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Level 3, 8/201 Adelaide Terrace
East Perth, WA, 6004

Dear Phoebe,

Proposal to undertake a *Phytophthora* Dieback Assessment

This letter presents a proposal for Terratree Pty Ltd (Terratree) to undertake a *Phytophthora* Dieback (Dieback) assessment of native vegetation within the Bidaminna Project proposed development mine which lies approximately 20 km east of Ledge Point.

The total assessment area is **2,740.8 hectares (ha)**, however only **522.3 ha** of this is within the Project Study area (likely disturbance footprint). Of the 522.3 ha Project Study area, only **488.6 ha** can be comprehensively assessed due to vegetation condition. In total **33.7 ha** must be Excluded from assessment due to the Degraded vegetation condition. The result of the Comprehensive assessment will inform a dieback risk assessment for the Excluded area. Of the remaining Project area, **1741.6 ha** is vegetated, unlikely to be disturbed and therefore only requires a Broadscale Dieback assessment.

Scope of Work

Terratree understand that the scope of work requires the following:

- Undertake a boundary recheck assessment of Quail Street Reserve and a baseline comprehensive assessment of adjoining reserves.
- Take representative samples for the testing of *Phytophthora* presence and send to an appropriate lab for identification.
- Develop a rapid Dieback assessment method for landowners within the Shire.
- Produce a *Phytophthora* Dieback assessment reports that includes Dieback occurrence mapping and recommendations for the management of risks to biodiversity assets.
- Develop a Hygiene Management Plan, including hygiene maps, to address and manage risk during construction and operational activities.
- Provide all Dieback occurrence spatial data in GDA '94 format.

Methods

The Dieback assessment will be undertaken in accordance with the Dieback Interpreter Guidelines: *FEM047 Phytophthora Dieback Interpreter's Manual for lands managed by the department* (Forest and Ecosystem Management Division (FEMD 2015). There are several different types of Dieback assessments including Comprehensive, Boardscale and Boundary Rechecks. The type of survey selected as the most appropriate will depend on whether ground disturbance activities are proposed. Regardless of the type of assessment to be undertake all surveys require a desktop study prior to commencement of fieldwork.

A desktop study of the study area will be undertaken prior to the field assessment to:

- review any available data for the study corridor of
 - government databases including the Vegetation Health Service database (maintained by the DBCA)
 - the Dieback Information and Management Delivery System (DIDMS) and publicly available technical reports (Project Dieback 2014).
- identify possible disease vectors e.g. tracks, utility corridors, ground disturbance, feral animals
- determine the location of high-risk areas e.g. areas of high disturbance and water-gaining sites.

Comprehensive assessment

This assessment type is the most commonly used within the vulnerable zone of WA. It involves comprehensive coverage of areas as small as one hectare or less, to the largest area only limited by resources, such as funding and interpreter availability. The method involves demarcating all obvious infested areas and then systematically assessing remaining areas using transects. Comprehensive assessments can be time consuming and costly. The unit cost increases with smaller assessment areas, denser vegetation, lower interpretability, increased travel distances and steep or inaccessible terrain. The confidence associated with this assessment type is high; accurate *Phytophthora* occurrence maps will be produced. (FEMD 2015). Comprehensive assessments are required when ground disturbance is proposed, and the project area is within the Dieback vulnerable zone.

Comprehensive assessments are recommended for all reserves as a baseline survey to inform hygiene management for activities within the reserves such as fuel load reduction, clearing of firebreaks and track construction.

Broadscale assessment

This method may only be used for non-operational purposes to show the proponent where the obvious infested sites are located. It is usually carried out for broadscale planning and targeting of areas for comprehensive assessment later if required. This method is often used in conjunction with a linear assessment for roads, tracks and firebreaks within the area. The broadscale assessment is done for areas surrounding the linear corridors. The corridor information is used operationally, and the broad information is used strategically. If an area within the broadscale assessment is to have disturbance activities, a comprehensive assessment method will be done for that specific area (FEMD 2015).

