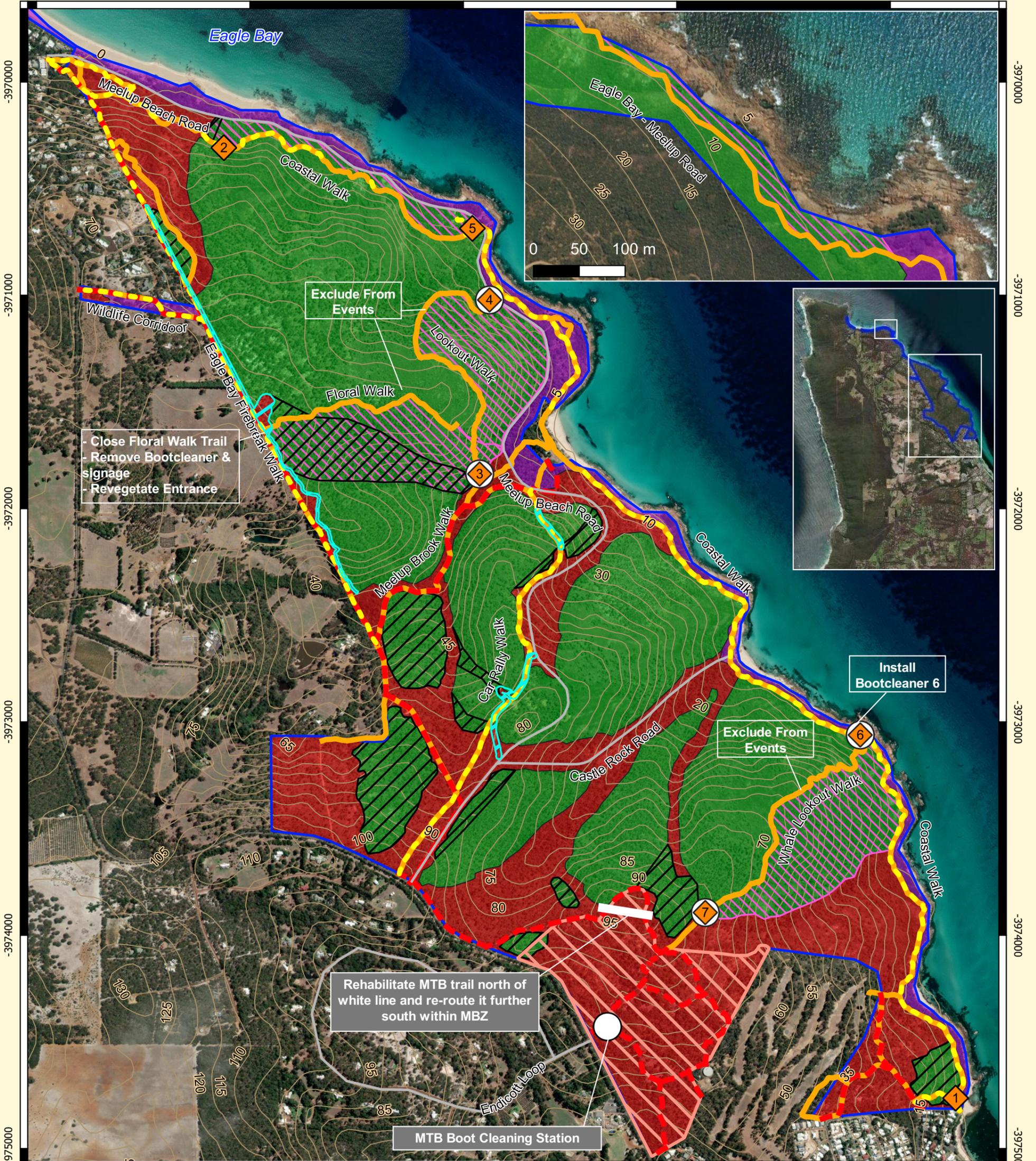
Dieback Occurrence

- Infested
- Uninfested
- Uninterpretable
- Meelup RP Boundary

- Limestone Sheeting
- Mountain Bike Trails
- Road_Icon
- Walking Trails
- Mountain Bike Zone

Figure 2.
Dieback Risk of Spread
Meelup Regional Park

Datum: GDA 1994 Projection: MGA Zone 50	Bark Job: BARK 53 Date: 25/06/2021
Scale @ A3: 1:17500	Revision 1
<p>0 200 400 600 800 m</p> <p>Phytophthora Occurrence combined data (BARK 2020 & DTS, 2017)</p>	



Legend

Areas at risk of Dieback Spread without Control Measures

- If Introduced Along Tracks (*~1-5yr estimated)
- Autonomous (Natural) spread (*~50-100yr estimated)

*Timeframes are Estimates only based on field observations of phytophthora disease

- Hygiene Management Stations
- Install Kissing Gates
- Dieback Occurrence
- Limestone Sheeting
- Infested
- Mountain Bike Trails
- Uninfested
- Road_Icon
- Uninterpretable
- Walking Trails
- Mountain Bike Zone
- Meelup RP Boundary

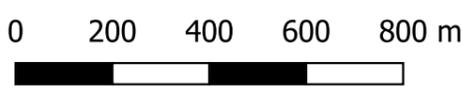
**Figure 3.
Dieback Risk and Management
Meelup Regional Park**

