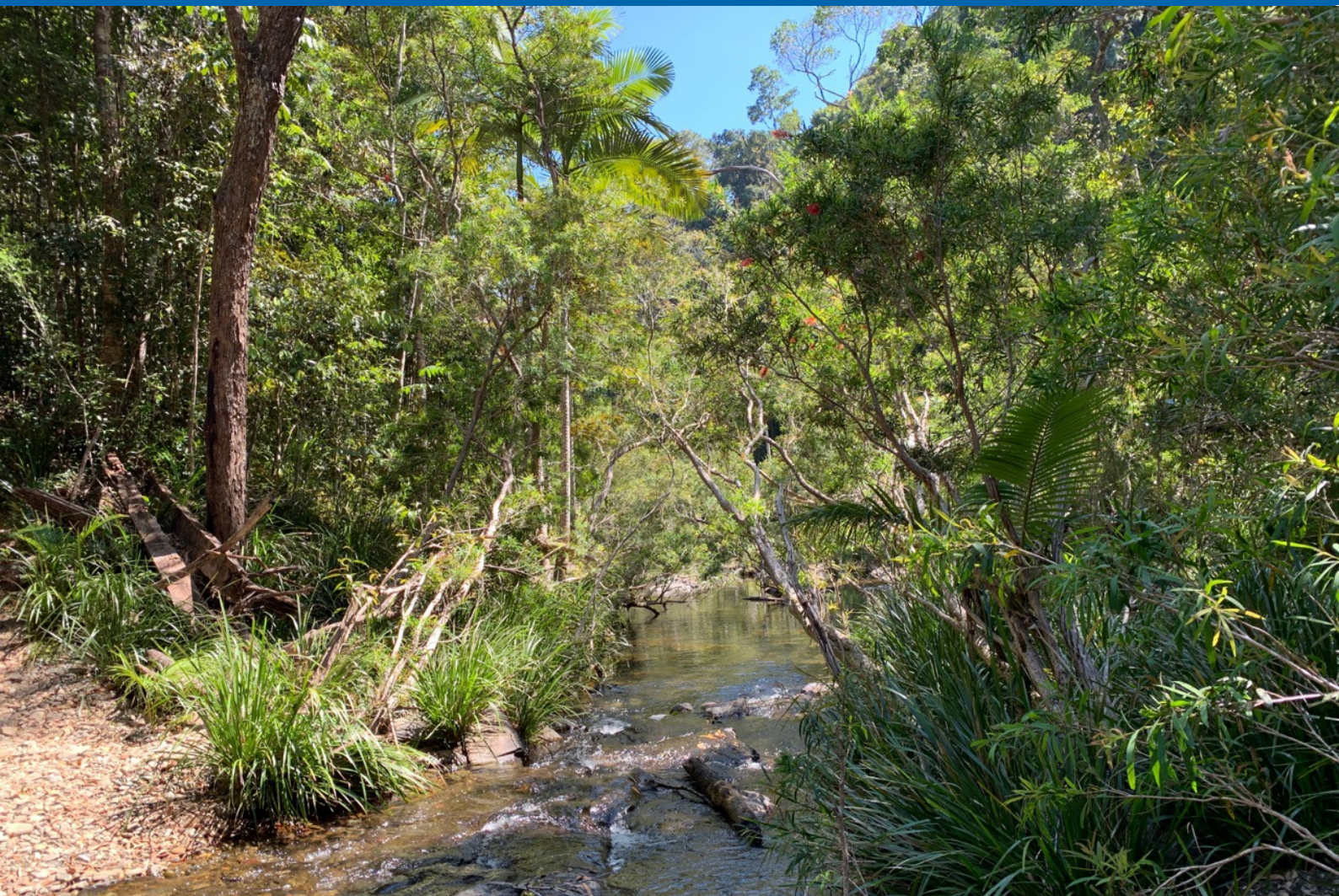




Department of State Development, Tourism, and Innovation

**Wangetti Trail Planning Report for Wangetti South at Wangetti
(Section A) to support an Operational Works Development Application for Works
in a Coastal Management District**

March 2021



Acronym list

Acronym	
AHD	Australian Height Datum
CEMP	Construction Environmental Management Plan
CESCP	Concept Erosion and Sediment Control Plan
CMD	Coastal Management District
Coastal Act	<i>Coastal Management and Protection act 1995</i>
Council	Douglas Shire Council
DAF	Department of Agriculture and Fisheries
DATSIP	Department of Aboriginal and Torres Strait Islander Partnerships
DEMP	Department of the Environmental – Environmental Management Plan
DR	Department of Resources
DTIS	Department of Tourism, Innovation and Sport
EMP	Environmental Management Plan
ESC	Erosion and Sediment Control
HAT	Highest Astronomical Tide
IECA	International Erosion Control Association
LGA	Local Government Area
MCU	Material Change Use
MNES	Matters of National Environmental Significance
QPWS	Queensland Parks and Wildlife Service
SARA	State Referral Assessment Agency
SDAP	State Development Assessment Provisions
TDPD	Tourism Development Projects Division
TMP	Traffic Management Plan
TMR	Department of Transport and Main Road
Wet Tropics	Wet Tropics of Queensland
WPDMP	Weeds, Pest and Diseases Management Plan
WTWHA	Wet Tropics World Heritage Area

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Appendix A - State Code 8: Coastal Development and tidal works
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Appendix C – Wangetti South Section A Design Drawings

1. Introduction

1.1 Project context

The Department of Tourism, Innovation and Sport (DTIS) - Tourism Development Projects Division (TDPD) is proposing to establish the Wangetti Trail, a 83.7 km trail which extends from south of Mowbray River to Palm Cove. The project is being delivered by TDPD as part of an adventure-based ecotourism development in north Queensland. The shared use trail will provide walkers and mountain bike riders with a unique experience to traverse through natural areas of north Queensland covering bushland and coastal areas, including the Wet Tropics of Queensland (Wet Tropics) and national parks.

The Wangetti Trail has been divided into three sections, North, South.

- Wangetti North Section, consists of approximately 54 kilometres (km) of shared use trail from south of the Mowbray River and the intersection of Captain Cook Highway road reserve, to the township of Wangetti, ending at Lot 2 SP309094.
- Wangetti South Section, consists of approximately 29.7 km of shared use trail from Lot 2 SP309094 (in the township of Wangetti), to Buchan Point, Palm Cove. Wangetti South Section is further divided into Wangetti South 'Section A', consisting of lands within the Douglas Shire Council (Council) Local Government Area (LGA); and Wangetti South 'Section B' consisting of lands within the Cairns Regional Council Local Government Area (LGA).

1.2 Development application components

This development application for Wangetti South Section A triggers the following:

- Development permit for Operational Works (Code Assessable) for works within a Coastal Management District to construct the trail within State coastal land within the coastal management district (this report).
- Development permit for a Material Change of Use (impact assessable) for an Environmental Facility and Nature-Based Tourism to establish the shared use trail and the public camping node within the project area (addressed in a separate report).
- The development application also triggers referral agency assessment for development within 25 m of a state-controlled road, being the Captain Cook Highway (addressed in a separate report).

This development permit for Operational Works (Code Assessable) for works within a Coastal Management District is to be read in conjunction with the Development permit for a Material Change of Use (impact assessable) report.

1.3 Project aspects included in this report

Wangetti South 'Section A', comprises of 17.7 km of shared use trail from Lot 2 SP309094 in the township of Wangetti, to Simpson Point (southern boundary of Douglas Shire Council LGA). Within this section, approximately 3.2 km of the shared use trail and 615 m of existing vehicle access track is within a coastal management district (CMD) and referred to herein as CMD Areas 1, 2, 3, 4, 5 and 6. These areas are described as:

- Approximately 3.2 km of shared use trail within CMD areas to accommodate both mountain bike users and hikers, consisting of natural ground and surface treatments, which will be a maximum of 1.5 m wide. The 1.5 m wide trail will be located within a 40 m survey corridor,

referred to as the construction allowance corridor, to allow flexibility for the placement of infrastructure during the construction phase. The trail will have an average gradient of <10% and a maximum gradient no greater than 15% (for short distances only). Built structures proposed as part of the trail include gully crossings, bridges, staircase

- A number of waterway crossings along the shared use trail that will comprise of rock armouring and bridges
- The formalisation (including minor vegetation trimming and ground treatments) of existing vehicle access tracks into service tracks to provide restricted access to the shared use trail for temporary construction purposes, permanent operational and maintenance purposes and for emergency services purposes.

CMD Areas 1 – 6 are further described below and in Table 1-1:

- CMD Area 1 consists of approximately 450 m of the shared use trail and two rock armour waterway crossings.
- CMD Area 2 consists of approximately 850 m of shared use trail and one waterway crossing.
- CMD Area 3 consists of approximately 1.70 km of shared use trail, 8 rock armour crossings and one bridge crossing and the formalization of four existing access tracks ranging from 20 m to 160 m in length to service tracks.
- CMD Area 4 consists of approximately 200 m of shared use trail.
- CMD Area 5 consists of approximately 150 m of existing service track.
- CMD Area 6 consists of approximately 285 m of existing service trail

The remaining areas of Wangetti South Section A are excluded from this application as they are located outside of CMD areas.

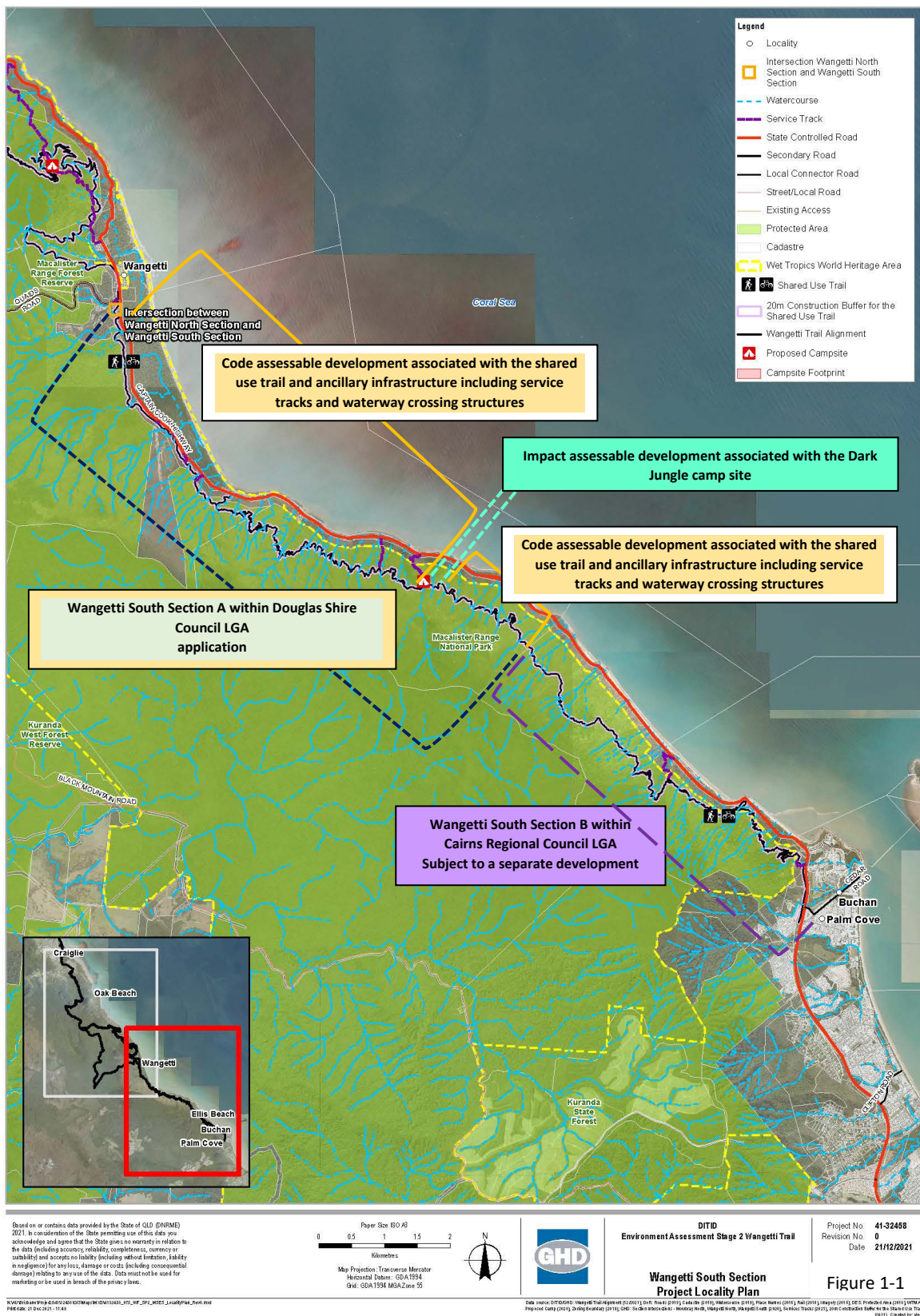


Table 1-1 Description of the proposed works within CMD Areas 1 - 6

CMD Areas

CMD Area 1

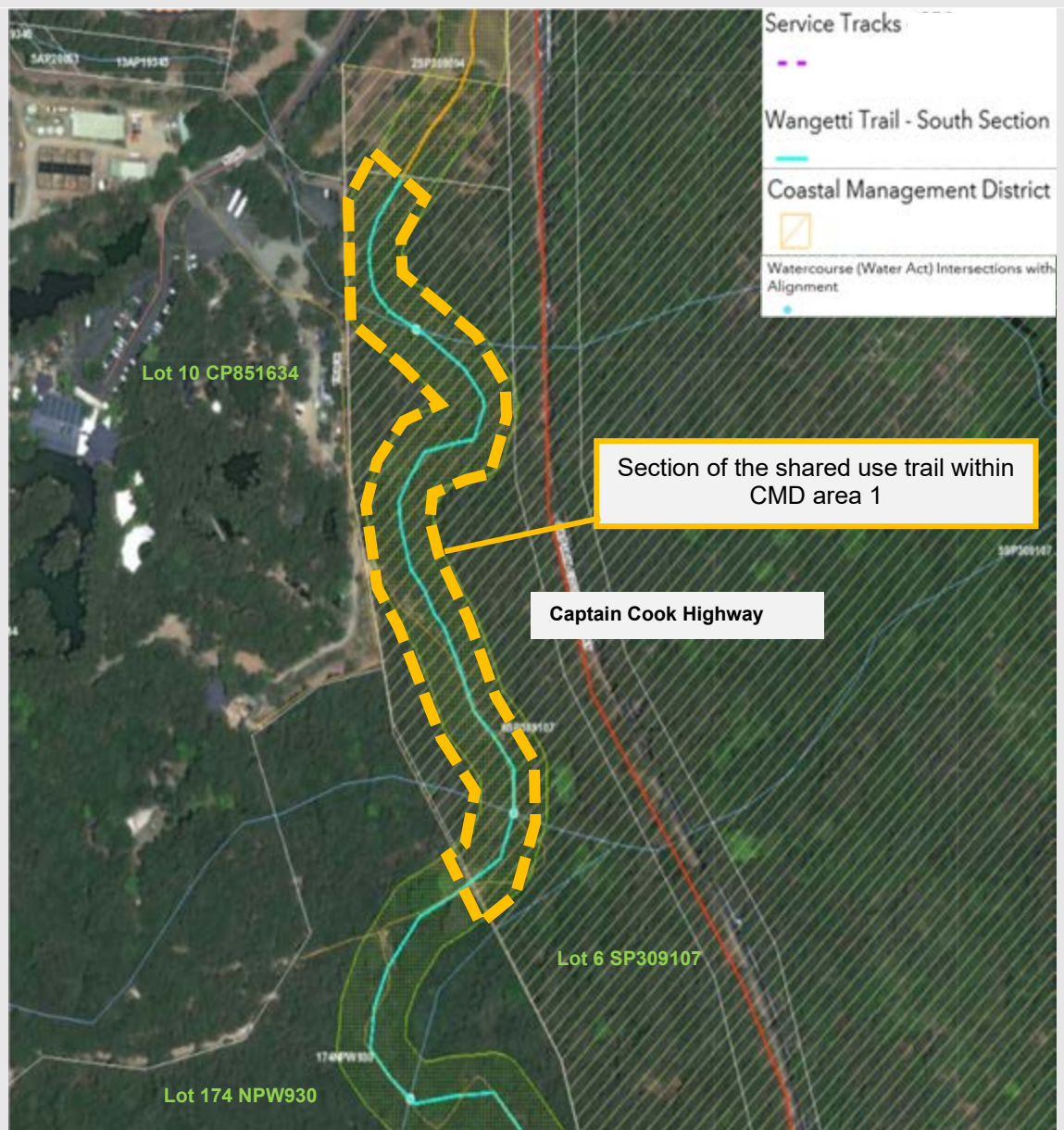
Lot: 6 on SP309107

Tenure: State reserve land (Department of Resources (DR))

Elevation: Above highest astronomical tide (HAT), located at 15 - 22 m AHD

Proposed works: Construction of 450 m of shared use trail and two rock armour crossings located above the high-water mark. Not in an erosion prone area.

The location of the shared use trail is set back more than 630 m from the foreshore and coastal features. It has been located as far landward as possible within state land and will align with existing access tracks where possible.



CMD Areas

CMD Area 2

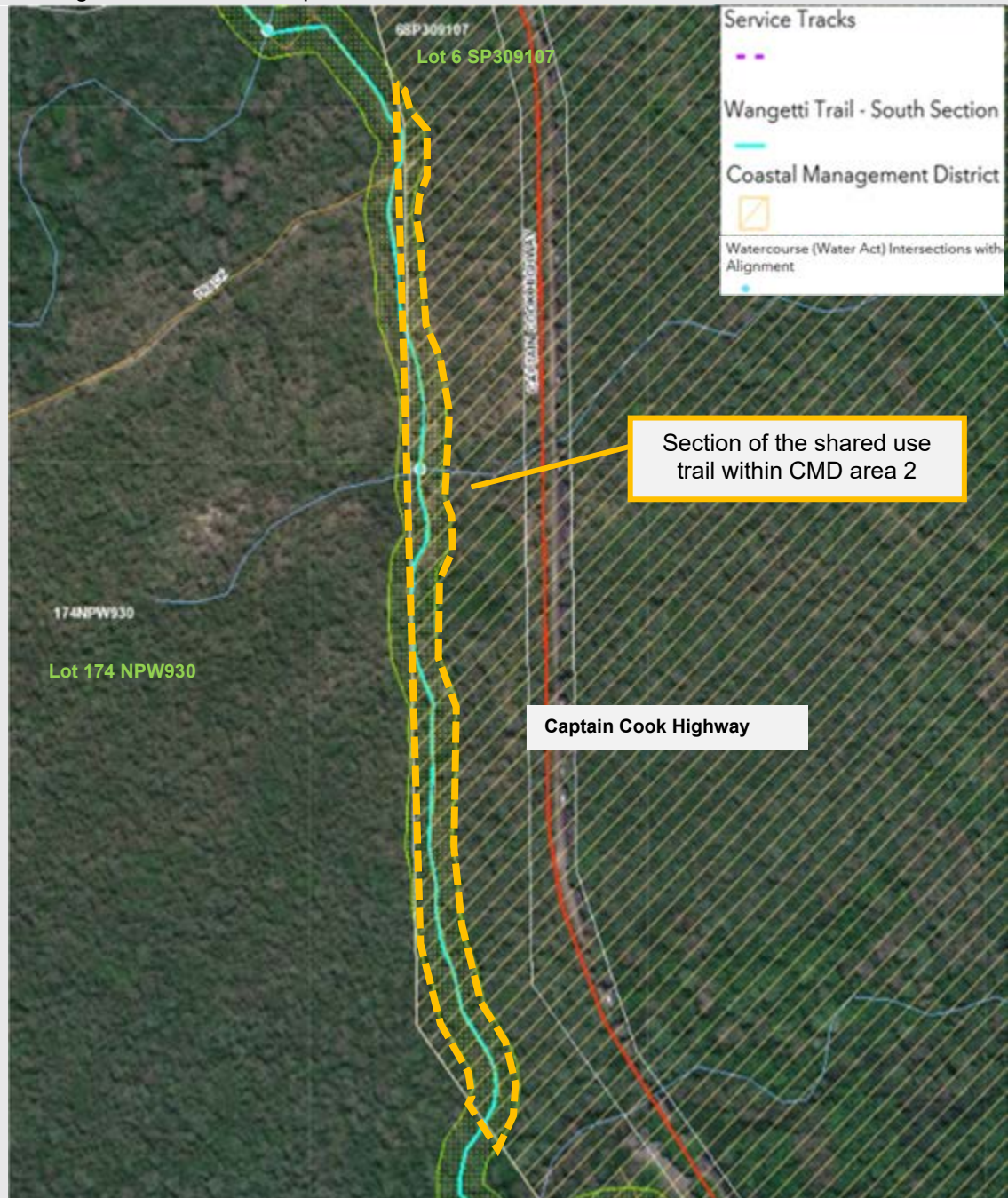
Lot: 6 on SP309107 (DR)

Tenure: State reserve land

Elevation: Above HAT, located at 10 m AHD

Proposed works: Construction of 850 m of shared use trail located above the high-water mark. Not in an erosion prone area.

The location of the shared use trail is set back more than 630 m from the foreshore and coastal features. It has been located as far landward as possible within state land and will align with existing access tracks where possible.



CMD Areas

CMD Area 3

Lot: 6 on SP309107 and Captain Cook Highway Road Reserve.

Tenure: State reserve land (DR) and State controlled road reserve

Elevation: Above HAT, located at 10 m AHD

Proposed works: Construction of 1.70 km of the shared use trail above the high-water mark and. Formalisation of four existing access tracks into services tracks are also proposed within CMD Area 3 (one of which is known as Rifle Road (discussed further within Section 4). Eight rock armour crossings and one bridge crossing are proposed along the shared use trail (refer to Appendix C). Small section in an erosion prone area.

The location of the shared use trail is set back more than 300 m from the foreshore and coastal features. It has been located as far landward as possible within state land and will safely intersect with the existing access tracks.



CMD Areas

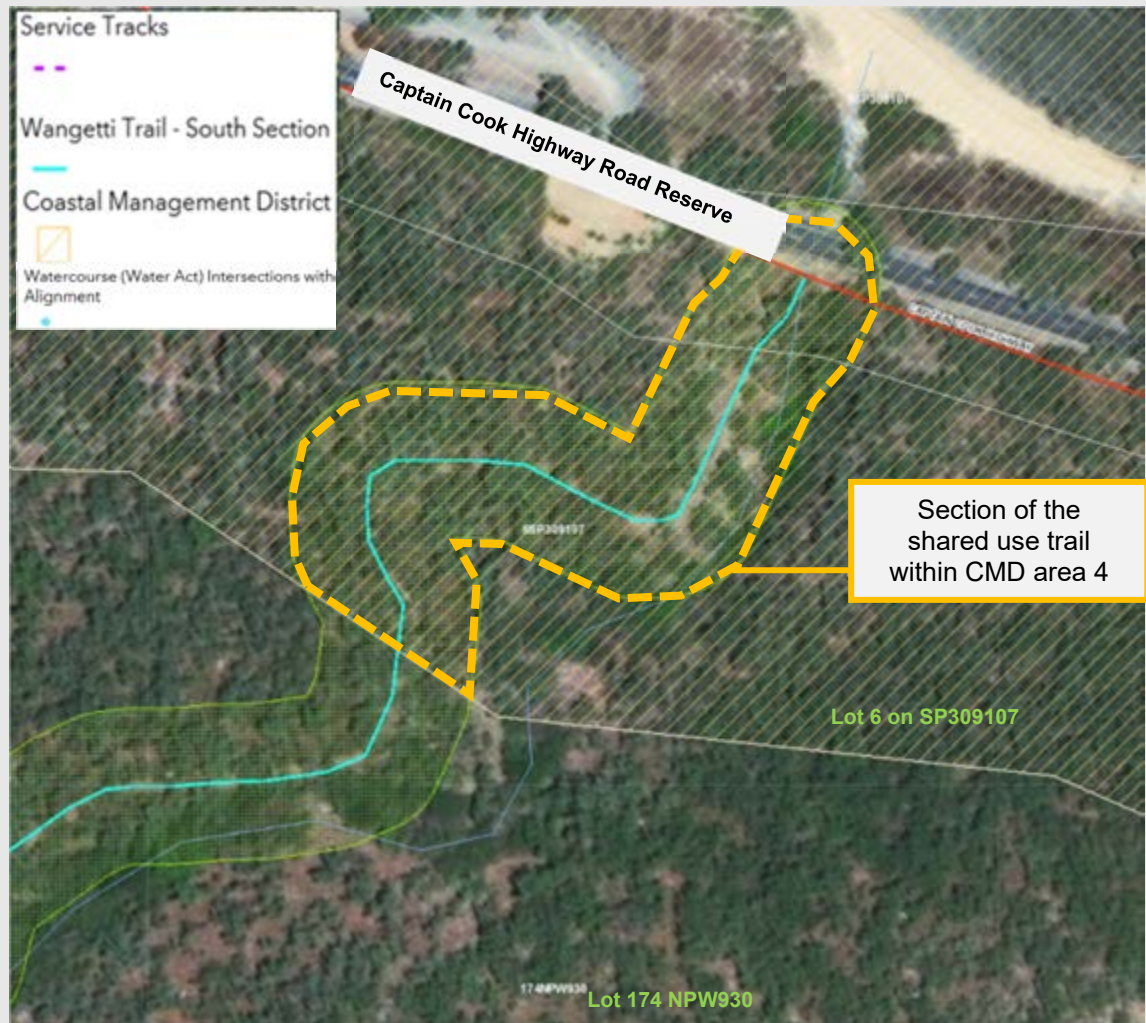
CMD Area 4

Lot: 6 on SP309107 and Captain Cook Highway Road Reserve.

Tenure: State reserve land (DR) and State controlled road reserve

Elevation: Above HAT, located at 10 m AHD

Proposed works: Construction of 200 m of the shared use trail above high-water mark. Not in an erosion prone area. The location of the shared use trail is set back 50 m from highest astronomical tide and other coastal features. It has been located as far landward as possible within State land and will align with existing cleared areas where possible.



CMD Areas

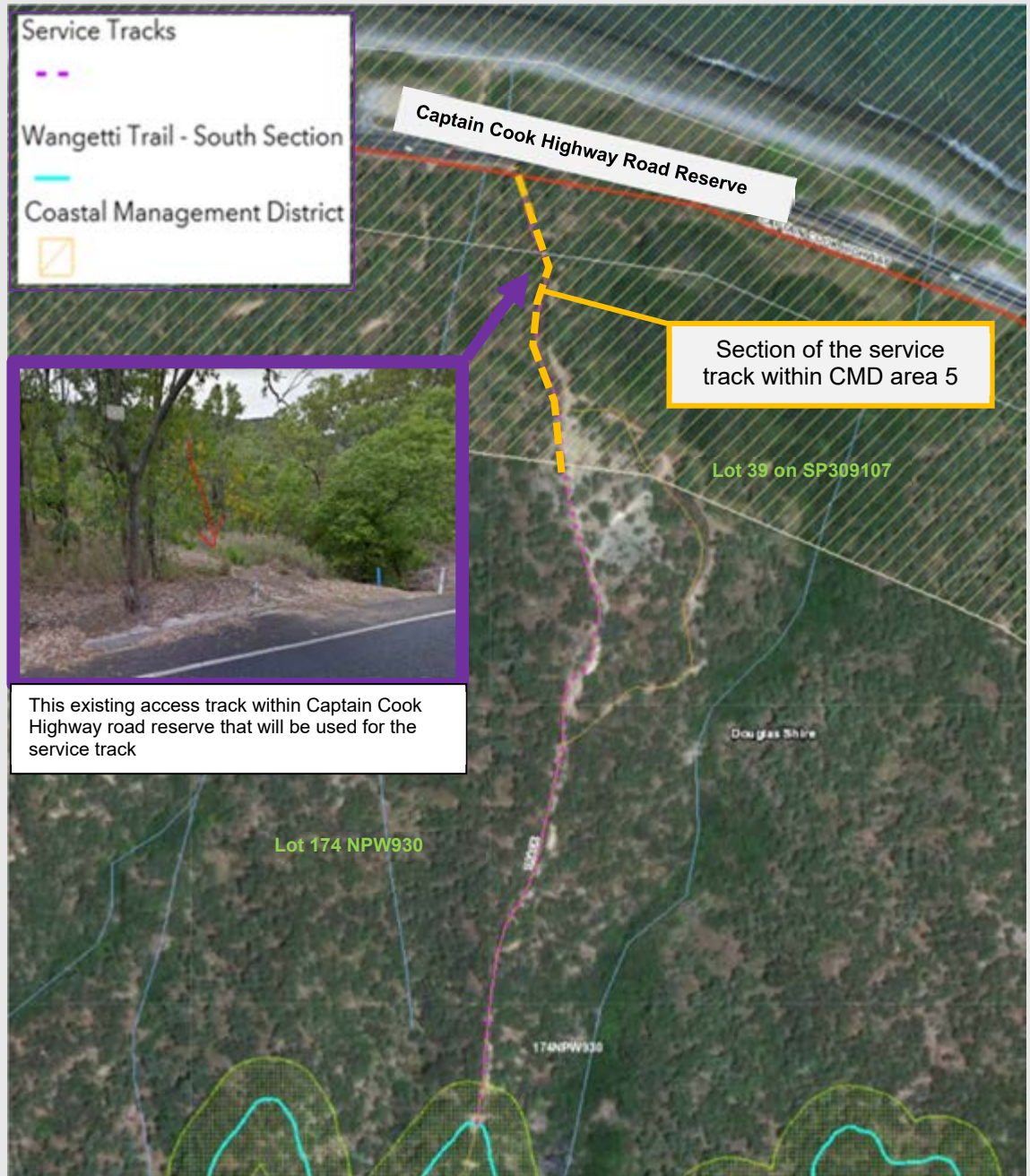
CMD Area 5

Lot: 39 on SP309107 and Captain Cook Highway Road Reserve.

Tenure: State reserve land (DR) and State controlled road reserve

Elevation: Above HAT, located at 10 m AHD

Proposed works: Formalisation of 150 m of existing service track located above the high-water mark. Not in an erosion prone area.



CMD Areas

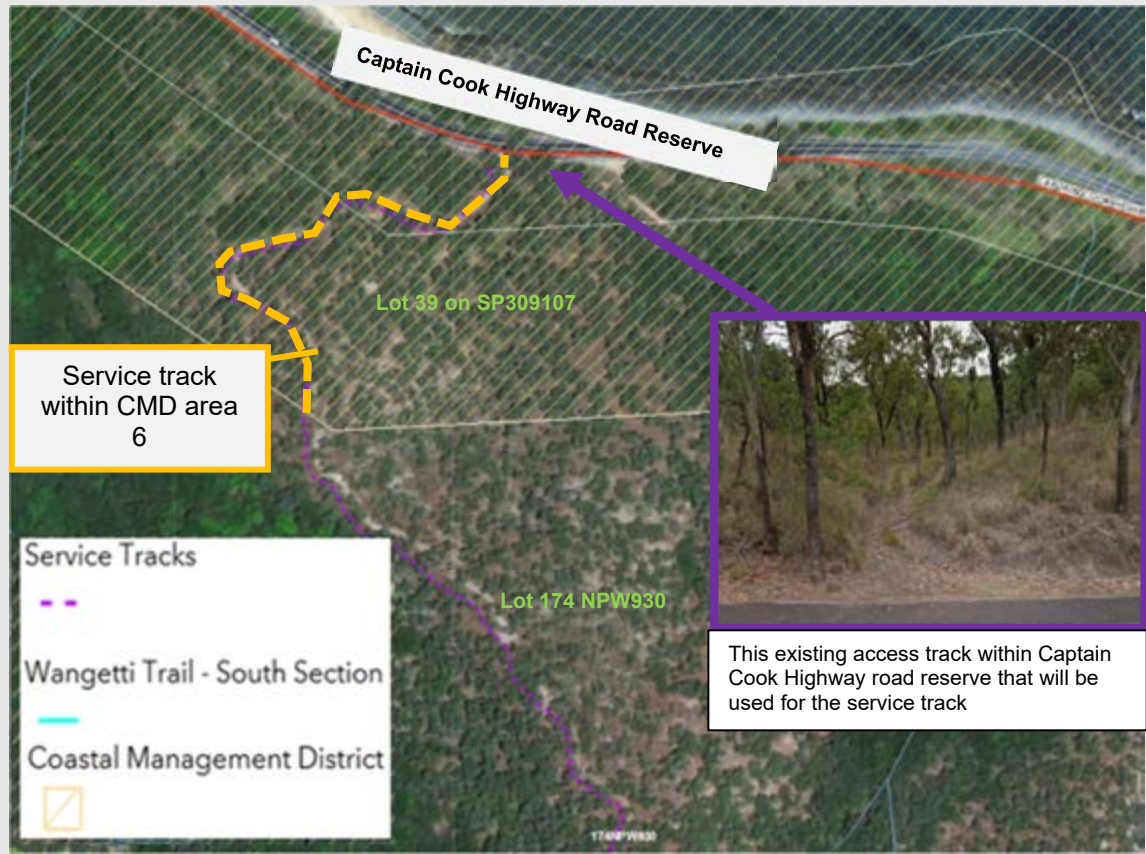
CMD Area 6

Lot: 39 on SP309107 and Captain Cook Highway Road Reserve.

Tenure: State Reserve and State-controlled road reserve

Elevation: Above HAT, located at 10 m AHD

Proposed works: Formalisation of 285 m of existing service track located above the high-water mark. Not in an erosion prone area. Service track from Ellis Beach intersecting the alignment in the Ellis Beach South Reserve. The service track will follow the existing access track.



1.4 Purpose of this report

The purpose of this report is to demonstrate that the proposed Wangetti South Section A works within CMD areas 1 to 6 comply with the relevant provisions of the *Coastal Management and Protection act 1995* (Coastal Act) and it meets the objectives for State Development Assessment Provision, State Code 8: Coastal development and Tidal Works (State Code 8).

The information provided in this report demonstrates that an operational works development permit should be issued for the proposed works. To support this, the following information has been included in this report:

- An overview of the proposed works and a summary of the pre-lodgement meeting minutes that were undertaken with the State Referral Assessment Agency (SARA) and Council (Section 2.3)
- Details of the development application (Section 2)
- A description of the existing environment where the works are proposed (Section 3)
- Details of the proposed works including justification for the project, alternative design that has been considered, construction methodology and materials (Section 4)
- Anticipated impacts and proposed management strategies (Section 5)
- An assessment of the proposed works against the relevant state planning legislation including State Development Assessment Provision, State Code 8: Coastal development and Tidal Works (State Code 8) (Section 6)

1.5 Limitations

This report has been prepared by GHD for DTIS and may only be used and relied on by DTIS for the purpose agreed between GHD and the DTIS as set out in Section 1.1 of this report. GHD otherwise disclaims responsibility to any person other than DTIS arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible. The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared. The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect. GHD has prepared this report on the basis of information provided by DTIS and others who provided information to GHD (including government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points. Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report. Site conditions (including the presence of additional marine plants) may change after the date of this report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

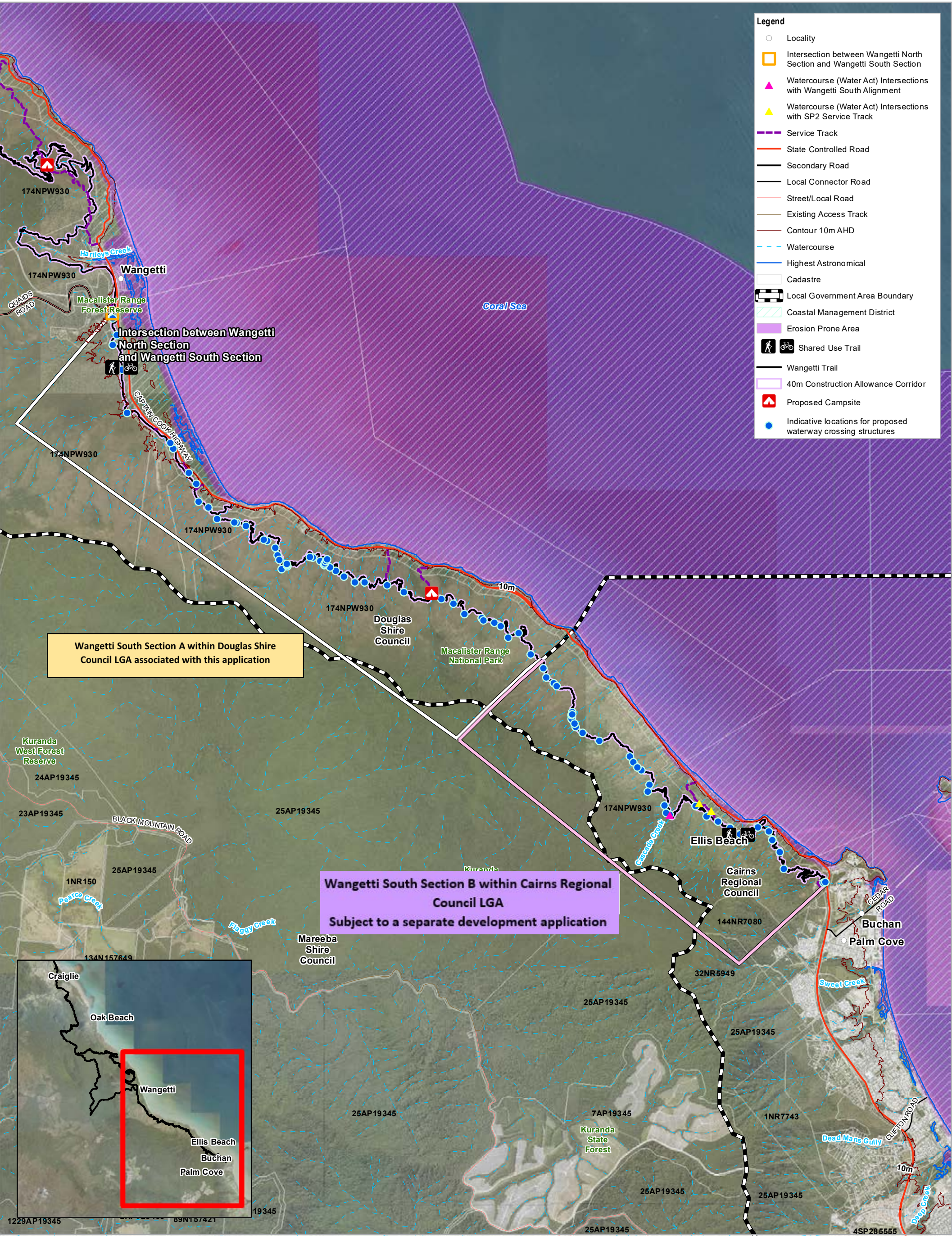
2. Summary of key application details relevant to this report

A summary of the key details of the development application for Wangetti South Section A for Operational works for works within a CMD area is outlined in Table 2-1.

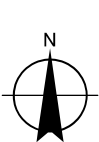
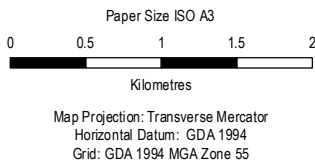
Table 2-1 Key application details relevant to this report

Component	Details
Applicant	The State of Queensland acting through DTIS C/- GHD Pty Ltd
Impacted Real Property Description and Registered Landowners	Portions of Lot 6 and Lot 39 on SP309107: State of QLD (Department of Resources (DR) and Captain Cook Highway Road Reserve: Department of Transport and Main Road (TMR)
Current land use	<ul style="list-style-type: none"> Lot 6 on SP309107: Conservation Lot 39 on SP309107: Conservation Captain Cook Highway Road Reserve: road reserve
Local Government Area	Douglas Shire Council
Development proposed within CMD areas	<p>DTIS - TDPD is proposing to establish the Wangetti Trail – Wangetti South, a 29.7 km shared use trail to accommodate both mountain bike users and hikers from Wangetti, to Palm Cove. The components of approximately 3.2 km of the shared use trail and formalising 615 m of existing service track infrastructure located within CMD areas and trigger assessment are outlined below:</p> <ul style="list-style-type: none"> CMD Area 1 consists of approximately 450 m of the shared use trail and two rock armour waterway crossings. CMD Area 2 consists of approximately 850 m of shared use trail and one waterway crossing. CMD Area 3 consists of approximately 1.70 km of shared use trail, 8 rock armour crossings and one bridge crossing and the formalization of four existing access tracks ranging from 20 m to 160 m in length to service tracks. CMD Area 4 consists of approximately 200 m of shared use trail. CMD Area 5 consists of approximately 150 m of existing service trail. CMD Area 6 consists of approximately 285 m of existing service trail.
Development components	Material change use (MCU) development application assessable against the local government planning scheme (code assessable) covering the Wangetti South Section A project area (refer to separate MCU Report). The MCU application will include the following operational works approvals:

	<ul style="list-style-type: none"> Operational works for work in a CMD <p>The purpose of this report is to demonstrate that the proposed Wangetti South Section A works within CMD areas 1 to 6 comply with the relevant provisions of the <i>Coastal Management and Protection act 1995</i> (Coastal Act) and it meets the objectives for State Development Assessment Provision, State Code 8: Coastal development and Tidal Works (State Code 8).</p>
Level of Assessment	Code Assessment – State Code 8: Coastal Development and Tidal Works
Assessment manager	Douglas Shire Council
Referral agencies	State Assessment and Referral Agency
Advice agencies	Department of Environment and Science
Contact details for application	<p>Sarah Wilson (GHD)</p> <p>Address: Level 13 – The Rocket, 203 Robina Town Centre Drive, Robina, QLD 4226</p> <p>Phone number: 07 5413 8133 and 0459 813 589</p> <p>Email: sarah.wilson@ghd.com</p>



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DITD
Environment Assessment Stage 2 Wangetti Trail

**Coastal Management District and
Erosion Prone Area Wangetti
South Section A**

Project No. 41-32458
Revision No. 0
Date 16/12/2020

FIGURE 2-1

2.1 Legal framework

Operational work is assessable development if the work involves interfering with quarry material as defined under the Coastal Act, on state coastal land above high-water mark as defined under Schedule 10, Part 17, Division 1, Section 28, item 1, b, i of the *Planning Regulation 2017*.

The definition of 'quarry material' under the Coastal Act is as follows:

Quarry material –

1. *Quarry material means material on state coastal land, other than a mineral within the meaning of any Act relating to mining*
2. *For item 1, material includes, for example, stone, gravel, sand, rock, clay, mud, silt and soil, unless it is removed from a culvert, stormwater drain or other drainage infrastructure as waste material.*

The definition of 'state coastal land' under Chapter 1, Section 17 the Coastal Act is as follows:

- (1) *State Coastal land means land in a coastal management district other than land that is –*
 - (a) *Freehold land, or land contracted to be granted in fee simple by the State; or*
 - (b) *A State forest or timber reserve under the Forest Act 1959; or*
 - (c) *In a watercourse or lake as defined under the Water Act 2000; or*
 - (d) *Subject to a lease or licence issued by the State.*

Works are proposed on land other than on freehold land and require the interference of quarry material, such as stone, gravel, sand, rock, clay, mud, silt and soil to allow for the construction of the trail, formalisation of services tracks and construction of rock armouring and bridges and will require an operational works for works in a CMD. These areas are identified in Table 1-1.

The operational works relating to works within a CMD will be assessed by the Douglas Shire Council with SARA as the referral agency, against the State Development Assessment Provisions (SDAP), being State Code 8: Coastal Development and Tidal Works and against schedule 3 of the Coastal Act code for assessable development that is prescribed tidal works.

2.2 Staging and timing

The Queensland Government is providing \$41.4 million from the State Budget to fund construction of the Wangetti Trail in Tropical North Queensland. This is complemented by the Australian Government's investment of \$8 million into the project from the National Tourism Icons Program. The development approvals are expected to be finalised by Quarter 2 2021, for construction to be underway in 2021. Subject to approvals, the Wangetti Trail is targeted to be operational and open to the public in 2022.

2.3 Pre-lodgement meeting outcomes

A pre-lodgement meeting was carried out on 6 September 2019 between:

- Cairns Regional Council
- Department of Agriculture and Fisheries
- Department of Environment and Science
- Department of Tourism, Innovation and Sport
- Department of Resources
- Department of State Development, Infrastructure, Local Government and Planning

- Department of Transport and Main Roads
- Douglas Shire Council
- GHD

The purpose of the meeting was to discuss the proposed material change of use and operational work triggered by the Wangetti South Section A proposed works. Outcomes of the meeting related to Tidal works and work in the coastal management district are summarised in Table 2-2 below.

Table 2-2 Pre-lodgement meeting notes

Matter	Response / Outcome
<p>Government supported transport infrastructure</p>	<p>Applicable</p> <p>The proposed development meets the definition of government supported transport infrastructure as advised by SARA referral agency assessment for the following matters of interest may not be applicable:</p> <ul style="list-style-type: none"> • native vegetation clearing • tidal works (maritime safety) • operational work near a state transport corridor • wetland protection area. <p>This has been addressed separately within the MCU Development Application Report for Wangetti South Section A.</p>
<p>Coastal management district and / or Tidal works or work in a coastal management district</p> <p>The proposed development will trigger referral agency assessment for operational work, where the proposed work interferes with quarry material. If a structure is to be constructed in on or above tidal water, the proposed development will also trigger referral agency assessment for tidal works.</p> <p>The proposed development will trigger referral agency assessment for a material change of use where operational work is carried out completely or partly in an erosion prone area in a coastal management district; and</p> <ul style="list-style-type: none"> • is extracting, excavating or filling 1,000m³ or more, or clearing native vegetation from an area of 1,000m² or more; or 	<p>Applicable</p> <p>Wangetti South Section A will involve operational works on state coastal land above the high-water mark within CMD areas. Therefore, it will trigger a development permit for Operational Works (Code Assessable) for works within a Coastal Management District to construct the trail within State coastal land within the coastal management district under Schedule 10, Part 17, Division 3, Table 1, Item 1 – Operational work that is tidal works or work in a coastal management district in the Planning Regulation 2017.</p> <p>The proposed works will not trigger referral under Schedule 10, Part 17, Division 3, Table 6, Item 1 – Material change of use involving work in a coastal management district, as the proposed works will not exceed the excavating or</p>

Matter	Response / Outcome
<ul style="list-style-type: none"> involves building work increasing the gross floor area on the premises by 1,000m² or more 	filling 1,000m ³ and/or the clearing native vegetation from an area of 1,000m ² .
Tidal work in tidal waters	Not Applicable Referral agency assessment is not required under Schedule 10, Part 17, Division 3, Table 2, Item 1 – Operational work that is the tidal works or work in a coastal management district of the Planning Regulation 2017 as the proposal is considered to be government supported transport infrastructure.
<p>The development application will be assessed against the current State Development Assessment Provisions, State code 8: Coastal development and tidal works.</p> <p>The development application should provide a response State code 8 in its entirety, identifying how the proposed development meets each performance outcome (PO). Particular attention should be paid to PO1, PO2, PO11, PO12 and PO16.</p>	Applicable The proposed development has been assessed against the relevant provisions under State Code 8. Refer to Section 6.2 and Appendix A for statements of code compliance with State Code 8.
<p>Where matters of state environmental significance are identified, the development application should:</p> <ol style="list-style-type: none"> provide a targeted assessment to ground truth any matters of state environmental significance identified; demonstrate how the development avoids adverse impacts on each matters of state environmental significance to the greatest extent practicable; where the above is not reasonably possible, demonstrate how impacts on matters of state environmental significance have or will be minimised and/or mitigated to the greatest extent practicable; demonstrate whether the development will have a Significant Residual Impact on any identified matters of state environmental significance using SARA's Significant Residual Impact Guideline. An assessment will need to be undertaken for each matters of state 	Applicable An assessment against matters of state environmental significance (MSES) has been undertaken for Wangetti South Section A and the summary of key findings the assessment is outlined in Section 3 and Section 5 and summarised below: <i>Response to (1)</i> Four ecological field surveys were undertaken for the Wangetti Trail Project (Wangetti South and Wangetti North) in 2019 in order to gather information about the environmental values associated with the existing environment, confirm the presence of threatened, near threatened and special least concern flora and fauna species, and record any key ecological features <i>Response to (2) and (3)</i> Section 5 of this report outlines the proposed impacts and management strategies that have been developed to

Matter	Response / Outcome
<p>5. environmental significance to determine whether the proposed development will result in a significant residual impact; and</p> <p>6. identify any potential offset obligation as obligation as per PO16 (3) of State Code 8.</p>	<p>avoid adverse impacts on matters of state environmental significance</p> <p><i>Response to (4), (5), and (6)</i></p> <p>It has been determined, through relevant ecological investigations, that works within CMD areas 1 to 6 will not have a significant residual impact on matters of state environmental significance and therefore will not trigger environmental offsets.</p>

3. Existing environment – Wangetti South Section A – CMD areas 1 - 6

3.1 Site Location

Wangetti South A Section is located within Douglas Shire Council LGA between Simpson Point and Wangetti. The project area of Wangetti South Section A extends approximately 17.7 km and is constrained by the Pacific Ocean to the east and the Macalister Ranges to the west and is almost entirely located within the Macalister Range National Parks and the Wet Tropics World Heritage Area (WTWHA).