Boundary Recheck assessment

A boundary recheck is undertaken to see if the Dieback occurrence boundary mapped during a comprehensive assessment is still accurate, or, if the disease has moved since the original mapping. The boundary recheck will assess the buffer zone between from the disease edge to ensure that it is still adequate, or if it needs to be modified.

Dieback Management Plan

The Dieback management plan will include a risk assessment which examines the likelihood of Dieback being present within or adjacent to the assessment area if it is found to be uninterpretable or cannot be assessed (excluded) due to vegetation condition. The risk assessment will also examine the consequences to biodiversity values of not managing the risk of Dieback during construction to determine the overall risk. Once the overall risk has been determined management actions will be outlined for specific construction activities, to reduce and minimise of introducing or spreading Dieback during construction.

The draft report and management plan will be provided to the Client for review, and any amendments made before the report is finalised, with the final report to be provided as a PDF document. All spatial mapping data (shapefile GDA 94 format) resulting from the Dieback assessment will be provided upon delivery of the report.

Recent Relevant Experience

Established in 2012, and specialising in Dieback assessment, flora and vegetation surveys and management and revegetation planning, Terratree has substantial experience servicing the resources sector, land developers, utilities, state and local governments.

Terratree has a core team of ecologists who possess substantial experience in the fields of botany, taxonomy, mycology and zoology and specialises in Dieback mapping, risk assessments and hygiene management planning.

Terratree has undertaken numerous Dieback assessments on a range of projects in the South-west and Midwest regions of Western Australia, including major linear infrastructure developments in the Northern Sandplains, Swan Coastal Plain and Jarrah Forest bioregions.

Terratree also has extensive experience in the preparation of Dieback Management Plans (DMPs) having prepared DMPs for clients in the mining, construction, and government.

Some relevant project examples are listed in **Table 1**. The projects detailed were selected for inclusion due to their specific similarities and relevance to this in terms of size and scope of work.

Table 1: Examples of relevant completed projects

Project Type	Site Name	Location	Client	Year
Comprehensive and Broadscale Dieback Assessment	Atlas Project	Cervantes	Image Resources	2020
<p>Key outcomes</p> <p>The assessment revealed no evidence of <i>Phytophthora</i> Dieback within the study area which totalled 1116.0 ha. Seventeen soil and tissue samples were taken from recently dead and dying disease indicator species, none of which returned positive results for Dieback. Approximately half of the assessment area was mapped as Uninfested, 27% Uninterpretable and 23% was Excluded from assessment due to the degraded condition of the vegetation. Terratree concluded with a recommendation for the development of a Dieback Hygiene Management Plan for the project prior to the commencement of ground disturbing activities.</p>				
Linear Dieback Assessment	Bidamina North and Bidamina South	Bidamina	Image Resources	2017
<p>Key outcomes</p> <p>A total of five soil and tissue samples were taken from recently dead disease indicator species. All samples returned a negative result for <i>P. cinnamomi</i> or other <i>Phytophthora</i> species. The Dieback assessment found no Dieback infestations within the assessment area. The whole of the assessment area (181.57 ha) was categorised as Uninfested and Protectable. Therefore, appropriate hygiene measures should be implemented to ensure that the <i>Phytophthora</i> pathogen is not introduced to the assessment area.</p>				
Targeted Flora and Dieback assessment	Bidamina and Cooljarloo Projects	Bidamina and Cooljarloo	Image Resources	2018
<p>Key outcomes</p> <p>The entire study area was mapped as 'Uninfested' for Dieback. Four samples were taken for diagnosis of potential symptoms of <i>Phytophthora cinnamomi</i>. Two samples returned negative results. One sample returned a positive result for another <i>Phytophthora</i> species. This <i>Phytophthora</i> species was having a minor impact on the surrounding environment and was not causing any major ecological changes in the local area. One sample returned a positive result for Aplosporella, a pathogenic fungi species. This species was having a minor impact on the surrounding environment.</p>				
Broadscale Dieback Assessment	West Mine and East Mine	Eneabba	Iluka	2018
<p>The assessment was conducted in hot, dry weather during November after having had little or no rain in the preceding months increased the difficulty of assessment of indicator species deaths as being attributable to <i>Phytophthora</i> Dieback. To achieve greater confidence in mapping the assessment areas, 5 samples taken from areas exhibiting what was perceived to be strong disease expression. These samples were sent to the Centre for Phytophthora Science and Management at</p>				