Datum: GDA 1994
Projection: MGA Zone 50

Bark Job: BARK 53
Date: 25/06/2021

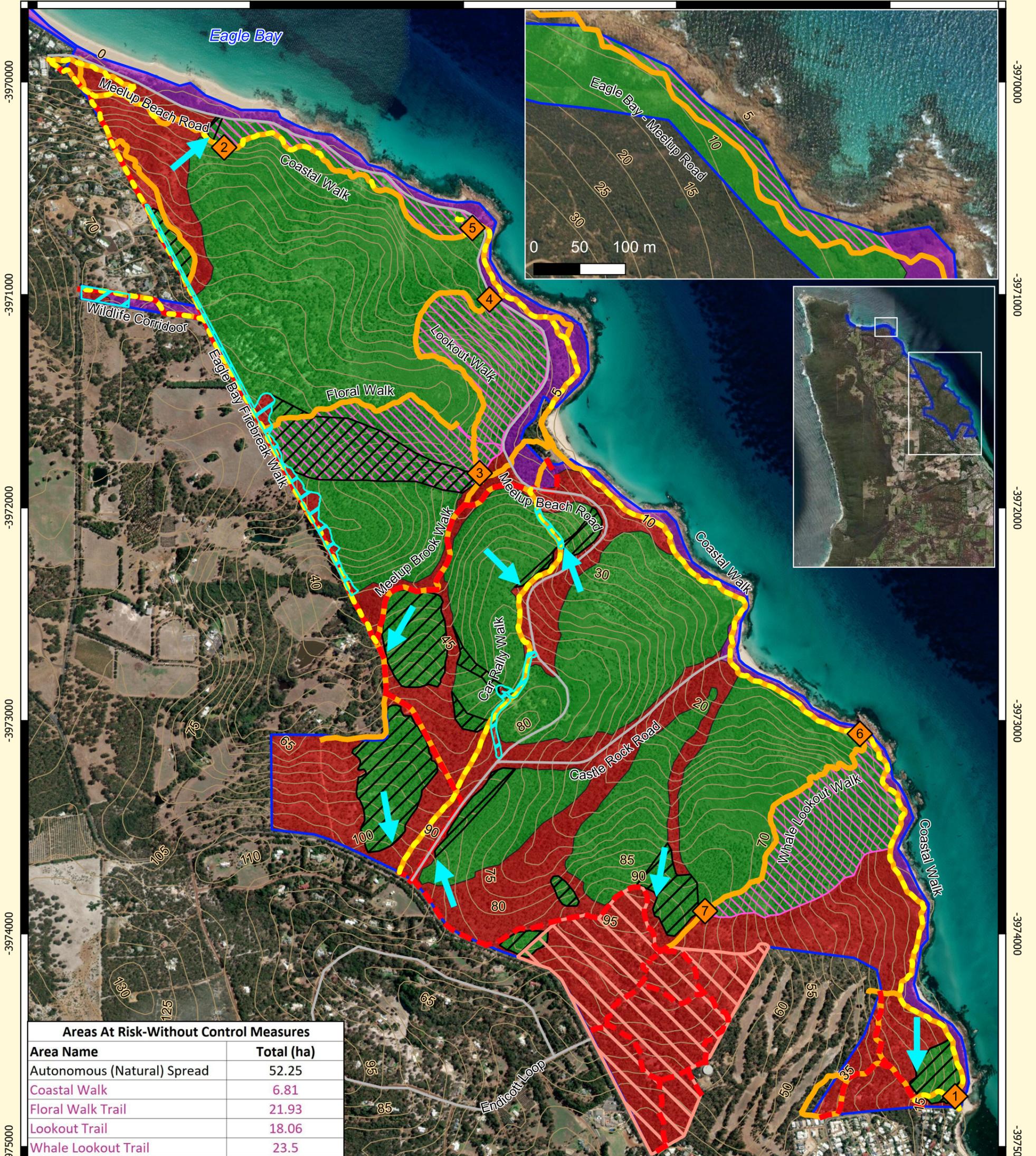
Scale @ A3: 1:17500

Revision 1



Phytophthora Occurrence combined data (BARK 2020 & DTS, 2017)





Areas At Risk-Without Control Measures	
Area Name	Total (ha)
Autonomous (Natural) Spread	52.25
Coastal Walk	6.81
Floral Walk Trail	21.93
Lookout Trail	18.06
Whale Lookout Trail	23.5

Legend

Areas at risk of Dieback Spread without Control Measures

- If Introduced Along Tracks (*~1-5yr estimated)
- Autonomous (Natural) spread (*~50-100yr estimated)

*Timeframes are Estimates only based on field observations of phytophthora disease

Dieback Occurrence

- Infested
- Uninfested
- Uninterpretable

Other Features

- Limestone Sheeting
- Mountain Bike Trails
- Road_Icon
- Walking Trails
- Mountain Bike Zone
- Meelup RP Boundary
- Existing Treatment (BARK, 2019)
- Potential Treatment

Figure 4.
Existing and Potential Dieback Treatment
Areas
Meelup Regional Park

Datum: GDA 1994 Projection: MGA Zone 50	Bark Job: BARK 53
Scale @ A3: 1:17500	Date: 25/06/2021
0 200 400 600 800 m	Revision 1
Phytophthora Occurrence combined data (BARK 2020 & DTS, 2017)	

-3970000
-3971000
-3972000
-3973000
-3974000
-3975000

-3970000
-3971000
-3972000
-3973000
-3974000
-3975000