Largely, the Wangetti South Section A alignment traverses the eastern slopes of the Macalister Ranges and intersects an array of different vegetation types, including rainforests and open woodland ecosystems. The landscape contains volcanic mountain ranges and a mix of permanent and semi-permanent waterways, with topography ranging from sea level to 250 m Australian Height Datum (AHD).

Property details and land ownership details for the properties that are intersected by the alignment and are located within a CMD area are identified in Table 1-1 and Table 2-1.

3.2 Land use, zoning and tenure

The Wangetti South Section A alignment is wholly mapped within the conservation zone of the *Douglas Shire Planning Scheme 2018* or as State controlled road reserve. The land is undeveloped and has high ecological and scenic values consistent with the adjoining wet tropics heritage values and the Macalister Range National Park.

Land impacted within the CMD falls within Lots 6 and 39 on SP309107 which is a State reserve tenure for conservation purposes, trustee being the Department of Resources (DR); and the Captain Cook Highway Road Reserve, trustee being Department of Transport and Main Road (TMR) and the Douglas Shire Council.

The Wangetti South Section A CMD areas 1 to 6 are located outside of the nearest State protected areas being the Macalister Range National Park (described as Lot 174 NPW930) under the *Nature Conservation Act 1992* and *Wet Tropics World Heritage Protection and Management Act 1993*. The CMD areas are adjacent to areas managed by the Wet Tropics Management Authority (WTMA) (as shown in Figure 3-1).

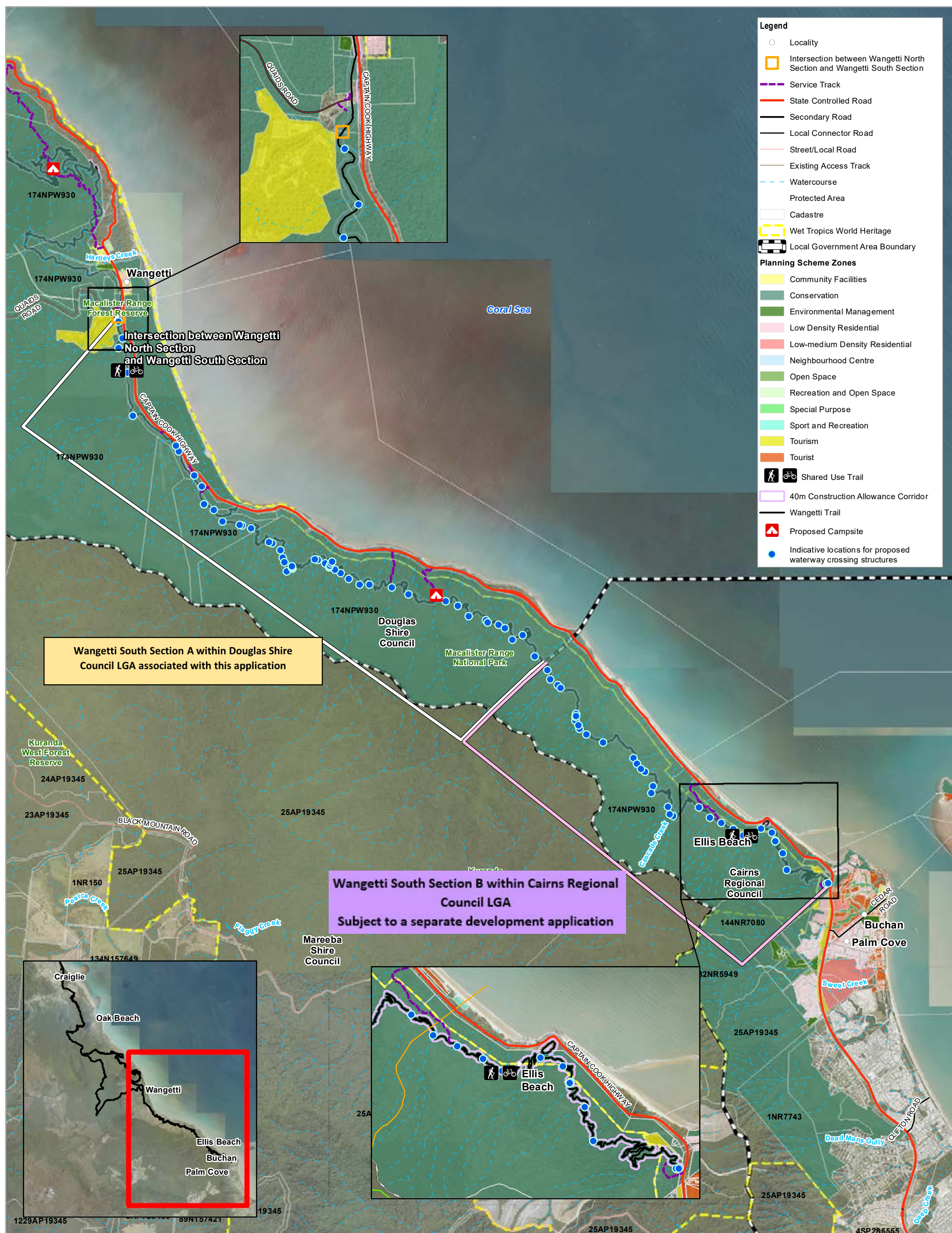
3.3 Surrounding land use

Land uses surrounding Wangetti South Section A are outlined in Table 3-1 and shown in Figure 3-2 below.

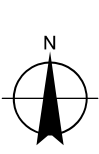
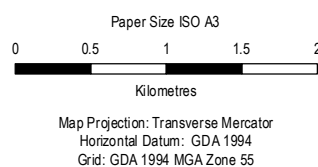
Table 3-1 Surrounding land uses

Direction	Land use
North	<p>Wangetti South Section A is surrounded by the following land uses in the north:</p> <ul style="list-style-type: none">Wangetti Town – Wangetti is located to the north east of the Wangetti South Section A and is a coastal town in Far North Queensland with a population of approximately 50 people. Wangetti's main attraction is Hartley's Crocodiles Adventures (Australian native animal zoo and farm). Wangetti is located approximately 43 km north west of Cairns, a

Direction	Land use
	major commerce centre for Far North Queensland. Tourism plays a major part to Cairns' and the region's local economy.
South	<p>South of the subject site contains the Macalister Range National Park and Cairns Regional Council LGA. The Wangetti Trail continues south / south east to Cairns Regional Council LGA.</p> <ul style="list-style-type: none"> Macalister Range National Park - Macalister Range National Park protects a rugged, forested range along the far northern coastline of Queensland. A picturesque park, rising steeply from the shoreline, it overlooks the tropical islands and waters of the Great Barrier Reef Marine Park. Mount Charlie, the park's highest point, reaches 880 m. It is near this peak that the crest of the Great Dividing Range is at its closest point to the Australian coastline (apart from its northern extremity at Cape York Peninsula). It is part of the WTWHA and contains a number of existing access tracks Captain Cook Highway – State Controlled Road – Captain Cook Highway carries a moderately high amount of traffic, as it is the main road linking Cairns and Port Douglas. Townships located along the Captain Cook Highway include Palm Cove, Ellis Beach, Wangetti and there are limited tourist services such as accommodation, hospitality and attractions along the highway.
East	<p>Wangetti South Section A is surrounded by the following land uses in the east:</p> <ul style="list-style-type: none"> Captain Cook Highway – State Controlled Road Coral Sea – The Coral Sea is located to the north and east of the site, rich in marine habitats and reef systems. The Coral Sea contains the Great Barrier Reef, which attracts locals and tourists for water activities including snorkelling, scuba diving and helicopter flights.
West	<p>Wangetti South Section A is surrounded by the following land uses in the west:</p> <ul style="list-style-type: none"> Macalister Range National Park



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Environment Assessment Stage 2 Wangetti Trail

Wangetti South Section A Land Use Map

Project No. 41-32458
Revision No. 0
Date 16/12/2020

FIGURE 3-1

\\ghdnet\ghd\A\U\Brisbane\Projects\4132458\GIS\Maps\MXD\4132458_067_WT_SP2_DevApp_Zoning_SouthAB_Rev0.mxd
Print date: 16 Dec 2020 - 15:11

Data source: DTID/GHD: Wangteti Trail Alignment (11/2020); DNRM: Roads (2019), Cadastre (2019), Watercourse (2014), Place Names (2016), Rail (2016), Imagery (2016), Local Government Area Boundary (2018); DAF: Waterway Barrier Works (2016); DES: Protected Area (2018); W.TMA: Proposed Campsite(2020), Zoning Boundary (2019); CRC: Planning Scheme Zones (2016); DSC: Planning Scheme Zones (2018); GHD-Section Intersections - Wangteti North, Wangteti South (2020), Service Tracks (2020), 4.0m Construction Allowance Corridor (2020), Indicative Waterway Crossing Locations (2020). Created by: k



Figure 3-2 Existing tourism ventures surrounding Wangetti South Section A (Queensland Globe, 2020)

3.4 Existing infrastructure within project area

The CMD areas are within reserve land zoned as conservation and is currently undeveloped. There is no existing pedestrian, telecommunications, water, electricity or sewerage infrastructure present.

3.5 Soils and topography

Topography

The Wangetti South Section A alignment is comprised of coastal floodplains, volcanic mountain ranges and estuarine mudflats. The CMD areas are located between 10 – 22 m AHD.

Soil

The location of the trail on the slopes of the Macalister range, has a high probability of erosion and sedimentation. According to the Australian Atlas of Soils, the project area consists of three major soil groups:

- **Dermosols** – these soils generally have a well-structured surface and are usually non-dispersive due to the low sodium content, therefore erosion risk is reduced. These soils are present in the northern section of the trail alignment
- **Ferrosols** – are typically well-drained and have good ability to produce vegetation. This soil type is present in the southern portion of the trail alignment
- **Kurosols** – these soils typically have poor infiltration due to their hard-setting surface. This results in a large proportion of water running off and causing erosion. These soils can be dispersive in the subsoil and contain high salt levels which can lead to erosion. These soils are present in the central portion of the trail alignment.

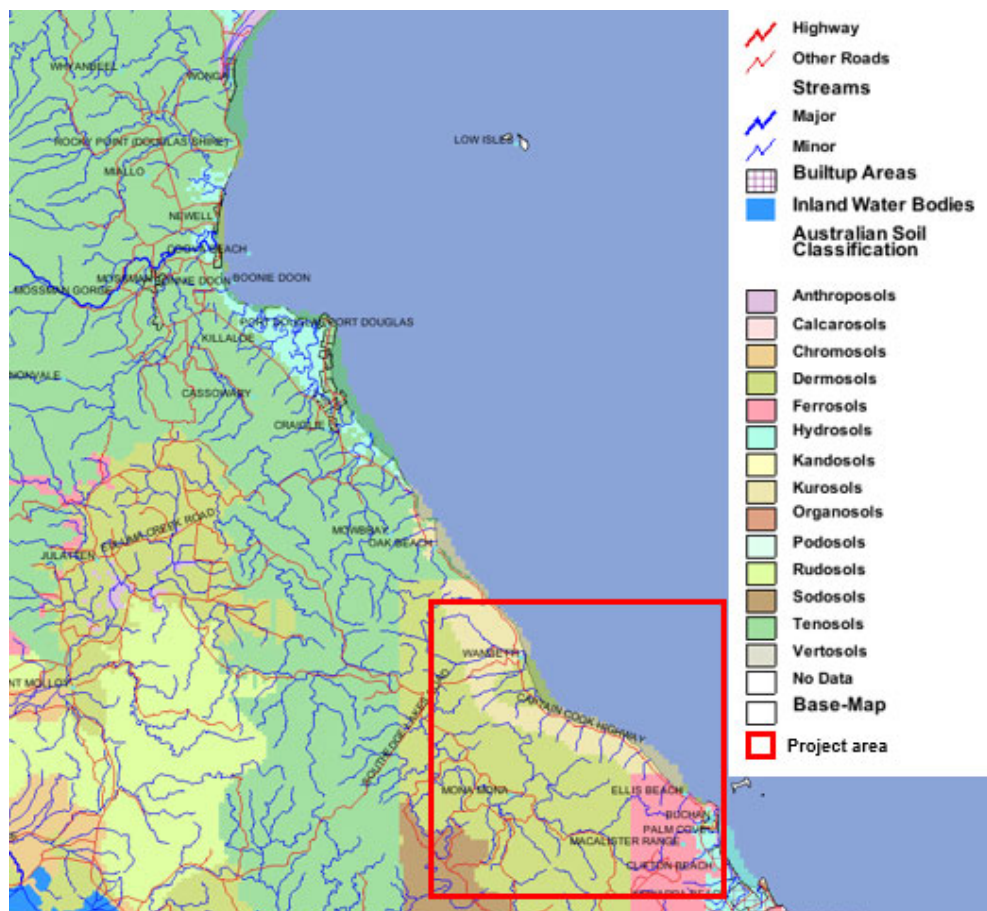




Figure 3-3 Soil types (ASRIS 2012)

Acid sulfate soils

In Queensland, coastal areas lower than 5 m AHD are likely to have acid sulfate soils (ASS) present. ASS can also be found buried beneath newer soils at elevations below 20 m AHD. Portions of the Wangetti South Section A including those within the CMD are mapped as occurring below 5 m AHD or between 5 and 20 m AHD under the Douglas Shire Council ASS overlay. Therefore, ASS may be present in these areas. Refer to Table 3-5.

Excavation works associated with the proposed works will be limited to less than 1.5 m in depth as the works will be limited to surface works to allow for the construction of the trail and formalisation of the service tracks. ASS is not to be considered to be impacted by the proposed works. No detailed ASS investigations have been undertaken to date for the Wangetti South A project area as this will be the responsibility of the nominated design and construction contractor.

Table 3-2 CMD areas within mapped acid sulfate soils areas

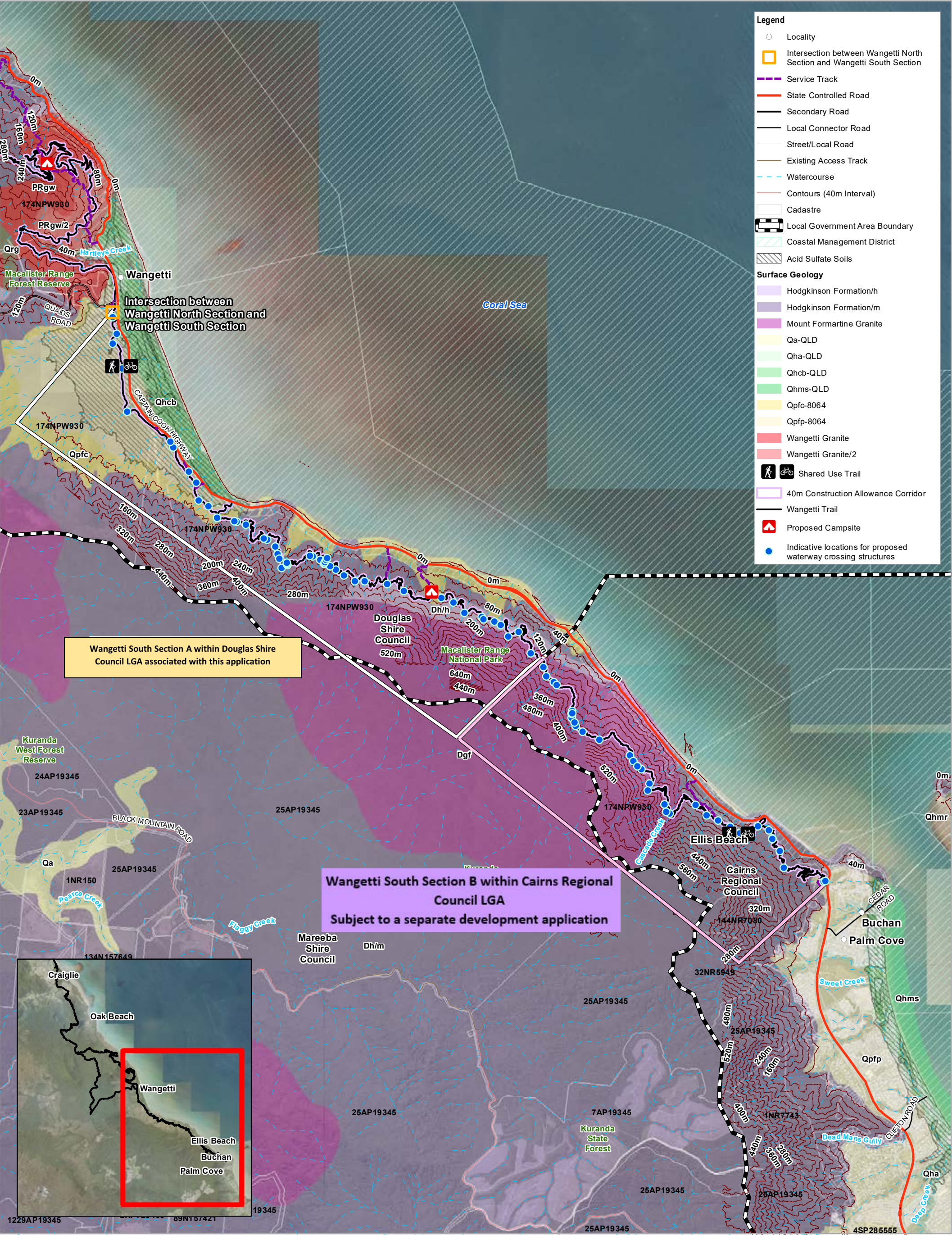
CMD areas	Acid sulfate soils mapping
<p>CMD area 1 located within Douglas Shire Council Acid Sulfate Soils (15-22m AHD) Overlay map.</p> <p>Excavation works will be limited to less than 1.5 m in depth. ASS is not to be considered to be impacted by the proposed works.</p>	
<p>CMD areas 2-6 located within Douglas Shire Council Acid Sulfate Soils (10m AHD) Overlay map.</p> <p>Excavation works will be limited to less than 1.5 m in depth. ASS is not to be considered to be impacted by the proposed works.</p>	

Geology

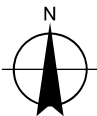
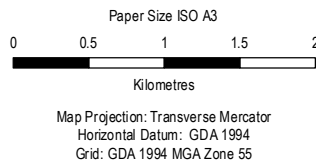
The Queensland Globe 1:100,000 Detailed Surface Geology dataset indicates a varied surface geology within the project area. The surface geology is summarised in Table 3-3 and Figure 3-5.

Table 3-3 Summary of surface geology

	Rock unit	Lithological summary	Dominant rock	Rock type	Age
	Hodgkinson Formation (Hdm)	Mainly dark grey, thin bedded, mudstone, subordinate thin to thick bedded arenite beds, minor chert and basalt	Mudrock	Stratified unit (including volcanic and metamorphic)	Early Devonian – late Devonian
	Mount Formative Granite (Dgf)	Muscovite-biotite granite, strongly foliated and sheared	Granitoid	Intrusive unit	Late Devonian
	Hodgkinson Formation (Dh/h)	Hornfelsed / metasomatised arenite and mudstone	Arenite – mudrock	Stratified unit (including volcanic and metamorphic)	Early Devonian – late Devonian
	Qhcb	Moderately well sorted, fine to coarse grained quartzose to shelly sand and some gravel: beach ridges and cheniers	Sand	Stratified unit (including volcanic and metamorphic)	Holocene
	Qpfp	Silty gravel grading to gravelly clay, clay and silt; gentle to very gentle coalescing alluvial fans	Alluvium	Stratified unit (including volcanic and metamorphic)	Pleistocene
	Qpfc	Coarse boulder deposits (on granites), silty and clayey gravel (on metasediments); steep alluvial and colluvial fans, cones and aprons	Alluvium	Stratified unit (including volcanic and metamorphic)	Pleistocene



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Environment Assessment Stage 2 Wangetti Trail

**Wangetti South Section A Surface
Geology and Acid Sulfate Soils**

Project No. 41-32458
Revision No. 0
Date 16/12/2020

FIGURE 3.4

3.6 Flora and fauna

Four ecological field surveys were undertaken for the Wangetti Trail Project (Wangetti South and Wangetti North) in 2019 during the design development phase in order to gather information about the environmental values associated with the existing environment, confirm the presence of threatened, near threatened and special least concern flora and fauna species, and record any key ecological features that should be avoided or considered during the construction of the proposed works. Three of these surveys covered the CMD areas.

Timing of the ecological field survey events allowed for assessment over two seasons, namely Autumn and Spring. Field surveys that covered the CMD areas, were undertaken on the following dates:

- 8 to 12 April 2019: This field survey focused on areas between Hartleys Creek and Buchan Point
- 26 to 30 August 2019: This survey focused on the coastal, mountainous sections from Hartley's Creek to Turtle Cove and also covered Simpson Point and Ellis Beach
- 2 to 6 September 2019: This field survey focused on the western part of the alignment (from Tresize Road to Turtle Cove) and any remaining areas surveyed from Slip Cliff Point to Redcliff Point

A MSES report was prepared to outline the MSES and other State environmental matters under the *Fisheries Act 1994*, *Water Act 2000*, *Nature Conservation Act 1992*, *Environmental Protection Act 1994* and *Coastal Protection and Management Act 1995* and *Planning Act 2016* which are likely to be impacted by the proposed works associated with the Wangetti South Section B. A summary of key findings from the MSES report is outlined in the sections below.

Threatened flora species

A total of 15 threatened flora species were predicted or recorded in desktop searches generated for the Wangetti South Section A, including the CMD areas. The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters search (PMST search) predicted 12 threatened flora species that have the potential to occur within the Wangetti South Section A. State based searches (i.e. Wildlife Online, Species Profile Search and Biomaps) identified five threatened flora species that have been historically recorded within the desktop search extent of Wangetti South Section A.

No threatened state flora species were recorded within the Wangetti South survey area during the field surveys. During the survey effort it was noted that potential habitat exists within the project area for the following threatened flora species:

- *Anoectochilus yatesiae* ((Marbled jewel orchid)
- *Dendrobium bigibbum*
- *Myrmecodia beccarii* (Ant plant)
- *Randia audasii*
- *Rhomboda polygonoides*
- *Toechima pterocarpum* (Orange tamarind)

Regulated vegetation

Regulated vegetation is mapped over Wangetti South Section A. The regulated vegetation mapped within the CMD areas 1- 6 are outlined in Table 3-7 and displayed in Figure 3-6:

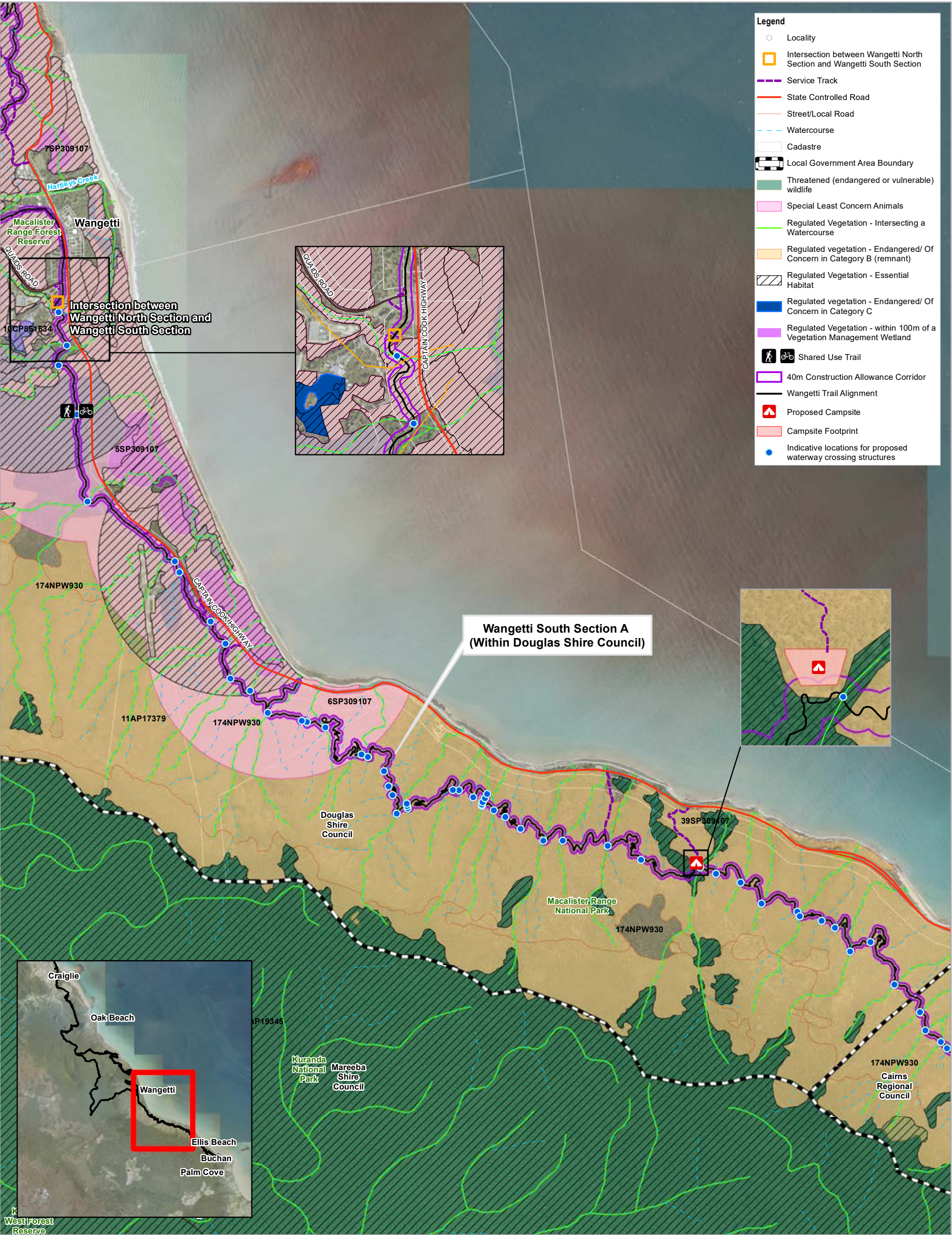
- 8a Regulated Vegetation - Endangered/Of concern in Category B (remnant)

- 8c Regulated Vegetation - Category R (GBR riverine regrowth)
- 8d Regulated Vegetation - Essential habitat
- 8e Regulated Vegetation - intersecting a watercourse **results in km
- 8f Regulated Vegetation - within 100m of a Vegetation Management Wetland.

Table 3-4 Regulated vegetation mapped over the CMD areas within Wangetti South Section A

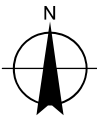
South Section A - Wangetti to CRC Boundary	Disturbance within each CMD Area (HA)					
MSES	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6
8a Regulated Vegetation - Endangered/Of concern in Category B (remnant)	1.42	0.05	4.90	0.85	Nil	0.05
8c Regulated Vegetation - Category R (GBR riverine regrowth)	0.31	Nil	0.07	Nil	0.02	Nil
8d Regulated Vegetation - Essential habitat	1.42	1.79	6.05	0.04	Nil	Nil
8e Regulated Vegetation - intersecting a watercourse **results in km	0.13	0.03	0.30	0.10	Nil	Nil
8f Regulated Vegetation - within 100m of a Vegetation Management Wetland	Nil	Nil	0.26	Nil	Nil	Nil
Vegetation clearing will only occur to establish the shared use trail and waterway crossings.	Yes	N/A	Yes	N/A	N/A	N/A
Vegetation clearing will only occur to establish the shared use trail	N/A	Yes	N/A	Yes	Yes	Yes

Under Schedule 21, Part 1, Item 1 (19) of the Planning Regulation 2017, an exemption applies to clearing of native vegetation for constructing or maintaining infrastructure stated in Schedule 5 of the Planning Regulation, where the infrastructure is government supported transport. Wangetti South Section A has been determined to be government supported transport.



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Paper Size ISO A3
0 0.2 0.4 0.6 0.8
Kilometres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55



DITD
Environment Assessment Stage 2 Wangetti Trail

Ecological features of Wangetti
South Section A

Project No. 41-32458
Revision No. 0
Date 9/02/2021

FIGURE 3-5

3.7 Regional ecosystems

Table 3-8 identifies the mapped regional ecosystems associated with CMD areas 1 to 6 within Wangetti South Section A.

Table 3-5 Regional ecosystems mapped over the CMD areas within Wangetti South Section A

South Section A - Wangetti to CRC Boundary	Disturbance within each CMD Area (HA)					
Regional Ecosystem	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6
Category C area containing endangered regional ecosystems	0.10	Nil	0.01	Nil	Nil	Nil
Category C area containing of concern regional ecosystems	0.17	Nil	0.06	Nil	0.02	Nil
Category A or B area containing endangered regional ecosystems	1.42	0.05	4.55	Nil	Nil	Nil
Category A or B area containing of concern regional ecosystems	Nil	Nil	0.35	0.85	Nil	0.05
Category A or B area that is a least concern regional ecosystem	Nil	2.44	1.66	Nil	Nil	Nil
Non Remnant	0.10	Nil	0.19	Nil	0.01	0.00
Vegetation clearing will only occur to establish the shared use trail and waterway crossings.	Yes	N/A	Yes	N/A	N/A	N/A
Vegetation clearing will only occur to establish the shared use trail.	N/A	Yes	N/A	Yes	N/A	N/A
The existing access track will be used for the service track resulting in minimal clearing.	N/A	N/A	N/A	N/A	Yes	Yes

Regional ecosystems (RE) were observed during the field surveys within Wangetti South Section A and they are outlined below:

- *Eucalyptus leptophleba*, *Corymbia clarksoniana* open forest to woodland, on alluvium, in near-coastal areas with moderate rainfall (7.3.44);
- *Eucalyptus leptophleba*, *Corymbia clarksoniana* and *E. platyphylla* open forest to woodland on metamorphic foothills (7.11.49);
- Simple to complex microphyll to notophyll vine forest, often with *Agathis robusta* or *A. microstachya*, on granites and rhyolites of moist foothills and uplands (7.12.7);
- Notophyll or mesophyll vine forest with *Archontophoenix alexandrae* or *Licuala ramsayi*, on granites and rhyolites (7.12.7a); and
- *Eucalyptus leptophleba* and *Corymbia clarksoniana* open forest to woodland, on foothills on granite and rhyolite (7.12.59).

Under Schedule 21, Part 1, Item 1 (19) of the Planning Regulation 2017, an exemption applies to clearing of native vegetation for constructing or maintaining infrastructure stated in Schedule 5 of the Planning Regulation, where the infrastructure is government supported transport. Wangetti South Section A has been determined to be government supported transport.

3.8 Marine plants

Wangetti South Section A is partly located within a coastal environment where it runs parallel to the Captain Cook Highway, where there is the potential for marine plants protected under the *Fisheries Act 1994* (Fisheries Act) to be present within the proposed works footprint. During the ecological field surveys, marine plants were investigated.

It was determined that the proposed works associated with Wangetti South Section A will not result in damage/disturbance to marine plants protected under the Fisheries Act. The refinement of the proposed works during the design phase has meant that no clearing of marine plants will be required above and/or below the highest astronomical tide for Wangetti South Section A.

3.9 Threatened fauna species

Seven distinct fauna habitat types have been recorded within the Wangetti South survey area during the field surveys completed by GHD in 2019. These include the following:

- Ephemeral waterways
- Eucalypt woodland on steep rocky slopes
- *Melaleuca* swamp
- Mixed *Melaleuca viridiflora* woodlands on inundated plains
- Open woodland over grasses on undulating plains
- Permanent streams
- Vine forest.

These fauna habitats can support a wide variety of terrestrial and aquatic fauna species.

CMD areas 1, 2 and 3 intersect a total of 9.25 ha of mapped 7a Threatened (endangered or vulnerable) wildlife as outlined in Table 3-9. CMD areas 1, 2, 3 and 4 intersect a total of 11.32 ha of mapped 7b Special least concern animals as outlined in Table 3-9.

Table 3-6 MSES fauna habitat intersected by Wangetti South Section A

South Section A - Wangetti to CRC Boundary	Disturbance within each CMD Area (HA)					
MSES	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6
7a Threatened (endangered or vulnerable) wildlife	1.42	1.74	6.09	Nil	Nil	Nil
7b Special least concern animals	1.42	2.49	6.56	0.85	Nil	Nil

The MNES and MSES fauna species that are known, likely of may occur within the Wangetti South Section are outlined below in Table 3-7.

Table 3-7 MNES and MSES fauna species that are known, likely or may occur within Wangetti South Section

MNES and MSES species known, likely or may occur	
Bird species	<ul style="list-style-type: none"> • <i>Casuarus casuaris</i> (Southern cassowary) • Migratory birds (e.g. eastern curlew, great sand plover) • Non-migratory species (e.g. masked owl)
Amphibian species	<ul style="list-style-type: none"> • <i>Litoria dayi</i> (Australian lace lid) • <i>Litoria nannotis</i> (Waterfall frog) • <i>Litoria nyakalensis</i> (Mountain mistfrog) • <i>Litoria rheocola</i> (Common mistfrog) • <i>Litoria serrata</i> (Tapping green eyed frog)
Mammal species	<ul style="list-style-type: none"> • <i>Dasyurus maculatus gracilis</i> (Spotted-tailed quoll) • <i>Dasyurus hallucatus</i> (Northern quoll) • <i>Dendrolagus lumholtzi</i> (Lumholtz's tree-kangaroo) • <i>Hipposideros semoni</i> (Semon's leaf-nosed bat) • <i>Phascolarctos cinereus</i> (Koala) • <i>Pteropus conspicillatus</i> (Spectacled flying-fox) • <i>Rhinolophus robertsi</i> (Large-eared horseshoe bat) • <i>Saccolaimus saccolaimus nudicluniatus</i> (Bare-rumped sheath-tailed bat) • <i>Xeromys myoides</i> (Water mouse)
Aquatic species	<ul style="list-style-type: none"> • <i>Stiphodon semoni</i> (Opal cling goby) • <i>Stiphodon rutilarueus</i> (Orange cling goby) • <i>Stiphodon pelewensis</i> (Emerald cling goby) • <i>Stiphodon surrufus</i> (Birdsong cling goby)

To minimise impacts to protected fauna species, pre-clearance surveys will be undertaken during the construction phase prior to any vegetation clearing and will involve an appropriately qualified ecologist/botanists. Trail routing will take place along the alignment of least disturbance and trail watercourse crossing points should be sited where there is minimal disturbance to stream banks and riparian vegetation and preferably over exposed bedrock. Manual construction methods will be encouraged over mechanised methods and only existing access roads are to be utilised, with no new access roads constructed.

Of the above mentioned fauna species, two EPBC Act listed species were considered to 'likely to occur' within Wangetti South Section based on the presence of potentially suitable habitat and previous records and they include the southern cassowary and opal cling goby (GHD, 2020).

The southern cassowary is listed as endangered under the EPBC Act has the potential to be impacted by the Wangetti trail development by habitat reduction and a possible increase in interactions with people. The impact to the Southern Cassowary has been assessed and details can be found in the Cassowary Management Plan.

According to the Cassowary Management Plan, Wangetti South Section A consist of a small area of moderate priority habitat management area and areas of low and lowest priority habitat management. These areas may provide important seasonal resources, but potential core habitat features are either diminished or lacking and the likelihood of interactions between cassowaries, construction crew and trail users is very low to nil. To respond to the potential threats and impacts to the southern cassowary habitat as part of the project, mitigation measures have been developed for the design, construction and operational phases and are outlined in the Cassowary Management Plan.

Opal cling gobies are listed as critically endangered under the EPBC Act and therefore steps need to be taken to protect their highly favourable habitat located along short, steep coastal streams in the Wet Tropics. Several of these streams will be crossed as part of the shared use trail and management of the sediment and limiting impact to these waterways is required to

ensure the gobies habitat is maintained. Eliminating waterway barrier works will reduce the impact on the opal cling goby as waterway passages used by this fish will therefore not be interrupted.

3.10 Biosecurity

Invasive plants and pest species considered to be present or have the potential to occur within the Wangetti South Section project area have been identified in the Wangetti South Section Preliminary Weed, Pest and Disease Management Plan which has been developed for Wangetti South Section (refer to Appendix B). In addition, there are three environmental diseases (pathogens) that pose a high risk to the Wangetti South project area

- Myrtle rust (*Puccinia psidii*) – fungal disease affecting plants in the Myrtaceae family. This pathogen is known to be threat to WTWHA (WTMA, 2020)
- Root rot fungus (*Phytophthora* fungus) – kills all plant species rooted in soil. Commonwealth listed ‘key threatening process’. This pathogen is known to be threat to WTWHA (WTMA, 2020)
- Chytridiomycosis disease – frog disease caused by the chytrid fungus. Commonwealth listed ‘key threatening process’. This pathogen is known to be threat to WTWHA (WTMA, 2020) Frog chytrid fungus has been identified as a primary cause of massive mortality of stream-dwelling frogs in the Wet Tropics bioregion (WTMA, 2020).

There are also several Queensland Biosecurity Zones which are mapped over the Wangetti South Section according to the Queensland Government -Business Queensland Maps of Queensland biosecurity zones (2020) and they include the electric ant biosecurity zone, Asian honey bee infested area and Northern banana biosecurity zone.

Weed and pest species and pathogens identified onsite are to be managed in accordance with the Weed, Pest and Disease Management Plan which is been prepared for the construction and operational phases of the project. Hygiene procedures and ongoing monitoring to detect incursions are to be carried out to minimise transfer of invasive species.

3.11 Waterways

Waterways

Wangetti South Section A traverses a number of watercourses and ‘yet to be mapped features’ under the *Water Act 2000*. Wangetti South Section A also intersects a number of mapped Queensland Waterways for Waterway Barrier Works on Queensland Globe which are protected under the *Fisheries Act 1994*. Refer to Figure 2-1.

As the trail will intersect a number of waterways, various waterway crossings will be required at these locations to allow hikers and mountain bikers to safely cross the waterway. The exact and type of structure proposed as the waterway crossings will be determined by the trail builder and will comprise of the following options:

- Rock armour crossings
- Gully crossing style bridges.

Table 3-11 below identifies which of the CMD areas within Wangetti South Section A intersects waterways.

Table 3-8 CMD areas within Wangetti South Section A that intersects waterways.

CMD areas	Waterway mapped under the <i>Water Act 2000</i>	Waterway mapped under the <i>Fisheries Act 1994</i>	Comments
CMD Area 1 consists of approximately 0.45 km of the shared use trail and two rock armour waterway crossings.	Two minor watercourses	Two moderate risk waterways	The rock crossings will be designed and constructed to be in accordance with a bed level crossings under the Department of Agriculture and Fisheries (DAF) accepted development requirements for operational work that is constructing or raising waterway barrier works.
CMD Area 2 consists of approximately 0.85 km of shared use trail and one waterway crossing.	One minor watercourse	One moderate risk waterways	The rock crossings will be designed and constructed to be in accordance with a bed level crossings under the DAF accepted development requirements for operational work that is constructing or raising waterway barrier works.
CMD Area 3 consists of approximately 1.70 km of shared use trail, 8 rock armour crossings and one bridge crossing and the formalization of four existing access tracks ranging from 0.02 km to 0.16 km in length to service tracks.	Five minor watercourses	Three moderate risk waterways	<p>The rock crossings will be designed and constructed to be in accordance with a bed level crossings under the DAF accepted development requirements for operational work that is constructing or raising waterway barrier works.</p> <p>The bridge will comply with <i>What is not a waterway barrier work?</i> and will not constitute waterway barrier works.</p>

Wetlands

The CMD areas within Wangetti South Section A does not intersect any mapped wetlands.

- CMD area 1 – Does not intersect any mapped wetlands.

- CMD area 2 – Does not intersect any mapped wetlands.
- CMD area 3 – Does not intersect any mapped wetlands.
- CMD area 4 – Does not intersect any mapped wetlands.
- CMD area 5 – Does not intersect any mapped wetlands.
- CMD area 6 – Does not intersect any mapped wetlands.

The proposed works will not result in operational works that changes the form of land, or involves placing a structure on land, in a way that diverts water to or from a wetland in a wetland protection area and involves excavating or filling (within 200m of the wetland more than 100m³ or more than 1,000 m³ within a wetland. The proposed works does not trigger state referral for works in wetlands in the Planning Regulation. Mitigation measures have been developed for the construction phase to manage any potential impacts from the project on surrounding water resources and this is discussed further in Section 5

Coastal Management District and Erosion Prone Areas

Wangetti South Section A intersects 12.04 ha of CMD as outlined below in Table 3-9 and shown in Figure 2-1. There are only two areas within mapped erosion prone area and the proposed works will not exceed the excavating or filling 1,000m³ and/or the clearing native vegetation from an area of 1,000m².

Table 3-9 CMD area intersected by Wangetti South Section A

South Section A - Wangetti to CRC Boundary	Disturbance Area (HA)					
	MSES	CMD Area 1	CMD Area 2	CMD Area 3	CMD Area 4	CMD Area 5
						CMD Area 6
Coastal management district		1.79	2.49	6.82	0.85	0.03
						0.06

Details of the proposed works within the CMD is also described in Table 1-1.

As a result, the proposed works triggers the following triggers under the Planning Regulation:

- Schedule 10, Part 17, Division 3, Table 1, Item 1 – Operational Work that is tidal works or works in a coastal management district - Parts of the trail are located within in state coastal land within CMD. Assessment against the current State Development Assessment Provisions, State Code 8: Coastal Development and Tidal Works has been undertaken.

3.12 Hazard, health and safety

Wangetti South Section A traverses an area which is susceptible to a number of hazards, health and safety matters. This section provides a summary of the existing hazard, health and safety matters within the project area and immediate surrounds. It also assesses the potential impacts as a result of the project.

The majority of the Wangetti South Section A will be located within national park offering a remote trail experience to hikers and mountain bikers and as a result carries an inherent risk for the users. This includes:

- bites from snakes, spiders, and insects
- potential hostile intersection with fauna species
- allergic reactions to plant species along the trail
- heat/cold exposure, falls and sprains, etc.
- extreme weather events occurring within the project area and requiring evacuation

Wangetti South Section is also characterised by steep terrain, is home to dangerous animals and plants and there is the potential for extreme weather events to occur in the area. All of these matters could have adverse impacts on construction personnel working within Wangetti South Section during the construction phase.

Bushfires

Wangetti South Section A project area is located within a bushfire hazard area, it is located within steep terrain and is surrounded by vegetation, and as a result there is the risk of bushfires impacting the project area. Fires can start and spread rapidly and are often unpredictable. If there is a long spell of hot, dry weather and it's windy, the fire risk increases. Generally, the fire season in Far North Queensland is through the winter ("dry" season) and spring months.

Bushfire management measures will need to be considered for all phases of the project. Material and structure within the project area will also need to consider the impacts of bushfires.

Tropical Cyclones

Geographically, tropical cyclones are observed to affect the areas of the Gulf of Carpentaria and Cape York Peninsula to the north of the State and the eastern coastline extending from the northern tip of Queensland to central coastal regions. Wangetti South Section B project area is susceptible to tropical cyclones. Tropical cyclones are low pressure systems that form over warm tropical waters and have gale force winds (sustained winds of 63 km/h or greater and gusts in excess of 90 km/h) near the centre. Technically they are defined as a non-frontal low pressure system of synoptic scale developing over warm waters having organised convection and a maximum mean wind speed of 34 knots or greater extending more than half-way around near the centre and persisting for at least six hours.

Management measures and the appropriate design standards will need to be considered for all phases of the project to protect people and structures from severe storm events and cyclones.





Landslides

The project is located within steep terrain and there are areas mapped as susceptible to potential landslides. It is not anticipated that the proposed development will exacerbate any existing landslide hazard impacts. A CESCOP has been developed for the project and will be further developed by the design and construct contractor and then implemented to mitigate any potential impacts to land stability

Dangerous plants and animals

Within Wangetti South Section A, particularly within the national park extent there are several dangerous plants and animals that have the potential to cause harm to the construction team, trail operator staff and users of the trail. They are listed in Table 3-10 below. Management measures have been considered for all phases of the project to protect people and the species from hostile interactions.

Table 3-10 Dangerous plants and animals within Wangetti South Section A

Dangerous plant or animal	Photograph
<p>Wait-a-while vine (<i>Calamus muelleri</i>)</p> <p>Wait-a-while vines have hooked spines that can catch on skin or clothes and is difficult to unattached the hooks.</p>	
<p>Hairy Mary (<i>Calamus radicalis</i>)</p> <p>If skin comes into contact with the leaves it can result in a bad reaction.</p>	
<p>Stinging Trees (<i>Dendrocnide moroides</i>)</p> <p>If skins comes into contact with the leaves, fine silica-tipped hairs inject venom like mini-syringes and it causes extreme pain with symptoms including an intense stinging sensation that can last for several weeks.</p>	
<p>Eastern brown snake (<i>Pseudonaja textilis</i>)</p> <p>The eastern brown snake is a highly venomous, fast-moving, aggressive snake that together with other browns are responsible for more deaths every year in Australia than any other group of snakes.</p>	

Southern cassowary (*Casuarus casuarius*)
Cassowaries have an inner toe fitted with a long, straight, nail which can cause serious injury when used defensively.



3.12.1 Social and economic

Population centres

There are two main population areas within close vicinity to Wangetti South Section A and they include Port Douglas and Palm Cove.

Port Douglas is a well-known and loved tourism destination, justifiably famous for its high end luxury getaways, its coconut tree fringed white sand beaches and access to two World Heritage listed assets – the Great Barrier Reef and the Wet Tropics World Heritage Area. It is located within Douglas Shire Council and Douglas Shire has a population of around 11,717 people according to the 2016 Census. The economy of the region is driven by tourism (with 1.2 million visitors annually) and agriculture (mainly sugar cane farming and processing). With an 80% economic reliance on tourism, the Douglas Shire ranks as the most tourism dependent region in Australia.

At the southern end of Wangetti South Section B lies Palm Cove. Palm Cove is a small suburb located on the coast at the northern extent of the Cairns municipal area. It is a popular holiday destination with hotels, private residences, restaurants and beautiful beaches and is only 25-30 minutes drive from the centre of Cairns.

One of the larger cities in Queensland, the Cairns municipal area has a population of around 160,000 people and is the economic centre of Tropical North Queensland. Key economic sectors in the municipality are tourism and agriculture. With a modern airport servicing International and Domestic markets, Cairns is generally the gateway for visitors to Tropical North Queensland.

Economic opportunities from the Wangetti Trail Project

There are many commercial opportunities that will arise from the Wangetti Trail, including:

- Operation of the proposed on-trail lodges
- Guided and/or facilitated tours (tours may offer various levels of service from basic shuttling of luggage, to one-on-guiding, meal and campsite preparation, etc.
- Cultural activities, including indigenous dance, storytelling etc.
- Shuttle services for walkers and riders
- Gear and equipment hire, including bikes, tents etc.
- Event opportunities, including hiking, trail running and mountain biking events
- Provision of food and camping supplies
- Off-trail accommodation
- Off-trail restaurants and cafes.