Murdoch University for retesting using DNA techniques after initially returning negative results. After retesting, one sample returned a positive result for *Phytophthora multivora*, providing greater confidence in the negative results from the other four samples, but also illustrating the fact that sampling under suboptimal conditions in the northern sandplains can produce false negative results. A total of 19 soil and tissue samples were taken from recently dead disease indicator species. These were predominantly *Banksia* spp., along with a *Hakea*, two *Lambertia* and one *Jacksonia* species. No positive results for *Phytophthora cinnamomi* were recorded. Two positive results were recorded for *P. multivora*, as was one positive result for *P. arenaria*.

Dieback Assessment	Bindoon Bypass	Bindoon	Jacobs Group	2018
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Key outcomes

Terratree undertook a Comprehensive Dieback Assessment for the Bindoon Bypass, near Bindoon, WA, for the Jacobs Arup Joint Venture. In total, 2785.57ha was assessed, which represented 86.36% of the Bindoon Bypass project area. The assessment was undertaken in accordance with the in accordance with the FEM047 *Phytophthora* Dieback Interpreter’s Manual. It consisted of a visual assessment of native vegetation within the assessment area and collection of soil and tissue samples of recently dead disease indicator species for diagnostic testing. The assessment area was comprehensively assessed with a focus on high-risk areas including tracks, firebreaks, disturbed areas and watercourses.

Comprehensive Dieback Assessment and Treatment	16 Reserves	Melville	City of Melville	2018, 2019
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Key outcomes

The City of Melville engaged Terratree Pty Ltd in 2018 to undertake a comprehensive Dieback assessment of twelve reserves within the City of Melville LGA encompassing an area of approximately 100ha. In 2019, Terratree Pty Ltd was again engaged by the City of Melville to undertake a comprehensive Dieback assessment of a further four reserves encompassing an area of approximately 90ha. These assessments determined the extent of Dieback within City reserves and facilitate the implementation of Dieback treatment programs to protect vulnerable susceptible vegetation. The comprehensive Dieback assessments identified and mapped the Dieback occurrence status of all lands within the assessment area. The mapping was followed with treatment, conducted by Terratree’s subcontractor. The project was completed on time and within the allocated budget.

Dieback Monitoring	Indian Ocean Drive	Lancelin - Cervantes	Main Roads	2015, 2016, 2017
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Key outcomes

Terratree completed several years of annual Dieback monitoring and mapping along 90km of the Indian Ocean Drive, turn-offs and service areas, drainage areas and other high-risk vectors. No infestations of *P. cinnamomi* have been identified during monitoring. However, fourteen separate infestations of other *Phytophthora* species have been identified, with discussion on risk to biodiversity assets and potential management implications.

Note: Referees for the listed projects can be provided upon request.

Personnel

Joseph Grehan BSc. (Env. Science); Post-Graduate Diploma (Env. Management)

Principal Ecologist and DBCA Registered Dieback Interpreter

Joe established Terratree in 2012 to offer comprehensive ecological assessment and management services to clients throughout Australia. Joe is an environmental consultant with over 17 years' experience in environmental impact assessment, management and rehabilitation planning and botanical surveys, plus *Phytophthora* Dieback detection, diagnosis, mapping, and management planning. He has worked as an ecologist, environmental consultant, Dieback Interpreter and government regulator with the former WA Departments of Conservation and Land Management and the Department of Environment and Conservation. Joe has undertaken botanical surveys and reporting including EPA Targeted and Detailed vegetation mapping and targeted searches for conservation significant flora throughout Western Australia.