There are a number of high-profile competitive mountain biking events that could potentially utilise sections of the Wangetti Trail, including the internationally known Croc Trophy and Triple R Mountain Bike Race, but more importantly it could also help to generate unique new events, for example in trail running or adventure racing.

Community consultation

Throughout the project lifecycle, there has been extensive engagement with the local community, tourism industry, Councils and regional organisations and conservation interest groups. The Wangetti Trail Project Team maintains a project website and e-newsletter which is updated regularly with all project updates¹. DTIS have prepared the Wangetti Trail Project Consultation Report which provides an account of the various community and stakeholder engagement activities at and across certain phases of the project.

Tourism land uses surrounding Wangetti South Section A

Wangetti South Section A is considered to be located in a prime position and compliments the region by providing an adventure-based ecotourism development. There are already a number of established tourism attractions in proximity to the project area, which are detailed below (refer to Figure 3-6):

- **Wangetti Beach** - Wangetti Beach is just north of Palm Cove in Tropical North Queensland. Running from Slip Cliff Point to Red Cliff Point, the four kilometres of almost straight coastline has no facilities, with only a car park on either end of the beach and a stretch of highway connecting them. When visiting Wangetti Beach, it is a must to stop by the southern end as this raw patch stunning and untouched coastline has been naturally eroded, leaving a quirky pebble stone covered section of the beach. You can build stone towers or try your hand at skipping the stones across the water, climb across and adventure through the pebbled mounts, or simply checkout the unique scenery. With easy access from Palm Cove and a plethora of camping sites close by, Wangetti Beach offers fun, relaxation, and a great view of the entire beach from the northern lookouts.
- **Hartley's Crocodile Adventures** - Hartley's Crocodile Adventures is the best place to see crocodiles and local wildlife in the North. 2500 metres of boardwalks you can see an array of wildlife, including beautiful tropical birds, wallabies, reptiles, insects and more.

¹ Project website: <https://www.dtis.qld.gov.au/our-work/qld-ecotourism-trails/wangetti-trail>

Noise emissions

The majority of Wangetti South Section A is located within national park and is typified by a generally low noise environment. The northern section of the project area in Wangetti is subject to more noise as it is located in a built-up urban area. The proposed works are likely to result in increased noise during the construction phase (intermittent, transient and short-term) and operational phase due to increased number of people and machinery and equipment movement through the project area.

Potential sources of noise emissions generated by the project during the construction phase include:

- Construction equipment operating within the project area
- Construction team operating within the project area

Potential sources of noise emissions generated by the project during the operational phase include:

- Hikers and mountain bikers using the trail and camp sites
- Vehicles using the access tracks to access the trail/camp sites
- Noise generated from maintenance workers maintaining trail and camp sites.

3.12.3 Cultural heritage

Indigenous cultural heritage

A search of the Department of Aboriginal and Torres Strait Islander Partnerships (DATSIP) Cultural Heritage database was undertaken on 21st December 2020 to identify recorded Indigenous cultural sites within 5 km and 20 km of the project area. The 5 km buffer DATSIP search identified eight recorded cultural heritage sites, while the 20 km buffer search identified 175 recorded cultural heritage sites. The sites are recorded to contain a variety of significant features including scarred trees, shell middens, artefact scatter, grinding grooves, resource and quarry areas, story places, paintings and burial places.

Due to the predominantly undeveloped nature of the project area it cannot be assumed that the sites identified within the DATSIP cultural heritage search are a conclusive representation of all archaeological materials and sites within the area. The presence of multiple identified sites suggests that additional undetected sites of cultural significance may exist throughout the project area. Environmental management for the project should adhere to the measures in the *Aboriginal Cultural Heritage Act 2003* Duty of Care Guidelines. The project would constitute a Category 5 development and should not proceed without cultural heritage assessment.

World heritage

The Wangetti South Section A traverses the Wet Tropics World Heritage Area, which is recognised as a national heritage place for both natural and Indigenous values.

European cultural heritage

A search of the Queensland Heritage Register revealed no State heritage sites are located within the project area. Similarly, no local historical or European heritage sites are identified within the Douglas Shire Council LGAs.

3.12.4 Transport

Wangetti South Section A project area intersects sealed and unsealed roads and includes both State-controlled roads, local council roads and QPWS-owned roads. Refer to Table 3-11 which provides a list of the roads intersected.

The project will include ancillary service tracks to allow for restricted vehicle access along the alignment during the construction phase, operational phase, and maintenance phase and for emergency access. These service tracks will connect to the existing road network and will predominantly be used by side by side vehicles during maintenance and larger construction vehicles. This service track will be gated to members of the public, discouraging access and use. Passive surveillance from users of the trail and monitoring of the trail by QPWS and the trail operator will assist in ensuring that unlawful activities, such as motorbike riding, do not occur with the project area.

Table 3-11 Roads intersected by Wangetti Section A within CMD areas

Road name	Ownership	Local Council Area	Proposed use
Captain Cook Highway	TMR	DSC	There are 5 existing access tracks within Captain Cook Highway road within CMDs that will be used for the project as service tracks.
Rifle Range Road	DR	DSC	Existing access road referred to as Rifle Range Road from Captain Cook Highway. Lot 6 on SP309107 and Captain Cook Highway Road Reserve. Location: (latitude and longitude) -16.680236 145.573963
Unnamed track	DR	DSC	Existing dirt track from Captain Cook Highway Location: (latitude and longitude) -16.678332 145.571872 Lot 6 on SP309107 and Captain Cook Highway Road Reserve.
Unnamed track	DR	DSC	Existing dirt track from Captain Cook Highway Location: (latitude and longitude) -16.694385 145.603293 Lot 39 on SP309107 and Captain Cook Highway Road Reserve.
Unnamed track	DR	DSC	Existing dirt track from Captain Cook Highway Location: (latitude and longitude) -16.696813 145.608836 Lot 39 on SP309107 and Captain Cook Highway Road Reserve.

3.12.5 Waste management

Wangetti South Section A would produce all types of waste during construction and operation including glass, paper, food/ kitchen scraps, construction waste, cardboard, and plastic (including recyclables) in addition to vegetation material as a result of clearing. The waste hierarchy of *avoid, reduce, reuse, recycle, dispose* should be implemented to avoid potential

environmental impacts and reduce disposal costs. Disposal costs would include transport of the material to landfill.

The project area is predominantly within an area which is previously undisturbed protected area within the national park. As such, waste management will need to be implemented in order to maintain the existing values of the natural environment. A discussion of the potential waste to be generated during the construction phase and operational phase is outlined below.

During construction, it is anticipated that the following waste streams could be generated by the construction teams:

- Waste, oil or fuel are possible as a result of the construction of the proposed trail and camp sites
- Packaging from material used during construction phase
- Domestic waste produced by construction team
- Excess soils/rocks and vegetation.

During operation of the trail and camp sites, it is anticipated that the following waste streams could be generated:

- Domestic waste produced by the users of the trail, including ecotourism operating staff
- Waste, oil or fuel are possible as a result of vehicles servicing the camps and trail for maintenance purposes
- Used mountain bike tyres/chains etc.

The project will incorporate sustainability initiatives in the construction and operational phases of the project such as:

- Use of recycled construction materials
- Use of local materials and contractors
- Minimisation and recycling of wastes
- Energy reductions through efficiency measures
- Regular vehicle maintenance to reduce emission rates

Water use reductions through water recycling, use of recycled water and use of soil stabilisers to minimise water use.

4. Proposed works

4.1 Proposed works

This section discusses in detail the proposed works within CMD area 1 to 6 and these are outlined in Table 4-1 to Table 4-5.

4.2 Overview

An overview of the proposed works within each CMD area is outlined in Table 4-1. The project has been designed such that it is responsive to the natural environmental values, enhancing conservation and protection of a cherished part of Tropical North Queensland. World Trail were appointed to design the alignment and completed a walkthrough, working closely with Traditional Owners, specialist consultants and engineers. The project and its ancillary facilities will be low-impact and, to the greatest extent possible, ecologically sustainable and preserve and protect community resources. For this reason, no utility connections will be installed. Rather, water will be collected via rainwater tanks for isolated use and wastewater will be collected and disposed of, offsite. General waste by patrons will be kept and disposed of offsite.

Table 4-1 Overview of components proposed with the CMD areas

Component	Potential impacted values	Reference	Applicable CMD area
Shared use trail	Vegetation disruption, including canopy cover, will be minimised and will be limited to trimming (where possible). Ongoing vegetation management will likely be required.	Table 4-2 Description of the shared use trail including location, key structures, construction methodology and how it will be maintained	CMD area 1 CMD area 2 CMD area 3 CMD area 4
Waterway Crossings including rock armouring and low level bridge (minor water crossing).	Only a small component of this area will result in permanent disturbance.	Table 4-4 Waterway crossings, component description location, key structures, construction methodology and intended maintenance	CMD Area 1 CMD Area 2 CMD Area 3
Service Track	Limited vegetation is required for only one service track (Service track 4) to remove vegetation that has grown over the existing access tracks.	Table 4-3 description of the service vehicle tracks including location, key structures, construction methodology and how it will be maintained	CMD area 3 CMD area 5 CMD area 6

Table 4-2 Shared use trail: component description location, key structures, construction methodology and intended maintenance

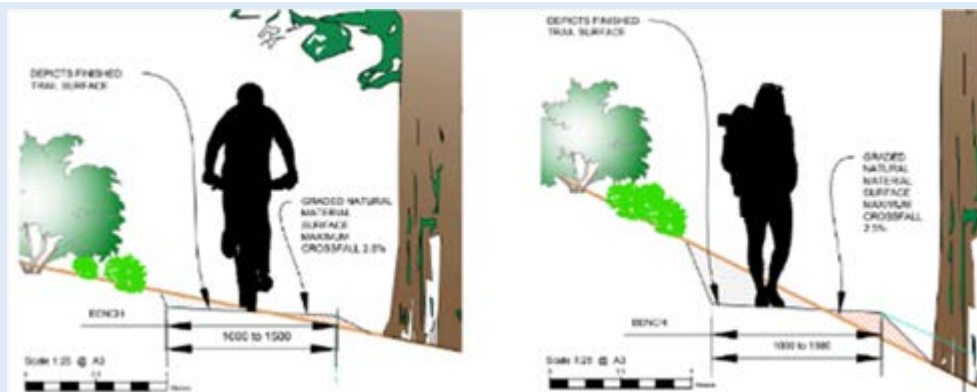
Shared use trail	
Proposal appreciation	The shared use trail has been designed with a maximum width of 1.5 m to provide flexibility to allow mountain bikers to use the trail with walkers should the market require this. It also gives flexibility over time for the trail to be adjusted accordingly.
WTWHA	The shared use trail is located within Zone B and C of the WTWHA under the Wet Tropics Management Plan (July 2017 version).
Key Structures	<p>Generally 1.5 m wide, the trail will be constructed utilising the natural soil and rock found along the trail. The trail will have an average gradient of <10% and a maximum gradient no greater than 15% (for short distances only). Built structures are also proposed as part of the trail and include gully crossings, bridges, staircases, platforms, rock armouring and signage, where appropriate and required.</p> <p>The trail will be supported through interpretive signage throughout. These include:</p> <ul style="list-style-type: none"> Trailhead signs – designated entry point to the trail, communicating: <ul style="list-style-type: none"> A map of the trail including a description of each section Wangetti Trail and key stakeholder logos Code of conduct Minimum requirement and details on phone reception Emergency procedures Information on water availability Booking protocols for camp sites Interpretive information such as the cultural and environmental significant of the area Decision point signs / directional signs – used at the start of each section to enable trail users to make an informed decision whether to proceed Way markers – bollard or post with symbols to guide trail users in the correct direction Interpretive signs – focused on telling the story or cultural aspect of a local environmental value, local flora and/or fauna or local history. <p>Trail signage will be installed with a unique location identification number to be quoted in emergency situations. Emergency responders would be provided with GPS coordinates corresponding to each of these numbers and instructions to access that point. These signs will be installed within the 1.5 m wide clear zone of the trail for easy use by users.</p>
Vegetation	The shared use trail will allow for winding around natural obstacles and integrating within the natural environment. Vegetation disruption, including canopy cover, is minimised. Ongoing vegetation management will likely be required.

Shared use trail

Visual examples from World Trail (2020) *Wangetti Trail Construction Methodology*



General Trail layout from World Trail (2020) *Wangetti Trail Construction Methodology*



Construction

Materials and equipment

Material anticipated to be used by the nominated contractor to construct the trail will include:

- In situ soils – the proposed finished surface for the majority of the trail will be natural soils. Where extra soil is required, it can usually be sourced from the balanced cut and fill process used to create the bench which becomes the finished trail, with soil moved up or down the rail to manage local excesses or deficiencies
- Ballast rock – ballast rock will be used as a base course in low-lying wet areas or flat sandy areas, to build up the trail surface and provide a firm foundation. Ballast rock can vary, but is generally a durable crushed stone with sharp corners and edges, free of impurities, weathering and organic materials. Igneous and metamorphic rocks such as granite, gneiss, and basalt make excellent ballast.
- Fine crushed rock - crushed rock will be used from time to time as a wearing course. Generally the wearing course of the trail will be the natural soil, but crushed rock may be required in situations where ballast rock has been specified as a base course.
- Geofabric underlay
- Rock – in situ from within the construction corridor will be utilised to create rock walling to restrain soil to a slope
- Mortar and concrete – mortar and concrete, along with rock, geofabric and drainage materials will be used to create retaining walls to restrain soils to a slope

Shared use trail	
	<ul style="list-style-type: none"> Pre-cast concrete steps – pre-cast concrete steps, along with concrete, road base, mortar, large rocks and anchors will be used to allow the trail to climb up/down steep slopes.
Methodology	<p>The process for constructing a standard trail is as follows (WT, 2020):</p> <ul style="list-style-type: none"> Pre-start trail review: The trail will be re-walked and assessed with the exact alignment re-marked. Although noting that during construction, if something needs to be avoided, the trail can be moved within the 40 m corridor Vegetation clearing: The temporary construction corridor is defined as 2.5 m (0.5 m either side of the 1.5 m permanent trail width) and to about 2.5 m high. Clearing of the corridor will be undertaken in 100 – 150 m sections and will be undertaken manually using tools such as brush cutters, chainsaws and hedge trimmers, and hand tools like loppers, hand saws and secateurs. Large trees will not be removed and the trail will re-routed around them. All cleared vegetation will be cut into small pieces and dispersed throughout the surrounding area. The process of clearing only 100-150 m ahead at a time allows for a visible amount of vegetation to be cleared ahead of where the machine is operating. Cut the bench using the cut and fill technique: Soil removed from the inner side of the bench will be used to build up the outer edge of the bench. This will be constructed with a small rubber-tracked excavator with a minimum track width of about 900 mm. On steeper slopes, dry strong rock walls, built from rock sourced during construction, will be created. This step is sometimes undertaken by hand where: <ul style="list-style-type: none"> It is not physically possible to get the mini excavator to the location (for example, a steep sided creek requiring the construction of a bridge, which will not be trafficable by a mini-excavator, or there are large boulders that prevent access to the machine) It is not safe to use the mini excavator (for example, on steep side slopes or in locations of unstable ground) Areas of high environmental or cultural heritage significance, requiring minimal excavation Close to large tree roots Other trail embellishments: Trail surfacing, steps, rock armouring and bridges will then be constructed Definition of trail: The trail will be defined by placing rocks, logs or other obstacles as necessary to define the preferred riding/hiking line for users. Clean up: Removal of loose rocks and roots, compaction of tread and drainage management (for example, ensuring grade reversals flow correctly) Curing: The trail is given a period of rest, known as 'curing', to allow the trail tread to settle and harden. <p>QPWS will have a shadow ranger on-ground during the construction of the shared use trail to provide guidance to the construction contractor.</p>
Operational and Maintenance Phase	<p>The shared use trail (including built structures along the trail), within the protected area estate, will be maintained in accordance with QPWS trail maintenance/ procedures/manuals.</p>

Table 4-3 Service tracks: component description location, key structures, construction methodology and intended maintenance

Service Tracks	
Proposal appreciation	The project will include ancillary service tracks to allow for restricted vehicle access along the alignment during the construction phase, operational phase, and maintenance phase and for emergency access. These will connect to the to the existing road network and will predominantly be used by side by side vehicles during maintenance and larger construction vehicles. The service tracks will be gated to members of the public, discouraging access and use. Passive surveillance from users of the trail and monitoring of the trail by QPWS and the trail operator will assist in making sure that the unlawful activities e.g. motorbike riding does not occur with the project area.
Key Structures	Grading/improvements of some of the existing access tracks may be undertaken to allow them to cater for the vehicles to be used for the project.
Vegetation	Limited vegetation is required to remove vegetation that has grown over the existing access tracks. Overhanging vegetation over the existing access tracks will be cut back. Ongoing vegetation management will be required.

Service Tracks within CMD

CMD Area 3

Lot: 6 on SP309107 and Captain Cook Highway Road Reserve.

Tenure: State reserve and State controlled road reserve

Elevation: Above HAT, located at 10 m AHD

Description: Existing dirt track from Captain Cook Highway.

Location: (latitude and longitude)

-16.678332 145.571872



Service Tracks

CMD Area 3

Lot: 6 on SP309107 and Captain Cook Highway Road Reserve.

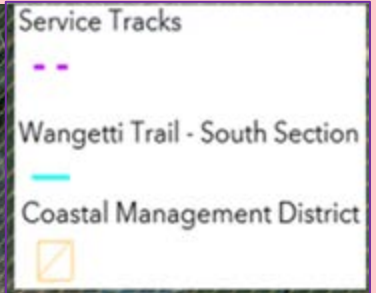
Tenure: State reserve and State controlled road reserve

Elevation: Above HAT, located at 10 m AHD

Description: Existing access road referred to as Rifle Range Road from Captain Cook Highway.

Location: : (latitude and longitude)

-16.680236 145.573963



CMD Area 3

Lot: 6 on SP309107 and Captain Cook Highway Road Reserve.

Tenure: State reserve and State controlled road reserve

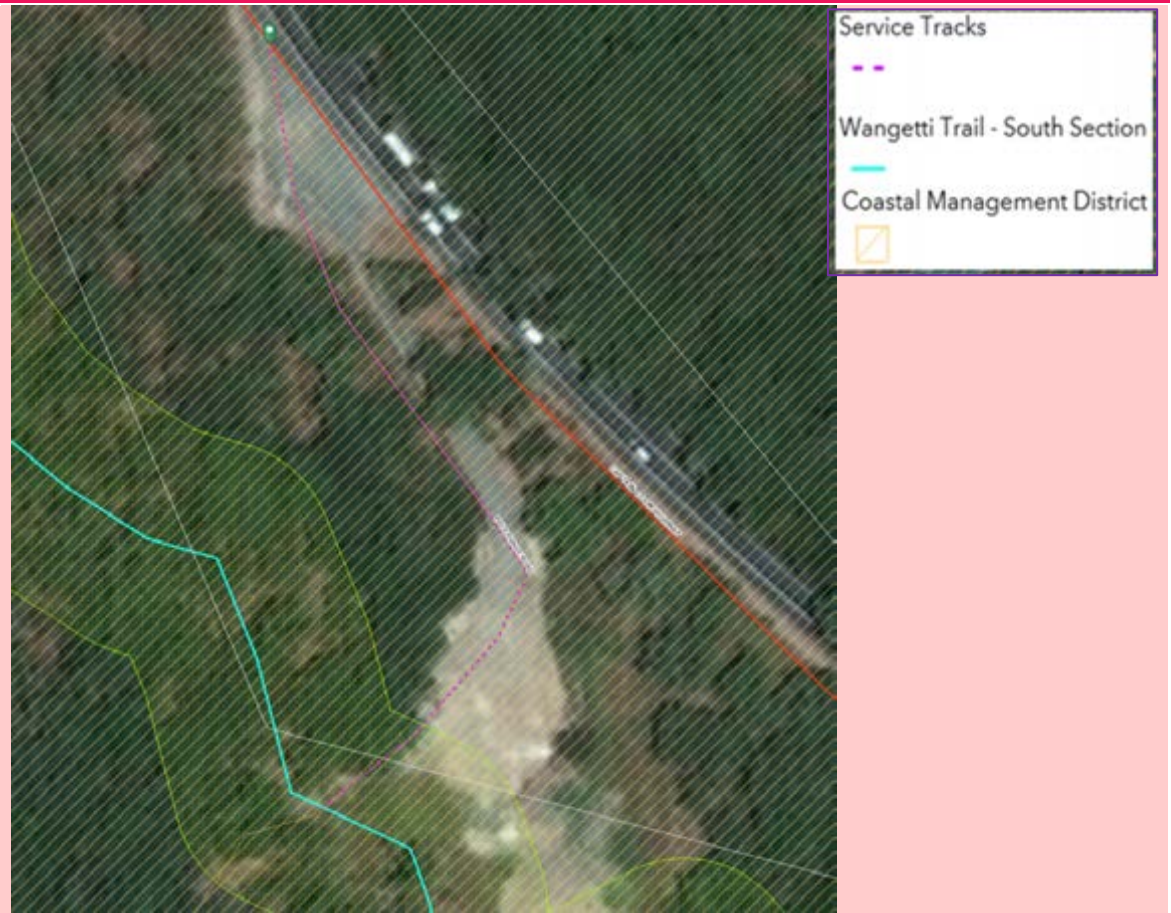
Elevation: Above HAT, located at 10 m AHD

Description: Existing access road referred to as Rifle Range Road from Captain Cook Highway.

Location: : (latitude and longitude)

-16.682746 145.575359

Service Tracks



Service Tracks

CMD Area 5

Lot: 39 on SP309107 and Captain Cook Highway Road Reserve.

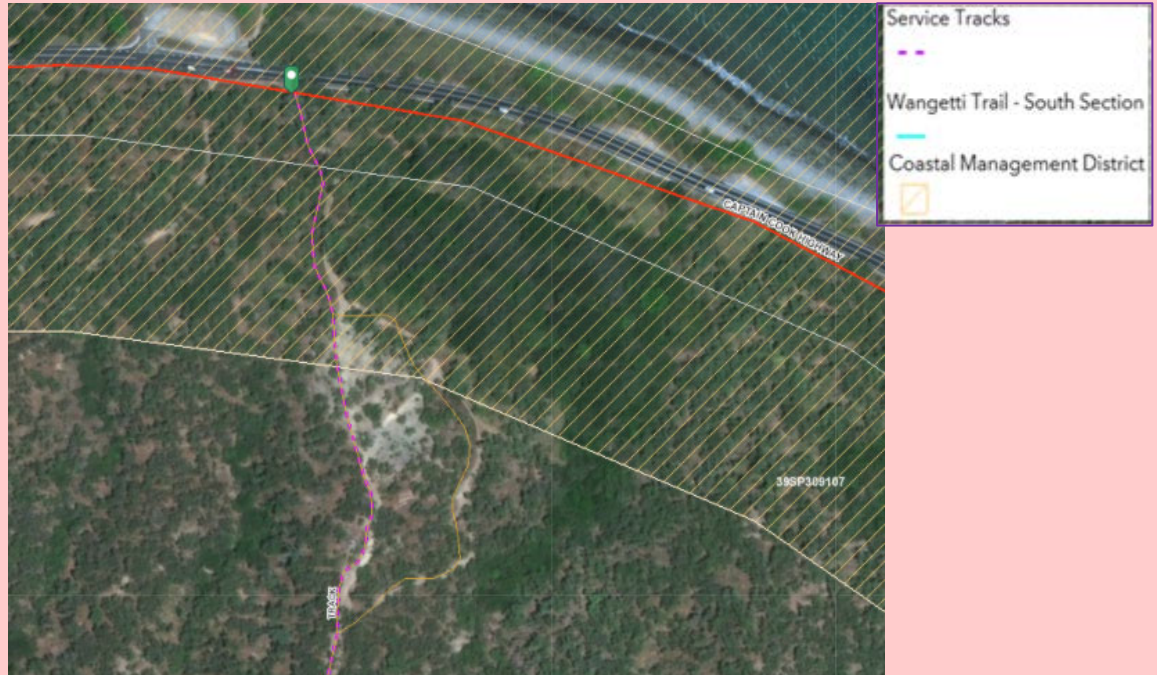
Tenure: State reserve and road reserve

Elevation: Above HAT, located at 10 m AHD

Description: Existing dirt track from Captain Cook Highway.

Location: : (latitude and longitude)

-16.694385 145.603293



Service Tracks

CMD Area 6

Lot: 39 on SP309107 and Captain Cook Highway Road Reserve.

Tenure: State Reserve and State-controlled road reserve

Elevation: Above HAT, located at 10 m AHD

Description: Existing dirt track from Captain Cook Highway.

Location: : (latitude and longitude)

-16.696813 145.608836



Construction

Materials and equipment Methodology

Limited works will occur to the existing access tracks other than removal of vegetation where it obstructs the movement of vehicles and some minor surface treatments to provide safe passage for vehicles.

Operation and maintenance

Operation and maintenance phase

The service tracks will be managed in accordance with QPWS trail maintenance procedures manuals.

The service tracks will be used by the operators and managers of Wangetti Trail and will be used for the following purposes:

- Deliver equipment and supplies to the camp sites
- Be used by emergency vehicles for emergencies
- Be used to access the trail and camp sites for maintenance purposes
- The service tracks will be gated to restrict access to the general public.

The trail and service tracks will be maintained in accordance with QPWS trail maintenance/ procedures/manuals for those parts of the service tracks that are within the protected area estate.

Table 4-4 Waterway crossings: component description location, key structures, construction methodology and intended maintenance

Waterway crossings along the shared use trail	
Proposal appreciation	As the trail will intersect a number of waterways, waterway crossings will be required at various locations to allow hikers and mountain bikers to safely cross the waterway.
Key Structures	<p>The exact type of structures proposed at the waterway crossings will be recommended by the trail builder and approved by the land manager and will comprise of rock armouring and low level bridge (minor water crossing).</p> <p>Rock armouring</p> <p>Rock armouring is a technique used to harden the trail surface, using rocks of 400 – 800 mm in size, embedded into the ground to create a hard, rock paved surface. Rock armouring is used in the following situations:</p> <ul style="list-style-type: none"> • Wet and boggy areas where no alternative route is available • Steep gradients, to reduce the potential for erosion and to provide traction • In high trafficked areas to prevent erosion and compaction. <p>Low-level bridge (minor water crossing)</p> <p>21 single span gully crossing bridges will be used within multiple locations along the alignment, over areas of large gully crossings. The design aspects of the structure include the following:</p> <ul style="list-style-type: none"> • The bridges will range from 5 m to 25m and the width of the bridges would be 1.2 m, limited to pedestrians and cyclists • A maximum area of 21 m² has been allowed on either side of the water way (42 m²) to allow for the installation. However, only a small component of this area will result in permanent disturbance and this will be determined during the detailed design phase by the nominated construction contractor • The bridge could be constructed by hand with sections of the crossing walked • Either banks appeared gentle in slopes and not steep, even in height levels either side of the crossing • The materials used for the built structures will be durable enough to withstand the harsh tropical climate and natural environment • The anticipated method of construction to be adopted by the construction contractor for the bridge is outlined below: • Site preparation works including clearing and grubbing • Setup of work areas, including a crane pad, on both sides of the waterway • The topsoil will be stripped and the ground cut to abutment base level • A crane will move the bridge into place • The bridge is to be assembled in situ by hand <p>Removal of all construction materials from site and implementation of appropriate site rehabilitation prior to work completion.</p>
Vegetation	Minor vegetation clearing will be required to allow for construction of the crossings.

Waterway crossings along the shared use trail

Visual examples for waterway crossings from World Trail (2020) Wangetti Trail Construction Methodology



Rock armouring



Low level bridge

4.3 Infrastructure provisions to support the project

To ensure the project will be of low-impact to the surrounding environment, no utility connections will be installed to connect to municipal infrastructure with any of the CMD areas.

4.3.1 Water, sewer and stormwater

No water, sewer or stormwater infrastructure is proposed within CMD Areas 1-6.

4.3.2 Electricity and telecommunications

No electricity or telecommunications infrastructure is proposed within CMD Areas 1-6.

4.3.3 General waste

It is anticipated the operation of the Wangetti Trail will closely resemble other walking and biking tracks in that the volume of waste per person will be limited to the amount that can be carried by patrons onto the trail. No waste infrastructure is proposed within Wangetti Trail Section A.

Waste generated during the construction phase will be removed from the project and waste will not contain any contaminated or hazardous materials.

4.4 Design and construction strategy for Wangetti South Section A

4.4.1 Overview

Delivery of the Wangetti Trail has been split into multiple works packages which suit the specialist skills of targeted builders and contractors accordingly. A design and construct (D&C) contractor has been awarded for Wangetti South Section A and B. Subject to approvals, the investigations, survey and design works are set to commence in early 2021. All works will be subject to conditions of the environmental approvals to protect and preserve the environment and cultural heritage.

To assist with delivery of the project the following guidance documents have been developed:

- The Wangetti Trail Construction Methodology Manual including concept design drawings – This document has been developed to guide construction activities associated with the Wangetti Trail project to minimise impacts to the environment and ensure compliance with all permits, approvals and legislative requirements. This document is intended to provide a high-level amount of information for contractors to inform the eventual Construction Environmental Management Plan. It also including concept level drawings of the share use trail design including ancillary infrastructure and waterway crossings.
- Preliminary Environmental Management Plan (refer to Section 5 for more information)
- Preliminary Construction Environmental Management Plan (refer to Section 5.2 for more information)
- Concept Erosion and Sediment Control Plan (refer to Section 5 for more information)
- Preliminary Weeds, Pest and Diseases Management Plan (refer to Section 5 for more information)
- Preliminary Traffic Management Plan (refer to Section 5 for more information).

The above guidance documents have been included with this development application as supporting documentation.

The D&C contractor will be responsible for developing detailed design drawings, issue for construction drawings, confirming the construction methodology, finalising the environmental management documentation during the Pre-Start Trail Review (PSTR) stage.

At the commencement of the construction, the entire project area will be broken into Construction Segments. The Construction Segments assist in reducing the amount of area to be exposed during the construction phase, which in turns reduces impacts to the natural environment and reduces the impact to the movement of wildlife in the area. Before starting the construction of a Construction Segment, a Pre-Start Trail Review will be undertaken. The purpose of the PSTR is to review and inspect the proposed alignment of the trail with the TDPD Project Manager, prior to construction starting, to confirm the exact alignment within the groundtruthed corridor, identify any specific environmental values to be protected (including values identified to date together with any additional values identified during the PSTR) and to discuss and agree on specific construction treatments.

The following personnel will be involved in the PSTR:

- TDPD Project Manager
- Contractor's Project Manager
- Contractor's Trail Designer/Builder for that Construction Segment
- Suitably qualified botanist/ecologist
- DES Shadow Ranger.

A representative of the respective land manager(s), Queensland Parks and Wildlife Services (QPWS), Wet Tropics Management authority (WTMA) and the Traditional Owners will be invited to attend the PSTR.

Other personnel may also be required – for example, if the trail is in close proximity to areas of high environmental values, qualified environmental specialists should be present to provide assistance in micro-siting the trail to avoid impacts to these values. In areas of high cultural heritage values, qualified archaeologists and/or Traditional Owners should be present.

Prior to commencing the PSTR, known information about the Construction Segment will be gathered and assessed – length, proposed difficulty rating, likely construction treatments, known environmental issues that have been identified.

4.4.2 Staging and timing

In 2018, TDPD completed Stage 1, an initial application to the Department of Infrastructure, Transport, Regional Development and Communities Regional Growth Fund for the purpose of gaining funding for the construction of the Wangetti Trail. A Business Case was then developed to assist the funding applications and to inform the Commonwealth and Queensland Governments on the costs and benefits of constructing the Wangetti Trail.

Stage 2 is now being progressed to continue developing the planning and environmental assessment of the trail, and to gain the appropriate approvals required. Construction is scheduled for Quarter 2 of 2021.

Subject to approvals, the Wangetti Trail is targeted to be operational and open to the public in 2022.

4.4.3 Drawing register

The list of drawings associated with the proposed works for CMD areas 1-6 as described in the above sections is outlined in Table 4-5 below and are included in Appendix C.

Table 4-5 Drawing Register associated with the CMD area 1- 6 within Wangetti South Section A

Design drawing reference	Date	Creator	What the design is for	Location
WTSTD-001-WG2	07/04/20	World Trail	Typical trail benching standard drawings	Various sections along the shared use trail as nominated by the D&C contractor once they complete the PSTR.
WTSTD-033-WG2	07/04/20	World Trail	Vegetation clearing standard drawings	Various sections along the shared use trail as nominated by the D&C contractor once they complete the PSTR.
WTSTD-046 WG2	07/04/20	World Trail	Trail grade reversal placements and dimensions standard drawing	Various sections along the shared use trail as nominated by the D&C contractor once they complete the PSTR.
WTSTD-047 WG2	07/04/20	World Trail	Rock walled switchback placement and dimensions standard drawing	Various sections along the shared use trail as nominated by the D&C contractor once they complete the PSTR.
WTSTD-048 WG2	07/04/20	World Trail	Standard switchback placement and dimensions standard drawing	Various sections along the shared use trail as nominated by the D&C contractor once they complete the PSTR.
WTSTD-034-WG2	7/04/20	World Trail	Rock retaining wall up to 500 mm placement and dimensions standard drawings	Various sections along the shared use trail as nominated by the D&C contractor once they complete the PSTR.
WTSTD-004-WG2	7/04/20	World Trail	Rock retaining wall up to 1000 mm placement and dimensions standard drawings	Various sections along the shared use trail as nominated by the D&C contractor once they complete the PSTR.
WTSTD-045-WG2	7/04/20	World Trail	Ballast surfacing placement and dimensions standard drawing	Various sections along the shared use trail as nominated by the D&C contractor once they complete the PSTR.
WTSTD-003-WG2	07/04/20	World Trail	Precast concrete steps placement and dimensions standard drawings	Various sections along the shared use trail as nominated by the D&C contractor once they complete the PSTR.
WTSTD-005-WG2	24/03/20	World Trail	Natural rock seat placement and dimensions standard drawings	Various sections along the shared use trail as nominated by the D&C contractor once they complete the PSTR.
WTSTD-007-WG2	07/04/20	World Trail	Rock armouring placement and dimensions standard drawing	Various sections along the shared use trail intersected by waterways as nominated by the D&C contractor once they complete the PSTR
S030	03/09/2018	Bligh Tanner	For minor crossings and typical gullies	Various sections along the shared use trail intersected by waterways as nominated by the D&C contractor once they complete the PSTR
S031	03/09/2018	Bligh Tanner	For minor crossings and typical gullies	Various sections along the shared use trail intersected by waterways as nominated by

Design drawing reference	Date	Creator	What the design is for	Location
				the D&C contractor once they complete the PSTR
Concept Gully Crossings GA – Option	01/05/29	GHD	Concept Gully Crossings	Various sections along the shared use trail intersected by waterways as nominated by the D&C contractor once they complete the PSTR
WTSTD-011-WG2	07/04/20	World Trail	Adjustable rock matting 900 mm place and dimensions standard drawings	Various sections along the shared use trail as nominated by the D&C contractor once they complete the PSTR.
WTSTD-019-BF	07/04/20	World Trail	Rock and concrete spoon drains placement and dimensions standard drawing	Various sections along the shared use trail as nominated by the D&C contractor once they complete the PSTR
WTSTD-013-WG2	07/04/20	World Trail	Trail handrail – multisection placement ad dimensions standard drawing	Various sections along the shared use trail as nominated by the D&C contractor once they complete the PSTR
WTSTD-014-WG2	07/04/20	World Trail	Trail handrail – single section placement and dimensions standard drawing	Various sections along the shared use trail as nominated by the D&C contractor once they complete the PSTR
WTSD-015-WG	07/04/20	World Trail	Handrail – Post and Rail Installation Placement and Dimensions Standard Drawing	Various sections along the shared use trail as nominated by the D&C contractor once they complete the PSTR
WTSD-030-WG2	07/04/20	World Trail	Precast Concrete Steps Trail Grading Guidelines Standard Drawing	Various sections along the shared use trail as nominated by the D&C contractor once they complete the PSTR
WTSTD-031-WG2	24/03/20	World Trail	Trail – Tree Root Protection Placement and Dimensions	Various sections along the shared use trail as nominated by the D&C contractor once they complete the PSTR
WTSTD-029-WG2	24/03/20	World Trail	Raised embankment – Dual Use Placement and Dimensions	Various sections along the shared use trail as nominated by the D&C contractor once they complete the PSTR
WTSTD-040-WG2	24/03/20	World Trail	Sediment Control Placement and Dimensions	Various sections along the shared use trail as nominated by the D&C contractor once they complete the PSTR
WTSTD-041-WG2	24/03/20	World Trail	Sediment Control – Silt Fence Placement and Dimensions	Various sections along the shared use trail as nominated by the D&C contractor once they complete the PSTR
WTSTD-042-WG2	24/03/20	World Trail	Sediment Control – Silt Fence Notes Placement and Dimensions	Various sections along the shared use trail as nominated by the D&C contractor once they complete the PSTR

Design drawing reference	Date	Creator	What the design is for	Location
WTSD-021-WG2	25/03/20	World Trail	Trail Closure and Rehabilitation Placement and Dimensions Standard Drawing	Various sections along the shared use trail as nominated by the D&C contractor once they complete the PSTR.
4132458_072 Plan – 1 of 5	29/01/21	GHD	Wangetti Trail South Section A Locality Plan – shared use trail, waterway crossings, service tracks and trail head	Various sections along the shared use trail as nominated by the D&C contractor once they complete the PSTR
4132458_072 Plan – 2 of 5	29/01/21	GHD	Wangetti Trail South Section A Locality Plan – shared use trail, waterway crossings, service tracks and trail head	Various sections along the shared use trail as nominated by the D&C contractor once they complete the PSTR
4132458_072 Plan – 4 of 5	29/01/21	GHD	Wangetti Trail South Section A Locality Plan – shared use trail, waterway crossings, service tracks and trail head	Various sections along the shared use trail as nominated by the D&C contractor once they complete the PSTR

4.5 Alternative alignments

Alternative locations for Wangetti South Section A including the trail alignment was evaluated against criteria contemplating minimising impacts on cultural, World Heritage and environmental values, practicalities of access, the extent of previous clearance and operational requirements, whilst maintaining the ecotourism development objectives of providing a quality nature based tourism experience. The finalised alignment, trail and public camping node including amenities block were determined to represent minimal environmental risk. The proposed infrastructure has been carefully situated in previously disturbed areas and following existing access tracks wherever possible to achieve a least disturbance outcome.

The majority of the project area is located on national park, state land (including reserve land, unallocated state land) and state-controlled road reserve. There are no alternative locations for the project. The project aligns with the Far North Queensland Regional Plan 2009–2031 tourism development objectives to develop Far North Queensland into a world-class destination for nature-based tourism opportunities. The project will provide a low-impact, nature-based tourism attraction that will showcase the natural and cultural assets of Far North Queensland, while educating visitors about the values that makes Far North Queensland a region of outstanding ecological significance.

A summary of the alternative alignments considered during the development of the final alignment for the project are discussed below.

Alternative alignment 1 - Refined conceptual alignment with a total length of 83.5 km from Port Douglas to Palm Cove, including a shared use trail and 5 camp sites. It was determined that the conceptual alignment was not feasible in the field and needed to be changed significantly, as the conceptual alignment did not take into consideration the numerous waterways and environmentally sensitive areas intersected by the trail alignment. This meant that the conceptual alignment would be traversing sections punctuated by numerous deviations in/out of gullies, adding 10-20% extra distance to the trail and resulting in challenging build conditions. Alternative alignment 1 was not selected.

Alternative alignment 2 - Preliminary ground-truthed alignment with a total length of 119.2 km from Port Douglas to Palm Cove and including a shared use trail and 7 camp sites. According to the Wangetti Trail Detailed Design Report (World Trail, 2018), amendments were made to the conceptual alignment following preliminary ground-truthing field works undertaken by the World Trail staff. However, there were a number of issues identified as part of the ground-truthing process of the alignment which required further amendment of the alignment and they are summarised below:

- The length of the main route had increased substantially from the conceptual alignment, from 76 km to 110 km
- More camp sites and more days – the increased length required the addition of two new camp site locations (Camp Site 3 – Vodafone and Camp Site 4 – Pinnacles)
- Challenging build – Extremely steep and challenging building conditions identified on the ascent and descent to the Spring Creek plateau
- Private properties – Concerns around the proximity of the trail to private properties in the Oak Beach locality
- Dual direction link to Spring Creek – Concerns around the experience and the potential for people to short-cut the link section through to Spring Creek camp site.

Alternative alignment 2 was not selected.

Alternative alignment 3 - Final ground-truthed alignment with a total length of 91.47 km from Port Douglas to Palm Cove and including a shared use trail and 7 camp sites. Further refinement was required for the final ground-truthed alignment as a response to field investigations completed for the area and additional consultation with stakeholders, regulatory authorities and landowners. This resulted in some minor amendments to the alignment, amendments to the location of the camps and the inclusion of a separate mountain bike trail using existing access tracks. This has also resulted in the removal of one of the proposed camps on the basis of sensitive environmental areas being deemed too significant to accommodate a camp site at the proposed location. Alternative alignment 3 was not selected and required further refinement to satisfy stakeholders, land owners and regulatory authorities.

Therefore, following careful evaluation of alternative alignments for the project, the final alignment consisting of: the shared use trail, waterway crossings, Dark Jungle and service tracks was selected and there are no other feasible alternatives proposed for the project.

Justification for the work

The Wangetti Trail project aims to deliver an iconic international ecotourism experience with direct economic benefits to regional Queensland and local Traditional Owners, potentially attracting up to 28,000 local and international visitors annually. It is estimated that thousands of walkers and mountain bike riders will visit the Wangetti Trail and offer thousands of new overnight stays every year.

The Wangetti Trail will enhance conservation and protection of a cherished part of Tropical North Queensland and deliver environmental, social and economic benefits to local communities and to Queensland, including:

- New funding sources to preserve, protect and present national parks and their cultural heritage
- Better controls to limit damaging and uncontrolled activities within parks including feral animal management
- Long-term job and business opportunities for Traditional Owners and their future generations
- Enhanced connection to country whilst ensuring the protection and preservation of Land and Country
- Stronger appreciation and understanding of Indigenous culture
- Underpinning long-term growth and liveability in the Tropical North and builds community resilience for their respective regional communities
- Supporting Traditional Owner businesses, existing local businesses and new business opportunities
- 150 new local jobs created including opportunities to develop local skills and increase diversity of regional jobs
- Potential to host domestic and international competitive sporting events, such as mountain-biking competitions.

5. Proposed impacts and management strategies

This section provides a summary of the potential impacts that the construction and operation of the project within CMD areas 1-6 (within Wangetti South Section A) is anticipated to have on the values of the receiving environment, which includes:

- Land use, land tenure, special areas
- Soils and topography
- Flora and fauna
- Biosecurity
- Water resources
- Hazard, health and safety
- Social and economic
- Public amenity
- Cultural heritage
- Transport
- Waste management.

Table 5-1 outlines the potential impacts to the above-mentioned values during the construction, operation and maintenance phases. Mitigation measures developed for the project are detailed in the Preliminary Environmental Management Plan in Appendix B.

Table 5-1 Summary of potential impacts to the existing environment

Impact	Project phase			
	Planning and design	Construction	Operation	Maintenance
Land use, land tenure and special areas				
Issues with securing ILUA with the traditional owners within the project area prior to planning and design	Yes	NA	NA	NA
Increasing people numbers have a potential to adversely affect World Heritage Values	NA	NA	Yes	NA
Inappropriate or intensive recreation activities may negatively impact on conservation	NA	NA	Yes	NA

Impact	Project phase			
	Planning and design	Construction	Operation	Maintenance
Works proposed within rural and conservation zoning that does not currently contain any development may result in decreased landscape character	NA	NA	Yes	NA
Undertaking construction activities below 5 m AHD in areas that are likely to contain Potential Acid Sulfate Soils (PASS) or Actual Acid Sulfate Soils (AASS) that could result in the acidification of the surrounding environment.	NA	Yes	NA	NA
Soils and topography				
Trail users may displace soil and progressively wear down natural trail elements	NA	NA	Yes	NA
Movement of soils can adversely impact on dispersive soils which have a high erosion risk and tunnel and gully erosion can occur.	NA	Yes	Yes	NA
Erosion of soils may occur during construction. Trafficability could also prove difficult within upper layers (such as sand or clay) in wet conditions	NA	Yes	Yes	Yes
Soil compaction as a result of construction and operation equipment and vehicles moving in the area and could prove difficult within the upper loose sandy layers and the silty clay layers if exposed and trafficked under wet conditions. The upper sandy layer often overlies the less permeable silty clay layer. This ground profile can often result in wet or saturated upper layers for some time following periods of high rainfall as the sand layer is	NA	Yes	Yes	Yes

Impact	Project phase			
	Planning and design	Construction	Operation	Maintenance
typically limited to horizontal drainage.				
Flora and fauna				
Construction activities resulting in the removal of vegetation, including MNES and MSES	NA	Yes	NA	NA
Construction activities may impact flora and fauna biodiversity in the area	NA	Yes	NA	NA
Development outside of the nominated works area and within Ecologically Significant Areas	NA	Yes	NA	NA
Injury or loss of native flora and fauna as a result of the vehicles not using designated access tracks. Trail users not following designated trail.	NA	Yes	Yes	Yes
Habitat fragmentation due to construction and on-going operation of project	NA	Yes	Yes	Yes
Illegal taking of protected flora and fauna species by the general public/construction crew.	NA	Yes	Yes	Yes
Trampling of plants as a result of trail users walking off track	NA	NA	Yes	Yes
Additional disturbance to aquatic environments associated with increased foot traffic and potential deviation from designated trail areas	NA	NA	Yes	NA
Additional disturbance and disruption of flora and fauna due to increased access of area	NA	Yes	Yes	Yes
Biosecurity				

Impact	Project phase			
	Planning and design	Construction	Operation	Maintenance
Introduction or spread of weeds from construction/ operation activities or materials	NA	Yes	Yes	Yes
Spread of electric ants leading to increase pest activities	NA	Yes	Yes	Yes
The spread of Chytridiomycosis to amphibians within the project area.	NA	Yes	Yes	Yes
Introduction and accumulation of food and other waste leading to increased pest activities	NA	Yes	Yes	Yes
Interference of local wildlife by domestic animals	NA	Yes	Yes	N/A
Water resources				
Potential for flooding to occur upstream or downstream as a result of the sizing and treatment of waterway crossings	NA	NA	Yes	NA
Reduction in water quality through ineffective treatment of erosion and sediment and total suspended solids.	NA	Yes	Yes	NA
Sediment entering drainage lines or waterways and causing a reduction in downstream water quality.	NA	Yes	Yes	Yes
Major storms and resulting flooding may impact on activities. Flooding may impact on users of existing access tracks and trails	NA	Yes	Yes	Yes
Equipment used to complete works and the chemicals used in the construction. Equipment used for on-site works during the construction phase include: <ul style="list-style-type: none"> • Mini Excavators • Bobcats 	NA	Yes	N/A	NA

Impact	Project phase			
	Planning and design	Construction	Operation	Maintenance
<ul style="list-style-type: none"> Power carriers Chainsaws Compactors Generators General construction tools and equipment (drills, saws, sanders, etc.). <p>Some of this equipment will require petrol to be stored on site. Equipment will be refuelled using petrol storage containers on site and there is the potential for contamination to surrounding water resources.</p>				
Hazard, health, and safety				
<p>Bites from snakes, spiders, and insects</p> <p>Potential hostile intersection with fauna species</p> <p>Allergic reactions to plant species along the trail</p>	NA	Yes	Yes	Yes
Heat/cold exposure, falls and sprains, etc.	NA	Yes	Yes	Yes
Extreme weather events occurring within the project area and requiring evacuation and impacting structures	NA	Yes	Yes	Yes
Social and economic				
Construction activities within road reserve may result in impacts to roads users	NA	Yes	Yes	Yes
Increase in employment opportunities and movement of people from another tourist attraction	NA	Yes	Yes	NA
Increase visitors using local region facilities and infrastructure	NA	Yes	Yes	NA

Impact	Project phase			
	Planning and design	Construction	Operation	Maintenance
Public amenity				
Additional noise and vibration associated with construction/operation may negatively impact flora and fauna*	NA	Yes	Yes	NA
Additional noise and vibration associated with the movement of hikers and mountain bike riders along the trail and within the nodes.	NA	NA	Yes	NA
Production of greenhouse gases as a result of machinery use*	NA	Yes	NA	NA
Decline of air quality related to construction/operational machinery and dust particles* Production of greenhouse gases as a result vehicle using the access tracks to service the trail and nodes.	NA	Yes	Yes	Yes
Light sources generated from the construction phase and operational phase adversely impacting on wildlife.	NA	Yes	Yes	Yes
Cultural heritage				
Potential to find unrecorded cultural heritage*	NA	Yes	NA	NA
Potential to disturb identified cultural heritage*	NA	Yes	NA	NA
Additional access to sensitive and restricts sites that may impact on Traditional Owner cultural values*	NA	Yes	Yes	Yes
Transport				
Increased traffic as a result of construction activities impacting existing road users	NA	Yes	NA	NA

Impact	Project phase			
	Planning and design	Construction	Operation	Maintenance
Construction activities within the road reserve impacting other road users	NA	Yes	NA	NA
Degradation of the existing access tracks	NA	Yes	Yes	Yes
Waste management				
Waste generation/ pollution of local area during construction/ operation*	NA	Yes	Yes	Yes
Responsibility	TDPD	D&C contractor	Operator in Partnership with DES/ QPWS	Operator in Partnership with DES/ QPWS

5.1 Management Strategies

TDPD has developed a number of management plans in order to address the impacts identified in Table 5-1. These management plans have been developed in accordance with legislative requirements with respect to Commonwealth, State (Queensland) and local legislation and those statutory approvals that are associated with the project. Considerations of relevant authorities including but not limited to the Wet Tropics Management Authority (WTMA), DES, Queensland Parks and Wildlife Service (QPWS)), State emergency services (police/fire/ambulance) and TMR will be undertaken by TDPD.

As a result, a number of management plans have been developed for the construction and operational phase of the project and they include:

- Preliminary Environmental Management Plan (EMP)
- Preliminary Construction Environmental Management Plan (CEMP)
- Concept Erosion and Sediment Control Plan (CESCP)
- Preliminary Weeds, Pest and Diseases Management Plan (WPDMP)
- Preliminary Traffic Management Plan (TMP)
- MNES flora pre-clearance survey methodology.

The following sections below provide an overview of each plan and detail how the plans have been structured. The EMP has been attached as Appendix B, which appends the CEMP, CESCP, WPDMP, TMP and MNES flora pre-clearance survey methodology.

5.1.1 Preliminary Environmental Management Plan

Overview

The EMP details the performance objectives, actions and procedures to be carried out to minimise potential environmental impacts during the construction phase and operational phase of the Wangetti South Section A.

The EMP is the key reference document which identifies actions and commitments to be followed during the Project. The EMP serves as a benchmark for measuring the effectiveness of environmental protection and management. This will be achieved by specifying monitoring and reporting requirements, with nominated responsibilities and timing to ensure necessary performance objectives are met.

The contractors assigned to the Project will use the information in this document to develop an environmental management system and documentation for the construction and operational phase of the Project.

The EMP is a stand-alone, dynamic, document which will be reviewed and updated as required to reflect changes in processes, controls and procedures.

5.1.2 Preliminary Construction Environmental Management Plan

Overview

The CEMP guides construction activities associated with the Wangetti South Section A and B to prevent or minimise the environmental impacts and disturbance on site and to the surrounding environment during the construction phase. This CEMP has been prepared to satisfy the environmental obligations during the construction phase and complements the overarching Wangetti South Section A and B Environmental Management Plan.

The CEMP adopts a risk-based approach to identify and prioritise actions, which addresses the key environmental values, uses and sensitive components. The CEMP adopts provisions based on industry standard practices for minimisation and rehabilitation of environmental impacts during construction. The provisions reflect the potential for indirect and direct impacts posed by construction activities, such as unauthorised clearing, dust emissions during high winds and collisions with wildlife.

The CEMP is broken down into the following sections:

- Section 1: Introduction
- Section 2: Potential environmental impacts and risks
- Section 3: CEMP Provisions
- Section 4: Rehabilitation of works areas
- Section 5: Monitoring
- Section 6: Audit
- Section 7: Review
- Section 8: Emergency incident planning and response.

5.1.3 Concept Erosion and Sediment Control Plan

Overview

The CESC provides preliminary guidance to establish appropriate site erosion and sediment control (ESC) management measures to reduce potential adverse impacts during the construction phase of the Project. It is expected that prior to any construction activity for the Project, a detailed work specific ESCP will be developed by the contractor as part of the CEMP. The contractor will review the preliminary guidance provided in the CESC and provide greater detail based on construction methodology, geotechnical conditions, and timing of works.

The CESC does not prescribe or locate any permanent or temporary erosion or sediment control measures in detail but provides indicative locations for erosion and sediment control devices as one measure of meeting the contractor's responsibilities.

The CESC has been developed in general accordance with International Erosion Control Association's (IECA) Best Practice Erosion and Sediment Control Guidelines (2008).

Structure of the CESC

Table 5-2 below provides a breakdown of the structure of the CESC and an overview of each section.

Table 5-2 Structure of the CESC

Section	Comments
Section 1: Introduction	Includes project background, purpose and scope of the CESC, and relevant guidelines and legislation.
Section 2: Site description	Details all characteristics of the Project including location, proposed works, topography, geology, soils, and hydrology and drainage.
Section 3: Erosion hazard assessment	Preliminary erosion hazard assessment in accordance with Section 5.2 of the IECA Manual (IECA 2008). A preliminary

Section	Comments
	erosion hazard assessment provides an indication of the erosion risk of the Project as a whole.
Section 4: Construction staging and timing	Details the proposed construction staging of the Project, including the proposed staging of erosion and sediment controls.
Section 5: Erosion and sediment control measures	Identifies a range of suitable erosion, sediment and drainage control types, and their respective locations, that could be adopted for each disturbed area.
Section 6: Monitoring and maintenance	Details the requirements for site inspections and monitoring of ESC, wet weather preparedness and non-conformances and corrective actions.
Section 7: Conclusion	Details recommendations for erosion and sediment control relevant for the Project.

5.1.4 Preliminary Weeds, Pest and Diseases Management Plan

Overview

A preliminary WPDMP has been prepared to satisfy the obligations and complements the overarching Wangetti South Section A and B Environmental Management Plan.

The objectives of the WPDMP is to:

- Protect the biodiversity of the surrounding landscape of the adverse impacts from weeds
- Reduce weed infestations by integrating control methods and cost-effective management
- Manage weeds in disturbed areas and to protect rehabilitated areas
- Manage the weed species that are currently present on the site as well as off-site work areas
- Prevent introduction of new weed infestations to the Project area and adjoining areas
- Increase on-site awareness about the major weed species and manage pest species through strategic management, where possible
- Avoid and effectively manage impacts associated with weeds, pests and diseases.

The WPDMP provides an overview of the strategy, methods and controls implemented as part of the Wangetti South Section to manage the issue of weeds, pests and diseases. Specifically, this WPDMP identifies weeds, pests and potential diseases within the Wangetti South Section and describes management strategy, to identify, avoid and prevent/minimise and control the introduction of and spread of weeds, pests and diseases within the Wangetti South Section A and B and to neighbouring areas.

Structure of the WPDMP

Table 5-3 below provides a breakdown of the structure of the WPDMP and an overview of each section.

Table 5-3 Structure of the WPDMP

Section	Comments
Section 1: Introduction	Details the project background, purpose and objective of the WPDMP and site specific background documents.
Section 2: Roles and responsibilities	Outlines parties associated with the Wangetti South Section and the responsibilities regarding weeds, pests and disease management.
Section 3: Legal and other requirements	Details the applicable legislation, regulations, guidelines and strategies enacted by the Commonwealth, State of Queensland and local governments for weed, pest and disease management in the Wangetti South Section.
Section 4: Existing environment	Identifies the weeds, pests, diseases (pathogens) and biosecurity zones likely to occur within the Wangetti South Section.
Section 5: Impact assessment and mitigation	A summary of potential impacts associated with biosecurity matters that could be generated by activities undertaken during the construction and operational phases of the project and could impact on the ecological values of the receiving environment.
Section 6: Reporting, auditing and review	Reporting, auditing and review requirements relating to weed, pests and diseases.

5.1.5 Preliminary Traffic Management Plan

Overview

A preliminary TMP provides preliminary guidance to help establish appropriate traffic control and traffic management procedures manage potential hazards associated with the traffic environment during the Project and to reduce potential adverse impacts to people and wildlife during the construction and operational phases of the Project.

It is expected that prior to any construction activity and operational activity for the Project, a detailed work specific TMP will be developed by the contractor as part of the EMP. The contractor should review the preliminary guidance provided in this TMP and provide greater detail based on construction methodology, operational activities, and timing of works. The TMP will also need to be in general accordance with the MUTCD, Austroads Guide to Traffic Management and Transport and Main Roads Specifications MRTS02 Provision for Traffic.

Structure of the TMP

Table 5-4 below provides a breakdown of the structure of the WPDMP and an overview of each section.

Table 5-4 Structure of the TMP

Section	Comments
Section 1: Introduction	Details project background, and purpose and objectives of the TMP.

Section	Comments
Section 2: Project overview	Provides an overview of the Project including location, impacted properties, proposed works during construction and operational phases, and impacts to existing traffic and road environments.
Section 3: Traffic hazard risk assessment	Identifies traffic related risks that have been identified with the Project and could take place during the construction and operational phases of the Project.
Section 4: General specifications	Discusses the mitigation measures that have been developed to minimise the impacts to existing road network, pedestrians and MNES within the Project area and surrounding area associated by the movement of vehicles within the Wangetti South Section.

5.1.6 Matters of National Environmental Significance flora pre-clearance survey methodology

Overview

The purpose of the Matters of National Environmental Significance flora pre-clearance survey methodology was to outline the pre-clearance survey methodology to be adopted before starting construction works for the Wangetti South Section to demonstrate how protected flora species will be identified and managed as part of the project. Protected flora considered by the document are those that are listed as MNES under the EPBC Act. The document outlines the timing of the MNES flora pre-clearance survey, the personnel required to undertake the MNES flora pre-clearance survey and the methods to be adopted.

Structure of the MNES flora pre-clearance survey methodology

Table 5-5 below provides a breakdown of the structure of the MNES flora pre-clearance survey methodology and an overview of each section.

Table 5-5 Structure of the MNES flora pre-clearance survey methodology

Section	Comments
Section 1: Introduction	Details the project background, purpose of the document.
Section 2: MNES flora pre-clearance survey methodology	A discussion of the methodology, the target species, the survey team, the area to targeted and the timing of the survey.
Section 3: Reporting	Details of the reporting process and mechanism for the MNES flora pre-clearance survey during the PSTR.
Section 4: Predicted effectiveness	A discussion of the effectiveness of adopting the MNES flora pre-clearance survey methodology in order to avoid potential impacts to MNES flora species.

6. Assessable development and documentation

6.1 Assessable development

CMD Areas 1 to 6 are proposed above the HAT and is located on state coastal land under the Coastal Act. The proposed works will involve limited excavation works to establish the shared use trail within the CMD area and therefore trigger operational works that is interfering with quarry material on State coastal land above the high-water mark. The proposed works within CMD areas will also involve the formalisation of existing access track into service tracks to provide restricted access to the shared use trail for construction purposes, operational purposes, maintenance purpose and for emergency purposes. This could involve grading/improvements to the existing access tracks to allow them to cater for the vehicles to be used for the project. Limited clearing is required to remove vegetation that has grown over the existing access tracks. Only overhanging vegetation over the existing access tracks will be cut back.

Douglas Shire Council will be the assessment manager for the development application. The referral agency is SARA with DES being a technical agency for the operational works for work in a CMD component.

6.2 Compliance with State Code 8: Coastal development and tidal works

The proposed works within CMD areas 1 to 6 have been assessed against the relevant provisions under State Code 8. Refer to Appendix A for statements of code compliance with State Code 8.

The intent of State Code 8 is to:

- Protect infrastructure from the impacts of coastal erosion
- Maintain coastal processes
- Conserve coastal resources
- Maintain appropriate public use of, and access to and along, State Coastal Land
- Account for the projected impacts of climate change
- Avoid impacts on MSES and, where avoidance is not reasonably possible, minimise and mitigate impacts
- Provide and offset for significant residual impacts, where appropriate

Table 6-1 provides responses against the intent of State Code 8 to demonstrate that the proposed works for CMD areas 1- 6 are consistent with the intent of the Code.

Table 6-1 Assessment of the proposed works within CMD area 1-6 against the intent of State Code 8

Intent of State Code 8	Response
Protect infrastructure from the impacts of coastal erosion	CMD areas 1 to 6 have been located as far landward as possible to avoid impacts to coastal resources. The proposed works are also located away from residential areas and private properties. Refer to the response in Appendix A.
Maintain coastal processes	Works within CMD areas 1 to 6 will not directly or indirectly increase the severity of coastal erosion. The proposed works are minor in nature and where works are proposed, erosion and sediment control measures will be implemented. Construction activities will also be undertaken sequentially, with limited areas of exposed earth to occur at any one time. The proposed structures are sympathetic and embedded within the surrounding landscape. The structures are also to be constructed with natural materials where possible and do not interfere with coastal processes. They have been designed so that coastal processes can work around the structures without causing erosion. Refer to the response in Appendix A.
Conserve coastal resources	CMD areas 1 to 6 have been located as far landward as possible to avoid impacts to coastal resources. Refer to the response in Appendix A.
Maintain appropriate public use of, and access to and along, State Coastal Land	The shared use trail will open that area to enhance public use of and access to state coastal land. Refer to the response in Appendix A.
Account for the projected impacts of climate change	Refer the responses in Appendix A.
Avoid impacts on MSES and, where avoidance is not reasonably possible, minimise and mitigate impacts	Works within CMD areas 1 to 6 have been designed to avoid and minimise their impact on MSES and detailed response has been provided in Appendix A.
Provide and offset for significant residual impacts, where appropriate	It has been determined that works within CMD areas 1 to 6 will not trigger environmental offsets.

The proposed development is considered to comply with the provisions of State Code 8 as demonstrated by the responses in Table 6-1.

7. Conclusion

This report demonstrates the proposed works within the CMD areas 1 to 6 comply with the performance outcomes of State Code 8: Coastal Development and Tidal Works. From the preceding information, this report finds the proposed works within the CMD areas are consistent with the intent of the conservation zone, surrounding locality, and the applicable local and State Planning instruments.

The project has the support from the following parties: Wet Tropics Management Authority, DES, TMR and traditional owners. The project will provide a low-impact, nature-based tourism attraction that will showcase the natural and cultural assets of Far North Queensland, while educating visitors about the values that makes Far North Queensland a region of outstanding ecological significance. Potential impacts arising from the construction and operational phases of the project will be managed through the implementation of a number of management plans. It is recommended that this proposal is approved, subject to reasonable and relevant conditions.

Appendices

Appendix A - State Code 8: Coastal Development and tidal works

State code 8: Coastal development and tidal works

Table 8.2.1: All development

Performance outcomes	Acceptable outcomes	Response
Development in the erosion prone area		
<p>PO1 Development does not occur in the erosion prone area unless the development:</p> <ol style="list-style-type: none"> is one of the following types of development: <ol style="list-style-type: none"> coastal-dependent development; or temporary, readily relocatable or able to be abandoned; or essential community infrastructure; or redevelopment of an existing permanent building or structure that cannot be relocated or abandoned; and cannot feasibly be located elsewhere. 	No acceptable outcome is prescribed.	<p>PO1 – Complies</p> <p>Wangetti South Section A has six sections that intersect Coastal Management Districts (CMD) and there are two areas of which are mapped within erosion prone areas. The proposed works will not exceed the excavating or filling 1,000m³ and/or the clearing native vegetation from an area of 1,000m².</p> <p>The proposed development is to occur in this erosion prone area because:</p> <ul style="list-style-type: none"> The proposed trail will be limited to a permanent width of 1.5 m and will be constructed utilising existing soils. The trail and associated waterway infrastructure are considered to be expendable infrastructure if threatened by a storm event such as a cyclone. Further to this, it will not impact on the natural processes of the environment. The formalisation of existing access tracks into service tracks to provide restricted access to the shared use trail for construction purposes, operational purposes, maintenance purpose and for emergency purposes. The works are for an adventure-based ecotourism development that highlights the Wangetti coastal areas, it is not feasible for the project to be located elsewhere.
<p>PO2 Development other than coastal protection work:</p> <ol style="list-style-type: none"> avoids impacting on coastal processes; and ensures that the protective function of landforms and vegetation is maintained. 	No acceptable outcome is prescribed.	<p>PO2 – Complies</p> <p>The proposed development is an ecotourism shared use hiking trail through largely untouched land. The trail has been designed such that it is responsive to the natural environmental values, enhancing conservation and protection of a cherished part of Tropical North Queensland. The trail is set back from the coastline, located above HAT and is not expected to interfere with</p>

Performance outcomes	Acceptable outcomes	Response
<p>Note: In considering reconfiguring a lot applications, the state may require land in the erosion prone area to be surrendered to the State for coastal management purposes under the <i>Coastal Protection and Management Act 1995</i>.</p> <p>Where the planning chief executive receives a copy of a land surrender requirement or proposed land surrender notice under the <i>Coastal Protection and Management Act 1995</i>, this must be considered in assessing the application.</p>		<p>coastal processes. The trail also does not intersect any marine vegetation.</p> <p>The trail will be limited to a 1.5 m trail and 1 m temporary construction footprint (0.5 m either side of the trail) is proposed. While minor vegetation clearing is proposed, this area is minimal and any vegetation removed will be scattered through the surrounding environment, providing habitat for fauna in the area. The structures are sympathetic and embedded within the surrounding landscape. The structures are also to be constructed with natural materials where possible and do not interfere with coastal processes.</p> <p>Grading and improvements of existing access tracks will be undertaken to allow them to cater for vehicles to be used for the project. This work may include minor vegetation trimming of overhanging vegetation.</p> <p>Consequently, given the nature of the development, impacts on coastal process, landforms and vegetation will be minimal and mitigated where possible.</p>
<p>PO3 Development is located, designed and constructed to minimise the impacts from coastal erosion by:</p> <ol style="list-style-type: none"> 1. locating the development as far landward as practicable; or 2. where it is demonstrated that 1 is not feasible, mitigate or otherwise accommodate the risks posed by coastal erosion. 	<p>No acceptable outcome is prescribed.</p>	<p>PO3 – Complies</p> <p>Wangetti South Section A intersects six CMD areas and have been designed to be located as far landward as possible. The shared use trail is located above the high-water mark on state coastal land. Refer to Table 1-2.</p> <p>This development has been designed such that it is responsive to the natural environmental values, enhancing conservation and protection of a cherished part of Tropical North Queensland. To experience the best visual amenity that the region has to offer, the trails alignment hugs the shoreline in many cases. However, to minimise erosion impacts, the alignment is set back some distance from the foreshore and coastal features.</p> <p>The trail is considered to be expendable infrastructure if threatened by a storm event such as a cyclone and will not impact on the natural processes of the environment. Further to this, the works are for an adventure-based ecotourism development the use that highlights the Port Douglas coastal areas, it is not feasible for the project to be located elsewhere.</p> <p>TDPD has developed a number of management plans in order to address the impacts identified in Table 5 1. These mitigation measures have been developed in accordance with legislative requirements with respect to Commonwealth, State (Queensland)</p>

Performance outcomes	Acceptable outcomes	Response
		<p>and local legislation and those statutory approvals that are associated with the project. Considerations of relevant authorities including but not limited to the Wet Tropics Management Authority (WTMA), Department of Environment and Science (DES), Queensland Parks and Wildlife Service (QPWS)), State emergency services (police/fire/ambulance) and Department of Transport and Main Roads will be undertaken by TDPD.</p> <p>A number of management plans have been developed for the construction and operational phase of the project that will mitigate any identified risks associated with erosion, they include:</p> <ul style="list-style-type: none"> • Environmental Management Plan (EMP) • Construction Environmental Management Plan (CEMP) • Concept Erosion and Sediment Control Plan (CESCP) • Matters of National Environmental Significance (MNES) flora pre-clearance survey methodology.
PO4 Development does not significantly increase the risk or impacts to people and property from coastal erosion.	No acceptable outcome is prescribed.	<p>PO4 – Complies</p> <p>CMD area 1 -6 are located away from existing coastal processes, residential areas and private property. It is located within state land and therefore the risk or impacts to property or coastal erosion is low.</p> <p>The shared use trail will have a permanent disturbance footprint width of 1.5 m and a temporary disturbance footprint of 0.5 m either side of the permanent disturbance footprint, with a total temporary disturbance width of 1 m. Waterway crossings will be required. However, the proposed structures are sympathetic and embedded within the surrounding landscape. Further to this, the structures are also to be constructed with natural materials where possible and do not interfere with coastal processes.</p> <p>The location of the proposed works has been designed following numerous site investigations of the project area, discussions with landowners and stakeholders and input from the design team and the environment team.</p>

Performance outcomes	Acceptable outcomes	Response
<p>PO5 Development other than coastal protection work avoids directly or indirectly increasing the severity of coastal erosion either on or off the site.</p>	<p>No acceptable outcome is prescribed.</p>	<p>PO5 – Complies</p> <p>Wangetti South Section A Project area will not directly or indirectly increase the severity of coastal erosion. The proposed works are minor in nature and where works are proposed, erosion and sediment control measures will be implemented. Construction activities will also be undertaken sequentially, with limited areas of exposed earth to occur at any one time. The proposed structures are sympathetic and embedded within the surrounding landscape. The structures are also to be constructed with natural materials where possible and do not interfere with coastal processes. They have been designed so that coastal processes can work around the structures without causing erosion.</p> <p>A number of management plans have been developed for Wangetti South Section (A and B) in order to address the impacts to MSES and MNES. These mitigation measures have been developed in accordance with legislative requirements with respect to Commonwealth, State (Queensland) and local legislation and statutory approvals associated with the project. Considerations of relevant authorities including but not limited to the Wet Tropics Management Authority (WTMA), Department of Environment and Science (DES), Queensland Parks and Wildlife Service (QPWS)), State emergency services (police/fire/ambulance) and Department of Transport and Main Roads, will be undertaken by TDPD.</p> <p>The management plans that have been developed for the construction and operational phase of the project are outlined below:</p> <ul style="list-style-type: none"> — Preliminary Environmental Management Plan (EMP) — Preliminary Construction Environmental Management Plan (CEMP) — Concept Erosion and Sediment Control Plan (CESCP).
<p>PO6 In areas where a coastal building line is present, building work is located landward of the coastal building line unless coastal protection work has been constructed to protect the development.</p>	<p>No acceptable outcome is prescribed.</p>	<p>PO6 – Not Applicable</p> <p>The works are not proposed in an area where a coastal building line is present.</p>

Performance outcomes	Acceptable outcomes	Response
Artificial waterways		
PO7 Development of artificial waterways, canals and dry-land marinas minimises impacts on coastal resources by: <ol style="list-style-type: none"> maintaining the tidal prism volume of the natural waterway to which it is connected demonstrating a whole-of-life strategy for the disposal of dredged material. 	No acceptable outcome is prescribed.	PO7 – Not Applicable Development does not consist of constructing artificial waterways.
Coastal protection work		
PO8 Works for beach nourishment minimise adverse impacts on coastal processes and avoid any increase in the severity of erosion on adjacent land by: <ol style="list-style-type: none"> sourcing sand from an area that does not adversely impact on the active beach system ensuring imported sand is compatible with natural beach sediments and coastal processes of the receiving beach. 	No acceptable outcome is prescribed.	PO8 – Not Applicable Development does not consist of beach nourishment works.
PO9 Erosion control structures are only constructed where there is an imminent threat to buildings or infrastructure of value, and there is no feasible option for either: <ol style="list-style-type: none"> beach nourishment; or relocation or abandonment of structures. <p>Statutory Note: The monetary value of buildings or infrastructure should be more than the cost of associated erosion control structures.</p>	No acceptable outcome is prescribed.	PO9 – Not Applicable Development does not consist of erosion control structures.
PO10 Erosion control structures minimise interference with coastal processes, or any increase to the severity of erosion on adjacent land by: <ol style="list-style-type: none"> locating the erosion control structure as far landward as practicable and directly adjacent to the structure it is intended to protect 	No acceptable outcome is prescribed.	PO10 – Not Applicable Development does not consist of erosion control structures.

Performance outcomes	Acceptable outcomes	Response
<ol style="list-style-type: none"> 2. where required and feasible, importing sand to the site to mitigate any increase in the severity of erosion 3. the design of the structure. 		
Water quality		
<p>PO11 Development:</p> <ol style="list-style-type: none"> 1. maintains or enhances environmental values of receiving waters 2. achieves the water quality objectives of Queensland waters 3. avoids the release of prescribed water contaminants to tidal waters. <p>Note: See Environmental Protection (Water) Policy 2009 for the relevant water quality objectives.</p>	No acceptable outcome is prescribed.	<p>PO11 – Complies</p> <p>Wangetti South Section A traverses a number of watercourses and 'yet to be mapped features' under the Water Act 2000. Wangetti South Section A also intersects a number of mapped Queensland Waterways for Waterway Barrier Works on Queensland Globe which are protected under the Fisheries Act 1994. CMD area 1, 2 and 3 will intersect a number of waterways, various waterway crossings will be required at these locations to allow hikers and mountain bikers to safely cross the waterway. The exact and type of structure proposed as the waterway crossings will be determined by the trail builder and will comprise of the following options:</p> <ul style="list-style-type: none"> — Rock armour crossings — Gully crossing style bridges. <p>Appropriate erosion and sediment control measures will be installed.</p> <p>The proposed works are not considered to result in a significant impact to waterways for the following reasons:</p> <ul style="list-style-type: none"> • A single span bridge will be used to minimise disturbance with waterways and loss of aquatic habitats. The bridge will be designed to completely span suitable habitat and limit public access to waterways. No in-stream crossings will be included. • During construction phase, all machinery and vehicle hygiene protocols to be followed at all times to prevent the introduction of weeds and pathogens. Vehicles, plant and equipment to be used for the project would be required to be clean with Weed and Seed Hygiene Declaration certificates. Vehicles, plant and equipment to be inspected prior to being used to ensure they are clean.

Performance outcomes	Acceptable outcomes	Response
		<ul style="list-style-type: none"> Disinfecting vehicles and machinery. This will be undertaken during the construction phase of the project and maintained throughout. Techniques for installing the bridges has been outlined in the Wangetti Trail Construction Methodology Manual and include spanning the full width of the waterway so that no works occurs within the waterway and existing nature features are left in place within the waterway. <p>Further to this, the construction contractor will develop and implement a CEMP to manage the release of runoff during the construction and a Water Quality Management Plan. This Plan will allow for the construction contractor to monitor the works and check that the works comply with the requirements of Environment Protection Policy (Water and Wetland Biodiversity) 2019 and catchment management plans prepared for local waterways. During construction, daily checks of erosion and sediment control measures will be undertaken to ensure that they remain efficient.</p>
Category C and R areas of vegetation		
PO12 Development: <ol style="list-style-type: none"> avoids impacts on category C areas of vegetation and category R areas of vegetation; or minimises and mitigates impacts on category C areas of vegetation and category R areas of vegetation after demonstrating avoidance is not reasonably possible. 	No acceptable outcome is prescribed.	<p>PO12 – Complies</p> <p>Wangetti South Section A CMD areas intersect Category C regional ecosystems in:</p> <ul style="list-style-type: none"> CMD Area 1: <ul style="list-style-type: none"> Endangered RE: 0.10 ha Of concern RE: 0.17 ha CMD Area 3: <ul style="list-style-type: none"> Endangered RE: 0.01 ha Of concern RE: 0.06 ha <p>Wangetti South Section A is exempt from triggering an operational work involving clearing native vegetation under Schedule 10, Part 3, Division 4, Table 1, Item 1, as the proposed works is considered to meet the definition of government supported transport infrastructure.</p>

Performance outcomes	Acceptable outcomes	Response
		<p>Under Schedule 21, part 1, section 1, item 14(b) of the Planning Regulation 2017, an exemption applies for the clearing of native vegetation for constructing or maintaining infrastructure stated in Schedule 5 of the Planning Regulation if the infrastructure is government supported transport infrastructure.</p> <p>Schedule 5 of the Planning Regulation 2017 covers transport infrastructure, including transport infrastructure stated in schedule 2 of the Act, definition development infrastructure. Given that Wangetti South Section A work involve developing infrastructure for pedestrian and cyclists is it considered to be a 'public cycleway'. Therefore, the project is exempt from the clearing of remnant Category B, Category C and Category R vegetation.</p> <p>Vegetation clearing not required for the full extent of the area as the trail. The benefits of a single track trail is that it can wind around obstacles such as trees, large rocks, and bushes, it can blend into the surrounding environment, and disturbs much less ground, making it easier to maintain.</p>
Public use of and access to state coastal land		
PO13 Development maintains or enhances public use of and access to and along state coastal land (except where this is contrary to the protection of coastal resources or public safety).	No acceptable outcome is prescribed.	<p>PO13 – Complies</p> <p>The shared use trail will open that area to enhance public use of and access to state coastal land.</p> <p>The Wangetti Trail project aims to deliver an iconic international ecotourism experience with direct economic benefits to regional Queensland and local Traditional Owners, potentially attracting up to 28,000 local and international visitors annually. It is estimated that thousands of walkers and mountain bike riders will visit the Wangetti Trail and offer thousands of new overnight stays every year.</p> <p>The Wangetti Trail will enhance conservation and protection of a cherished part of Tropical North Queensland and deliver environmental, social and economic benefits to local communities and to Queensland.</p>
PO14 Private marine development ensures that works: <ol style="list-style-type: none"> 1. are used for marine access purposes only 2. minimise the use of state coastal land 3. do not interfere with access between navigable waterways and adjacent properties. 	No acceptable outcome is prescribed.	<p>PO14 – Not Applicable</p> <p>The Wangetti South Section A Project area does not include construction of a private marine development.</p>

Performance outcomes	Acceptable outcomes	Response																																																															
PO15 Development ensures erosion control structures are located within the premises they are intended to protect unless there is no feasible alternative.	No acceptable outcome is prescribed.	PO15 – Not Applicable The proposed works is not considered to meet the definition of an erosion control structure. However, the proposed trail and associated waterway infrastructure (rock armour) will provide a safe designated path for pedestrians and mountain bikers to use as part of an ecotourism experience. By providing the works, it avoids the creation of informal tracks which have the potential to cause coastal erosion in the area, whilst providing an ecotourism experience for users. The proposed works are set back from the HAT tide level and marine plant areas and will therefore avoid impacts to coastal processes.																																																															
Matters of state environmental significance																																																																	
PO16 Development: <div><div>1. avoids impacts on matters of state environmental significance; or</div><div>2. minimises and mitigates impacts on matters of state environmental significance after demonstrating avoidance is not reasonably possible; and</div><div>3. provides an offset if, after demonstrating all reasonable avoidance, minimisation and mitigation measures are undertaken, the development results in an acceptable significant residual impact on a matter of state environmental significance.</div></div> Statutory note: For Brisbane core port land, an offset may only be applied to development on land identified as E1 Conservation/Buffer, E2 Open Space or Buffer/Investigation in the Brisbane Port LUP precinct plan. For the Brisbane Port LUP, see www.portbris.com.au . Note: Guidance for determining if the development will have a significant residual impact on the matter of state environmental significance is provided in the Significant Residual Impact Guideline, Department of State Development, Infrastructure and Planning, 2014. Where the significant residual impact is considered an	No acceptable outcome is prescribed.	PO16 – Complies The proposed works impact on matters of state environmental significance (MSES). The impact (in hectares) is summarised in the table below. <table><tr><th></th><th>CMD Area 1</th><th>CMD Area 2</th><th>CMD Area 3</th><th>CMD Area 4</th><th>CMD Area 5</th><th>CMD Area 6</th></tr><tr><td>CMD (ha)</td><td>1.79</td><td>2.49</td><td>6.82</td><td>0.85</td><td>0.03</td><td>0.06</td></tr><tr><td>7a Threatened (endangered or vulnerable) wildlife (ha)</td><td>1.42</td><td>1.74</td><td>6.09</td><td>-</td><td>-</td><td>-</td></tr><tr><td>7b Special least concern animals (ha)</td><td>1.42</td><td>2.49</td><td>6.56</td><td>0.85</td><td>-</td><td>-</td></tr><tr><td>8a Regulated vegetation – Endangered / Of Concern in Category B (remnant) (ha)</td><td>1.42</td><td>0.05</td><td>4.90</td><td>0.85</td><td>-</td><td>0.05</td></tr><tr><td>8c Regulated vegetation – Category R (GBR riverine regrowth) (ha)</td><td>0.31</td><td>-</td><td>0.07</td><td>-</td><td>0.02</td><td>-</td></tr><tr><td>8d Regulated vegetation – essential habitat (ha)</td><td>1.42</td><td>1.79</td><td>6.05</td><td>0.04</td><td>-</td><td>-</td></tr><tr><td>8e Regulated vegetation – intersecting a watercourse (km)</td><td>0.13</td><td>0.03</td><td>0.30</td><td>0.10</td><td>-</td><td>-</td></tr><tr><td>8f Regulated vegetation – within 100 m of a vegetation management wetland</td><td>-</td><td>-</td><td>0.26</td><td>-</td><td>-</td><td>-</td></tr></table>		CMD Area 1	CMD Area 2	CMD Area 3	CMD Area 4	CMD Area 5	CMD Area 6	CMD (ha)	1.79	2.49	6.82	0.85	0.03	0.06	7a Threatened (endangered or vulnerable) wildlife (ha)	1.42	1.74	6.09	-	-	-	7b Special least concern animals (ha)	1.42	2.49	6.56	0.85	-	-	8a Regulated vegetation – Endangered / Of Concern in Category B (remnant) (ha)	1.42	0.05	4.90	0.85	-	0.05	8c Regulated vegetation – Category R (GBR riverine regrowth) (ha)	0.31	-	0.07	-	0.02	-	8d Regulated vegetation – essential habitat (ha)	1.42	1.79	6.05	0.04	-	-	8e Regulated vegetation – intersecting a watercourse (km)	0.13	0.03	0.30	0.10	-	-	8f Regulated vegetation – within 100 m of a vegetation management wetland	-	-	0.26	-	-	-
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Performance outcomes	Acceptable outcomes	Response
<p>acceptable impact on the matter of state environmental significance and an offset is considered appropriate, the offset should be delivered in accordance with the <i>Environmental Offsets Act 2004</i>.</p>		<p>Multiple alternatives were considered for the proposed works and the final alignment was selected as it avoided a number of matters of national environmental significance and is located on the landward most edge of the CMD areas.</p> <p><u>Essential habitat</u></p> <p>The proposed works within the CMD areas are not considered to result in a significant impact to essential habitat for the following reasons:</p> <ul style="list-style-type: none"> clearing of essential vegetation complies with the width thresholds specified in Table 1, SDAP Module 8 and exceeding the area threshold by less than 50% <p>The shared use trail within the CMD areas will be limited to a permanent width of 1.5m.</p> <ul style="list-style-type: none"> The benefits of a shared use trail is that it can wind around obstacles such as trees, large rocks, and bushes, it can blend into the surrounding environment, and disturbs much less ground, making it easier to maintain. No fences area proposed along the trail and therefore will not impede the movement of fauna species across the trail. The proposed infrastructure is not considered to lead to a long-term decrease in the size of a local population; or reduce the extent of occurrence of the species; or fragment an existing population. The shared use trail will have a temporary disturbance of up to 0.5 m on either side of the 1.5 m trail. This has been allowed during the construction phase in order to accommodate construction equipment including a small excavator. Up to 2.5 m height temporary disturbance has been allowed during the construction phase in order to accommodate construction equipment including a small excavator. A construction allowance corridor– 20 m on either side of the trail (total buffer of 40 m) has been allowed for the trail to provide flexibility to the trail builders to deviate from the alignment up to 20 m to either side, in order to respond to any unexpected issues that may arise. The 40 m corridor should

Performance outcomes	Acceptable outcomes	Response
		<p>be sufficient in most cases to enable the trail to be moved or adjusted to avoid any environmentally sensitive wildlife areas/plants/plant communities that may be identified in subsequent approvals.</p> <p>The shared use trail will not function as a barrier to the movement of wildlife, as no structure will be established, and the clearing footprint will be very narrow with a permanent footprint of 1.5 m in width. Furthermore, clearing will retain large canopy trees wherever possible with the intention that disruption of habitat connectivity will be mitigated.</p> <ul style="list-style-type: none"> The proposed infrastructure is not considered to result in invasive species that are harmful to an endangered or vulnerable species becoming established in the endangered or vulnerable species' habitat; or introduce disease that may cause the population to decline. A Preliminary Weeds, Pest and Diseases Management Plan (WPDMP) has been developed for the construction and operational phases of the project. <p><u>Regulated Vegetation</u></p> <p>The shared use trail within the CMD areas will be limited to a permanent width of 1.5m. However, the benefits of a shared use trail is that it can wind around obstacles such as trees, protected plants, large rocks, and bushes, it can blend into the surrounding environment, and disturbs much less ground, making it easier to maintain. No fences area proposed along the trail and therefore will not impede the movement of fauna species across the trail.</p> <p>Therefore, no significant impacts to regulated vegetation are expected for the project.</p> <p>Wangetti South Section A project is exempt from triggering an operational work involving clearing native vegetation under Schedule 10, Part 3, Division 4, Table 1, Item 1, as the proposed</p>

Performance outcomes	Acceptable outcomes	Response
		<p>works is considered to meet the definition of government supported transport infrastructure.</p> <p>Under Schedule 21, part 1, section 1, item 14(b) of the Planning Regulation 2017, an exemption applies for the clearing of native vegetation for constructing or maintaining infrastructure stated in Schedule 5 of the Planning Regulation if the infrastructure is government supported transport infrastructure.</p> <p>Schedule 5 of the Planning Regulation 2017 covers transport infrastructure, including transport infrastructure stated in schedule 2 of the Act, definition development infrastructure. Given that Wangetti South Section A work involves developing infrastructure for pedestrian and cyclists is it considered to be a 'public cycleway'. Therefore, Wangetti South Section B project is exempt from the clearing of remnant Category B, Category C and Category R vegetation.</p> <p>Vegetation clearing not required for the full extent of the area as the trail. The benefits of a single track trail is that it can wind around obstacles such as trees, large rocks, and bushes, it can blend into the surrounding environment, and disturbs much less ground, making it easier to maintain.</p> <p><u>Connectivity areas</u></p> <p>The CMD areas are considered to potentially contain connectivity area - areas of remnant vegetation outside urban areas containing prescribed regional ecosystems that are required for ecosystem functioning. The shared use trail within the CMD areas are not considered to result in a significant impact to connectivity areas for the following reasons:</p> <ul style="list-style-type: none"> • The benefits of a shared use trail is that it can wind around obstacles such as trees, large rocks, and bushes, it can blend into the surrounding environment, and disturbs much less ground, making it easier to maintain. No fences area proposed along the trail and therefore will not impede the movement of fauna species across the trail. • Clearing of trees that provide habitat to fauna species is carried out in a way that ensures animals in the area being

Performance outcomes	Acceptable outcomes	Response
		<p>cleared (the clearing site) have enough time to move out of the clearing site without human intervention;</p> <ul style="list-style-type: none"> The clearing must be carried out in stages. Suitability qualified fauna spotter/ecologist to be available during the construction phase to provide advice. An experienced fauna spotter-catcher is to conduct an inspection of the trail alignment ahead of vegetation disturbance and track construction clearing. The spotter must be present through all stages of clearing. Standard fauna spotter-catcher vegetation clearing protocols are to be followed, including inspection of potential habitat features prior to disturbance. The shared use trail will only be used by mountain bike riders and hikers. <p><u>Protected wildlife habitat</u></p> <p>The CMD areas are considered to contain protected wildlife habitat, as it is home to a number of plant and animal species protected under the NC Act. The shared use trail within CMD areas are not considered to result in a significant impact to protected wildlife habitat for the following reasons:</p> <ul style="list-style-type: none"> The shared use trail within the CMD areas will be limited to a permanent width of 1.5m. The benefits of a shared use trail is that it can wind around obstacles such as trees, large rocks, and bushes, it can blend into the surrounding environment, and disturbs much less ground, making it easier to maintain. No fences area proposed along the trail and therefore will not impede the movement of fauna species across the trail. <p><u>Waterways that potentially provides fish passage</u></p> <p>There is waterway that potentially provides fish passage within CMD areas and single span bridges and rock armour crossings area proposed over waterways. The proposed works are not</p>

Performance outcomes	Acceptable outcomes	Response
		<p>considered to result in a significant impact to waterways for the following reasons:</p> <ul style="list-style-type: none"> • A single span bridge will be used to minimise disturbance with waterways and loss of aquatic habitats. The bridge will be designed to completely span suitable habitat and limit public access to waterways. No in-stream crossings will be included. • During construction phase, all machinery and vehicle hygiene protocols to be followed at all times to prevent the introduction of weeds and pathogens. Vehicles, plant and equipment to be used for the project would be required to be clean with Weed and Seed Hygiene Declaration certificates. Vehicles, plant and equipment to be inspected prior to being used to ensure they are clean. • Disinfecting vehicles and machinery. This will be undertaken during the construction phase of the project and maintained throughout. • Techniques for installing the bridges has been outlined in the Wangetti Trail Construction Methodology Manual and include spanning the full width of the waterway so that no works occurs within the waterway and existing nature features are left in place within the waterway. • Fish passage will be maintained within intersected waterways. • Erosion and sediment control measures will be implemented. <p><u>Other MSES</u></p> <p>The following MSES are not located within the CMD areas 1-6:</p> <ul style="list-style-type: none"> • Legally secured offset areas • Marine plants • Protected areas • Declared fish habitat area and highly protected zones of state marine parks • Designated precincts in strategic environmental areas

Performance outcomes	Acceptable outcomes	Response
		<ul style="list-style-type: none"> wetland in a wetland protection area (WPA); wetland of high ecological significance (HES); and wetland or watercourse in a high ecological value (HEV) water. <p><i>Management Plans developed for Wangetti South Section</i></p> <p>A number of management plans have been developed for Wangetti South Section (A and B) in order to address the impacts to MSES and MNES. These mitigation measures have been developed in accordance with legislative requirements with respect to Commonwealth, State (Queensland) and local legislation and statutory approvals associated with the project. Considerations of relevant authorities including but not limited to the Wet Tropics Management Authority (WTMA), Department of Environment and Science (DES), Queensland Parks and Wildlife Service (QPWS)), State emergency services (police/fire/ambulance) and Department of Transport and Main Roads, will be undertaken by TDPD.</p> <p>The management plans that have been developed for the construction and operational phase of the project are outlined below:</p> <ul style="list-style-type: none"> — Preliminary Environmental Management Plan (EMP) — Preliminary Construction Environmental Management Plan (CEMP) — Concept Erosion and Sediment Control Plan (CESCP) — Preliminary Weeds, Pest and Diseases Management Plan (WPDMP) — Preliminary Traffic Management Plan (TMP) — Matters of National Environmental Significance (MNES) flora pre-clearance survey methodology.

Table 8.2.2: All operational work

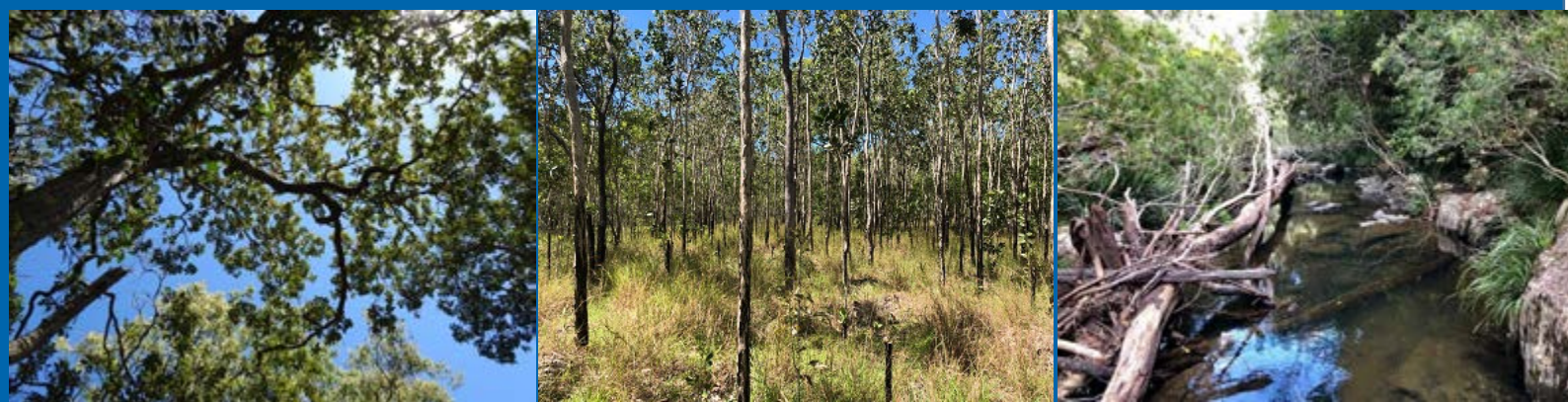
Performance outcomes	Acceptable outcomes	Response
Private marine development		
PO17 Private marine development does not require the construction of coastal protection work, shoreline or riverbank hardening or dredging for marine access purposes.	No acceptable outcome is prescribed.	PO17 – Not Applicable Wangetti South Section A Project area does not include construction of a private marine development.
Disposal of solid waste or dredged material from artificial waterways		
PO18 Solid waste from land and dredged material from artificial waterways is not disposed of in tidal water unless it is for beneficial reuse.	No acceptable outcome is prescribed.	PO18 – Not Applicable Wangetti South Section A Project area does not include development of an artificial waterway or disposal of solid waste or dredged material from an artificial waterway.
Disposal of dredged material other than from artificial waterways		
PO19 Dredged material is returned to tidal water where this is needed to maintain coastal processes and sediment volume.	No acceptable outcome is prescribed.	PO19 – PO20 – Not Applicable Wangetti South Section A Project area does not involve dredging or disposal of dredged material.
PO20 Where it is not needed to maintain coastal processes and sediment volume, the quantity of dredged material disposed to tidal water is minimised through beneficial reuse or disposal on land.	No acceptable outcome is prescribed.	
All dredging and any disposal of dredged material in tidal water		
PO21 All dredging and any disposal of dredged material in tidal water is: 1. demonstrated to be safe with regard to protection of the marine environment and by meeting the National Assessment Guidelines for Dredging 2009, Department of Environment and Energy, 2009, or later version; and 2. supported by a monitoring and management plan that protects the marine environment and that complies with the National Assessment Guidelines for Dredging 2009, Department of Environment and Energy, 2009, or later version.	No acceptable outcome is prescribed.	PO21 – Not Applicable Wangetti South Section A Project area does not involve dredging or disposal of dredged material.

Performance outcomes	Acceptable outcomes	Response
Reclamation		
PO22 Development does not involve reclamation of land below tidal water, other than for the purposes of: <ol style="list-style-type: none"> 1. coastal-dependent development, public marine development or community infrastructure; or 2. strategic ports, priority ports, boat harbours or strategic airports and aviation facilities, in accordance with a statutory land use plan or master plan, where there is a demonstrated net benefit for the state or region and no feasible alternative exists; or 3. coastal protection work or work necessary to protect coastal resources or coastal processes. 	No acceptable outcome is prescribed.	PO22 – Not Applicable Wangetti South Section A does not involve reclamation of land below tidal water.