Joe is experienced in providing advice and preparing environmental approval documentation relating to mining and other proposals requiring EPA, DMIRS, DBCA and other State and Commonwealth Government approvals. He is competent in all areas of project management, including staff management, client liaison, liaising with regulatory authorities and technical reporting. Joe has prepared several Conservation, and Exploration Management Plans that have been approved by the regulatory authorities.

If successful, Joe will be responsible for overall project management and client liaison, and the Dieback field assessment

Aaron Caubo BSc. (Conservation Biology)

DBCA Registered Dieback Interpreter and Ecologist

Aaron is registered Dieback interpreter and has experience in Dieback detection, diagnosis, mapping and management planning in the Jarrah Forest, Swan Coastal Plain and Northern Sandplains regions. Aaron has comprehensive understanding and in ecosystem restoration planning, environmental impact and degradation assessments and riparian foreshore assessments and a working knowledge of Western Australian flora, fauna, geology, and soils.

Aaron is competent in technical report writing, desktop assessments and is proficient in the use of GIS mapping software.

If successful Aaron will be responsible for the Dieback field assessment including taking samples, managing spatial data, and contributing to developing the report.

Jemma Marshall BSc. (Environmental and Marine Science), Diploma in Conservation and Land Management

Botanist / Dieback Interpreter Trainee

Jemma has extensive experience working in the field and offers expertise in environmental restoration, including seed collection, planting, planning and conducting weed mapping and management. Jemma is also experienced in a range of ecological assessment, including Targeted flora and vegetation surveys and Black Cockatoo habitat assessments, and has capability in GIS and writing technical reports and management plans.

If successful Jemma will be assisting n with the field survey.

Norman Lai MSc. (Biology & Ecology); BSc. (Environmental Science and Marine Science)

Ecologist and Dieback Interpreter Trainee

Norman has a broad understanding and range of experience in environmental management as an academic, technician and graduate ecologist. He is currently training under DBCA registered Dieback interpreters and has undertaken Dieback assessment in the southern Jarrah forest. He has experience in environmental rehabilitation services and planning, weed survey and identification, and modelling of terrestrial and aquatic ecosystems.

Norman is competent in technical report writing, desktop assessment, field survey and sampling, and the use of GIS mapping software. Norman is also proficient in the use of Microsoft Office and R-studio software to interpret environmental data meaningfully and generate quality reports.

If successful Norman will be assisting n with the field survey.

Fee Proposal

Terratree proposes a lump-sum fee of **\$69,394.50 (excl. GST)** to undertake the Dieback assessment, produce mapping and prepare a technical report. **Table 2** below provides a breakdown of the proposed fee timing of delivery.

Table 2: Breakdown of fee proposal

FEE PROPOSAL COMPONENT	RATE (\$ AUD)	UNITS	COST (excl. GST)
Desktop Review			
OH&S (Job Hazard Analysis and Safe Work Method Statement)	120	2	\$240.00
Desktop Review of existing data and reports	120	2	\$240.00
Field Survey			\$0.00
Dieback Assessment - 2 teams with 1 DBCA Registered Dieback Interpreter & 1 Dieback Interpreter Trainee/Ecologist on each team (4 personnel)	480	100	\$48,000.00
Report Preparation			
Dieback Assessment Report	120	32	\$3,840.00
Internal Review	150	4	\$600.00
Report finalisation including addressing client comments	120	2	\$240.00
Preparation of Dieback Management Plan			\$0.00
Figures			
Project Location	120	1	\$120.00
Dieback Occurrence Map	120	4	\$480.00
Internal Map review	150	1	\$150.00
Disbursements			
Food and Accommodation x 4 people (\$150 per person per day) = \$600 per day	600	10	\$6,000.00
Samples (25 samples@\$160 each)	160	25	\$4,000.00
Vehicle Expenses-2 vehicles x 2 return trips to site (1200km) plus 40km per day travel to and from site x 10 days (400km)	0.8	1600	\$1,280.00
Field Equipment and Materials (\$90/day)	90	10	\$900.00
Project Management (admin and client liaison)		5% of total (excl. GST)	\$3,304.50
Total (excl. GST)			\$69,394.50
GST			\$6,939.45
Total (incl. GST)			\$76,333.95