Table 8.2.3: Operational work which is not assessed by local government

Performance outcomes	Acceptable outcomes	Response
PO23 Works are located and designed such that they continue to operate safely during and following a defined storm tide event.	AO23.1 Tidal work is designed and located in accordance with the Guideline: Building and engineering standards for tidal works, Department of Environment and Heritage Protection, 2017.	PO23 – Complies Works do not involve tidal works. The proposed works are not considered to significantly impact on the tidal areas due to the minor nature of the works. Further to this, the proposed structures are sympathetic and embedded within the surrounding landscape. The structures are also to be constructed with natural materials where possible and do not interfere with coastal processes. They have been designed so that coastal processes can work around the structures without causing erosion.

Appendix B - Wangetti South Section A Preliminary Environmental Management Plan

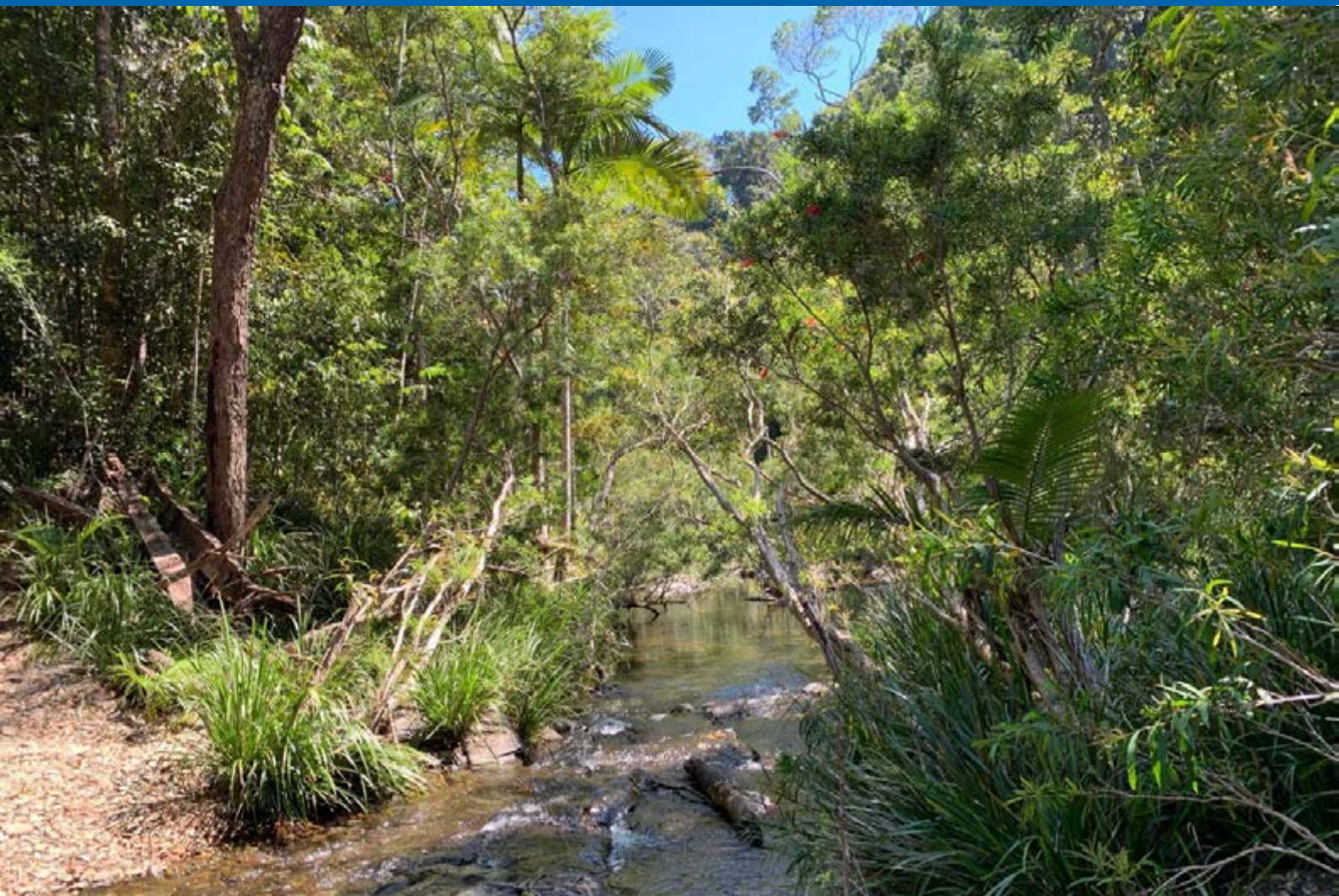


Department of State Development, Tourism, and Innovation

Wangetti Trail South Section (Wangetti to Palm Cove)

Preliminary Environmental Management Plan

February 2021



Abbreviation and acronyms

Abbreviation/acronym	Definition
ACH Act	<i>Aboriginal Cultural Heritage Act 2003</i>
AHD	Australian height datum
AS	Australian Standard
AWTGS	Australian Walking Track Grading System
CEMP	Preliminary Construction Environmental Management Plan
CESCP	Concept Erosion and Sediment Control Plan
CHMA	Cultural Heritage Management Agreement
CMP	Cassowary Management Plan
DAF	Department of Agriculture and Fisheries
DATSIP	The Department of Aboriginal and Torres Strait Islander Partnerships'
DAWE	Department of Agriculture, Water and the Environment
DEMP	Department of the Environment – Environmental Management Plan
DES	Department of Environment and Science
DR	Department of Resources (previously referred to as Department of Natural Resources Energy and Mines)
DSDILGP	Department of State Development, Infrastructure, Local Government and Planning (previously referred to as Department of State Development, Manufacturing, Infrastructure and Planning)
DSDTI	Department of State Development, Tourism and Innovation
DTMR	Department of Transport and Main Roads
EMP	Environmental Management Plan
EPBC Act	<i>Commonwealth Environment Protection and Biodiversity Conservation Act 1999</i>
EP Act	<i>Environmental Protection Act 1994</i>
ESCP	Erosion and Sediment Control Plan
GBO	General Biosecurity Obligation
GED	General Environmental Duty
GHD	GHD Pty Ltd
ILUA	Indigenous Land Use Agreement
km	Kilometre
m	Metre
MNES	Matters of national environmental significance
MOU	Memorandum of understanding
MSES	Matters of state environmental significance
MTBA TRDS	the Australian Mountain Bike Trail Guidelines Trail Difficulty Rating System
NC Act	<i>Nature Conservation Act 1992</i>

Abbreviation/acronym	Definition
QPWS	Queensland Parks and Wildlife Service
RPP	Riverine protection permit
SMP	Species Management Plan
TDPD	Tourism Development Projects Division
TI Act	<i>Transport Infrastructure Act 1994</i>
TMP	Preliminary Traffic Management Plan
WPDMP	Preliminary Weed, Pest and Disease Management Plan
WTWHA	Wet Tropics World Heritage Area
YGAC	Yirrganydji Aboriginal Corporation

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Appendix B – Cassowary Management Plan
Appendix C – Preliminary Weed, Pest, and Disease Management Plan
Appendix D – Preliminary Traffic Management Plan
Appendix E – Preliminary Construction Environmental Management Plan
Appendix F – Matters of national environmental significance flora pre-clearance survey methodology
Appendix G – Wangetti Trail Construction Methodology Manual April 2020

1. Introduction

1.1 Background

The Department of State Development, Tourism and Innovation (DSDTI) – Tourism Development Projects Division (TDPD) is proposing to establish the Wangetti Trail – Wangetti South (Project) Section, a 29.7 kilometre (km) shared use trail to accommodate both mountain bike users and hikers from the southern boundary Lot 2 SP309094 in the township of Wangetti, to Palm Cove (refer to Figure 2-1).

The Wangetti South Section will comprise of the following components:

- 29.7 km shared use trail to accommodate both mountain bike users and hikers, consisting of natural ground and surface treatments, which will be a maximum of 1.5 m wide. The 1.5 m wide trail will be located within a 40 metre (m) survey corridor, referred to as the construction allowance corridor, to allow flexibility for the placement of infrastructure during the construction phase. The trail has been designed to be a 'Mountain Biking – intermediate (blue square with blue outline) as defined in the Australian Mountain Bike Trail Guidelines Trail Difficulty Rating System (MTBA TDRS) and grade 3 for hikers, as defined in the Australian Walking Track Grading System (AWTGS), which also equates to Class 3 in the Australian Standard (AS) for Walking Tracks, Part 1: Classification and Signage (AS 2156.1-2001). The trail will have an average gradient of <10% and a maximum gradient no greater than 15% (for short distances only). Built structures proposed as part of the trail include gully crossings, bridges, staircases, platforms, rock armouring and signage, where appropriate and required.
- A number of waterway crossings along the shared use trail that will comprise of the following: rock armouring, boulder crossings and low-level bridge (minor water crossing).
- Dark Jungle (public camping node and amenities block)
- The formalisation of existing access tracks into service tracks to provide restricted access to the shared use trail and Dark Jungle for construction purposes, operational purposes, maintenance purpose and for emergency purposes.

The Wangetti South Section is being proposed over four properties located within the Douglas Shire Council and Cairns Regional Council local government areas. The project area intersects both the Macalister Range National Park and the Wet Tropics World Heritage Area (WTWHA).

The project is being delivered by TDPD as part of an adventure-based ecotourism development in north Queensland. The shared use trail will provide walkers and mountain bike riders with a unique experience to traverse through natural areas of north Queensland covering bushland and coastal areas, including the Wet Tropics of Queensland (Wet Tropics), and national parks.

Development of an Environmental Management Plan (EMP) to detail the performance objectives, actions and procedures to be carried out to minimise potential environmental impacts during construction phase and operational phase of the Wangetti South Section.

1.2 Purpose of this report

GHD Pty Ltd (GHD) has prepared this EMP as a means to guide responsible environmental management during the construction and operation phases of the Wangetti Trail – Wangetti South section. Conformance to this EMP will ensure that the Project meets the general environmental duty of Section 319 of the *Environmental Protection Act 1994*:

“A person must not carry out any activity that causes, or is likely to cause, environmental harm unless the person takes all reasonable and practicable measures to prevent or minimise the harm.”

The EMP is a stand-alone, dynamic, document which will be reviewed and updated as required to reflect changes in processes, controls and procedures. This EMP has been developed with information that was available at the time of compilation and has considered the requirements in the Department of the Environment – Environmental Management Plan (DEMP) Guidelines 2014. This EMP is the key reference document which identifies actions and commitments to be followed during the Project. This EMP will serve as a benchmark for measuring the effectiveness of environmental protection and management. This will be achieved by specifying monitoring and reporting requirements, with nominated responsibilities and timing to ensure necessary performance objectives are met.

The contractors assigned to the Project will use the information in this document to develop environmental management system and documentation for the construction and operational phase of the Project.

This EMP is structured according to an overarching framework EMP (this document) supported by the following sub-plans:

- Preliminary Construction Environmental Management Plan (CEMP)
- Concept Erosion and Sediment Control Plan (CESCP)
- Preliminary Weed, Pest and Disease Management Plan (WPDMP) for the construction and operational phases of the Project.
- Matters of National Environmental Significance flora pre-clearance survey methodology
- Preliminary Traffic Management Plan (TMP) for the construction and operational phases of the Project.
- Cassowary Management Plan (CMP) for the construction and operational phases of the Project.

This is a continuously evolving document that should take into account changes in construction techniques and statutory requirements. This EMP has also been prepared in response to Chapter 5 of the Request for Information from Department of Agriculture, Water and the Environment (DAWE). The EMP provides a summary of measures to be adopted for the Project to avoid, mitigate, and manage impacts from the construction and operational phases of the project on matters of national environmental significance (MNES) and matters of state environmental significance (MSES).

1.3 Scope of works

This EMP covers the construction and operation of the Wangetti Trail – Wangetti South Section, from the southern boundary Lot 2 SP309094 in the township of Wangetti, to Palm Cove and includes all activities such as:

- Preclearance surveys for protected fauna and flora
- Construction of the 1.5m wide shared use trail within a 40m wide construction allowance corridor and ancillary infrastructure including vegetation clearance along the trail (1.5m wide permanent with 0.5m on either side for temporary disturbance.). Including the trail head at the intersection of the shared use trail and the Captain Cook Highway at Ellis Beach.
- Operation of the shared use trail

- Construction of Dark Jungle public camp site
- The operation of Dark Jungle public camp site.
- Formalisation and maintenance of service tracks.

1.4 Assumptions and limitations

This report: has been prepared by GHD for The Department of State Development, Tourism and Innovation and may only be used and relied on by The Department of State Development, Tourism and Innovation for the purpose agreed between GHD and theThe Department of State Development, Tourism and Innovation as set out in section 1.3 of this report.

GHD otherwise disclaims responsibility to any person other than The Department of State Development, Tourism and Innovation arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by The Department of State Development, Tourism and Innovation and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

2. Site Description

2.1 Location

The South Section of Wangetti Trail is located between Wangetti Township and Palm Cove in Far North Queensland. The land parcels that Wangetti South Section intersects are outlined in Table 2-1.

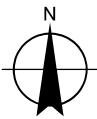
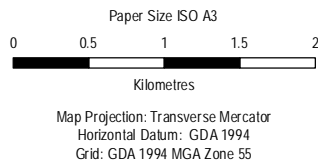
Table 2-1 Wangetti South Section land parcels details

Affected property	Address / Coordinates	Owner Details	Tenure	Locality	Proposed works
Reserves					
31SP129117	Captain Cook Highway, Ellis Beach, South Reserve	State of QLD (Department of Resources (DR))	Reserve	Ellis Beach	Trail
6SP309107	Captain Cook Highway Wangetti	State of QLD (DR)	Reserve	Wangetti	Service track Trail
Lot 39 on SP309107	Captain Cook Highway, Wangetti	State of QLD (DR)	Reserve	Wangetti	Service track
State Land					
2SP309094	Captain Cook Highway Wangetti	State of QLD (DR)	Unallocated state land Proposed to be declared as transferable land under the <i>Aboriginal Land Act 1992</i>	Wangetti	Trail
National Park					
174NPW930	Macalister Range National Park	State of QLD (DR)	National Park	Macalister Range	Trail Service track Dark Jungle
Road Reserves					
Road Reserve	Captain Cook Highway	DTMR	Road Reserve	Palm Cove – Port Douglas	Trail
Leasehold					
13NR5512	Captain Cook Highway Ellis Beach	Lessee – Bellbird Park Developments Pty Ltd	State Leasehold Land Non-competitive lease 9/2568 – Tourism purposes namely tourist accommodation and ancillary facilities	Ellis Beach	Service track

The Wangetti South Section is located within Douglas Shire Council local government area and Cairns Regional Council local government area. The shared use trail within Wangetti South Section extends 29.7 km and is constrained by the Coral Sea to the east and the Macalister Ranges to the west and is almost entirely located within the Macalister Range National Parks and the WTWHA (refer to Figure 2-1 for a locality plan of the trail).



Based on or contains data provided by the State of QLD (DNRME) 2020. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for marketing or be used in breach of the privacy laws.



DITID
Environment Assessment Stage 2 Wangetti Trail

Project No. 41-32458
Revision No. 5
Date 1/12/2020

Wangetti South Section
Project Locality Plan

FIGURE 2-1

2.2 Existing Environment

The Wangetti Trail is to be developed partly within Macalister Range National Park which consists of rugged, forested range along the far northern coastline of Queensland and forms part of the WTWHA. This area is intersected by a number of waterways including ephemeral waterways which some providing fish passage for protected species. The area contains regional ecosystems supporting threatened and protected species. Given the sensitivity of the environment it is imperative that appropriate environmental management processes are implemented on site to minimise impact to the immediate and surrounding environment.

The project has been assessed and approved under the Wet Tropics Management Plan 1998 (Wet Tropics Permit No: WTMA20001a). Under the 1998 Plan, the project area is located within Zones B and C.

Zone B generally has a high degree of ecological integrity and it is in a natural state but is not necessarily remote from disturbance. Lands in zone B are less than 500 metres from all roads, cableways, power lines, pipelines, towers, mines, quarries and other structure; or, less than 700 metres from clearings; or include an area of up to 150 hectares of undisturbed habitat and have some obvious signs of disturbance in the last 40 years (WTMA, 2019).

Zone C contains disturbances and is generally associated with existing community infrastructure. Zone C includes areas where there are clearings, roads, power lines, pipelines, dams and cableways and also includes quarries, gravel scrapes, paddocks, building or home sites, orchards and plantations, forestry camps and parking areas (WTMA, 2019).

For the Wangetti trail construction to be compliant with the management of these areas, the environmental practices outlined in this document require implementation.

2.3 Key Environmental Issues

2.3.1 Soil and land management

The Wangetti South Section alignment is comprised of coastal floodplains, volcanic mountain ranges and estuarine mudflats. The alignment intersects coastal plains of 5 m – 30 m AHD at Buchan Point before traversing the eastern edges of the Macalister Ranges. The highest point of the alignment is approximately 570 m AHD at Mt Charlie. Largely, the alignment follows the eastern edge of the Macalister Ranges, at a topography of 250 – 300 m AHD.

The location of the trail on the slopes of the Macalister range, has a high probability of erosion and sedimentation. Works are to comply with the Concept Erosion and Sediment Control Plan (refer to Appendix A).

2.3.2 Biodiversity – Fauna

Nine distinct fauna habitat types have been recorded within the Wangetti South survey area during the field surveys completed by GHD in 2019. These include the following:

- *Acacia* woodland
- Disturbed rainforest
- Ephemeral waterways
- Eucalypt woodland on steep rocky slopes
- *Melaleuca* swamp

- Mixed *Melaleuca viridiflora* woodlands on inundated plains
- Open woodland over grasses on undulating plains
- Permanent streams
- Vine forest
- Modified landscapes.

These fauna habitats can support a wide variety of terrestrial and aquatic fauna species. The MNES and MSES fauna species that are known, likely or may occur within the Wangetti South Section are outlined below in Table 2-2.

Table 2-2 MNES and MSES fauna species that are known, likely or may occur within Wangetti South Section

MNES and MSES bird species	MNES and MSES amphibian species	MNES and MSES mammal species	MNES and MSES aquatic species
<p>MNES and MSES bird species that are known, likely or may occur:</p> <ul style="list-style-type: none"> • <i>Casuarus casuarus</i> (Southern cassowary) • Migratory birds (e.g. eastern curlew, great sand plover) • Non-migratory species (e.g. masked owl) 	<p>MNES and MSES amphibian species that are known, likely or may occur in the Wangetti South Section</p> <ul style="list-style-type: none"> • <i>Litoria dayi</i> (Australian lace lid) • <i>Litoria nannotis</i> (Waterfall frog) • <i>Litoria nyakalensis</i> (Mountain mistfrog) • <i>Litoria rheocola</i> (Common mistfrog) • <i>Litoria serrata</i> (Tapping green eyed frog) 	<p>MNES and MSES mammal species that are known, likely or may occur in the Wangetti South Section</p> <ul style="list-style-type: none"> • <i>Dasyurus maculatus gracilis</i> (Spotted-tailed quoll) • <i>Dasyurus hallucatus</i> (Northern quoll) • <i>Dendrolagus lumholtzi</i> (Lumholtz's tree-kangaroo) • <i>Hipposideros semoni</i> (Semon's leaf-nosed bat) • <i>Phascolarctos cinereus</i> (Koala) • <i>Pteropus conspicillatus</i> (Spectacled flying-fox) • <i>Rhinolophus robertsi</i> (Large-eared horseshoe bat) • <i>Saccolaimus saccolaimus nudicluniatus</i> (Bare-rumped sheath-tailed bat) 	<p>MNES and MSES aquatic species that are known, likely or may occur in the Wangetti South Section</p> <ul style="list-style-type: none"> • <i>Stiphodon semoni</i> (Opal cling goby) • <i>Stiphodon rutilarueus</i> (Orange cling goby) • <i>Stiphodon pelewensis</i> (Emerald cling goby) • <i>Stiphodon surrufus</i> (Birdsong cling goby)

MNES and MSES bird species	MNES and MSES amphibian species	MNES and MSES mammal species	MNES and MSES aquatic species
		<ul style="list-style-type: none"> <i>Xeromys myoides</i> (Water mouse) 	

To minimise impacts to protected fauna species, pre-clearance surveys will be undertaken during the construction phase prior to any vegetation clearing and will involve an appropriately qualified ecologist/botanists. Trail routing will take place along the alignment of least disturbance and trail watercourse crossing points should be sited where there is minimal disturbance to stream banks and riparian vegetation and preferably over exposed bedrock. Manual construction methods will be encouraged over mechanised methods and only existing access roads are to be utilised, with no new access roads constructed.

Of the above mentioned fauna species, two *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) listed species were considered to 'likely to occur' within Wangetti South Section based on the presence of potentially suitable habitat and previous records and they include the southern cassowary and opal cling goby (GHD, 2020).

The Southern cassowary is listed as endangered under the EPBC Act has the potential to be impacted by the Wangetti trail development by habitat reduction and a possible increase in interactions with people. The impact to the Southern Cassowary has been assessed and details can be found in the Cassowary Management Plan (Appendix B).

Opal cling gobies are listed as critically endangered under the EPBC Act and therefore steps need to be taken to protect their highly favourable habitat located along short, steep coastal streams in the Wet Tropics. Several of these streams will be crossed as part of the shared use trail and management of the sediment and limiting impact to these waterways is required to ensure the gobies habitat is maintained. Eliminating waterway barrier works will reduce the impact on the opal cling goby as waterway passages used by this fish will therefore not be interrupted. The impact to the Opal Cling Goby has been assessed and details can be found in Section 2 of the Wangetti South Preliminary Documentation.

2.3.3 Biodiversity – Flora

No EPBC Act listed flora species, threatened ecological communities and/or Queensland State listed flora species have been confirmed present within the construction allowance corridor during field surveys for Wangetti South Section completed by GHD in 2019 (GHD, 2020). However, the following EPBC listed and Queensland State listed flora species were considered likely to occur within Wangetti South Section based on the presence of potentially suitable habitat and previous records:

- Ant Plant (*Myrmecodia beccarii*) - Vulnerable
- Dwarf butterfly orchid (*Vappodes lithocola*¹) (also known as *Dendrobium lithocola*, and the Queensland Flora Census 2019 groups this species into *Dendrobium biggibum*) – Endangered
- Orange Tamarind (*Toechima pterocarpum*) - Endangered
- Velvet jewel orchid (*Zeuxine polygonoides*²) (also known as *Rhomboda polygonoides*) – Vulnerable
- *Randia audasii* – Likely to occur

- *Rhomboda polygonoides* – Likely to occur

Other MNES and MSES flora species that may occur in the Wangetti South Section are outlined below:

- *Phaius pictus* – May occur
- *Phalaenopsis amabilis* subsp. *rosenstromii* (Native moth orchid) – May occur
- *Polyscias bellendenkerensis* – May occur
- *Archontophoenix myolensis* (Myola palm) – May occur
- *Anoectochilus yatesiae* (Marbled jewel orchid) – May occur
- *Canarium acutifolium* – May occur
- *Dendrobium mirbelianum* (Dark-stemmed antler orchid) – May occur
- *Diplazium cordifolium* – May occur

To minimise impacts to protected flora species, pre-clearance surveys will be undertaken during the construction phase prior to any vegetation clearing and will involve an appropriately qualified ecologist/botanists. Trail routing will take place along the alignment of least disturbance and trail watercourse crossing points should be sited where there is minimal disturbance to stream banks and riparian vegetation and preferably over exposed bedrock. Manual construction methods will be encouraged over mechanised methods and only existing access roads are to be utilised, with no new access roads constructed.

In addition, the Wangetti South Matters of National Environmental Significance flora pre-clearance survey methodology has been developed and outlines the pre-clearance survey methodology to be adopted before starting construction works. It also outlines how protected flora species will be identified and managed as part of the project (refer to Appendix F).

2.3.4 Biosecurity

Invasive plants and pest species considered to be present or have the potential to occur within the Wangetti South Section project area have been identified in the Wangetti South Section Preliminary Weed, Pest and Disease Management Plan which has been developed for Wangetti South Section (refer to Appendix C). In addition, there are three environmental diseases (pathogens) that pose a high risk to the Wangetti South project area

- Myrtle rust (*Puccinia psidii*) – fungal disease affecting plants in the Myrtaceae family. This pathogen is known to be threat to WTWHA (WTMA, 2020).
- Root rot fungus (*Phytophthora* fungus) – kills all plant species rooted in soil. Commonwealth listed 'key threatening process'. This pathogen is known to be threat to WTWHA (WTMA, 2020).
- *Chytridiomycosis* disease – frog disease caused by the chytrid fungus. Commonwealth listed 'key threatening process'. This pathogen is known to be threat to WTWHA (WTMA, 2020) Frog chytrid fungus has been identified as a primary cause of massive mortality of stream-dwelling frogs in the Wet Tropics bioregion (WTMA, 2020).

There are also several Queensland Biosecurity Zones which are mapped over the Wangetti South Section according to the Queensland Government – Business Queensland Maps of Queensland biosecurity zones (2020) and they include the electric ant biosecurity zone, Asian honey bee infested area and Northern banana biosecurity zone.

Weed and pest species and pathogens identified onsite are to be managed in accordance with the WPDMP which is been prepared for the construction and operational phases of the project (refer to

Appendix C). Hygiene procedures and ongoing monitoring to detect incursions are to be carried out to minimise transfer of invasive species.

2.3.5 Waterways

Watercourses are to be protected where practically possible. Given the sensitive nature of the site, it is imperative that that erosion and sediment control measures are to be implemented in accordance with Appendix A.

The trail will intersect a number of waterways which are protected under the *Water Act 2000* and *Fisheries Act 1994* and are shown on the map in Appendix A. As a result, a number of structures over waterways will need to be constructed to provide safe passage for trail users. The exact locations and type of structure proposed at the waterways will be determined by the trail builder and will comprise of the following options:

- Rock armouring
- Boulder crossings
- Low level bridge (single span bridges).

Construction and operational activities that could potentially impact on waterways are outlined in Table 2-3. Environmental controls to reduce impacts to waterways are outlined in the CEMP in Appendix E and CESC in Appendix A.

2.3.6 Cultural heritage

Segments of the Wangetti South Section are considered to have high heritage and cultural heritage values. The Wangetti South Section is also located within the Wet Tropics World Heritage Area, which is recognised as a national heritage place for both natural and Indigenous values. The Wet Tropics rainforests contain an almost complete record of the major stages in the evolution of plant life on earth.

The Wangetti South Section was altered to avoid culturally sensitive areas based on advice from Traditional Owner Rangers (GHD, 2020). The location of the shared use trail, camp site and service tracks have been selected as they are considered to avoid the areas of cultural heritage values based on information collected during discussions with Traditional Owners and collected during cultural heritage surveys (GHD, 2020).

The Yirrganydji People are recognised Traditional Owners for the country on which the Wangetti Trail traverses (Yirrganydji Gurabana Aboriginal Corporation, 2018). Engagement with the Yirrganydji Aboriginal Corporation (YGAC) and their Land and Sea Rangers Corporation was formalised through a memorandum of understanding (MOU) that outlined the project vision, objectives, governance framework, business case activities and responsibilities and commercial compensation (GHD, 2021). This agreement and the working relationship developed with the Yirrganydji People has established a strong relationship of trust and productivity, which has continued throughout the project phases as part of a process to agree and register an Indigenous Land Use Agreement for the Wangetti Trail (GHD, 2021).

To date, the following activities have been undertaken/are in development with the Yirrganydji people relating to the assessment and delivery of the Wangetti Trail Project (GHD, 2021):

- Execution of an MOU with the YGAC to participate in the business case development process including definition of overall aspirations for business opportunities for the trail as a precursor to an Indigenous Land Use Agreement (ILUA) and the engagement of Yirrganydji Land and Sea Rangers to provide cultural heritage advice during ground-truthing activities.
- Development of a statutory structure plan for the Wangetti Land Trust Aboriginal Land Act freehold land to be developed as a trail hub for the Wangetti Trail. Establishment of Traditional

Owner owned and operated auxiliary trail infrastructure in this location is strongly supported by the Project Team and Douglas Shire Council by way of formal Council resolution.

Execution of a Cultural Heritage Agreement protocol and engagement of cultural heritage monitors for the construction of the Mowbray River pedestrian bridge

- Drafting of an ILUA for the Wangetti Trail to be agreed and finalised before works commence in early 2021.

Engagement with the Traditional Owner Groups is ongoing and paramount to the successful delivery of the Wangetti Trail. Traditional Owners will be involved throughout all stages of the project – particularly during the procurement process for the eco-accommodation operator.

2.3.7 Public amenity and health

Sensitive receptors (e.g. existing residences, places of work, schools, agricultural or ecologically significant areas/species that could be impacted) within and surrounding the Project that may be potentially affected by the proposed works associated with Wangetti South Section include:

- Wet Tropics World Heritage Area
- National Parks
- Residential communities within Palm Cove and Wangetti.

The Project is predominantly within an area which has been subjected to very limited disturbance. Wangetti South Section is also characterised by steep terrain, is home to dangerous animals and plants and there is the potential for extreme weather events to occur in the area. All of these matters could have adverse impacts on construction personnel working within Wangetti South Section during the construction phase.

Construction and operational activities that could potentially impact on public amenity are outlined in Table 2-3.

2.4 Key environmental factors

Eight preliminary key environment factors have been identified in the referral for Wangetti South Section and they include:

- Biodiversity – Flora
- Biodiversity – Fauna
- Waterways
- Soil and land management
- Public amenity and health
- Waste management
- Biosecurity
- Cultural heritage.

Table 2-3 presents the eight preliminary key environmental factors relevant to construction and operation, the proposal activities that would affect the factors and the site-specific environmental values, uses and sensitive components that will be affected. Table 2-3 also identifies MNES and MSES that could be potentially impacted by construction and operational activities.

Table 2-3 Key environmental factors relevant to construction and operation

Key environmental factor	Activities that could affect the factor	Applicable MNES and MSES
Biodiversity – Flora	<ul style="list-style-type: none"> • Vegetation clearing - permanent and temporary loss of vegetation and habitat (direct impact) • Construction and operational vehicle movements • Construction and maintenance plant operation • Soil erosion and sediment generated from earthworks • Illegal collection of flora species by construction crew and/or trail users • Introduction and spread of invasive species from material brought into the project area • Damage to flora species by trail users not using designated routes. 	<p>MNES and MSES flora species that are known, likely or may occur in the Wangetti South Section:</p> <ul style="list-style-type: none"> • <i>Archontophoenix myolensis</i> (Myola palm) • <i>Anoectochilus yatesiae</i> (Marbled jewel orchid) • <i>Canarium acutifolium</i> • <i>Dendrobium fellowsii</i> • <i>Dendrobium mirbelianum</i> (Dark-stemmed antler orchid) • <i>Diplazium cordifolium</i> • <i>Diplazium pallidum</i> • <i>Myrmecodia beccarii</i> (Ant plant) • <i>Phaius pictus</i> • <i>Phalaenopsis amabilis</i> subsp. <i>rosenstromii</i> (Native moth orchid) • <i>Polyscias bellendenkerensis</i> • <i>Randia audasii</i> • <i>Rhomboda polygonoides</i> • <i>Toeckia pterocarpum</i> (Orange tamarind) • <i>Vappodes lithocola</i> (Dwarf butterfly orchid) (also known as <i>Dendrobium lithocola</i>, and the Queensland Flora Census 2019 groups this species into <i>Dendrobium biggibum</i>) • <i>Vappodes phalaenopsis</i> (Cooktown orchid) (Also known as <i>Dendrobium phalaenopsis</i> and the Queensland Flora Census 2019 groups this species into <i>Dendrobium biggibum</i>) • <i>Zeuxine polygonoides</i> (Velvet jewel orchid) (also known as <i>Rhomboda polygonoides</i>)
Biodiversity – Fauna	<ul style="list-style-type: none"> • Vegetation clearance resulting in injury and mortality to the local fauna • Vegetation clearance has the potential to impact on breeding areas for local fauna • Construction and operational vehicle movements in the project area, outside of nominated areas 	<p>MNES and MSES bird species that are known, likely or may occur:</p> <ul style="list-style-type: none"> • <i>Casuaris casuaris</i> (Southern cassowary) • Migratory birds (e.g. eastern curlew, great sand plover) • Non-migratory species (e.g. masked owl)

Key environmental factor	Activities that could affect the factor	Applicable MNES and MSES
	<ul style="list-style-type: none"> • Soil erosion and sediment generated from earthworks • Storage and management of waste from construction crew • Injury and mortality of wildlife resulting from direct collision with mountain bike riders • Illegal taking of wildlife • Disturbance of wildlife behaviour by increased noise from hikers and mountain bike riders • Introduction and spread of invasive species by the movement of hikers, cyclists and maintenance vehicles • Barrier effects and reduced movement to wildlife. 	<p>MNES and MSES amphibian species that are known, likely or may occur in the Wangetti South Section</p> <ul style="list-style-type: none"> • <i>Litoria dayi</i> (Australian lace lid) • <i>Litoria nannotis</i> (Waterfall frog) • <i>Litoria nyakalensis</i> (Mountain mistfrog) • <i>Litoria rheocola</i> (Common mistfrog) • <i>Litoria serrata</i> (Tapping green eyed frog) <p>MNES and MSES mammal species that are known, likely or may occur in the Wangetti South Section</p> <ul style="list-style-type: none"> • <i>Dasyurus maculatus gracilis</i> (Spotted-tailed quoll) • <i>Dasyurus hallucatus</i> (Northern quoll) • <i>Dendrolagus lumholtzi</i> (Lumholtz's tree-kangaroo) • <i>Hipposideros semoni</i> (Semon's leaf-nosed bat) • <i>Phascolarctos cinereus</i> (Koala) • <i>Pteropus conspicillatus</i> (Spectacled flying-fox) • <i>Rhinolophus robertsi</i> (Large-eared horseshoe bat) • <i>Saccolaimus saccolaimus nudicluniatus</i> (Bare-rumped sheath-tailed bat) • <i>Xeromys myoides</i> (Water mouse) <p>MNES and MSES aquatic species that are known, likely or may occur in the Wangetti South Section</p> <ul style="list-style-type: none"> • <i>Stiphodon semoni</i> (Opal cling goby) • <i>Stiphodon rutilarueus</i> (Orange cling goby) • <i>Stiphodon pelewensis</i> (Emerald cling goby) • <i>Stiphodon surrufus</i> (Birdsong cling goby)
Waterways	<ul style="list-style-type: none"> • Earthworks - Soil erosion and sediment • Installation of waterway crossings 	WTWHA

Key environmental factor	Activities that could affect the factor	Applicable MNES and MSES
	<ul style="list-style-type: none"> Earthworks and other construction activities have the potential to cause indirect degradation of aquatic habitats, particularly to opal cling goby habitat Use of construction machinery in and around aquatic habitat The shared use trail has potential to contribute to sedimentation to the environment. The movement of hikers and mountain bike riders have the potential to cause localised habitat degradation through exposure to run-off and sedimentation, and trail widening to avoid muddy or puddled areas Disturbance to surface waterways by hikers and cyclists the shared use trail and the operation of the public camp have the potential to cause indirect degradation of aquatic habitats. 	<p>Amphibian and aquatic species as outlined in Biodiversity – Fauna row above.</p> <p>Waterways protected under the <i>Fisheries Act 1994</i> and <i>Water Act 2000</i> and coastal management districts protected under the <i>Coastal Protection and Management Act 1995</i>.</p>
Soil and land management	<ul style="list-style-type: none"> Earthworks - Soil erosion and sediment Soil compaction as a result of construction equipment moving in the area Construction and operational equipment causing displacement of soils and/or rocks Trail users causing displacement of soils and/or rocks by not following designated routes. Chemicals and fuel used on-site during construction/operational phase impacting on the natural environment. 	<p>Wet Tropics World Heritage Area</p> <p>As per amphibian and aquatic species in Biodiversity – Fauna</p> <p>Waterways protected under the <i>Fisheries Act 1994</i> and <i>Water Act 2000</i> and coastal management districts protected under the <i>Coastal Protection and Management Act 1995</i>.</p>
Public amenity and heath	<ul style="list-style-type: none"> Vegetation clearance Construction/operational vehicle movements. Construction plant operation Soil erosion and earthworks Storage and management of waste from construction crew Storage and management of waste from campsite. Construction activities may be visible to varying degrees by 	<p>Wet Tropics World and National Heritage Area</p> <p>Waterways protected under the <i>Fisheries Act 1994</i> and <i>Water Act 2000</i></p> <p>Coastal management districts protected under the <i>Coastal Protection and Management Act 1995</i>.</p>

Key environmental factor	Activities that could affect the factor	Applicable MNES and MSES
	<p>people living, working, and travelling through the surrounding areas</p> <ul style="list-style-type: none"> Noise and vibration generated by trail users using the trail and impacting on sensitive receptors including wildlife Noise and vibration generated by construction plant, vehicles and equipment impacting on sensitive receptors including wildlife Noise generated by members of the public using vehicles illegally within the project area Potential air and dust impacts to sensitive receptors because of construction activities, attributable to exhaust emissions and fugitive dust During construction, construction activities have the potential to increase bushfire hazard. The use of construction machinery within the project area have the potential to ignite fires and include, but not limited to mini excavators; chainsaws, compactors, general construction tools and equipment such as drills, saws, sanders, etc. During operation trail users illegally starting fires Bushfires occurring within the project area impacting threatened flora and fauna species Steep terrain, remote location, the presence of dangerous animals and plants and potential of extreme weather events are associated with Wangetti South Section and could adversely impact on construction personnel and/or trail users in the following ways: <ul style="list-style-type: none"> Bites from snakes, spiders, and insects Allergic reactions to plant species along the trail Heat/cold exposure, falls and sprains, etc. 	<p>MNES and MSES species as outlined in the Biodiversity – Fauna row above.</p> <p>Heritage Area National Heritage Site</p> <p>Protected Areas - estates protected under the <i>Nature Conservation Act 1992</i> (NC Act).</p>

Key environmental factor	Activities that could affect the factor	Applicable MNES and MSES
	<ul style="list-style-type: none"> ○ Another hazard is the operation of a helicopter to transport construction material to the project area ○ Potential hostile intersection with fauna species ○ Extreme weather events requiring evacuation • Disruption to traffic along Captain Cook Highway from construction vehicles • Interference with wildlife by construction vehicles/operational vehicles • Impacts to sensitive environmental areas because of vehicles not using designated service tracks and/or members of the public using vehicles illegally within the project area • Congestion of vehicles at existing parking areas. 	
Biosecurity	<ul style="list-style-type: none"> • Introduction or spread of weeds/pests/pathogens from construction/ operation activities or materials within Wangetti South Section • Introduction or spread of weeds/pests/pathogens from trail user within Wangetti South Section. 	<p>MNES and MSES species as outlined in the Biodiversity – Fauna and Flora rows above.</p> <p>Wet Tropics World and National Heritage Area.</p> <p>Protected Areas - estates protected under the NC Act.</p>
Waste management	<ul style="list-style-type: none"> • Clearing of vegetation and cut and fill activities will be required to allow for the construction of the trail, camp sites and access tracks resulting in vegetation waste and excess spoil • Construction camps will produce general waste • Inappropriate waste management by construction personnel • Inappropriate waste management by operational staff • Generation of waste from trail users. 	<p>MNES and MSES species as outlined in the Biodiversity – Fauna and Flora rows above.</p> <p>Wet Tropics World and National Heritage Area.</p> <p>Protected Areas - estates protected under the NC Act.</p> <p>Waterways protected under the <i>Fisheries Act 1994</i> and <i>Water Act 2000</i></p>
Cultural heritage	<ul style="list-style-type: none"> • Potential to find unrecorded cultural heritage and to disturb identified cultural heritage 	<p>Wet Tropics World and National Heritage Area</p> <p>Protected Areas - estates protected under the NC Act.</p>

Key environmental factor	Activities that could affect the factor	Applicable MNES and MSES
	<ul style="list-style-type: none"> Additional access to sensitive and restricts sites that may impact on Traditional Owner cultural values. 	

3. Legislative Requirements

Wangetti South Section is to comply with all legislative requirements with respect to Commonwealth, State (Queensland) and Local legislation and a summary of the statutory approvals associated with the project is outlined in Table 3-1 below.

Table 3-1 Statutory approvals associated with Wangetti South

Legislation and Approval Type	Relevance to the project area
<i>Environment Protection and Biodiversity Conservation Act 1999</i> DAWE Referral	Wangetti South is considered to involve undertaking an action which has, will have, or is likely to have, an impact on a MNES. Therefore, project has been referred and is a controlled action that requires approval (reference EPBC 2020/8722).
Wet Tropics Management Plan 1998 <i>Wet Tropics Permit</i> Wet Tropics Management Authority (WTMA)	Wangetti South Section is located within the Wet Tropics World Heritage Area. The project has been approved (Wet Tropics Permit No: WTMA20001a) and a permit issued under Part 4, Division 1, Section 45 of the Wet Tropics Management Plan 1998 (<i>Wet Tropics World Heritage Protection Management Act 1993</i>) to allow for the proposed works to occur within the Wet Tropics Management Zone.
<i>Nature Conservation Act 1992</i> Authority required to construct trail and public camping areas under s34 of the NC Act.	Subject to s34 of the NC Act, a lease, agreement, license, permit or other authority over, or in relation to land in a protected area may be granted if the activity is consistent with the management principles for the areal and, if a management plan has been approved for the area, the management plan. The grant of an authority will be considered by the Chief Executive of the Department of Environment and Science (DES) for the construction of Wangetti Trail and public camping areas in the protected area estate.
<i>Nature Conservation Act 1992</i> Protected plant clearing permit	Where the alignment intersects a flora survey trigger area, a protected plant clearing permit or exemption notice will be required.
Species management program (SMP) under the <i>Nature Conservation Act 1992</i>	Given the number of protected fauna species located within the project area, a SMP may be required to allow for tampering in breeding areas. Breeding habitat is to be avoided for endangered, vulnerable species.
<i>Native Title Act 1993</i> ILUA or notification procedures	TDPD has been conducting meaningful engagement with Traditional Owners who have a native title claim or assert a native title interest in relation to trail area as outlined in Section 1.7 to address native title requirements for the project. ILUAs will be negotiated between native title parties and the State accordingly.

Legislation and Approval Type	Relevance to the project area
Under the <i>Aboriginal Cultural Heritage Act 2003</i> (ACH Act) a Cultural Heritage Management Agreement (CHMA) or similar may need to be established with the relevant Aboriginal parties	<p>TDPD has been conducting meaningful engagement with Traditional Owners who have interests in relation to trail area to address cultural heritage requirements under the ACH Act for the project.</p> <p>Archaeological reporting, including a Cultural Heritage Management Plan between the proponent and the Traditional Owners outlining how the project will be managed to avoid or minimise harm to Aboriginal cultural heritage (to the extent that harm cannot reasonably be avoided) will be negotiated before works commence</p> <p>The Department of Aboriginal and Torres Strait Islander Partnerships' (DATSIP) Duty of Care Guidelines are required to be followed to assist in conducting due diligence.</p>
Under the <i>Planning Act 2016</i> and Planning Regulation 2017 a Material Change of Use development permit assessable under the Douglas Shire Council planning scheme and a Material Change of Use development permit assessable under the Cairns Regional Council Planning Scheme	<p>A material change of use development permit application will be required for Wangetti South to establish the use within the project area.</p> <p>Pre-lodgement meetings have been undertaken with the former Department of State Development, Manufacturing, Infrastructure and Planning (referred to now as Department of State Development, Infrastructure, Local Government and Planning (DSDILGP), Douglas Shire Council, Cairns Regional Council, DES, former Department of Natural Resources Energy and Mines (referred now as DR), Department of Agriculture and Fisheries (DAF) and Department of Transport and Main Roads (DTMR).</p>
Under the Planning Regulation 2017 and <i>Vegetation Management Act 1999</i> (VM Act) an Operational works development approval for clearing of native vegetation	<p>Wangetti South does not trigger operational work involving clearing native vegetation under Schedule 10, Part 3, Division 4, Table 1, Item 1 under the <i>Planning Regulation 2017</i>, as the proposed works is considered to meet the definition of government supported transport infrastructure and is therefore exempt from the clearing of remnant Category B, Category C and Category R vegetation.</p>
Under the Planning Regulation 2017 and <i>Fisheries Act 1994</i> Development Permit for operational works for constructing/raising waterway barrier works Compliance with Accepted development requirements for operational work that is constructing or raising waterway barrier works and	<p>Boulder rock crossing will trigger a development permit for operational works waterway barrier works where the work does not comply with DAF's accepted development requirements.</p> <p>Bed level crossings associated with the project are considered to meet the accepted development requirements for operational work that is constructing or raising waterway barrier works' and riverine protection permit exemption requirements WSS/2013/726.</p>

Legislation and Approval Type	Relevance to the project area
<i>Water Act 2000</i> Riverine Protection Permit Exemption Requirements.	
Under the Planning Regulation and <i>Coastal Protection and Management Act 1995</i> . Development permit for operational works for interfering with quarry material on state coastal land above the high-water mark within a Coastal Management District	Parts of the project area are proposed within mapped coastal management district and therefore the proposed works would trigger a development permit for operational works for interfering with quarry material on state coastal land above the high-water mark within the coastal management district under Schedule 10 of the <i>Planning Regulation 2017</i> .
Under the <i>Land Act 1994</i> land owners consent for works on State Land	Land owner's consent is required from DR for work on state land to support material change of use development application.
Riverine protection permit (RPP) under the <i>Water Act 2000</i>	<p>There are a number of DR mapped watercourses along the proposed alignment. Bed level crossings are considered to meet the RPP exemption requirements WSS/2013/726.</p> <p>TDPD is an entity under schedule 2 of the RPP Exemption Requirements and therefore can follow the RPP exemption requirements WSS/2013/726 for any works proposed in a watercourse.</p> <p>Proposed works will be required to work within the vegetation clearing limit and excavation and placement of fill limit requirements.</p> <p>Where works result in the clearing of less than 0.5 ha of least concern regional ecosystem in a category B, C, R or X or carried out under an accepted development vegetation clearing code (other than if the vegetation is in a category A area), then the exemption requirements apply.</p> <p>Where works result in the excavation of 500 cubic metres or less, then the exemption requirements apply.</p> <p>Where works result in the placement of less than 150 cubic metres of fill, then the exemption requirements apply.</p>
Road corridor permit under the <i>Transport Infrastructure Act 1994</i> (TI Act)	Part of the project area is located within State controlled road reserve namely Captain Cook Highway which is managed by DTMR. Works within a state-controlled road reserve triggers a road corridor permit from DTMR.
Under the <i>Land Act 1994</i> Permanent closure or short-term occupation within road reserves	Permanent road closures or short-term occupation and construction within road reserves (excluding state-controlled roads) will be required during the construction phase of the project.

Legislation and Approval Type	Relevance to the project area
General Biosecurity Obligation (GBO) under the <i>Biosecurity Act 2014</i>	During the construction and operation phase of the project, activities are to be undertaken in accordance with the GBOs whereby all reasonable and practical measures are to be undertaken to prevent or minimise biosecurity risks. The Act identifies seven categories of restricted matters. Where activities are proposed contrary to the restriction for each category under the Act, a Restricted Matter Permit is required.
General Environmental Duty under the <i>Environmental Protection Act 1994</i> (EP Act)	Under the provisions of the EP Act, all persons, whether undertaking an activity authorised under the EP Act, are required to comply with the General Environmental Duty. The duty requires that <i>'A person must not carry out any activity that causes, or is likely to cause, environmental harm unless the person takes all reasonable and practicable measures to prevent or minimise the harm.'</i> This is applicable to all phases of the project.
Environmental offset requirements under the <i>Environmental Offsets Act 2014</i> <i>Commonwealth offsets policy (DSEWPC, 2012)</i>	DES has advised that state environmental offsets will be triggered for the project which will be administered under s34 and s35 of the NC Act. EPBC Act offsets are proposed in relation to impacts on the southern cassowary.

3.1 Wet Tropics Management Plan 1998

The project has been approved (Wet Tropics Permit No: WTMA20001a) and a permit issued under Part 4, Division 1, Section 45 of the Wet Tropics Management Plan 1998 (3 July 2017) (*Wet Tropics World Heritage Protection Management Act 1993*) to allow for the proposed works to occur within the Wet Tropics Management Zone. While the project was assessed in accordance with the 1998 plan, the project is considered to comply with the intent of the Wet Tropics Management Plan 2020.

An assessment has been undertaken against the provisions of the Wet Tropics Management Plan 1998 and is presented in Table 3-2.

Table 3-2 Assessment against the provisions of the Wet Tropics Management Plan 1998 (3 July 2017 version)

Wet Tropics Management Plan 1998 (3 July 2017 version)	Response
<p>Zone B – Zone B is comprised of land that is mostly of high integrity but not necessarily remote from disturbance.</p> <p>It is intended that, in Zone B, land be undergoing recovery or rehabilitation towards its natural state or becoming remote from disturbance by activities associated with modern</p>	<p>The majority of the project is located within Zone B under the Wet Tropics Management Plan 1998.</p> <p>The proposed trail is considered to meet the intent of Zone B by providing opportunities to connect with nature and to be surrounded by nature along the trail. The trail will allow for winding around natural obstacles and integrating within the natural environment. Vegetation disruption, including canopy cover, is minimised.</p>

Wet Tropics Management Plan 1998 (3 July 2017 version)	Response
<p>technological society; and a visitor may expect opportunities for solitude in a natural area requiring a degree of self-reliance; and management presence be limited mainly to activities required for the recovery or rehabilitation of the area.</p>	<p>The Wangetti South Section has been designed to minimise built structures like bridges, boardwalks and viewing platforms. These built structures pose a number of challenges:</p> <ul style="list-style-type: none"> • They are normally constructed from imported materials and can be intrusive in the natural environment • They can burn during bushfires or prescribed burns
<p>The management purpose of Zone B is, to the greatest possible extent—</p> <ol style="list-style-type: none"> To protect and enhance the integrity of land in the zone If the land is disturbed— <ol style="list-style-type: none"> To restore land in the zone to its natural state, as opportunities arise To include the land in zone A once it is sufficiently recovered or rehabilitated. 	<ul style="list-style-type: none"> • They can be difficult to construct in remote areas, due to the challenges of importing the materials • They increase the maintenance burden. <p>Where built structures are required, the design and finish will prioritise the use of local timbers and other materials that will age gracefully with time. Above all, the materials must be durable enough to withstand the harsh tropical climate and natural environment. Any built structures must be designed and engineered to be fit-for-purpose, to have minimal impact to the surrounding environment, to have minimal maintenance requirements and will need to take a minimalistic approach to materials given the remote nature of the trail, resulting in a minimal impact on the scenic beauty of the Wet tropics.</p>
<p>Zone C – Zone C is comprised of land on which, or adjacent to which, there is disturbance associated with community services infrastructure.</p> <p>It is intended that, in Zone C—</p> <ol style="list-style-type: none"> Land be mostly natural, but with some disturbance associated with community services infrastructure (community services infrastructure means infrastructure for community services such as, for example, transport services, electricity supply, water supply and telecommunications services), other community facilities and visitor facilities A visitor may expect various low-key opportunities for nature appreciation and social interaction in a natural setting, but with some 	<p>Where the trail is located within Zone C land, it is considered to meet the intent of Zone C areas, being, land be mostly natural, but with some disturbance associated with community services infrastructure.</p> <p>The Wangetti South Section has been designed to minimise built structures like bridges, boardwalks and viewing platforms. These built structures pose a number of challenges:</p> <ul style="list-style-type: none"> • They are normally constructed from imported materials and can be intrusive in the natural environment • They can burn during bushfires or prescribed burns • They can be difficult to construct in remote areas, due to the challenges of importing the materials • They increase the maintenance burden. <p>Where built structures are required, the design and finish will prioritise the use of local timbers and other materials that will age gracefully with time. Above all, the materials must be durable enough to withstand the harsh tropical climate and natural environment. Any built structures must be designed and engineered to be fit-for-purpose, to have minimal impact to the surrounding environment, to have minimal maintenance requirements and will need to take a</p>

Wet Tropics Management Plan 1998 (3 July 2017 version)	Response
<p>disturbance by activities associated with modern technological society</p> <p>e. Management presence may be obvious.</p>	<p>minimalistic approach to materials given the remote nature of the trail, resulting in a minimal impact on the scenic beauty of the Wet tropics.</p>
<p>The management purpose of Zone C is—</p> <p>f. To accommodate community services infrastructure, other community facilities and visitor facilities; but (b) to the greatest possible extent—</p> <p>(i) To ensure any adverse impact of activities carried out in the zone on the area's integrity is minimal and acceptable under this plan</p> <p>(ii) To otherwise protect and enhance the integrity of land in the zone.</p>	

3.2 Wet Tropics Strategic Plan 2020 – 2030

The Wet Tropics Strategic Plan 2020 - 2030 provides a 10-year policy framework to guide decision-making under the *Wet Tropics World Heritage Protection and Management Act 1993*. The primary purpose of the Wet Tropics Strategic Plan 2020 - 2030 is to enable the identification, protection, and conservation of the Wet Tropics for future generations. It states the desired outcomes that will be delivered and outlines the actions that will achieve this. An assessment has been undertaken against the provisions of the Wet Tropics Strategic Plan 2020–2030 with respect to Wangetti South Section and is outlined in Table 3-3.

Table 3-3 Assessment against the provisions of the Wet Tropics Strategic Plan 2020 – 2030

Wet Tropics Strategic Plan 2020 – 2030	Response
<p>1. Climate change and other threats</p> <p>Respond to the impacts of climate change and priority cross-tenure threats to the area</p>	<p>With respect to the production of greenhouse gases as a result of machinery use, selection of machinery is to be fit-for-purpose and low emission, wherever possible.</p> <p>Construction mitigation measures will be required to be incorporated into the contractor's CEMP. The contractor is also required to comply with the general environmental duty under the EP Act and Environmental Protection (Air) Policy 2008, as well as appropriate provisions under the contract documentation.</p>
<p>2. Support Rainforest Aboriginal Peoples</p>	<p>During the development of the trail, cultural heritage representatives were engaged to provide advice regarding the</p>

Wet Tropics Strategic Plan 2020 – 2030	Response
Promote and incorporate the rights, interests and aspirations of Rainforest Aboriginal Peoples in the management of the area.	<p>significant Aboriginal areas, significant Aboriginal objects and or evidence, of archaeological or historic significance along the trail.</p> <p>As part of the Project, TDPD has been engaging with Traditional Owners regarding the proposed works and to avoid impacts on cultural heritage values.</p>
<p>3. Involve the community</p> <p>Optimise community participation and connection with the area through innovative interpretation, with a focus on education, volunteering and social inclusion.</p>	<p>The Wangetti South Section experience will be uniquely Australian, emphasising the culture, history and way of life of the Traditional Owners, the Yirrganydji people. It will encourage a sense of exploration and a spirit of adventure. It will foster an appreciation of the natural environment and the diversity of flora and fauna within it.</p> <p>The Project will provide economic, cultural and educational benefits to the community, as summarised below.</p> <p><i>Economic</i></p>
<p>4. World-class tourism and recreation</p> <p>Enhance the World Heritage presentation and support opportunities for natural and cultural tourism and recreation</p>	<p>Wangetti South Section has the potential to diversify the tourism product offering in North Queensland, involve Traditional Owners and increase jobs by utilising Queensland's natural assets. The construction phase of the Project will provide an opportunity for the creation of local jobs and employment through the sourcing of material and equipment or through manual labour, while the operational phase of the Project will increase visitors to the area, supporting the local economies of Cairns, Wangetti and Port Douglas.</p> <p>The Wangetti South Section will provide access to a World Heritage listed assets –the WTWHA, which will create value for money experiences for tourists and provide opportunities for tourism operators to extend their offerings and capture markets that are seeking access to unique nature-based experiences (PWC, 2018).</p> <p><i>Cultural and spiritual</i></p> <p>The Wangetti South Section supports a healthy wellbeing and lifestyle by encouraging the physical, mental, and spiritual activity of participants. Contact with nature can enhance spiritual health, which underpins all other aspects of health (PWC, 2018).</p> <p><i>Educational</i></p> <p>The Wangetti South Section will create several educational opportunities, including the community, schools and universities to increase their knowledge and understanding around wildlife and conservation in WTWHA, with the opportunity to develop education programs to help teach and upskill students (PWC, 2018).</p>
<p>5. Minimise impacts</p> <p>Manage activities that may have been an impact on the area appropriately</p>	<p>Wangetti South Section has received a WTMA permit and therefore will be undertaken in accordance with Strategy 5 of the Wet Tropics Strategic Plan 2020 - 2030.</p>

Wet Tropics Strategic Plan 2020 – 2030	Response
through permit and zoning system.	

4. Roles and Responsibilities

To achieve the overall objective of sound environmental management throughout construction and operation of Wangetti South Section, with the least possible impact on the environment, a clear implementation and management structure is required.

The following section provides an overview of the minimum implementation structure for the project relating to environmental responsibilities. Specific roles and responsibilities shall be included in duty statements.

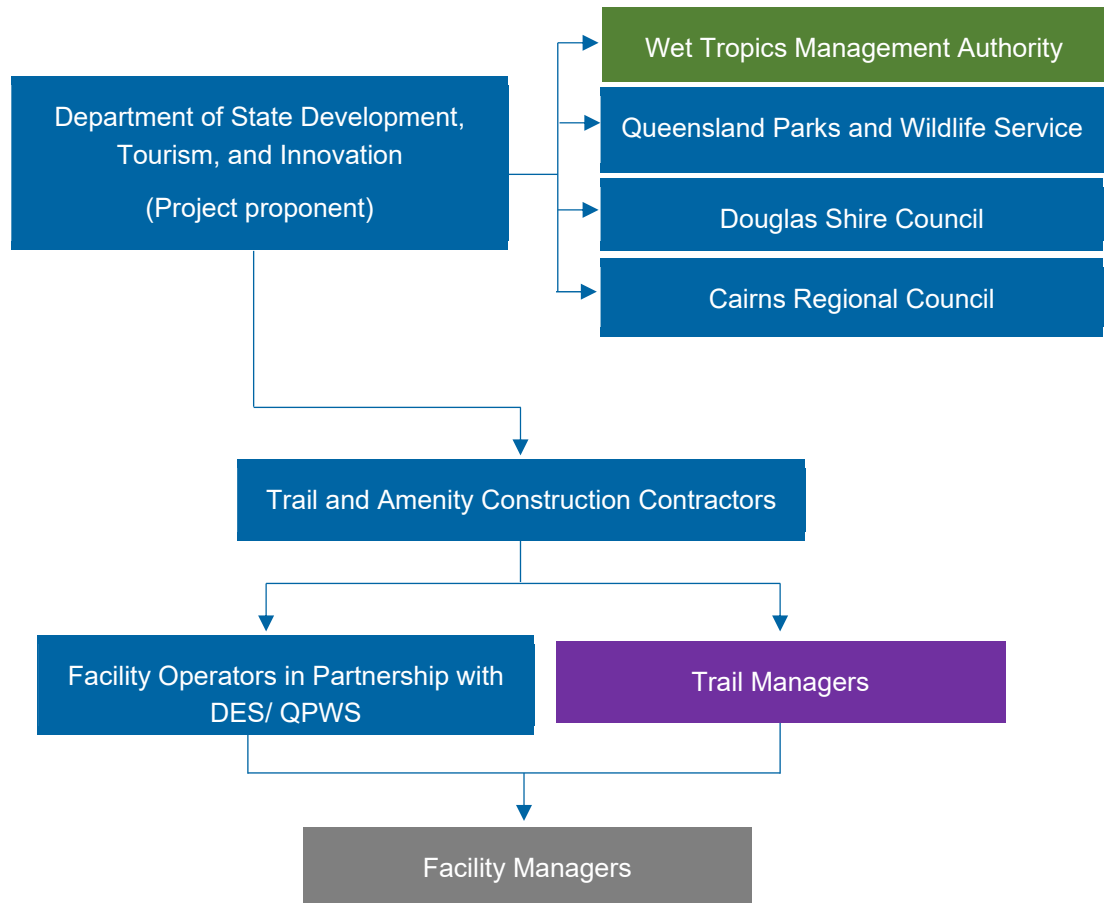


Figure 4-1 Project organisation chart

4.1.1 Site responsibilities

4.1.1.1 All personnel

All personnel associated with the planning, design, construction and operation of the trail are responsible for ensuring that they comply with this EMP, the General Environmental Duty (GED) and Duty to Notify in accordance with the EP Act (as detailed below).

General Environmental Duty

Section 319 of the EP Act states that every person has a GED. This GED requires that a person must not carry out an activity that causes or is likely to cause environmental harm unless the person takes all reasonable and practicable measures to prevent or minimise the harm. In deciding measures to be undertaken to fulfil the GED the following must be considered:

- The nature of the harm or potential harm
- The sensitivity of the receiving environment

- The current state of technical knowledge for the activity
- The likelihood of successful application of the different measures that might be taken
- The financial implications of the different measures as they would relate to the type of activity.

Compliance with the GED is a defence to offences related to causing unlawful environmental harm. If defendants can show that the harm happened while a lawful activity apart from the EP Act was being carried out and they fulfilled their GED, then they cannot be found guilty of causing unlawful environmental harm.

Duty to Notify

Section 320 of the EP Act requires that on becoming aware of serious or material environmental harm being caused by an activity that they are involved in, a person has a duty to report that harm, unless the harm is authorised by the Administering Authority (i.e. is undertaken in accordance with an approval or condition of a permit/licence). This is the duty to notify environmental harm. Failure to fulfil this duty is an offence and can lead to prosecution.

4.1.1.2 Department of State Development, Tourism and Innovation

Responsibilities of DSDTI as project proponent are as follows:

- Ensuring sufficient resources are available to implement EMP
- Ensure that all relevant licenses/permits/approvals are in place prior to any works being undertaken (if required)
- Ensure that key personnel are familiar with the EMP and are aware of their environmental responsibilities
- Ensure that all personnel operate in accordance with the EMP, statutory approvals and legislative requirements
- Ensure that the EMP is updated with conditions of approvals, permits and licences
- Communicating with all role players in the interests of a co-ordinated effort to protect the environment
- Ensure all preconstruction activities such as preclearance surveys are complete prior to construction (clearing commencing)
- Monitor and review (where required) environmental performance during construction of the project.

4.1.1.3 Construction contractor and trail builder

Contractor responsibilities are as follows:

- Implementation of the CEMP
- Implement the Weed, Pest and Disease Management Plan during construction (as per procedures outlined in Appendix E)
- Implementation of the Erosion and Sediment Control Plan during construction (ESCP)
- Implementation of the rehabilitation plan
- Implementation of the Pre-clearance Survey Methodology
- Implementation of the Cassowary Management Plan.

4.1.1.4 Trail Manager

Trail Manager responsibilities are as follows:

- Trail maintenance
- Repairs to damaged infrastructure (bridges, watercourse crossings, etc.) following adverse weather events
- Litter control along the trail
- Weed and pest management along the trail in the operation phase
- Erosion and sediment control during the operation phase.

4.1.1.5 Facility Operator in Partnership with DES/ QPWS/Local councils

Facility operators' responsibilities are as follows:

- Management of camp site facilities
- Management of trail head facilities
- Management of service tracks
- Ensure necessary guidance and advice is provided to all personnel with regard to environmental management requirements
- Ensure staff are appropriately qualified and trained regarding the requirements and responsibilities of the EMP.

5. Project Phases

5.1 Planning and Design Phase

Upon appointment of a contractor onsite they will be responsible for the Planning and Design Phase. This phase includes pre-clearance surveys, trail routing but does not include site clearance.

In keeping with the low impact, ecofriendly, ecotourism nature of the development activity the following principles have been considered during the planning and design phase of the project:

- Minimal vegetation clearance is to be encouraged across the entire development footprint
- Pre-clearance surveys are to be undertaken prior to any vegetation clearing
- The construction contractor's appropriately qualified person (ecologist/botanists) to undertake the preclearance survey and fauna spotter catcher activities
- Trail routing must take place along the alignment of least disturbance
- Trail watercourse crossing points should be sited where there is minimal disturbance to stream banks and riparian vegetation and preferably over exposed bedrock
- Manual construction methods are to be encouraged over mechanised methods
- Only existing access roads are to be utilised, with no new access roads constructed
- Where feasible, amenities are to be designed with energy efficiency measures such as solar lighting, natural cooling, rainwater harvesting, etc.
- The use of flood lighting will be avoided
- An emphasis should be given to the use of locally available building materials, recycled material
- Colour tones matching the surrounding natural environment should be utilised on new infrastructure (eco-accommodation) to limit visual impacts
- Informative signage will be established to provide education around the heritage values of the WHA and encourage minimal impact behaviours from visitors.

5.2 Construction Phase

The Construction Phase includes all activities from site establishment by a contractor, site clearance, to practical completion of all built facilities and activities and typically ends when the final payment certificate has been processed.

The general construction methodology to be adopted by the contractor during the construction phase is discussed in Wangetti Trail Construction Methodology Manual April 2020 in Appendix G.

A detailed CEMP has been developed for Wangetti South Section and is provided in Appendix E. The contractor will be required to update and amend the CEMP based on adopted construction approaches and the outcomes of approvals and permits associated with Wangetti South Section.

5.2.1 Access arrangements

Access to the shared use trail can be achieved through a number of different options, depending on the location.

During the construction phase the project area can be accessed via the existing service tracks that connect to the Captain Cook Highway, as nominated in the Wangetti Trail Construction Methodology Manual April 2020 and shown in Appendix G. The service tracks will be closed to the public at all times during construction. Access will be blocked by regulatory signage will be provided. It is the contractor's responsibility to ensure the day-to-day maintenance of these barriers.

During the operational phase the project area operational staff can access via the service tracks that connect to the Captain Cook Highway, as shown in Appendix D. The service tracks will be closed to the public at all times. Access will be blocked by gates and signage will be provided.

Trail users including hikers and cyclists can access the shared use trail via the trail head at Ellis Beach.

5.3 Operation Phase

The operational phase commences once the project area has been handed over by the contractor to the proponent. It should be noted that should there be further construction activities taking place, post the construction phase, then the specifications of the construction phase will still apply.

During the operational phase, the shared use trail, service tracks and public camping node will be managed in accordance with the Queensland Parks and Wildlife Service (QPWS) Asset and Infrastructure Management Business Rules (AIM business rules), QPWS operational policies, procedural guides, guidelines, information sheets, technical manuals and checklists. These documents set out standards that Wangetti South Section will need to comply with and provide a structured approach to ensure appropriate environmental management measures and controls are implemented as part of the project.

The anticipated activities associated with the operational phase include:

- Shared use trail and Dark Jungle used by cyclists and hikers
- Trail head will be open to all, no bookings required
- Maintenance of the shared use trail including the trail head and associated infrastructure by maintenance staff
- Maintenance of Dark Jungle by maintenance staff
- Maintenance of service tracks by maintenance staff.

6. Training

6.1 Training, awareness and competence

All personnel involved in the construction and operational phases shall be required to attend a compulsory induction before commencing any work on site. This education requirement will be the responsibility of the contractor. The environmental component of the induction shall include (but not be limited to) the following items:

- Guidance on the significance and sensitivity of environmental features along the Wangetti Trail
- Individual's and organisation's environmental obligations under relevant environmental legislation
- The potential environmental impacts of construction (where relevant)
- Controls and procedures to prevent impacts
- All staff shall be made aware of their GED and Duty to Notify responsibilities as per the EP Act and the implications of failing to fulfil these duties
- All staff shall be made aware of their environmental responsibilities under the CEMP and EMP in relation to implementing mitigation measures, reporting environmental incidents and complaints and implementing corrective actions
- All staff shall be made aware of their environmental responsibilities under the CEMP and EMP in relation to contaminated land, including identification of potentially contaminated land and procedures for working with potentially contaminated land
- All staff shall be given instructions on environmental emergency response procedures (i.e. firefighting, snake bite, spill kit locations and usage).

The environmental induction training should be developed prior to construction commencing and operational activities occurring.

6.1.1 Training register

A register of all environmental training delivered during the course of the construction and operation phases of the Project, (including inductions and toolbox talks), will be maintained for the duration specified by any environmental approvals. The register will be maintained to record training attendance and currency of training for each staff, contractor and visitor.

7. Monitoring and environmental inspections

7.1 Construction phase

The contractor will be required to develop an environment monitoring plan and schedule to be approved by the proponent for the construction phase of Wangetti South Section and to include the monitoring requirements as outlined in the EMP, CEMP, TMP, CESSCP, WPDMP and CMP.

7.2 Operational phase

The contractor will be required to develop an environment monitoring plan and schedule to be approved by TDPD for the operational phase of Wangetti South Section. Monitoring plan and schedule to consider the following environmental matters:

- Biodiversity (fauna)
- Biodiversity (flora)
- Biosecurity
- Soil and land management:
 - erosion and sediment control; and
 - chemical and fuel management)
- Public amenity and health:
 - bushfire
 - noise and vibration
 - air quality
 - hazards, health, safety and
 - roads and traffic
- Cultural heritage
- Water management
- Waste management.

It is the responsibility of TDPD to continually monitor the performance of the Contractor in accordance with the specifications contained in this Environmental Management Plan (EMP).

8. Documentation, document control and records

The contractor and the TDPD will ensure that an adequate document control system is in place to ensure that only current documentation is in use.

Records collected as part of environmental management activities will be retained by the Contractor and the TDPD for the legally required period of time. Environmental records include but may not be limited to:

- Site inspection checklists
- Environmental audit reports
- Training records
- Monitoring data
- Complaints and associated records of communication
- Meeting minutes.

During construction phase the Contractor will make these records available to the TDPD or any relevant authorities and their representatives on request. During the operational phase, the Proponent will make these records available to any relevant authorities and their representatives on request and where justified and in accordance with legislation.

9. Audit

9.1 Construction Phase

During construction activities, the Contractor will be responsible for complying with the relevant provisions as set out in this EMP and sub-plans.

All inspection and compliance reports of environmental performance will be stored in an electronic database that is used to enable corrective actions identified during the inspection/auditing process to be recorded, tracked and closed out. The information will be made available to the relevant regulatory authorities as required.

9.2 Operational Phase

During the operational phase, monitoring and maintenance of the trail and camping site will be managed in accordance with each land management agencies policies and procedures.

10. Review

During the construction phase and operational phase TDPD will regularly review and (if necessary) update the EMP and associated sub-plans. The review will take into account the following:

- Changes in legislative requirements (including conditions of approvals)
- Environmental performance, findings of environmental audits and inspections
- Outcomes of agency consultation
- Outcomes of consultation with communities and resolution of complaints
- Changes in external and internal policies, standards and guidelines.

The review will ensure the continuing suitability, adequacy, and effectiveness of the EMP. The review will include assessing opportunities for improvement.

11. Emergency, incidents and complaints

Emergency and incident responses will vary depending on the nature of the incident.

TDPD will be verbally notified of an incident on the day it occurs and as soon as practicable of the responsible person becoming aware of the incident, and in writing within 24 hours.

All notifications to authorities including but not limited to WTMA, DES, QPWS, State emergency services (police/fire/ambulance) and DTMR will be undertaken by TDPD.

The Contractor will be required to provide an Emergency Response Plan and for this plan to be thoroughly communicated to all staff members in the Construction Induction. The Emergency Response Plan should identify evacuation routes, mustering points, communication protocols and provide key contact details for local authorities and services. It should be compatible with the internal emergency response protocols of the various land managers.

When reporting environmental incidents to TDPD, the following information is to be provided:

- The name and contact details of the reporting person
- The date and time the environmental incident occurred
- The activity that was being undertaken when the incident occurred
- How the incident occurred
- Any containment measures put in place to reduce or contain environmental harm
- An assessment of the amount of environmental harm that occurred
- If any other stakeholders are aware of the incident.

Environmental incidents and corrective actions have been identified in the following subplans:

Sections 6.2 and 6.3 of the CЕССР (refer to Appendix A).

Section 5.2 of the СМР (refer to Appendix B).

Section 5.3.5 of WPDMP (refer to Appendix C).

Section 4 of the TMP (refer to Appendix D).

Section 4 of the CEMP (refer to Appendix E).

However, pro-active environmental risk management measures should be undertaken wherever possible, if events such as extreme rainfall or flooding are forecast. Some examples of environmental risk responses are provided in Table 11-1 below.

Table 11-1 Example environmental incidents and mitigation and reporting requirements

Incident	Mitigation Measures	Report
Failure of erosion and sediment control devices following rainfall event or flooding	Re-instatement of ESC devices	Report to TDPD
Identification of cultural heritage aspects during excavation	Cease operations and follow cultural heritage reporting procedure	Report to TDPD
Injury to fauna during site works	Following notification procedure.	Report to TDPD

Incident	Mitigation Measures	Report
Damage to vegetation	Cease operations in the vicinity of impacted vegetation. Attempt to stabilise area and engage project botanist.	Report to TDPD

The contractor during the construction phase to develop an emergencies, incidents and complaints protocols and reporting documentation to be agreed by TDPD.

The contractor during the operational phase to develop an emergencies, incidents and complaints protocols and reporting documentation to be agreed by TDPD.

12. Environmental Management Subplans

The following documents outlines the avoidance, mitigation and management measures that must be abided by during and after the project.

12.1 Concept Erosion and Sediment Control Plan

Refer to Appendix A.

12.2 Cassowary Management Plan

Refer to Appendix B.

12.3 Preliminary Weed, Pest and Disease Management Plan

Refer to Appendix C.

12.4 Preliminary Traffic Management Plan

Refer to Appendix D.

12.5 Preliminary Construction Environmental Management Plan

Refer to Appendix E.

12.6 Matters of National Environmental Significance flora pre-clearance survey methodology

Refer to Appendix F.

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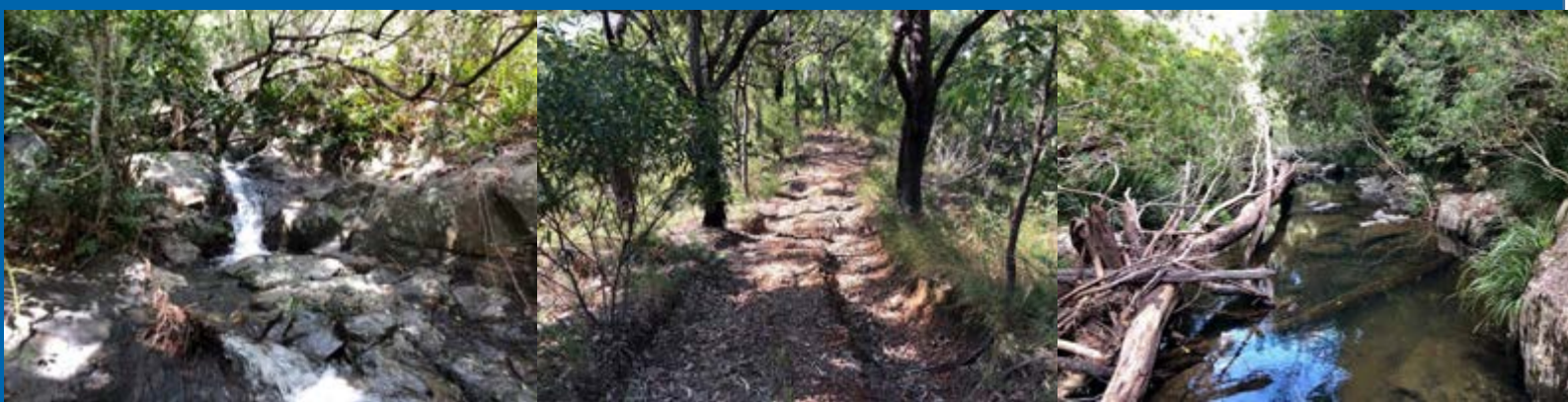
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Appendices

Appendix A – Concept Erosion and Sediment Control Plan



Department of State Development, Tourism and Innovation

Wangetti Trail South Section (Wangetti to Palm Cove)

Concept Erosion and Sediment Control Plan

December 2020

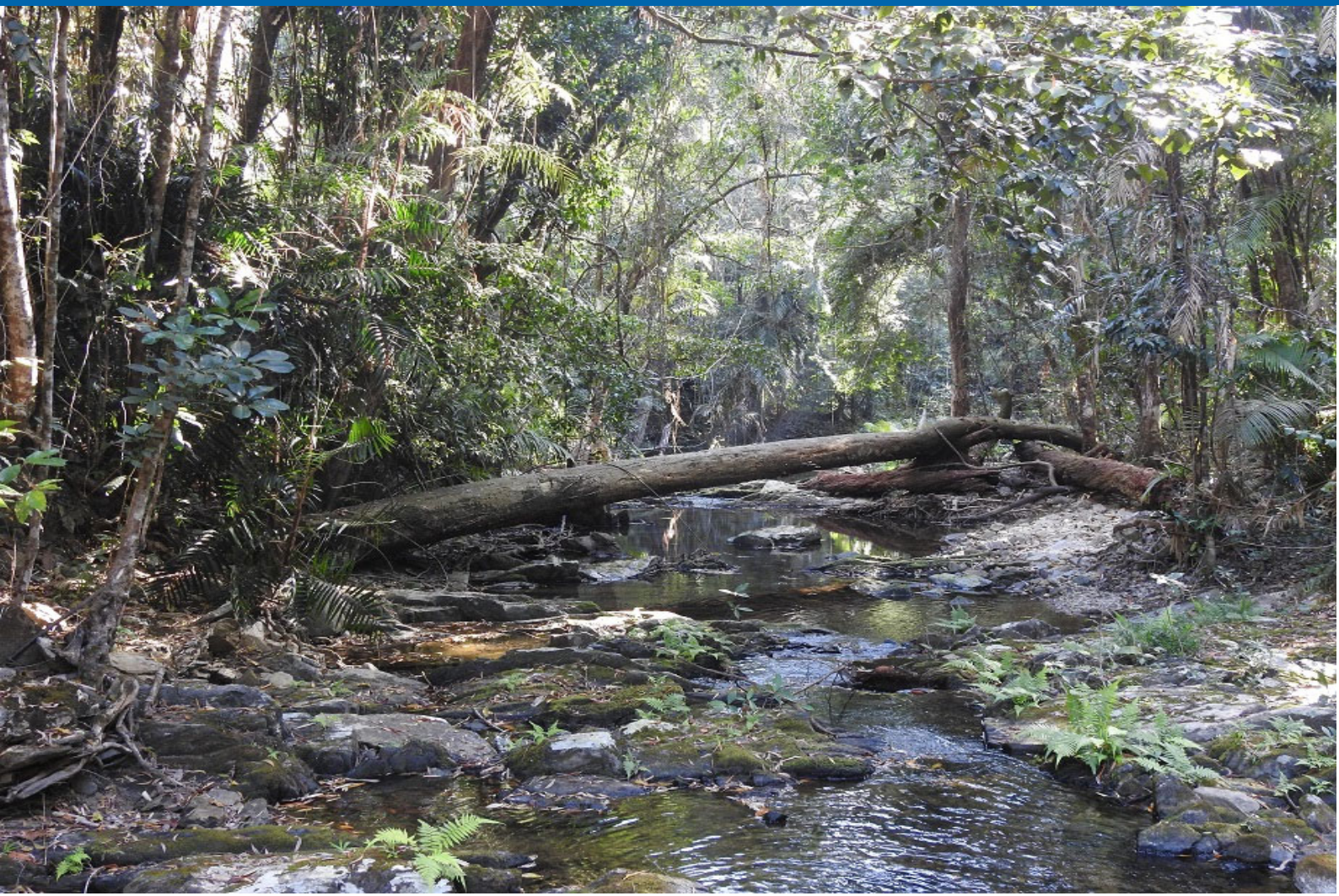


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- Appendix A – Erosion hazard assessment
- Appendix B – Sediment and drainage control standard drawings
- Appendix C – Inspection checklist template

1. Introduction

1.1 Project background

The Department of State Development, Tourism and Innovation (DSDTI) – Tourism Development Projects Division (TDPD) is proposing to establish the Wangetti Trail – Wangetti South ('Project') Section, a 29.7 kilometre (km) shared use trail to accommodate both mountain bike users and hikers from the southern boundary Lot 2 SP309094 in the township of Wangetti, to Palm Cove.

Development of a Concept Erosion and Sediment Control Plan ('CESCP' or 'Report') is required to support environmental approval applications for proposed works associated with the Project and to demonstrate to the regulatory authorities how erosion and sediment will be managed during the construction phase of the project.

This CESCP has been developed in general accordance with International Erosion Control Association's (IECA) Best Practice Erosion and Sediment Control Guidelines (2008), and the scope of services described below in Section 1.3.

1.2 Purpose of this report

This CESCP provides preliminary guidance to establish appropriate site erosion and sediment control (ESC) management measures to reduce potential adverse impacts during the construction phase of the Project. It is expected that prior to any construction activity for the Project, a detailed work specific Erosion and Sediment Control Plan (ESCP) will be developed by the Contractor as part of the Construction Environmental Management Plan (CEMP). The Contractor will review the preliminary guidance provided in this Report and provide greater detail based on construction methodology, geotechnical conditions, and timing of works.

This CESCP does not prescribe or locate any permanent or temporary erosion or sediment control measures in detail, but provides indicative locations for erosion and sediment control devices as one measure of meeting the Contractor's responsibilities.

During preparation of the ESCP, as a minimum, the Contractor will comply with the IECA guideline as outlined below:

- Ensure appropriate soil data is collected and site constraints identified
- Ensure appropriate consideration of erosion and sediment control requirements, site constraints and environmental issues occurs before, during and following the construction phase
- Identify and manage erosion hazards associated with any on-site land disturbance activity

1.3 Scope

As part of the scope of services for this Report, GHD provides preliminary ESC strategies in accordance with the standards outlined in the IECA 2008 guidelines. The following outcomes will be delivered in this Report:

- Identification of disturbed areas throughout the project site, where applicable
- Identification, and indicative location, of a range of suitable control types that could be adopted for each disturbed area
- Preliminary guidance on erosion and sediment control measures.

1.4 Relevant guidelines and legislation

Erosion and sediment controls will be established to comply with the relevant legislative requirements outlined below, as well as the *Best Practice Erosion and Sediment Control*, International Erosion Control Association (Australasia) (IECA 2008).

1.4.1 Environmental Protection Act 1994

All persons have a legal duty under the *Environmental Protection Act 1994* section 319 to take all reasonable and practicable measures to minimise or prevent environmental harm. Such harm can be caused if sediment from construction sites enters (washes, blows, falls or otherwise) into stormwater drains, roadside gutters or waterways. Under section 443 of the *Environmental Protection Act 1994* a person must not cause or allow a contaminant to be placed in a position where it could reasonably be expected to cause serious or material environmental harm or environmental nuisance (e.g. placing a stockpile adjacent to a waterway).

In addition, people who are in positions of management in a corporation have an additional duty under the *Environmental Protection Act 1994* to ensure that their corporation complies with the Act. This means supervisors need to take reasonable and practicable steps to ensure that the people under their control do not breach environmental laws.

People who become aware of environmental harm in association with their work (e.g. significant loss of sediment from their site works into a watercourse) have a legal duty under the *Environmental Protection Act 1994* to notify the Department of Environment and Science (DES).

1.4.2 Environmental Protection Policy (Water and Wetland Biodiversity) 2019

This policy sits under the *Environmental Protection Act 1994*. The *Environmental Protection Policy (Water and Wetland Biodiversity) 2019* provides environmental values and water quality objectives for Queensland waters. These are utilised when determining environmental harm and to inform other statutory and non-statutory decisions. The water quality objectives assist in identifying whether the environmental values are protected. These values and objectives will be utilised when determining risk of environmental harm from water releases or runoff, and appropriate erosion and sediment controls implemented.

1.4.3 Planning Act 2016

The *Planning Act 2016* is the mechanism for assessing all developments within Queensland. This act establishes the process for sustainable planning and development assessment in an ecologically sustainable way.

1.5 Limitations

This Report has been prepared by GHD for Department of State Development, Tourism and Innovation and may only be used and relied on by Department of State Development, Tourism and Innovation for the purpose agreed between GHD and the Department of State Development, Tourism and Innovation as set out in Section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than Department of State Development, Tourism and Innovation arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Department of State Development, Tourism and Innovation and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

2. Site description

2.1 Location

The Project is located between Wangetti Township and Palm Cove in North Queensland. The Project is located within the Douglas Shire Council and Cairns Regional Council local government areas.

The shared use trail within the Project extends 29.7 km and is constrained by the Coral Sea to the east and the Macalister Ranges to the West, and is almost entirely located within the Macalister Range National Parks and the Wet Tropics World Heritage Area (WTWHA), as identified on Figure 2-1 below.

2.2 Proposed works

The Project will comprise of the following components, which are discussed in further detail in the following sections:

- Construction of a shared use trail and formalisation of existing access tracks into service tracks, including various design features
- Construction of waterway crossings
- Construction of a public camping node and amenities block.

2.2.1 Trail and service track alignment

The Project will comprise of a 29.7 km shared use trail to accommodate both mountain bike users and hikers, consisting of natural ground and surface treatments, which will be a maximum of 1.5 m wide. The 1.5 m wide trail will be located within a 40 m survey corridor, referred to as the construction allowance corridor, to allow flexibility for the placement of infrastructure during the construction phase. The temporary disturbance area for the trail is defined as 2.5 m (0.5 m either side of the 1.5 m permanent trail width). Trail benching will be the main construction technique to be used to construct the vast majority of the trail. The majority of earthworks will be undertaken by a mini excavator to construct the bench which becomes the tread of the trail. It is generally a balanced cut and fill process.

Vegetation clearing is anticipated to generally occur simultaneously with the construction of the trail, but around 50 to 100 m ahead of the bulk earthworks. Care will be taken to ensure no windrows or stockpiles of cleared vegetation are created. Cleared vegetation will be scattered into the surrounding environment, without smothering existing vegetation.

Existing access tracks will be formalised into service tracks to provide restricted access to the shared use trail and public camping node for construction, operational, maintenance and emergency purposes.

2.2.2 Waterway crossings

The proposed trail is anticipated to cross a number of waterways. Based on the specific waterway size, structure and other conditions, various waterway crossing designs are anticipated along the shared use trail, including:

- Rock armouring – used to prevent soil erosion and compaction, to provide traction for users, or to harden the trail surface in boggy areas. Rock armouring to be used in ephemeral waterways only, where habitat for protected aquatic fauna species is not present.

- Boulder crossings – used when the trail crosses a small ephemeral waterways and there are suitable large rocks or boulders available locally to construct a boulder waterway crossing. Boulder waterway crossings are used to facilitate safe crossing of small watercourses, keeping riders and hikers largely above the water. They are long lasting, relatively inexpensive, impervious to bushfire and maintain a natural appearance relative to their location and setting. Boulder crossings are to be used in ephemeral waterways only, where habitat for protected aquatic fauna species is not present.
- Low level bridges (minor water crossing) – used when the trail crosses a small permanent waterway and/or supports habitat for protected aquatic fauna species. The Project includes 53 single span bridges ranging from upwards of 8 metres in length. These bridges are not classified as waterway barrier works as they meet the requirements for accepted development including:
 - The abutments do not extend into the waterway beyond the high bank
 - The bank revetment works do not extend beyond the toe of the bank
 - No scour protection is placed on the bed of the waterway upstream, downstream or under the structure
 - The proposed bridges will span the full width of the waterway with no structures being proposed within the waterway.

The Contractor will be responsible for ultimately determining the appropriate location for rock armouring and boulder crossings, based on the findings collected as part of the pre-clearance survey during the Pre-Start Trail Review.

2.2.3 Public camping node and amenities block

A public camping node and amenities block (called the 'Dark Jungle'), encompassing a footprint of 0.25 hectares, will be established and comprised of:

- 10 x 4 m diameter elevated camping decks
- 1 x 2.5 m x 2.5 m toilet block
- One communal gathering area including bike racks, table and seating, cooking and bench area and shelter
- Interconnecting pathways, boardwalks and access tracks.

2.2.4 Design features

As part of the construction of the shared use trail, as outlined in the Wangetti Trail Construction Methodology (World Trail 2020), where appropriate and required various design features are proposed, which include the following:

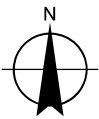
- Grade reversals – points at which trail gradient changes from up to down (or down to up) as the trail moves across a side slope. Grade reversals push water off the trail at the low point of the grade reversal, preventing erosion. Grade reversals effectively divide the trail into short, individual watersheds, so the drainage characteristics of one section of trail won't affect any other section.
- Switchbacks – a 180° turn on a hillside, engineered for drainage. The upper approach is usually insloped and the lower approach is usually outsloped. The switchback turn reverses the direction of a trail, and is located on a relatively level, constructed landing.
- Rock walling – (up to 500 mm) smaller structures designed to restrain soil to a slope that it would not naturally keep to (typically a steep, near-vertical or vertical slope).

- Retaining walls – larger structures designed to restrain soil to a slope that it would not naturally keep to (typically a steep, near-vertical or vertical slope).
- Ballast surfacing – a two course surfacing treatment, used to raise and/or harden the surface of the trail. Ballast surfacing is used in high traffic areas, sunken or low-lying areas, wet or boggy areas, or areas requiring the passage of vehicles. Due to the high bulk material requirements, it is usually only used in areas where vehicle access is available nearby to import materials. For the Wangetti Trail, this treatment is proposed to treat sections of existing, eroded, sunken four-wheel drive tracks in the flat terrain immediately south of Wangetti. In this area, the trail comes very close to the Captain Cook Highway to skirt around a military firing range. This proximity to the highway provides good access for trucks.
- Pre-Cast concrete steps – used to climb up/down steep sections of trail on hikers only sections.
- Natural rock seats – used at rest locations to provide seating. Locally found rocks are used.



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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55



DITD
Environment Assessment Stage 2 Wangetti Trail

Wangetti South Section
Project Locality Plan

Project No. 41-32458
Revision No. 5
Date 1/12/2020

FIGURE 2-1

2.3 Site topography

Largely, the Project alignment traverses the eastern slopes of the Macalister Ranges and intersects an array of different vegetation types, including rainforests and open woodland ecosystems. The landscape contains volcanic mountain ranges and a mix of permanent and semi-permanent waterways, with topography ranging from sea level to 250 m AHD. The trail is anticipated to have an average gradient of <10% and a maximum gradient no greater than 15% (for short distances only).

2.4 Regional geology

Geology of the Project consists primarily of mudrock and granitoid from the early to late Devonian age. Portions of alluvium geology is present in the north towards the township of Wangetti. Sand is also present in some coastal portions of the Project.

2.5 Soils

2.5.1 Soil type

The location of the trail on the slopes of the Macalister range, has a high probability of erosion and sedimentation. According to the Australian Atlas of Soils, the project area consists of three major soil groups:

- **Dermosols** – these soils generally have a well-structured surface and are usually non-dispersive due to the low sodium content, therefore erosion risk is reduced. These soils are present in the northern section of the trail alignment.
- **Ferrosols** – are typically well-drained and have good ability to produce vegetation. This soil type is present in the southern portion of the trail alignment.
- **Kurosols** – these soils typically have poor infiltration due to their hard-setting surface. This results in a large proportion of water running off and causing erosion. These soils can be dispersive in the subsoil and contain high salt levels which can lead to erosion. These soils are present in the central portion of the trail alignment.

Figure 2-2 details soil types in the north Queensland region, with the project area outlined in red.

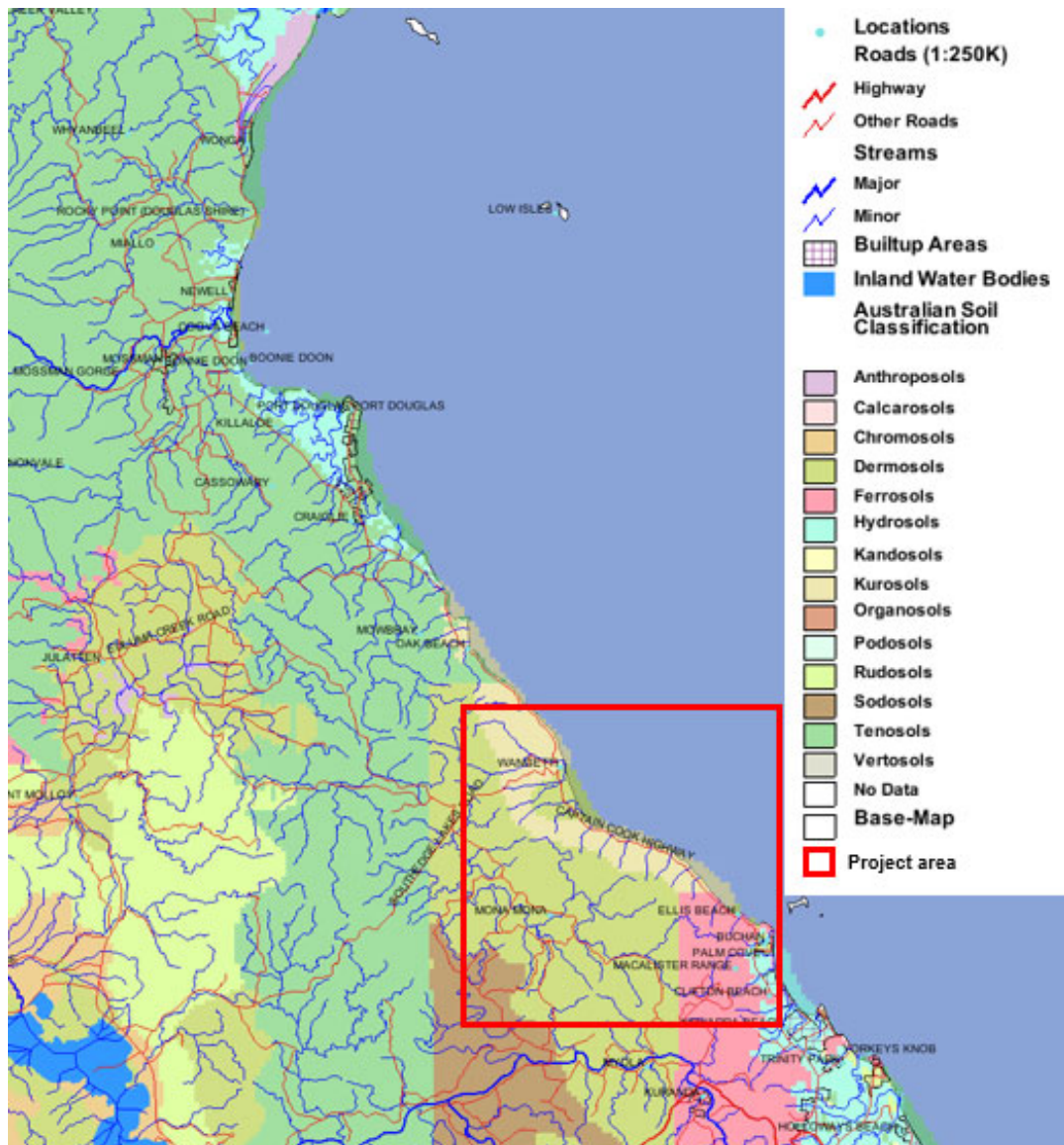


Figure 2-2 Soil types and distribution across the Project (ASRIS)

2.5.2 Soil sodicity

Sodic (dispersive) soils are soils that have a high proportion of sodium ions, relative to the amount of other cations within their chemical composition. They are considered 'sodic' when the amount of sodium impacts and degrades the soil properties through weakening the bonds between the soil particles. Soil sodicity is a natural feature of many Queensland soil types, with approximately 45% considered sodic in nature.