Notes and Assumptions

1. Terratree's payment terms are **strictly 30 days from the invoice date**.
2. This proposal does not include the costs for on-site or Health Safety and Environment inductions that may be required. If these are required, they will be charged on a fee for time basis, as outlined in **Table 3**.
3. The above fee proposal assumes that any relevant information about the subject site that the Client possesses, e.g. previous ecological reports, GIS database results or specific planning documents, will be made available to Terratree prior to the commencement of work.
4. The proposal assumes that access to the assessment areas will be uninhibited and organised by the Client prior to the field assessment.

5. The proposal does not allow for a return visit. Should a return visit be required (e.g. returning to take further samples), then additional costs will be incurred.
6. Any data acquisition required to complete the work will be obtained at a cost to the Client.
7. Any additional disbursements will be charged at cost plus 10%.
8. With the exception of additional essential disbursements, the fee proposal will not be exceeded unless a variation is required for out-of-scope work or unforeseen circumstances due to unsafe working conditions, access issues or injury to personnel.
9. All reporting and mapping undertaken has been costed to only allow for a single review of documentation from the Client. Should additional reviews of documentation be requested by the Client, this will be undertaken on an hourly basis and charged accordingly as outlined **Table 3**.
10. The proposal does not include printing the final report. Additional disbursement costs will be incurred if this is required.
11. Any work to be conducted that falls outside the scope can be completed on an hourly rates basis, as per **Table 3**.

Table 3: Hourly rates of key personnel

Personnel	Cost (excl. GST)
Principal Ecologist	\$150/hr
Registered Dieback Interpreter	\$130/hr
Senior Ecologist / GIS Technician	\$130/hr
Ecologist/Trainee Dieback Interpreter	\$110/hr

Timing

Terratree will be able to complete the field assessment, report and associated figures within four weeks of conducting the field survey. Once client feedback is received Terratree will provide finalised reports within two weeks. The work will be completed by **November 30th, 2021**.

Safety

Safety is one of Terratree's core values and we are committed to:

- Protecting the safety and health of our employees and meeting our obligations with respect to the protection of others affected by our activities.

- Protecting and preserving the natural environment in which we operate.

Terratree has developed a Workplace Health and Safety Management Plan to comprehensively manage risks within the workplace. All Terratree's projects with a field-based component are required to operate under the guidance of a Safe Work Method Statements (SWMS), which incorporates a Job Safety Analysis and appropriate controls to mitigate and manage risk. The SWMS will be provided to Image Resources before the survey is undertaken. All Terratree staff are required to hold current Remote Area First Aid certificates.

Closing

We would like to thank you for the opportunity respond to your work request and trust that it meets your needs and expectations. We are also happy to discuss any part of our proposal and customise this in response to your comments and suggestions. If you have any queries or concerns regarding the proposal, please do not hesitate to contact me on 0400 003 688.

Yours sincerely,



Joseph Grehan
Director and Principal Ecologist
Terratree Pty Ltd

References

FEMD (2015). *FEM047 Phytophthora Dieback Interpreter's Manual for lands managed by the department*, Forest and Ecosystem Management Division, Department of Biodiversity Conservation and Attractions, Western Australia.

Keighery, B.J. (1994). 'Bushland Plant Survey: A Guide to Plant Community Survey for the Community'. Wildflower Society of WA (Inc.), Nedlands, Western Australia.

Project Dieback (2014). The Dieback Information Data Management System (DIDMS) Version 1.7.0. Available at: didms.gaiaresources.com.au.

Attachment 1 - Curriculum Vitae of Specified Personnel