Sodic soils are structurally unstable in water and tend to break down into their basic particles. These soils are highly susceptible to 'chemical erosion' processes on sloped areas, or where soils are exposed or disturbed.

Site specific testing is to be undertaken as part of the site specific ESCP by the Contractor, to ensure adequate treatment of sodic soils is undertaken by implementing appropriate erosion and sediment controls, as well as soil treatments.

2.5.3 Soil erodibility

Soil erodibility is a function of the rate of infiltration at the surface, permeability of the soil and the coherence of the soil particles. To assist with the determination of soil erodibility, a number of field and/or laboratory tests can be undertaken including tests for dispersion, pH and sodicity.

Three major soil groups are located within the Project: dermosols, ferrosols and kurosols. Dermosols and ferrosols have moderate resistance to erodibility while kurosols are likely highly erosive.

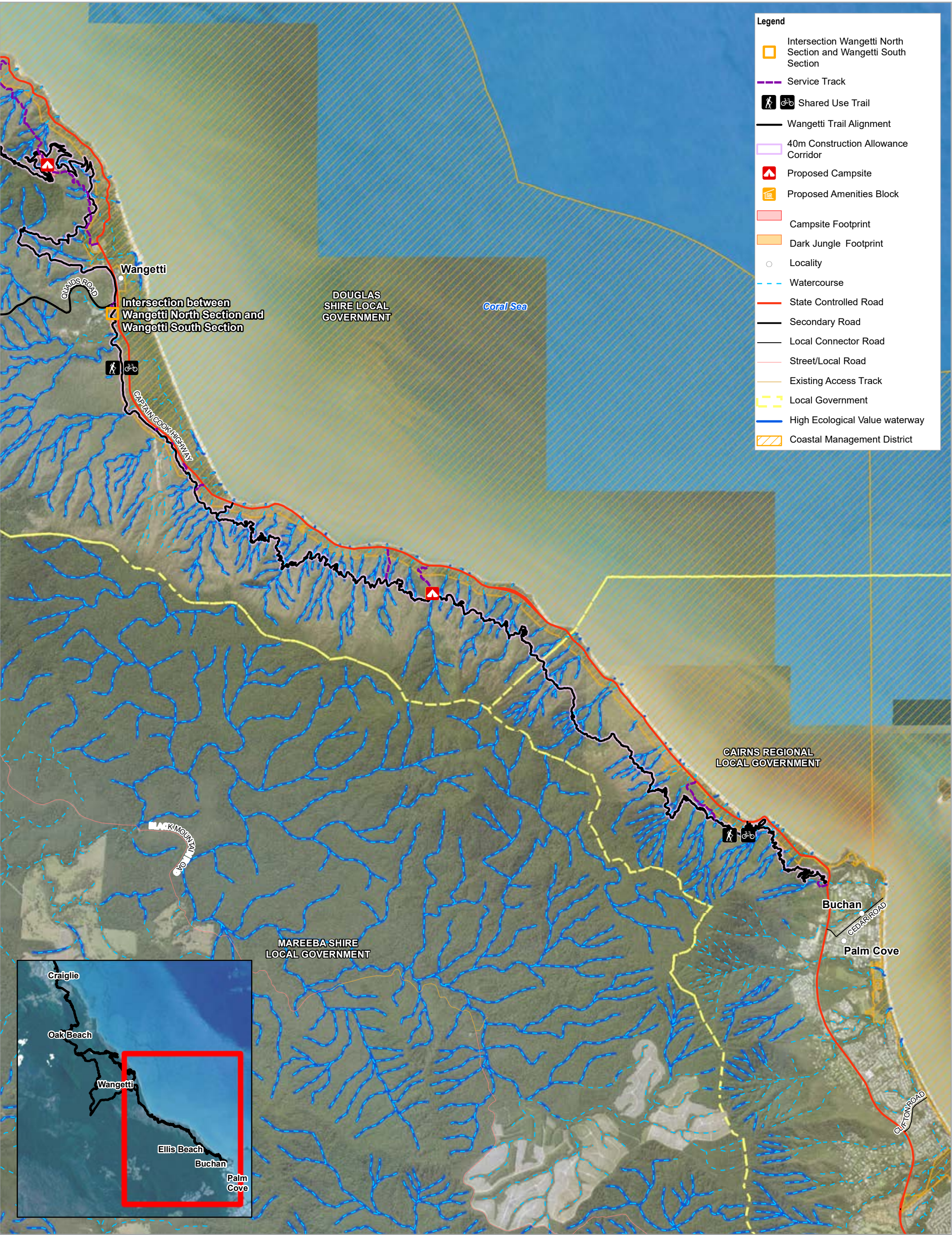
Where construction works are expected to expose subsoils within the central portion of the Project (where kurosol soils have been identified), sub-surface geology needs to be identified and characterised prior to the development of the ESCP by the Contractor, to appropriately identify and confirm if soils are highly erodible, and implement erosion and sediment controls accordingly.

2.6 Hydrology and drainage

The shared use trail will traverse and intersect several waterways varying from low to major, and permanent and semi-permanent waterways. The Project is located less than 1 km from the coast at most of the waterway crossings, with all waterways flowing into the ocean.

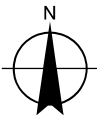
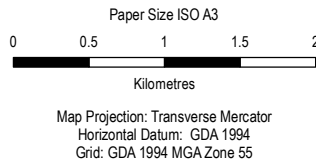
The Project is predominantly mapped within a coastal management district, erosion prone area, tidal waterways and a medium and high storm tide inundation area on the Department of State Development, Manufacturing, Infrastructure and Planning (DSDMIP) Development Assessment (DA) mapping. The majority of the alignment is also within the floodplain assessment overlay as mapped on the Douglas Shire Council Planning Scheme, which predominantly aligns with high storm tide hazard. The site is regarded to have low flood impact due to coastline proximity, whereby any flooding would rapidly flow out to sea from adequate drainage along the proposed alignment.

The trail alignment for the Project will cross approximately 23 waterways classified as watercourses under the *Water Act 2000*, as identified on Figure 2-3.



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DITID
Environment Assessment Stage 2 Wangetti Trail

Waterways
Mapped over Wangetti South Section

Project No. 41-32458
Revision No. A
Date 31/08/2020

FIGURE 2-3

Data source: DITID/GHD: Wangetti Trail Alignment (04/2020); DNRME: Roads (2019); Watercourse (2014); Place Names (2016); Rail (2016); Imagery (2015); Local Government Area (2018); DES: High Ecological Value Waterways (2017); DEHP: Coastal Management District (2016); WTMA: Proposed Camp and Amenities Block (2020); Zoning Boundary (2019); GHD: Section Intersections - Mowbray North, Wangetti North, Wangetti South (2020); Services Tracks (2020). Created by: knoble

All construction works to be undertaken in, or within close proximity to, waterways include the construction of waterway crossings. The waterway crossing construction is expected to cause minimal disruption and is scheduled to occur during the dry months when the waterways are likely to be dry. Visual inspections of any active waterway (waterways carrying water) are to be undertaken both upstream and downstream of the waterway crossing during construction to identify any changes in water quality through the construction area. If sediment-laden runoff is observed downstream of the waterway crossing, water quality monitoring will be required to ensure no contaminants from the site are discharged off site. Water quality performance requirements for the Project will be in accordance with the water quality objectives (WQO) outlined in the *Environmental Protection (Water and Wetland Biodiversity) Policy (EPP Water and Wetland Biodiversity) (2019: Great Barrier Reef River Basins – Wet Tropics Sub-Basin Environmental Values and Water Quality Objectives Basin No. 109-110 (DES 2019)*, detailed in Table 2-1.

Table 2-1 Water quality objectives

River basin name	Anthropogenic dissolved inorganic nitrogen (DIN) (tonnes/year)	Anthropogenic fine sediments (FS) (tonnes/year)
Mossman	52	6,000
Barron	35	32,000

Background water quality monitoring should be undertaken within waterways likely to carry water during the dry months, and therefore during waterway crossing construction, to compare the site specific water quality to the *EPP Water and Wetland Biodiversity* WQO identified above. If the site specific water quality differs considerably from the *EPP Water and Wetland Biodiversity* WQO, then the background water quality identified should be used as the preferred WQO.

3. Erosion hazard assessment

In accordance with Section 5.2 of the IECA Manual (IECA, 2008), a preliminary erosion hazard assessment has been undertaken as part of this CЕСP to provide an indication of the erosion risk for the site and identify indicative types and locations for erosion and sediment control measures through the Project.

3.1 Land disturbance activities

Land disturbance activities that have the potential to cause soil erosion and mobilisation of sediments are likely to include:

- Clearing and grubbing activities
 - Clearing of trees and other vegetation from the proposed trail alignment, service tracks and camping area. This will be undertaken using mini excavators, which require a minimum tread width of 1 m to operate safely. Where it is not safe, practical or desirable to use a mini excavator, the trail will be hand constructed.
All vegetation that is cleared is cut into small pieces and dispersed throughout the surrounding area; no large windrows or stockpiles should be present.
 - Construction of boulder waterway crossings and rock armouring. These crossings will be constructed using a rubber tracked mini excavator and hand tools, and include relocating nearby rocks or boulders to the waterway crossings. Typical dimensions for rock armoured areas will be 1.2 m (minimum) wide and often 5.0 m long.
 - Minor waterway crossings (small bridges spanning from 5 – 25 m) are used when the trail crosses a small permanent watercourse and suitable large rocks or boulders are not available locally to construct a boulder waterway crossing.
 - Traffic movement and construction activities along unsealed surfaces, creating erosion and generating dust.
- Bulk earthworks (cut and fill) activities
 - Trail benching is the main construction technique to be used to construct the vast majority of the trail. The earthworks will be undertaken by a mini excavator to construct the bench which becomes the tread of the trail.
When cutting the trail bench, the topsoil and mineral earth removed from the inner side of the bench are used to build up the outer edge of the bench. The benches will be approximately 1 – 1.5 m in width. It is noted that the cut material will be moved along the trail to areas where fill material is required, with no fill material removed off site.
 - Grade reversals will be constructed where appropriate along the trail, and are points at which trail gradient changes from up to down (or down to up) as the trail moves across a side slope.
 - Rock walling is used to retain soils of height between 0 and 500 mm. They may be used to retain the upslope or downslope batter.
 - Ballast surfacing is used in high traffic areas, sunken or low-lying areas, wet or boggy areas, or areas requiring the passage of vehicles. Due to the high bulk material requirements, it is usually only used in areas where vehicle access is available nearby to import materials.
 - Rock and concrete spoon drains will be constructed to convey surface runoff across the trail at a concentrated location. It could be used to manage the intersection of a small seasonal waterway and the trail, as per the description for rock armouring.

- Raised embankments will be constructed of extra 'fill' material to build the trail tread up higher. The fill material will usually be sourced from another area where there is an excess of material and moved along the trail to where it is required.
- Traffic movement and construction activities along unsealed surfaces, creating erosion and generating dust.

3.2 Rainfall and erosion risk

Rainfall data presented in Table 3-1 was sourced from the Bureau of Meteorology (BOM 2020) White Cliff Point Weather Station (Station ID 31189), which is located within 0.3 km of the Wangetti Township. The region has a tropical climate, with generally hot and humid summers and mild and dry winters. The majority of rain falls between December to March, with the highest mean rainfall occurring in February with 398.7 mm and the lowest mean rainfall occurring in August with 15.83 mm. The mean maximum annual temperature for the area is 29.1 °C, whilst the mean minimum temperature is 20.8 °C.

The rainfall and erosion risk for the project has been determined according to the criteria listed in Table 33 from IECA, 2008 (refer to Table 3-2).

Table 3-1 Rainfall and erosion risk

	January	February	March	April	May	June	July	August	September	October	November	December
Average rainfall (mm)	316.3	398.7	344.5	128.5	54.9	26.6	18.4	15.8	20.6	53.4	93.3	204.4
Erosion risk rating	E	E	E	H	M	VL	VL	VL	VL	M	M	H

Notes:

E = Extreme, H = High, M = Moderate, L = Low, VL = Very Low

Table 3-2 Erosion risk rating based on average monthly rainfall (IECA, 2008)

Erosion risk rating ^[1]	Expected 24 hour rainfall	Average monthly rainfall
Very Low	0 to 2 mm	0 to 30 mm
Low	2+ to 10 mm	30+ to 45 mm
Moderate	10+ to 25 mm	45+ to 100 mm
High	25+ to 100 mm	100+ to 225 mm
Extreme	> 100 mm	> 225 mm

Note: [1] Erosion risk rating based on worst case of expected rainfall within any 24-hour period or average monthly rainfall.

The Project is expected to occur across both the wet and dry seasons, with the construction of the trail and formalisation of the service tracks expected to commence in April/May 2021, with completion by April 2022 (approximately one year of construction). Project mobilisation is planned for February/March 2021, with clear and grub activities and bulk earthworks commencing from April/May. It is recommended that the majority of land disturbance works will be undertaken in the dry season between May and November to avoid high and extreme rainfall and erosion risk in the months of December to April. If works are not completed by December, it is advised that all land disturbance activities cease until April/May of the following year.

The Contractor shall ensure implementation of erosion and sediment controls, and shall also keep a record of rainfall forecast for the following week. Given the Project is located within the Wet Tropics, the Contractor, during high and extreme erosivity months (December to May) is to ensure that there are no unfinished/untreated exposed surfaces, and that all sediment controls are functioning and have the required capacity prior to predicted (greater than 50% chance) rainfall events.

All construction works to be undertaken in, or within close proximity to, waterways include the construction of waterway crossings. The waterway crossing construction is expected to cause minimal disruption and is scheduled to occur during the dry months when the waterways are likely to be dry. Site disturbances during the summer months, particularly between January and March, should be avoided whenever possible. If construction during the wet season is unavoidable, installation and maintenance of adequate erosion, drainage and sediment controls would be essential.

3.3 Preliminary erosion hazard assessment

Soil erosion hazard refers to the susceptibility of a parcel of land to the prevailing agents of erosion. The preliminary erosion hazard assessment adopted is based on the 'point score hazard assessment system' established in IECA Manual (IECA, 2008) and is included in Appendix A.

Based on this assessment, the Project site as a whole is considered to be "*high risk*" erosion hazard as the total score is 19 (disturbances with scores <17 are considered low risk). It is noted that the erosion hazard for the Project is conservative in nature and is considered across the Project as a whole.

As part of the development of the ESCP, it is recommended that the Contractor collect and analyse a number of soil samples across the Project to confirm soil conditions and better refine the above erosion hazard assessment. The assessment will also be further refined by the Contractor's understanding of the construction staging.

4. Construction staging and timing

4.1 Construction staging

The trail will be broken into construction segments. The purpose of creating construction segments is to break the project into smaller components, for ease of inspections, reporting, invoicing, practical completion, and staged opening. The segments will likely be determined based on the preferred staging approach undertaken by the TDPD Project Manager, or land tenures, or other variable to be determined closer to commencement of works.

Earthwork construction equipment will include a mini excavator, where it is not safe or suitable to use the excavator hand construction tools will be used. The construction corridor will be cleared in section lengths of approximately 100 to 150 m at a time. This process allows a visible amount of vegetation to be cleared ahead of where the excavator is operating, and the trail construction to be undertaken by the machine operator and trail labourers working behind the vegetation clearing activities to clean up before moving ahead to the next section.

4.2 Staging of work activities

Staging of works can be the most effective tool to minimise erosion risk, however ultimately the Contractor will be responsible for determining appropriate construction staging. For the purposes of this preliminary assessment, it is proposed that the following work activities are undertaken with respect to this CESP:

1. Prior to commencing construction, each separate trail construction segment is to be walked and assessed as part of a Pre-Start Trail Review undertaken by project managers and trail construction workers to determine the most suitable alignment. The alignment should be marked with flagging tape and no-go areas (i.e. areas outside the 40 m construction allowance corridor) to be understood. Noting that during construction if something needs to be avoided, the trail can be moved around within the 40 m construction allowance corridor.
2. Installation of downslope sediment fencing and upslope clean water diversion bunds at the boundary of the disturbed footprint, where soil disturbance is expected to occur. Where construction works are occurring in or adjacent to waterways, instream controls are to be installed. Erosion and sediment controls are to be progressively installed and decommissioned as the construction works progress along the trail or service tracks.
3. Clearing of vegetation along the proposed trail alignment and service tracks. Vegetation clearing to be undertaken during periods of none or minimal forecast rainfall (less than 5 mm rainfall). Waterways and adjoining banks are to be left undisturbed for as long as practicable and rehabilitated as soon as construction works have been completed. At this stage ground cover, herbs and grasses are left in place (they are later removed by the excavator). All vegetation that is removed is cut into small pieces and dispersed throughout the surrounding area; no large windrows or stockpiles will be present.
4. Bulk earthworks of trail alignment, service tracks and camping grounds within the active construction area. Sediment fencing is to be installed downslope of the disturbed area, to direct runoff to centralised locations for treatment, if required. If sediment fencing is unable to be established due to access or other issues, a suitable alternative is to be used. Exposed trail embankments and other exposed surfaces are to be stabilised as soon as practicable to minimise sediment loss.

Excess soil cuttings from trail benching is to be stockpiled away from waterways on selected flat areas until required in other portions of the trail, or for rehabilitation purposes.

5. Bulk earthworks at waterways, including rock armouring, boulder waterway crossings and other waterway crossings. Waterway crossing construction is expected to cause minimal disruption and is scheduled to occur during the dry months when the waterways are likely to be dry. Where earthworks occur in or adjacent to active waterways, sediment controls may require installation downstream of the waterway crossing if changes in water quality through the construction area are identified.

All construction work within waterways are identified as high risk zones as infrastructure placement (e.g. boulders) within the waterway is involved. Infrastructure placement is to be undertaken during dry forecasts where possible, where waterways are expected to be dry. If waterways are active during construction works, works within or directly adjacent to waterways are to be minimised, if possible, with visual inspection undertaken both upstream and downstream of the waterway crossings to identify any changes in water quality through the construction area.

6. Progressive stabilisation of work areas and disturbed areas in accordance with permanent stabilisation treatments, as soon as practicable. Sediment control measures are to remain in place for the duration agreed and determined by the TDPD Project Manager. As a minimum, sediment control measures should be retained until the trail curing period has finished and the trail or construction segment is deemed ready to be opened to the public (World Trail 2020).

All high risk activities associated with bulk earthworks, pavement works and revegetation / stabilisation must be completed within the proposed construction works period.

4.3 Construction timing

The Project is expected to occur across both the wet and dry seasons, with the construction of the trail and formalisation of the service tracks expected to commence in April/May 2021, with completion by April 2022 (approximately one year of construction). Project mobilisation is planned for February/March 2021, with clear and grub activities and bulk earthworks commencing from April/May. It is recommended that the majority of land disturbance works be undertaken in the dry season between May and November to avoid high and extreme rainfall and erosion risk in the months of December to April. If works are not completed by December, it is advised that all land disturbance activities cease until April/May of the following year.

5. Erosion and sediment control measures

The Contractor is responsible for implementing all erosion and sediment control measures and these must be implemented in accordance with best practice principles. The erosion, sediment and drainage control measures set out in this section are applicable across the entire Project site. The anticipated terrain to be encountered during construction will determine the type of erosion and sediment controls required, along with the soil characteristics.

All erosion, sediment and drainage control measures must remain in place until all construction works are completed and surfaces are stabilised and revegetated. Sediment control measures are to remain in place for the duration agreed and determined by the TDPD Project Manager. As a minimum, sediment control measures should be retained until the trail curing period has finished and the trail or construction segment is deemed ready to be opened to the public (World Trail 2020).

Standard ESC techniques shall be used in accordance with recommendations from IECA (2018). All control measures are to be designed, installed and maintained in accordance with management strategies identified in this CЕСSP and recommendations provide in IECA (2008), which are described in factsheets available from IECA (2008: Book 6).

5.1 Erosion control

Erosion is dependent on the likelihood and intensity of predicted and / or expected rainfall. Where construction activities are scheduled during the dry season when rainfall is unlikely or limited, the required erosion protection measures may be significantly less than if construction was to occur during the wet season (IECA 2008).

Erosion control measures shall be employed to reduce the likelihood of soil erosion occurring on site and to protect any exposed areas from raindrop impact erosion. Erosion control measures are to be progressively implemented as the construction segments progress along the Project alignment. A summary of erosion control measures suitable for various slopes are shown below in Table 5-1. Erosion controls blankets, mats and mesh utilised throughout the Project will need to be made from natural fibres, such as those depicted in Figure 5-1.

Table 5-1 Application of erosion control measures to soil slopes (IECA 2008)

Flat land (flatter than 1 in 10)	Mild slopes (1 in 10 – 1 in 4)	Steep slopes (steeper than 1 in 4)
Erosion control blankets, mats and mesh	Erosion control blankets, mats and mesh	Erosion control blankets, mats and mesh
Gravelling	Rock mulching	Rock armouring
Rock mulching		

Table extracted from IECA 2008 Table 4.4.13.



Figure 5-1 Erosion control blankets, mats and mesh made from natural figures

Minimise disturbance area

The area of disturbance shall be minimised by the Contractor through staged clearing activities, where possible. Specifically, the clearing phase shall minimise encroachment on sensitive areas, such as riparian vegetation, waterways and any mapped regional ecosystems. Exclusion zones are to be clearly set out and marked prior to clearing and bulk earthworks. The minimisation of disturbance area will be identified during the inspection of each construction segment, prior to vegetation clearing and bulk earthworks.

Vegetation clearing

Vegetation is only to be cleared in the pre-approved trail alignment. Where a deviation is considered necessary, vegetation clearing must remain within the 40 m construction allowance corridor, which should be clearly outlined. Vegetation clearing will generally occur simultaneously with the construction of the trail, but around 50 to 100 m ahead of the mini excavator. Care should be taken to ensure no windrows or stockpiles of cleared vegetation are created. Cleared vegetation is to be scattered into the surrounding environment, without smothering existing vegetation.

Vegetation clearing adjacent to waterways shall be minimised, where possible, and delayed until necessary. Progressive stabilisation and, where possible, revegetation of disturbed areas shall occur as reasonably practicable.

If vegetation clearing is required to be carried out well in advance of earthworks, the clearing contractor shall aim to remove only woody vegetation, leaving the understory growth. Grubbing and removal of ground cover and understory is to be delayed until immediately prior to revegetation occurring within that particular stage of development.

Groundcover and surface treatments

Revegetation and ground coverage of low-growing ground cover vegetation can be one of the most effective forms of permanent erosion controls (IECA 2008). Vegetation and groundcover increases the surface roughness, slowing stormwater runoff, protects the soil against raindrop impact and reduces the evaporation losses from the underlying soil.

Refer to Table 4.4.7 of the IECA Manual for best practise measures associated with site rehabilitation depending on the erosion risk based on monthly erosivity (very low to extreme).

5.2 Sediment control

Sediment control techniques shall be applied across the disturbed areas to limit mobilisation of and settle mobilised soil particles across the Project. Sediment control techniques slow the movement of water and allow the influence of gravity to settle out particles before discharging into the receiving environment.

The minimum sediment control standard is determined based on the erosion risk of the site (IECA 2008), which the Contractor is required to complete as part of the site specific ESCP.

Dust suppression

The most effective control measure against wind erosion is revegetation, however in some cases this is not reasonably practicable until the end of the construction period. As the trail is difficult to access by vehicles in most locations, the standard practice of using water tankers to suppress dust on site during construction periods is not practicable. Therefore, vegetation clearing should be kept to a minimum, and exposed surfaces must be rehabilitated as soon as practicable to minimise the potential environmental risk. Exposed areas are limited to 50 to 100 m ahead of an active work front further reducing potential wind erosion.

Sediment control devices

Sediment control measures are required within the construction segments where soil disturbance is expected, which has the potential for sediment movement off site. Sediment controls that are recommended for the Project include sediment fencing along the downslope of the disturbed footprint, topsoil bunds upslope of the disturbed footprint, with instream sediment controls (such as a sediment fence isolation barrier) downstream of waterway crossing works, where active waterways are identified. IECA standard drawings (Book 6, IECA 2008) of the recommended sediment controls (sediment fencing, topsoil bunds, and instream sediment controls) are attached as Appendix B.

Suitable sediment controls for various water flows are identified below in Table 5-2.

Table 5-2 Default classification of sediment control techniques (IECA 2008)

Sheet flow treatment techniques	Concentrated flow treatment techniques
Buffer zone	Coarse sediment trap
Filter/sediment fence	U-shaped sediment trap

Table extracted from IECA 2008 Table 4.5.3.

Stockpile management

Stockpiles of cleared vegetation are not included as part of this Project, as cleared vegetation will be scattered into the surrounding environment, without smothering existing vegetation. In the instance where a stockpile of vegetation is required for the Project, stockpiling sites are to be located above flood extents and within close proximity to the Project. Stockpiling will be negotiated with the Wet Tropics Management Authority prior to construction commencing.

Similar to soil disturbance footprints, sediment fencing and topsoil bunds are to be implemented downslope and upslope of stockpiles, respectively, if demanded by the site conditions. No stockpiling should occur during wet season and should be stockpiled for the minimum amount of time to avoid sediment runoff. For example, stockpiled soil cuttings are to be used for sections of the trail 100 to 150 m in front or behind excavation works.

Stormwater discharge off site

Stormwater is discharged from the Project into a number of large and small waterways. Many of the waterways are ephemeral and carry water after a rainfall event. All construction works to be undertaken in, or within close proximity to, waterways include the construction of waterway crossings. Visual inspections of any active waterway are to be undertaken both upstream and downstream of the waterway crossing during construction to identify any changes in water quality through the construction area. If sediment-laden runoff is observed downstream of the waterway crossing, water quality monitoring will be required to ensure no contaminants from the site are discharged off site. Water quality performance requirements for the Project will be in accordance with the water quality objectives outlined in the *Environmental Protection (Water and Wetland Biodiversity) Policy 2019: Great Barrier Reef River Basins – Wet Tropics Sub-Basin Environmental Values and Water Quality Objectives Basin No. 109-110* or background site specific water quality determined for the Project, if background water quality varies considerably from the EP (Water and Wetland Biodiversity) WQO.

5.3 Drainage control

The primary functions of drainage control measures are to minimise the risk of erosion, minimise the risk to the adopted erosion and sediment control measures, control the velocity and location of water flowing through the site, and to appropriately manage 'clean' and 'dirty' water flows through the site.

The proposed drainage measures for the Project are as follows:

- During all phases of construction, the management of upstream waters must be considered and appropriately managed. If waterways are active during construction works, works within and directly adjacent to waterways are to be minimised, if possible, with visual inspections undertaken both upstream and downstream of the waterway crossings to identify any changes in water quality through the construction area.
- Provide diversion works (clean water topsoil bunds) to direct clean water flows from external catchments upslope of the development area towards existing discharge points, where possible. Diversion drains are to be constructed as trapezoidal bunds or channels and appropriately lined to minimise the risk of scour occurring.
- Permanent drainage control should be established simultaneously with trail construction. These include design features such as switchbacks, rock and concrete spoon drains, ensuring grade reversals flow correctly and that the trail is outsloped where practical.
- Provide diversion works (dirty water channels) to direct dirty water flows from internal catchments towards sediment treatment devices, where necessary.
- Check dams are to be placed along the trail alignment during the construction of the design features detailed in Section 2.2.4, where bulk earthworks have occurred and resulted in exposed slopes and surfaces. The purpose of check dams is to reduce runoff velocities and minimise soil erosion caused during rainfall runoff events. The IECA standard drawing (Book 6, IECA 2008) for rock check dams is attached as Appendix B.

6. Monitoring and maintenance

6.1 Site inspections and monitoring

6.1.1 General

In accordance with Section 7.2 of the IECA Manual, the Contractor shall make allowance for the preparation of a formal monitoring and maintenance program prior to site establishment. The monitoring and maintenance program shall make allowance for required site inspections (detailed in Section 6.1.3), monitoring of erosion and sediment control devices (including water quality monitoring) and reporting of results, inspections and non-compliance.

6.1.2 Responsible persons

In accordance with Chapter 7 of the IECA Manual, the Contractor shall generally be responsible for all items prescribed in this Report. The Contractor shall identify appropriate persons to ensure compliance with erosion and sediment control requirements and objectives for the project duration.

In addition to the erosion and sediment control elements detailed in this report, the Contractor shall also ensure the following general management practices are incorporated:

- Establish an erosion and sediment control training program for site staff
- Appropriately control subcontractors and material suppliers
- Suitably control site traffic to minimise dust generation and undesirable soil compaction outside designated accesses
- Maintain adequate supplies of emergency erosion and sediment control materials and ensure that these items are available at all times, particularly prior to imminent rainfall
- Establish an appropriate site inspection routine as well as the staff responsible for these inspections.

For further information regarding general construction practice and the management of construction sites, refer to Chapter 7 of the IECA Manual and the IECA 'Site Management' fact sheet.

6.1.3 Inspections and monitoring

General

Site inspections and monitoring are to be undertaken in accordance with Sections 6.17, 7.4, 7.6 and Appendix I of the IECA Manual and as detailed below. ESCPs are living documents that can and should be modified as site conditions change, or if the adopted measures fail, to achieve the required treatment standard. When a site inspection detects a notable failure in the adopted ESC measures, the source of the failure must be investigated and appropriate amendments made to the site and the plans.

Inspections

The IECA Manual requires that all erosion and sediment control measures be inspected as detailed in Table 6-1. An example inspection checklist template is included in Appendix C.

Table 6-1 Site inspection requirements

Frequency	Requirements
Daily (during rainfall)	<ul style="list-style-type: none"> • All drainage, erosion and sediment control measures (when work is occurring on site) • All instream erosion and sediment control measures (when work is occurring on site) • Occurrences of excessive sediment deposition (whether on or off site) • Water quality monitoring where a visible change in water quality is observed downstream of a waterway crossing.
Weekly	<ul style="list-style-type: none"> • All drainage, erosion and sediment control measures (when work is not occurring on site) • All instream erosion and sediment control measures (when work is not occurring on site) • Occurrences of excessive sediment deposition (whether on or off site) • Occurrences of construction materials, litter or sediment placed, deposited, washed or blown from the site, including deposition by vehicular movements • Litter and waste receptors • Oil, fuel and chemical storage facilities.
Prior to anticipated runoff-producing rainfall (within 24 hours of rainfall occurring)	<ul style="list-style-type: none"> • All drainage, erosion and sediment control measures • All temporary flow diversion and drainage works.
Prior to rainfall event of sufficient intensity and duration to cause runoff (within 18 hours of rainfall occurring)	<ul style="list-style-type: none"> • All drainage, erosion and sediment controls • All temporary flow diversion and drainage works • All instream erosion and sediment control measures.
Following runoff-producing rainfall (within 18 hours of rainfall event)	<ul style="list-style-type: none"> • All drainage, erosion and sediment control measures • All instream erosion and sediment control measures • Occurrences of excessive sediment deposition (whether on or off site) • Occurrences of construction materials, litter or sediment placed, deposited, washed or blown from the site, including deposition by vehicular movements • Water quality monitoring where a visible change in water quality is observed downstream of a waterway crossing.

Water quality monitoring

As mentioned in Section 2.6, visual inspections of any active waterway is to be undertaken both upstream and downstream of the waterway crossing during construction to identify any changes in water quality through the construction area. If sediment-laden runoff is observed downstream of the waterway crossing, water quality monitoring will be required to ensure no contaminants from the site are discharged off site. Water quality performance requirements for the Project will be in accordance with the water quality objectives (WQO) outlined in the *Environmental*

Protection (Water and Wetland Biodiversity) 2019: Great Barrier Reef River Basins – Wet Tropics Sub-Basin Environmental Values and Water Quality Objectives Basin No. 109-110 (DES 2019) or background site specific water quality determined for the Project, if background water quality varies considerably from the EP (Water and Wetland Biodiversity) WQO.

If the water quality objectives are not met, additional water quality monitoring may be required to assess the effectiveness of remediation erosion and sediment control measures.

6.1.4 Maintenance

Any erosion and sediment control failures or excess sediment build up identified during the site inspections is to be rectified as soon as practicable following identification.

Any sediment removed from devices will be disposed of in a lawful manner that does not cause ongoing soil erosion or environmental harm.

6.1.5 Reporting

Site check sheets will be filled out weekly, and monthly reports will be completed by the Contractor. Monthly reports shall include water quality monitoring reports (if required), details of the performance of the site's monitoring and maintenance activities, non-compliances and corrective actions implemented.

As the site has been identified as 'high risk' (see Section 3.3), the Contractor may be required to engage an independent, appropriately qualified person (i.e. CPESC) to undertake erosion and sediment control audits to confirm compliance with best practice. This is to be confirmed as part of the Contractor's ESCP when the erosion risk hazard is updated based on soil data, the confirmed trail alignment and refined construction staging.

A register of all ESC inspections and audits, if undertaken, will be maintained for the duration of the project site works, and will be available for review during site inspections undertaken by a regulatory authority. Any environmentally relevant incidents which occur on the site should be recorded, and also be available for review during site inspections undertaken by regulatory authorities.

If erosion and sediment controls are found to be deficient or failed in service, due to unforeseen circumstances, corrective action is to be undertaken immediately which may include modifications to the approved ESCP.

6.2 Wet weather preparedness

In accordance with the IECA Manual, the project site shall be appropriately prepared for both likely and unlikely wet weather conditions. The Contractor will prepare a wet weather preparedness plan to establish appropriate erosion and sediment control measures and actions that may be implemented prior to a predicted wet weather event.

The following erosion and sediment control measures will be considered where appropriate for inclusion within the wet weather preparedness plan:

- Inspect the condition of all erosion and sediment control devices on site to ensure that these measures are operationally effective prior to the rainfall event
- Establish temporary flow diversion up-slope of open, newly formed batters
- Stabilise all drainage pathways and exposed surfaces still subject to construction with temporary erosion and sediment control techniques (i.e. erosion control blankets or hydraulic blankets)
- Secure erosion control blankets with additional anchorage such as rocks or timber stakes

6.3 Non-conformances and corrective actions

Where an environmental non-conformance occurs regarding erosion and sediment control (such as loss of sediment from the site or accidental discharge of sediment into adjacent waterways), the Contractor shall immediately inform DSDTI of the incident. The Contractor must also prepare a monthly report detailing any incidents of environmental nuisance and non-conformance for review by DES, if requested in the ESCP.

The Contractor has a responsibility to report to DSDTI all major environmental incidents that risk causing environmental harm under the *Environment Protection Act 1994*.

Where an environmental incident occurs, the following mitigation strategies shall be adopted as a minimum:

- All non-conformances and incidents are to be corrected as soon as possible and strategies implemented to reduce the likelihood of the incident reoccurring
- Containment of the sediment laden runoff, where possible
- The environmental representative is to review the erosion and sediment control measures in place for effectiveness and check maintenance records
- The appropriate persons is to review the erosion and sediment control measures in place for effectiveness and check maintenance records
- An incident / accident report is to be completed for all incidents and non-conformances.

Where incidents have occurred, the Contractor shall ensure that all reasonable and practical control measures are implemented for future operations. This may include reviewing water quality monitoring data, where exceedances have been found, and implementing additional and/or alternative controls to achieve the required environmental outcomes.

7. Conclusion

This Report has been produced to support environmental approval applications for proposed works associated with the Project and demonstrate the management of erosion and sediment hazards and risks for the Project and demonstrates compliance with the relevant requirements with IECA.

Further recommendations for erosion and sediment controls relevant to this project are:

- Undertake site investigations to confirm geotechnical and soil conditions (characterisation of dispersive and sodic soils) that will inform the site-specific ESCP
- Undertake additional erosion risk assessment as part of the ESCP following the identification of the proposed trail alignment and required earthwork activities, to update the erosion risk and required ESC measures
- Prepare a construction ESCP as part of the CEMP for the Project, in accordance with the IECA guidelines and recommendations provided in this Report, prior to any disturbance occurring within the Project.

8. References

Department of Natural Resources, Mines and Energy 2018. *Queensland Globe*, State of Queensland.

Department of Agricultural and Fisheries 2020. *Accepted development requirements for material change of use that is aquaculture*, State of Queensland.

Department of Agriculture and Fisheries 2013. *Code for Self-assessable Development – Minor Waterway Barrier Works, Part 3 Culvert Crossings*, State of Queensland.

Department of Environment and Science 2019. *Environmental Protection (Water and Wetland Biodiversity) Policy 2019: Great Barrier Reef River Basins – Wet Tropics Sub-Basin Environmental Values and Water Quality Objectives Basin No. 109 & 110*, Queensland Government.

IECA 2008. *Best Practice Erosion and Sediment Control*, International Erosion Control Association (Australasia), Picton, NSW.

World Trail 2020. *Wangetti Trail Construction – Final Version*, Cairns, QLD.

Appendices

Appendix A – Erosion hazard assessment



Appendix A Preliminary Erosion Hazard Assessment

Department of Innovation and
Tourism Industry Development
Wangetti South

Erosion Hazard Assessment

Project Name: Wangetti Trail - Wangetti South Section

Table 1 Erosion Hazard Assessment

Wangetti Trail - Wangetti South Section		
Controlling Factors	Point System	
Item 1 – Average slope of Disturbance Area		
not more than 3%	0	4
more than 3% but not more than 5%	1	
more than 5% but not more than 10%	2	
more than 10% but not more than 15%	4	
more than 15%	6	
Item 2 – Soil Classification Group		
GW, GP, GM, GC	0	3
SW, SP, OL, OH	1	
SM, SC, MH, CH	2	
ML, CL, or if <i>imported fill</i> is used, or if soils are untested	3	
<i>*Soils are crushed mudstone</i>		
Item 3 – Emerson (Dispersion) Class Number		
Class 4, 6, 7, or 8	0	4
Class 5	2	
Class 3, (default value if soils are untested)	4	
Class 1 or 2	6	
Item 4 – Anticipated Duration of Soil Disturbance		
not more than 1 month	0	0
more than 1 month but not more than 4 months	2	
more than 4 months but not more than 6 months	4	
more than 6 months	6	
Item 5 – Area of Disturbance		
not more than 1000 m ²	0	0
more than 1000 m ² but not more than 5000 m ²	1	
more than 5000 m ² but not more than 1 ha	2	
more than 1 ha but not more than 4 ha	4	
more than 4 ha	6	
Item 6 – Waterway Disturbance		
No disturbance to a watercourse, open drain or channel	0	2
Involves disturbance to a constructed open drain or channel	1	
Involves disturbance to a natural watercourse	2	
Item 7 – Rehabilitation Method		
Percentage of area (relative to total disturbance) revegetated by seeding without light mulching (i.e. worst-case revegetation method).		0
not more than 1%	0	
more than 1% but not more than 5%	1	
more than 5% but not more than 10%	2	
more than 10%	4	



Appendix A Preliminary Erosion Hazard Assessment

Department of Innovation and
Tourism Industry Development
Wangetti South

Erosion Hazard Assessment

Project Name: Wangetti Trail - Wangetti South Section

Table 1 Erosion Hazard Assessment

Controlling Factors	Point System	Wangetti Trail - Wangetti South Section
Item 8 – Receiving Waters		
Saline waters only	0	
Freshwater body (e.g. creek or freshwater lake or river)	2	2
Item 9 – Subsoil Exposure		
No subsoil exposure except of service trenches	0	
Subsoils are likely to be exposed	2	2
Item 10 – External Catchments		
No external catchment	0	
External catchment diverted around the soil disturbance	1	1
External catchment not diverted around the soil disturbance	2	
Item 11 – Road Construction		
No road construction	0	0
Involves road construction works	2	
Item 12 – pH of soils to be revegetated		
more than pH 5.5 but less than pH 8	0	
other pH values, or if soils are untested	1	1
TOTAL SCORE		19
		High Risk Site.

Appendix B – Sediment and drainage control standard drawings

Drawing number	Drawing title
SF-01, SF-02	Sediment fence
DB-01	Flow diversion bank (topsoil bund)
SFB-01, SFB-02	Sediment fence isolation barrier
RCD-01	Check dams

INSTALLATION

1. REFER TO APPROVED PLANS FOR LOCATION, EXTENT, AND CONSTRUCTION DETAILS. IF THERE ARE QUESTIONS OR PROBLEMS WITH THE LOCATION, EXTENT, OR METHOD OF INSTALLATION, CONTACT THE ENGINEER OR RESPONSIBLE ON-SITE OFFICER FOR ASSISTANCE.

2. CLEAR THE LOCATION FOR THE BANK, CLEARING ONLY THE AREA THAT IS NEEDED TO PROVIDE ACCESS FOR PERSONNEL AND EQUIPMENT.

3. REMOVE ROOTS, STUMPS, AND OTHER DEBRIS AND DISPOSE OF THEM PROPERLY. DO NOT USE DEBRIS TO BUILD THE BANK.

4. FORM THE BANK FROM THE MATERIAL, AND TO THE DIMENSION SPECIFIED IN THE APPROVED PLANS.

5. IF EARTH IS USED, THEN ENSURE THE SIDES OF THE BANK ARE NO STEEPER THAN A 2:1 (H:V) SLOPE, AND THE COMPLETED BANK MUST BE AT LEAST 500mm HIGH.

6. IF FORMED FROM SANDBAGS, THEN ENSURE THE BAGS ARE TIGHTLY PACKED SUCH THAT WATER LEAKAGE THROUGH THE BAGS IS MINIMISED.

7. CHECK THE BANK ALIGNMENT TO ENSURE POSITIVE DRAINAGE IN THE DESIRED DIRECTION.

8. THE BANK SHOULD BE VEGETATED (TURFED, SEEDED AND MULCHED), OR OTHERWISE STABILISED IMMEDIATELY, UNLESS IT WILL OPERATE FOR LESS THAN 30 DAYS OR IF SIGNIFICANT RAINFALL IS NOT EXPECTED DURING THE LIFE OF THE BANK.

9. ENSURE THE EMBANKMENT DRAINS TO A STABLE OUTLET, AND DOES NOT DISCHARGE TO AN UNSTABLE FILL SLOPE.

MAINTENANCE

1. INSPECT FLOW DIVERSION BANKS AT LEAST WEEKLY AND AFTER RUNOFF-PRODUCING RAINFALL.

2. INSPECT THE BANK FOR ANY SLUMPS, WHEEL TRACK DAMAGE OR LOSS OF FREEBOARD. MAKE REPAIRS AS NECESSARY.

3. CHECK THAT FILL MATERIAL OR SEDIMENT HAS NOT PARTIALLY BLOCKED THE DRAINAGE PATH UP-SLOPE OF THE EMBANKMENT. WHERE NECESSARY, REMOVE ANY DEPOSITED MATERIAL TO ALLOW FREE DRAINAGE.

4. DISPOSE OF ANY COLLECTED SEDIMENT OR FILL IN A MANNER THAT WILL NOT CREATE AN EROSION OR POLLUTION HAZARD.

5. REPAIR ANY PLACES IN THE BANK THAT ARE WEAKENED OR IN RISK OF FAILURE.

REMOVAL

1. WHEN THE SOIL DISTURBANCE ABOVE THE BANK IS FINISHED AND THE AREA IS STABILISED, THE FLOW DIVERSION BANK SHOULD BE REMOVED, UNLESS IT IS TO REMAIN AS A PERMANENT DRAINAGE FEATURE.

2. DISPOSE OF ANY SEDIMENT OR EARTH IN A MANNER THAT WILL NOT CREATE AN EROSION OR POLLUTION HAZARD.

3. GRADE THE AREA AND SMOOTH IT OUT IN PREPARATION FOR STABILISATION.

4. STABILISE THE AREA BY GRASSING OR AS SPECIFIED IN THE APPROVED PLAN.

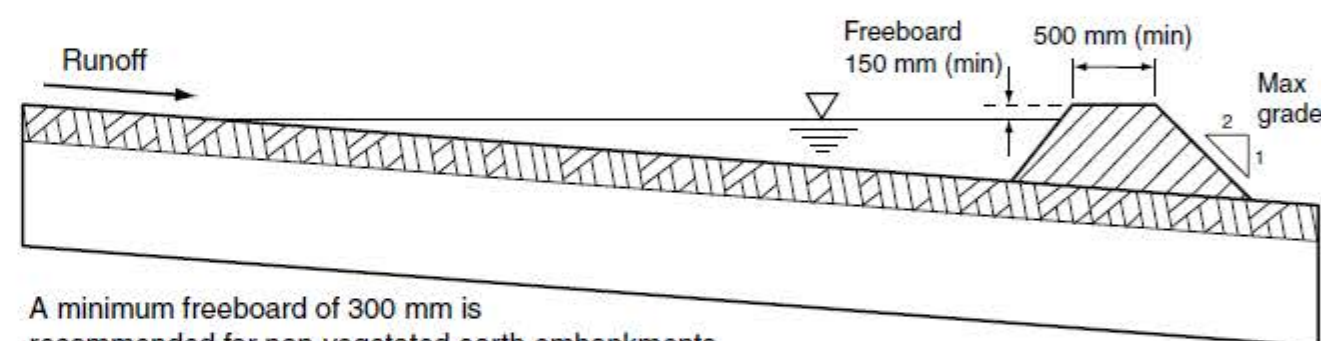
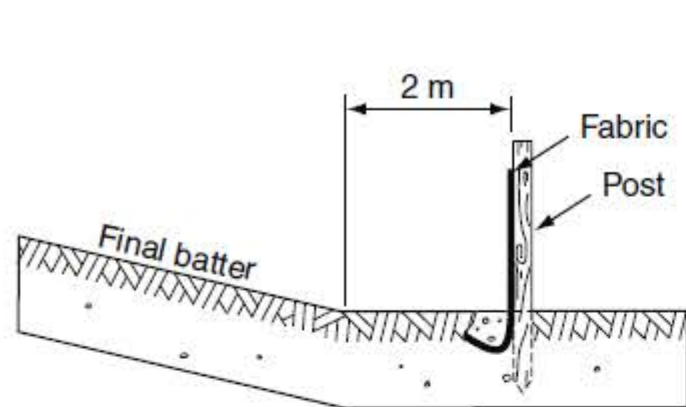


Figure 1 - Typical profile of flow diversion bank formed from earth

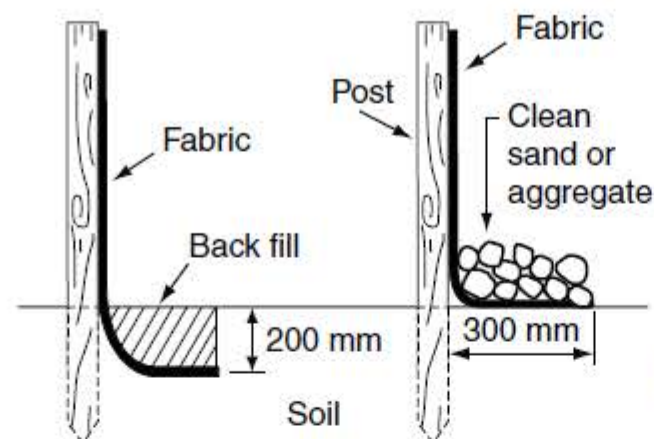
Table 1 - Recommended dimensions of flow diversion banks

Parameter	Earth banks	Vegetated banks	Compost berms	Sandbag berms
Height (min)	500 mm	500 mm	300 mm	N/A
Top width (min)	500 mm	500 mm	100 mm	N/A
Base width (min)	2500 mm	2500 mm	600 mm	N/A
Side slope (max)	2:1 (H:V)	2:1 (H:V)	1:1 (H:V)	N/A
Freeboard	300 mm	150 mm	100 mm	50 mm

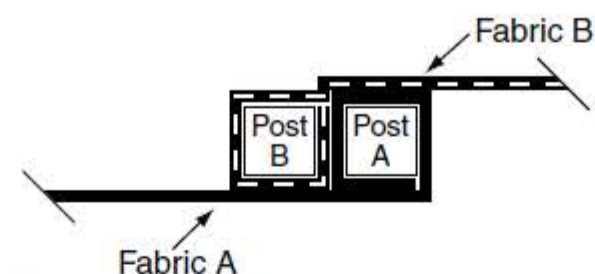
Drawn:	Date:		
GMW	Dec-09	Flow Diversion Banks	DB-01



(a) Location of fence relative to base of slope

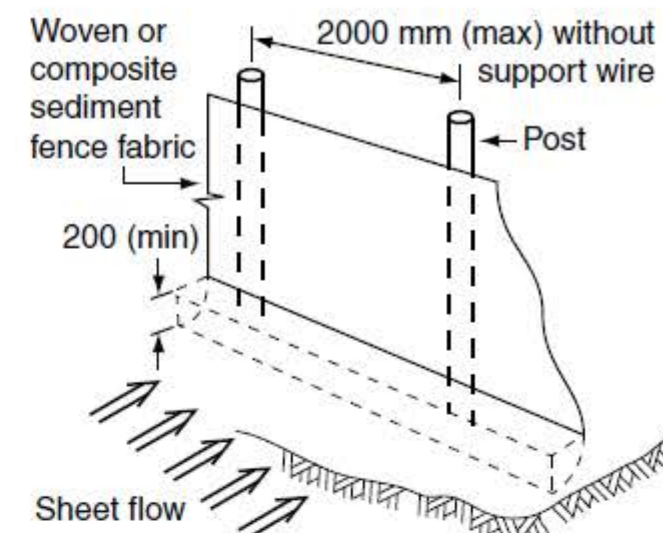


(b) Anchoring base of fabric

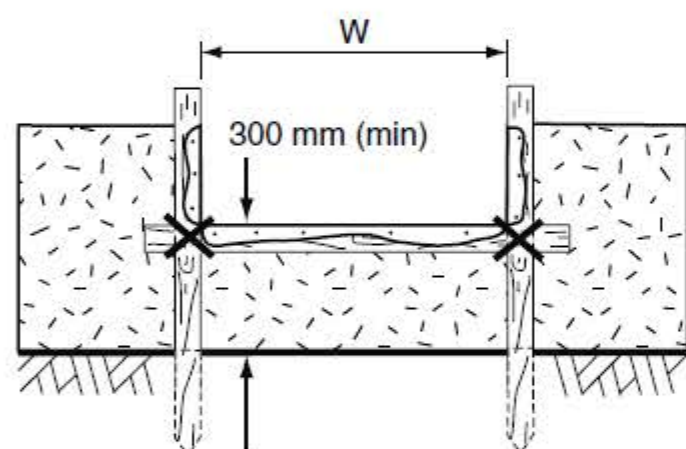


Fabric to fold around each stake one full turn. Stake B to be drive tightly against Stake A. The tops of both stakes to be secured with wire.

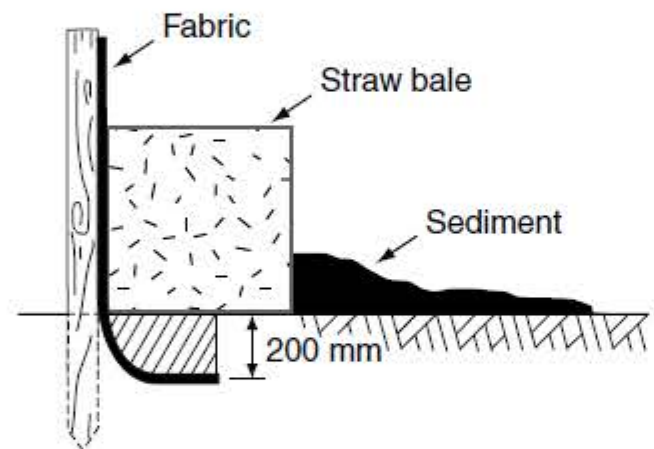
(c) Joining fabric - Method 1



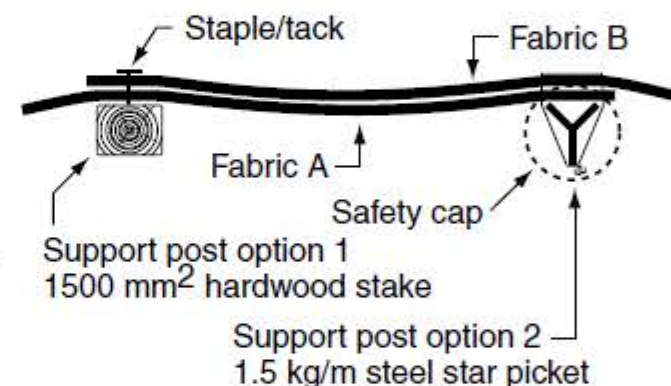
(d) Installation without backing support



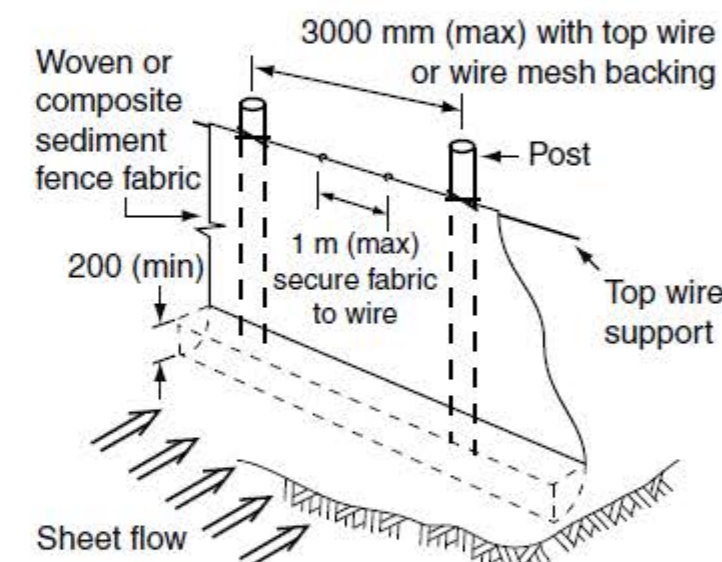
(e) Spill-through weir



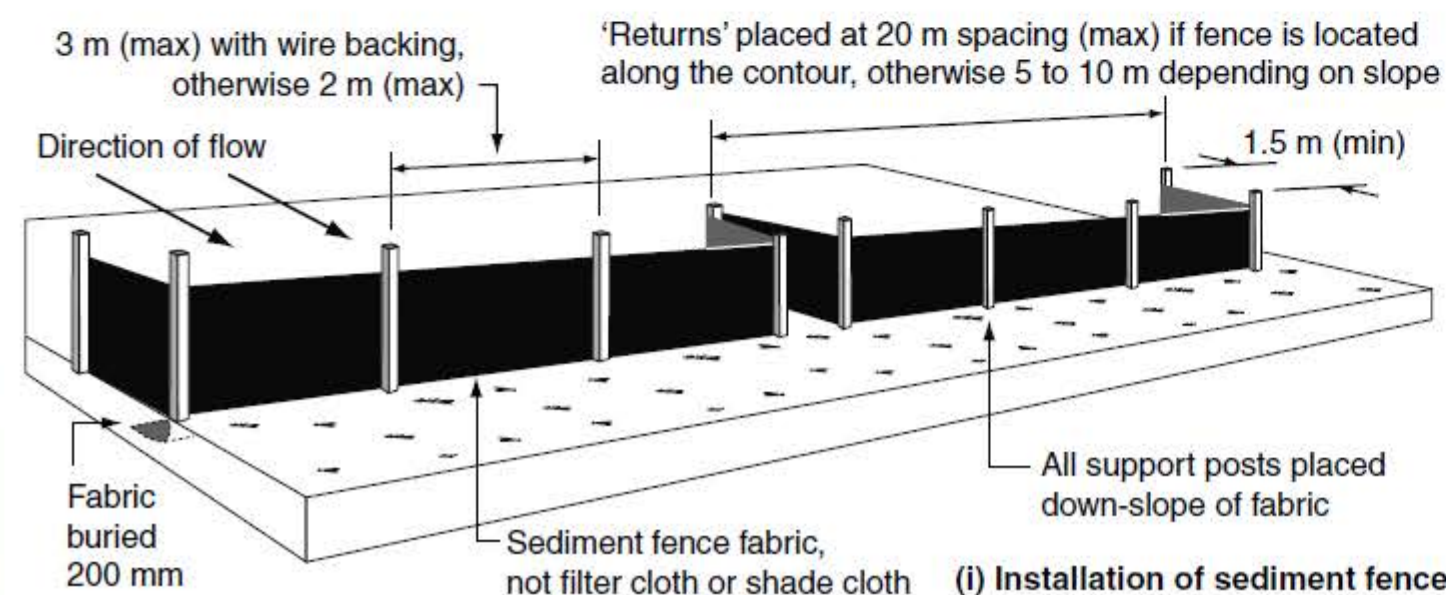
(f) Placement of up-slope straw bale



(g) Joining fabric - Method 2



(h) Installation with top wire support



(i) Installation of sediment fence

Notes:

1. Sediment fence to be installed along a line of constant ground elevation wherever practical.
2. Both end of the sediment fence to extend up the slope at least 1m.
3. Support post to be spaced a maximum 2m unless the fence is supported by a top wire or wire mesh backing, in which case 3m maximum spacing.
4. Fence 'returns' shall be installed at maximum 20m spacing if fence is installed along the contour, otherwise 5 to 10m maximum spacing.
5. Minimum 4 staples or tie wires per stake.

Drawn:	Date:		
GMW	Dec-09	Sediment Fence	SF-01

MATERIALS

FABRIC: POLYPROPYLENE, POLYAMIDE, NYLON, POLYESTER, OR POLYETHYLENE WOVEN OR NON-WOVEN FABRIC, AT LEAST 700mm IN WIDTH AND A MINIMUM UNIT WEIGHT OF 140GSM. ALL FABRICS TO CONTAIN ULTRAVIOLET INHIBITORS AND STABILISERS TO PROVIDE A MINIMUM OF 6 MONTHS OF USEABLE CONSTRUCTION LIFE (ULTRAVIOLET STABILITY EXCEEDING 70%).

FABRIC REINFORCEMENT: WIRE OR STEEL MESH MINIMUM 14-GAUGE WITH A MAXIMUM MESH SPACING OF 200mm.

SUPPORT POSTS/STAKES: 1500mm² (MIN) HARDWOOD, 2500mm² (MIN) SOFTWOOD, OR 1.5kg/m (MIN) STEEL STAR PICKETS SUITABLE FOR ATTACHING FABRIC.

INSTALLATION

1. REFER TO APPROVED PLANS FOR LOCATION, EXTENT, AND REQUIRED TYPE OF FABRIC (IF SPECIFIED). IF THERE ARE QUESTIONS OR PROBLEMS WITH THE LOCATION, EXTENT, FABRIC TYPE, OR METHOD OF INSTALLATION CONTACT THE ENGINEER OR RESPONSIBLE ON-SITE OFFICER FOR ASSISTANCE.

2. TO THE MAXIMUM DEGREE PRACTICAL, AND WHERE THE PLANS ALLOW, ENSURE THE FENCE IS LOCATED:

- (i) TOTALLY WITHIN THE PROPERTY BOUNDARIES;
- (ii) ALONG A LINE OF CONSTANT ELEVATION WHEREVER PRACTICAL;
- (iii) AT LEAST 2m FROM THE TOE OF ANY FILLING OPERATIONS THAT MAY RESULT IN SHIFTING SOIL/FILL DAMAGING THE FENCE.

3. INSTALL RETURNS WITHIN THE FENCE AT MAXIMUM 20m INTERVALS IF THE FENCE IS INSTALLED ALONG THE CONTOUR, OR 5 TO 10m MAXIMUM SPACING (DEPENDING ON SLOPE) IF THE FENCE IS INSTALLED AT AN ANGLE TO THE CONTOUR. THE 'RETURNS' SHALL CONSIST OF EITHER:
(i) V-SHAPED SECTION EXTENDING AT LEAST 1.5m UP THE SLOPE; OR
(ii) SANDBAG OR ROCK/AGGREGATE CHECK

DAM A MINIMUM 1/3 AND MAXIMUM 1/2 FENCE HEIGHT, AND EXTENDING AT LEAST 1.5m UP THE SLOPE.

4. ENSURE THE EXTREME ENDS OF THE FENCE ARE TURNED UP THE SLOPE AT LEAST 1.5m, OR AS NECESSARY, TO MINIMISE WATER BYPASSING AROUND THE FENCE.

5. ENSURE THE SEDIMENT FENCE IS INSTALLED IN A MANNER THAT AVOIDS THE CONCENTRATION OF FLOW ALONG THE FENCE, AND THE UNDESIRABLE DISCHARGE OF WATER AROUND THE ENDS OF THE FENCE.

6. IF THE SEDIMENT FENCE IS TO BE INSTALLED ALONG THE EDGE OF EXISTING TREES, ENSURE CARE IS TAKEN TO PROTECT THE TREES AND THEIR ROOT SYSTEMS DURING INSTALLATION OF THE FENCE. DO NOT ATTACH THE FABRIC TO THE TREES.

7. UNLESS DIRECTED BY THE SITE SUPERVISOR OR THE APPROVED PLANS, EXCAVATE A 200mm WIDE BY 200mm DEEP TRENCH ALONG THE PROPOSED FENCE LINE, PLACING THE EXCAVATED MATERIAL ON THE UP-SLOPE SIDE OF THE TRENCH.

8. ALONG THE LOWER SIDE OF THE TRENCH, APPROPRIATELY SECURE THE STAKES INTO THE GROUND SPACED NO GREATER THAN 3m IF SUPPORTED BY A TOP SUPPORT WIRE OR WEIR MESH BACKING, OTHERWISE NO GREATER THAN 2m.

9. IF SPECIFIED, SECURELY ATTACH THE SUPPORT WIRE OR MESH TO THE UP-SLOPE SIDE OF THE STAKES WITH THE MESH EXTENDING AT LEAST 200mm INTO THE EXCAVATED TRENCH. ENSURE THE MESH AND FABRIC IS ATTACHED TO THE UP-SLOPE SIDE OF THE STAKES EVEN WHEN DIRECTING A FENCE AROUND A CORNER OR SHARP CHANGE OF DIRECTION.

10. WHEREVER POSSIBLE, CONSTRUCT THE SEDIMENT FENCE FROM A CONTINUOUS ROLL OF FABRIC. TO JOIN FABRIC EITHER:
(i) ATTACH EACH END TO TWO OVERLAPPING STAKES WITH THE FABRIC FOLDING AROUND THE ASSOCIATED STAKE ONE TURN, AND WITH

THE TWO STAKES TIED TOGETHER WITH WIRE; OR
(ii) OVERLAP THE FABRIC TO THE NEXT ADJACENT SUPPORT POST.

11. SECURELY ATTACH THE FABRIC TO THE SUPPORT POSTS USING 25 X 12.5mm STAPLES, OR TIE WIRE AT MAXIMUM 150mm SPACING.

12. SECURELY ATTACH THE FABRIC TO THE SUPPORT WIRE/MESH (IF ANY) AT A MAXIMUM SPACING OF 1m.

13. ENSURE THE COMPLETED SEDIMENT FENCE IS AT LEAST 450mm, BUT NOT MORE THAN 700mm HIGH. IF A SPILL-THROUGH WEIR IS INSTALLED, ENSURE THE CREST OF THE WEIR IS AT LEAST 300mm ABOVE GROUND LEVEL.

14. BACKFILL THE TRENCH AND TAMP THE FILL TO FIRMLY ANCHOR THE BOTTOM OF THE FABRIC AND MESH TO PREVENT WATER FROM FLOWING UNDER THE FENCE.

ADDITIONAL REQUIREMENTS FOR THE INSTALLATION OF A SPILL-THROUGH WEIR

1. LOCATE THE SPILL-THROUGH WEIR SUCH THAT THE WEIR CREST WILL BE LOWER THAN THE GROUND LEVEL AT EACH END OF THE FENCE.

2. ENSURE THE CREST OF THE SPILL-THROUGH WEIR IS AT LEAST 300mm THE GROUND ELEVATION.

3. SECURELY TIE A HORIZONTAL CROSS MEMBER (WEIR) TO THE SUPPORT POSTS/ STAKES EACH SIDE OF THE WEIR. CUT THE FABRIC DOWN THE SIDE OF EACH POST AND FOLD THE FABRIC OVER THE CROSS MEMBER AND APPROPRIATELY SECURE THE FABRIC.

4. INSTALL A SUITABLE SPLASH PAD AND/OR CHUTE IMMEDIATELY DOWN-SLOPE OF THE SPILL-THROUGH WEIR TO CONTROL SOIL EROSION AND APPROPRIATELY DISCHARGE THE CONCENTRATED FLOW PASSING OVER THE WEIR.

MAINTENANCE

1. INSPECT THE SEDIMENT FENCE AT LEAST WEEKLY AND AFTER ANY SIGNIFICANT RAIN. MAKE NECESSARY REPAIRS IMMEDIATELY.

2. REPAIR ANY TORN SECTIONS WITH A CONTINUOUS PIECE OF FABRIC FROM POST TO POST.

3. WHEN MAKING REPAIRS, ALWAYS RESTORE THE SYSTEM TO ITS ORIGINAL CONFIGURATION UNLESS AN AMENDED LAYOUT IS REQUIRED OR SPECIFIED.

4. IF THE FENCE IS SAGGING BETWEEN STAKES, INSTALL ADDITIONAL SUPPORT POSTS.

5. REMOVE ACCUMULATED SEDIMENT IF THE SEDIMENT DEPOSIT EXCEEDS A DEPTH OF 1/3 THE HEIGHT OF THE FENCE.

6. DISPOSE OF SEDIMENT IN A SUITABLE MANNER THAT WILL NOT CAUSE AN EROSION OR POLLUTION HAZARD.

7. REPLACE THE FABRIC IF THE SERVICE LIFE OF THE EXISTING FABRIC EXCEEDS 6-MONTHS.

REMOVAL

1. WHEN DISTURBED AREAS UP-SLOPE OF THE SEDIMENT FENCE ARE SUFFICIENTLY STABILISED TO RESTRAIN EROSION, THE FENCE MUST BE REMOVED.

2. REMOVE MATERIALS AND COLLECTED SEDIMENT AND DISPOSE OF IN A SUITABLE MANNER THAT WILL NOT CAUSE AN EROSION OR POLLUTION HAZARD.

3. REHABILITATE/REVEGETATE THE DISTURBED GROUND AS NECESSARY TO MINIMISE THE EROSION HAZARD.

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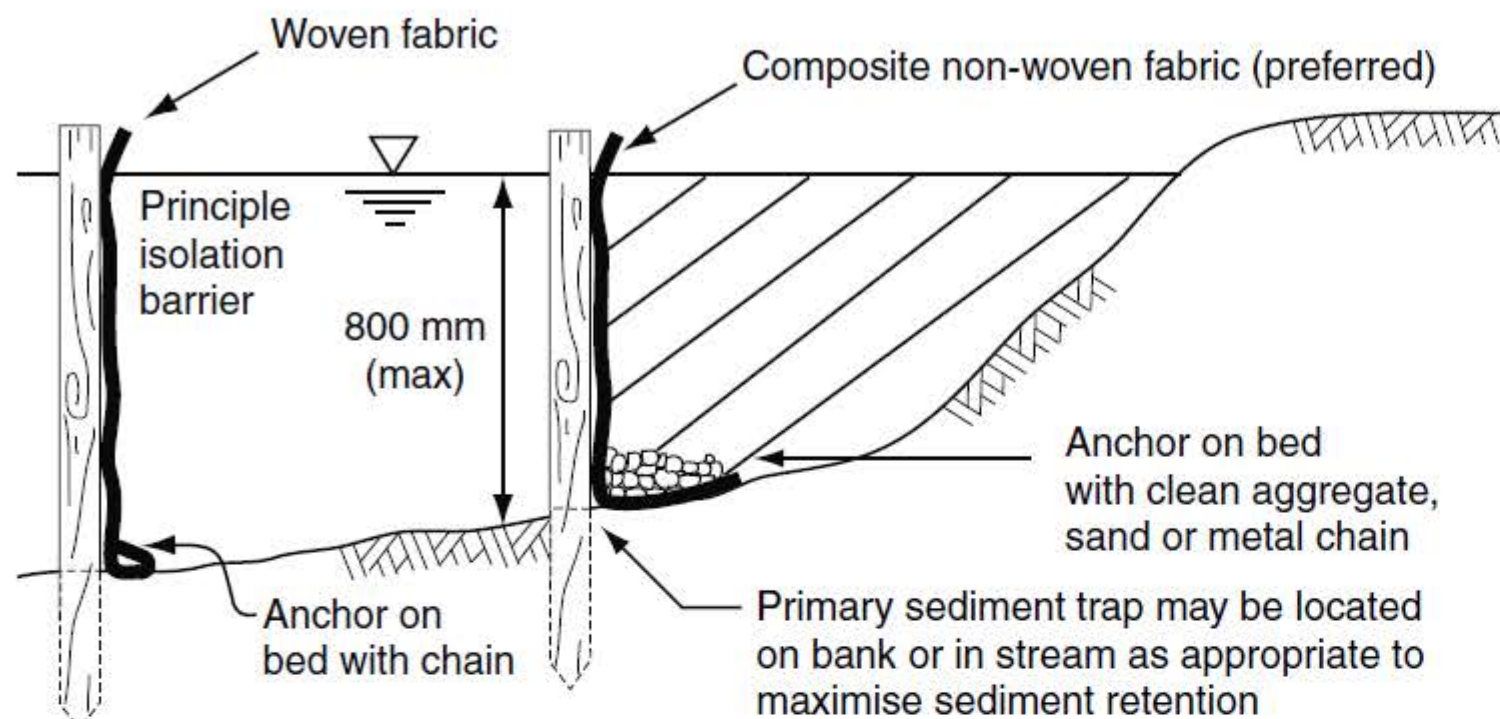
GMW

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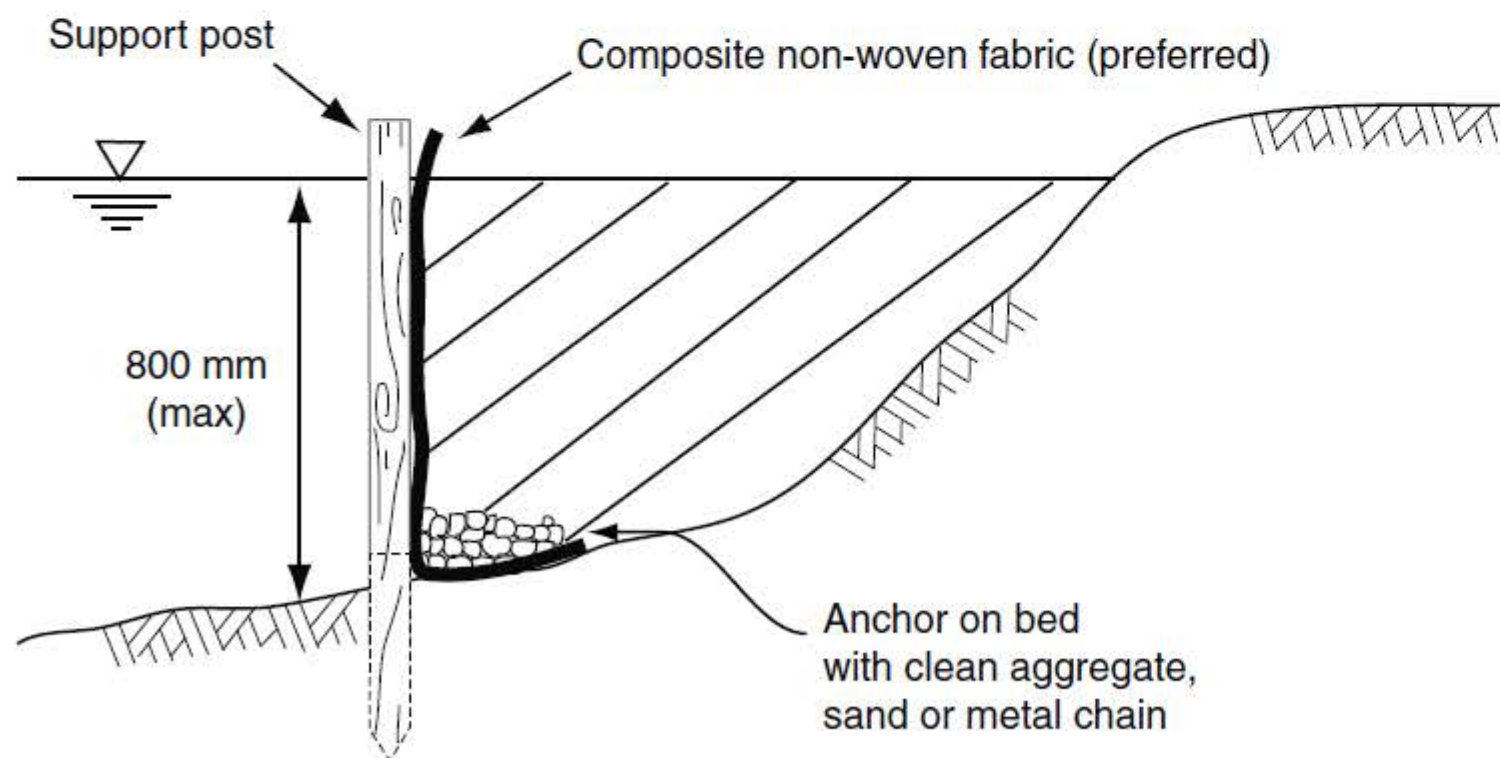
Apr-10

Sediment Fence

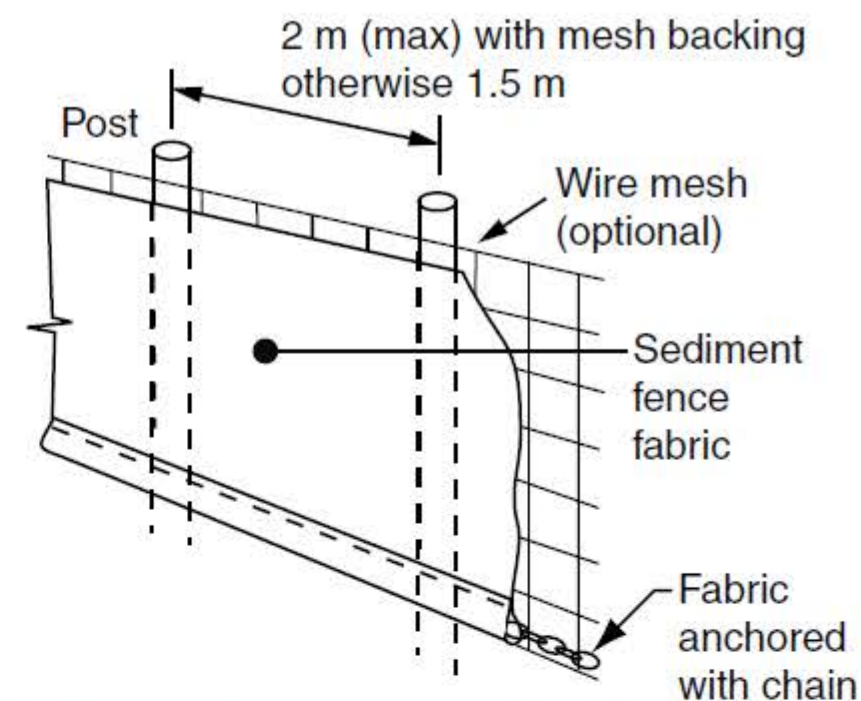
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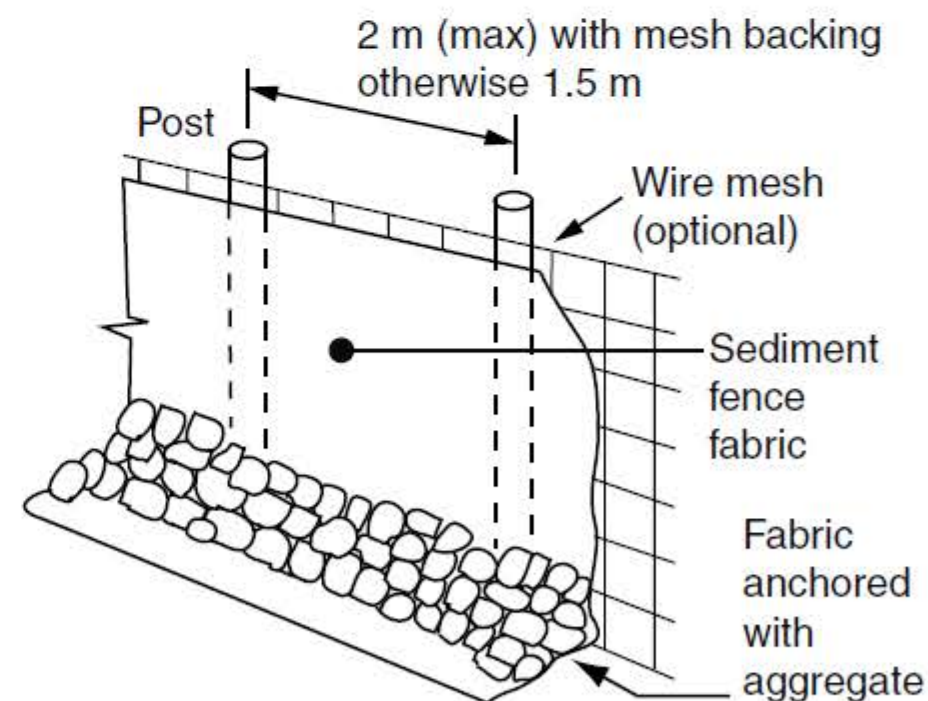
(a) Sediment fence isolation barrier with separate landward sediment fence



(c) Sediment fence isolation barrier acting as a combined isolation barrier and sediment trap



(b) Sediment fence isolation barrier with fabric anchored by ballast chain



(c) Sediment fence isolation barrier with fabric anchored by aggregate

Drawn:	Date:	Sediment Fence Isolation Barrier	SFB-01
GMW	Feb-10		

Catchments & Creeks Pty Ltd

MATERIALS

FABRIC: POLYPROPYLENE, POLYAMIDE, NYLON, POLYESTER, OR POLYETHYLENE WOVEN OR NON-WOVEN FABRIC, AT LEAST 700mm IN WIDTH AND A MINIMUM UNIT WEIGHT OF 140GSM. ALL FABRICS TO CONTAIN ULTRAVIOLET INHIBITORS AND STABILISERS TO PROVIDE A MINIMUM OF 6 MONTHS OF USEABLE CONSTRUCTION LIFE (ULTRAVIOLET STABILITY EXCEEDING 70%).

FABRIC REINFORCEMENT: WIRE OR STEEL MESH MINIMUM 14-GAUGE WITH A MAXIMUM MESH SPACING OF 200mm.

SUPPORT POSTS/STAKES: 1500mm² (MIN) HARDWOOD, 2500mm² (MIN) SOFTWOOD, OR 1.5kg/m (MIN) STEEL STAR PICKETS SUITABLE FOR ATTACHING FABRIC.

BALLAST (OUTER BARRIER): MINIMUM 8mm CHAIN OR EQUIVALENT, OR MINIMUM 50mm AGGREGATE.

STAPLES: HEAVY DUTY WIRE STAPLES AT LEAST 25mm LONG, OR WIRE TIES.

INSTALLATION

1. PRIOR TO COMMENCING ANY WORKS, OBTAIN ALL NECESSARY APPROVALS AND PERMITS REQUIRED TO CONDUCT THE NECESSARY WORKS INCLUDING PERMITS FOR THE DISTURBANCE OF RIPARIAN AND AQUATIC VEGETATION, AND THE CONSTRUCTION OF ALL PERMANENT OR TEMPORARY INSTREAM BARRIERS AND INSTREAM SEDIMENT CONTROL MEASURES.
2. REFER TO APPROVED PLANS FOR LOCATION AND DIMENSIONAL DETAILS. IF THERE ARE QUESTIONS OR PROBLEMS WITH THE LOCATION, DIMENSIONS OR METHOD OF INSTALLATION CONTACT THE ENGINEER OR RESPONSIBLE ON-SITE OFFICER FOR ASSISTANCE.
3. CONFIRM IF A SINGLE OR DOUBLE FENCE IS REQUIRED.

4. IF THERE IS FLOW WITHIN THE WATERCOURSE OR DRAINAGE CHANNEL AT THE TIME OF INSTALLATION OF THE ISOLATION BARRIER, THEN TAKE APPROPRIATE MEASURES TO MINIMISE THE RELEASE OF SEDIMENT DURING ITS INSTALLATION. SUCH MEASURES SHOULD ONLY BE INSTALLED IF CONSIDERED APPROPRIATE FOR THE LOCAL CONDITIONS, AND ONLY IF THEIR INSTALLATION IS JUDGED TO PROVIDE A NET OVERALL ENVIRONMENTAL BENEFIT.
5. TO THE MAXIMUM DEGREE PRACTICABLE, CONSTRUCTION ACTIVITIES AND EQUIPMENT SHOULD NOT OPERATE WITHIN OPEN FLOWING WATERS.
6. IDENTIFY THE APPROPRIATE LOCATION OF THE OUTER ISOLATION BARRIER. FOR REASONS OF SAFETY, THE OUTER BARRIER SHOULD NOT BE PLACED IN WATER DEPTHS EXCEEDING 1.2m.
7. IF PLACED IN LARGE OPEN WATERS, INSTALL THE ISOLATION BARRIERS SUCH THAT THE TOP OF EACH FENCE IS AT LEAST 300mm ABOVE THE WATERLINE TO PREVENT OVER-TOPPING BY WAVES OR FLUCTUATIONS IN WATER LEVEL.
8. PLACE THE SUPPORT POSTS (OUTER BARRIER) AT A MAXIMUM SPACING OF 2m WITH WIRE MESH BACKING, OR 1.5m WITHOUT WIRE MESH BACKING. DRIVE THE POSTS 600mm INTO THE CHANNEL BED OR UNTIL THE POST ARE SECURE. IF THE SUPPORT POST CANNOT BE DRIVEN 600mm INTO THE BED, THEN ADDITIONAL BRACING MAYBE REQUIRED.
9. ATTACH ANY FENCE REINFORCEMENT (WIRE MESH) AS SPECIFIED IN THE APPROVED PLANS OR AS DIRECTED.
10. PRIOR TO INSTALLING THE FABRIC, SECURE (SEW) A BALLAST CHAIN INTO THE BOTTOM OF THE FABRIC.
11. ATTACH THE SPECIFIED FABRIC TO THE CHANNEL SIDE OF THE POSTS. WHERE POSSIBLE, USED A CONTINUOUS ROLL OF FABRIC. IF THIS IS NOT POSSIBLE, CONSTRUCT SUITABLE LEAK-PROOF JOINTS IN THE FABRIC.

12. FASTEN THE FABRIC SECURELY USING HEAVY-DUTY STAPLES OR NAILS (WITH A WASHER) AT A MAXIMUM SPACING OF 50mm. USE WIRE TIES TO SECURELY ATTACH THE FABRIC TO THE WIRE MESH (IF USED).
13. IF IT IS NOT PRACTICABLE TO ATTACH A BALLAST TO THE BOTTOM OF THE FABRIC, THEN SECURE THE BOTTOM 300mm OF FABRIC TO THE CHANNEL BED USING A CONTINUOUS PLACEMENT (MINIMUM 50mm) OF LARGE AGGREGATE OR CLEAN ROCK FILL.
14. AFTER INSTALLING THE OUTER ISOLATION BARRIER, INSTALL THE SECOND LANDWARD BARRIER (IF REQUIRED). THE LANDWARD BARRIER IS USUALLY LOCATED JUST ABOVE THE NORMAL WATER LINE, BUT SHOULD BE LOCATED SO AS NOT TO INTERFERE WITH ADJACENT CONSTRUCTION ACTIVITIES.
15. ENSURE THE TOP OF THE FABRIC OF THE OUTER BARRIER IS AT LEAST 200mm ABOVE THE MAXIMUM EXPECTED, DRY WEATHER (I.E. NON-FLOOD FLOW) WATER LEVEL.
16. INSTALL THE LANDWARD SEDIMENT FENCE IN ACCORDANCE WITH THE NORMAL INSTALLATION PROCEDURES FOR A SEDIMENT FENCE, EXCEPT THE MAXIMUM SPACING OF SUPPORT POSTS IS 2m WITH OR WITHOUT A WIRE MESH BACKING. ENSURE THE FABRIC IS ATTACHED TO THE LANDWARD SIDE OF THE POSTS.

MAINTENANCE

1. INSPECT THE ISOLATION BARRIER DAILY AND AFTER ANY SIGNIFICANT CHANGE IN STREAM FLOW. MAKE NECESSARY REPAIRS IMMEDIATELY.
2. INSPECT THE BARRIER FOR TURBIDITY LEAKS THAT MIGHT BE CAUSED BY HOLES IN THE BARRIER OR DAMAGE TO THE FABRIC-STREAMBED CONTACT.
3. REPAIR ANY TORN SECTIONS WITH A CONTINUOUS PIECE OF FABRIC FROM POST TO POST.

4. WHEN MAKING REPAIRS, ALWAYS RESTORE THE SYSTEM TO ITS ORIGINAL CONFIGURATION UNLESS AN AMENDED LAYOUT IS REQUIRED OR SPECIFIED.

REMOVAL

1. ALL COMPONENTS OF THE SEDIMENT FENCE ISOLATION BARRIER SHOULD BE REMOVED AS SOON AS POSSIBLE AFTER IT IS NO LONGER NEEDED.
2. IF EXCESSIVE SEDIMENT OR DEBRIS HAS COLLECTED AROUND THE BARRIER, THEN REMOVE SUCH MATERIAL BEFORE THE BARRIER IS REMOVED AND DISPOSE OF SUCH MATERIAL PROPERLY.
3. ENSURE ANY CHANNEL WATER CONTAINED WITHIN THE ENCLOSED CHANNEL AREA IS SUITABLY TREATED BEFORE EITHER THE WATER IS DISCHARGED FROM THE ENCLOSURE OR THE ISOLATION BARRIER IS REMOVED.
4. IF IT IS NOT FEASIBLE TO WAIT FOR ADEQUATE SETTLEMENT OF SUSPENDED SEDIMENTS, THEN WHERE PRACTICABLE, PUMP THE SEDIMENT-LADEN WATER TO AN OFF-STREAM DE-WATERING SEDIMENT CONTROL SYSTEM FOR TREATMENT. THIS TREATMENT AREA SHOULD IDEALLY BE LOCATED AT LEAST 50m FROM THE CHANNEL.
5. STARTING FROM THE UPSTREAM END, REMOVE ALL MATERIALS USED TO FORM THE ISOLATION BARRIER AND DISPOSE OF IN A SUITABLE MANNER THAT WILL NOT CAUSE AN EROSION OR POLLUTION HAZARD.
6. RESTORE THE WATERCOURSE CHANNEL TO ITS ORIGINAL CROSS-SECTION, AND SMOOTH AND APPROPRIATELY STABILISE AND/OR REVEGETATE ALL DISTURBED AREAS.

Drawn:	Date:		
GMW	May-10	Sediment Fence Isolation Barrier	SFB-02

MATERIALS

ROCK: 150 TO 300mm NOMINAL DIAMETER, HARD, EROSION RESISTANT ROCK. SMALLER ROCK MAY BE USED IF SUITABLE LARGE ROCK IS NOT AVAILABLE.

SANDBAGS: GEOTEXTILE BAGS (WOVEN SYNTHETIC, OR NON-WOVEN BIODEGRADABLE) FILLED WITH CLEAN COARSE SAND, CLEAN AGGREGATE, STRAW OR COMPOST.

INSTALLATION

1. REFER TO APPROVED PLANS FOR LOCATION AND INSTALLATION DETAILS. IF THERE ARE QUESTIONS OR PROBLEMS WITH THE LOCATION OR METHOD OF INSTALLATION, CONTACT THE ENGINEER OR RESPONSIBLE ON-SITE OFFICER FOR ASSISTANCE.

2. PRIOR TO PLACEMENT OF THE CHECK DAMS, ENSURE THE TYPE AND SIZE OF EACH CHECK DAMS WILL NOT CAUSE A SAFETY HAZARD OR CAUSE WATER TO SPILL OUT OF THE DRAIN.

3. LOCATE THE FIRST CHECK DAM AT THE DOWNSTREAM END OF THE SECTION OF CHANNEL BEING PROTECTED. LOCATE EACH SUCCESSIVE CHECK DAM SUCH THAT THE CREST OF THE IMMEDIATE DOWNSTREAM DAM IS LEVEL WITH THE TOE OF THE CHECK DAM BEING INSTALLED.

4. ENSURE THE CHANNEL SLOPE IS NO STEEPER THAN 10:1 (H:V). OTHERWISE CONSIDER THE USE OF A SUITABLE CHANNEL LINER INSTEAD OF THE CHECK DAMS.

5. CONSTRUCT THE CHECK DAM TO THE DIMENSIONS AND PROFILE SHOWN WITHIN THE APPROVED PLAN.

6. WHERE SPECIFIED, THE CHECK DAMS SHALL BE CONSTRUCTED ON A SHEET OF GEOTEXTILE FABRIC USED AS A DOWNSTREAM SPLASH PAD.

7. EACH CHECK DAM SHALL BE EXTENDED UP THE CHANNEL BANK (WHERE PRACTICABLE) TO AN ELEVATION AT LEAST 150mm ABOVE THE CREST LEVEL OF THE DAM.

MAINTENANCE

1. INSPECT EACH CHECK DAM AND THE DRAINAGE CHANNEL AT LEAST WEEKLY AND AFTER RUNOFF-PRODUCING RAINFALL.

2. CORRECT ALL DAMAGE IMMEDIATELY. IF SIGNIFICANT EROSION OCCURS BETWEEN ANY OF THE CHECK DAMS, THEN CHECK THE SPACING OF DAMS AND WHERE NECESSARY INSTALL INTERMEDIATE CHECK DAMS OR A SUITABLE CHANNEL LINER.

3. CHECK FOR DISPLACEMENT OF THE CHECK DAMS

4. CHECK FOR SOIL SCOUR AROUND THE ENDS OF EACH CHECK DAM. IF SUCH EROSION IS OCCURRING, CONSIDER EXTENDING THE WIDTH OF THE CHECK DAM TO AVOID SUCH PROBLEMS.

5. IF SEVERE SOIL EROSION OCCURS EITHER UNDER OR AROUND THE CHECK DAMS, THEN SEEK EXPERT ADVICE ON AN ALTERNATIVE TREATMENT MEASURE.

6. REMOVE ANY SEDIMENT ACCUMULATED BY THE CHECK DAMS, UNLESS IT IS INTENDED THAT THIS SEDIMENT WILL REMAIN WITHIN THE CHANNEL.

7. DISPOSE OF COLLECTED SEDIMENT IN A SUITABLE MANNER THAT WILL NOT CAUSE AN EROSION OR POLLUTION HAZARD.

REMOVAL

1. WHEN CONSTRUCTION WORK WITHIN THE DRAINAGE AREA ABOVE THE CHECK DAMS HAS BEEN COMPLETED, AND THE DISTURBED AREAS AND THE DRAINAGE CHANNEL ARE SUFFICIENTLY STABILISED TO RESTRAIN EROSION, ALL TEMPORARY CHECK DAMS MUST BE REMOVED.

2. REMOVE THE CHECK DAMS AND ASSOCIATED SEDIMENT AND DISPOSE OF IN A SUITABLE MANNER THAT WILL NOT CAUSE AN EROSION OR POLLUTION HAZARD.

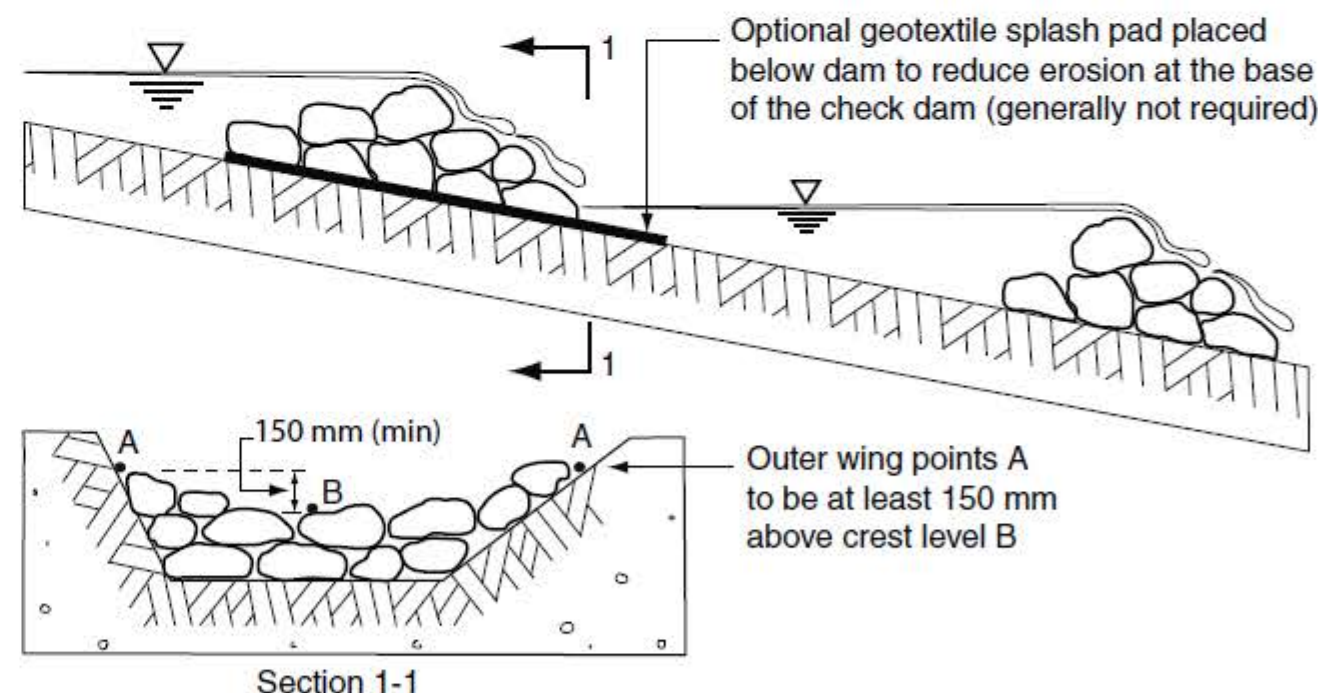


Figure 1 - Layout and profile of check dams (rock check dams shown)

Drawn:	Date:		
GMW	Dec-09	Check Dams	RCD-01

Appendix C – Inspection checklist template

_____ Inspection Checklist

Location:

Date:

Time:

Weather Conditions:

Days since last rainfall event:

Inspection conducted by:

Element	Yes	No	Comments	Actions (refer to Corrective Actions for each element)	Action Completed (tick box and sign)

(Note, a site plan and photographic evidence must accompany this checklist to identify the severity and locations of observed issues)

GHD

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Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	E Love / N Ambrey	S Petersen	On file	G Squires		09/12/2020

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Appendix B – Cassowary Management Plan

Department of State Development, Tourism and Innovation

Wangetti Trails Project

Cassowary Management Plan

February 2021



environmentPACIFIC

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Wangetti Trails Project, Cassowary Management Plan

Document Status

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Appendix A

Cassowary Foodplants in the Wangetti Trails Project Area

1. Introduction

1.1 This Plan

This plan is intended to assist in the planning/design, construction and operation/maintenance aspects of the Wangetti Trail (north and south) in consideration of the southern cassowary ('cassowary' *Casuarius casuarius johnsonii*).

The primary purpose of this Plan is to provide guidance in managing potential impacts and negative interactions between cassowaries and human activities.

This Plan does not replace and is subordinate to legislative, regulatory and planning provisions relevant to the management of the values of the Wet Tropics World Heritage Area (WTWHA).

This Plan does not abrogate responsibility of the Management Authorities for the Wangetti Trail from the fulfillment of conditions as may be issued for permits, authorities, and approval for the construction, operation and maintenance of the Wangetti Trail. Legislative obligations will prevail where there is a conflict between this Plan and regulatory requirements.

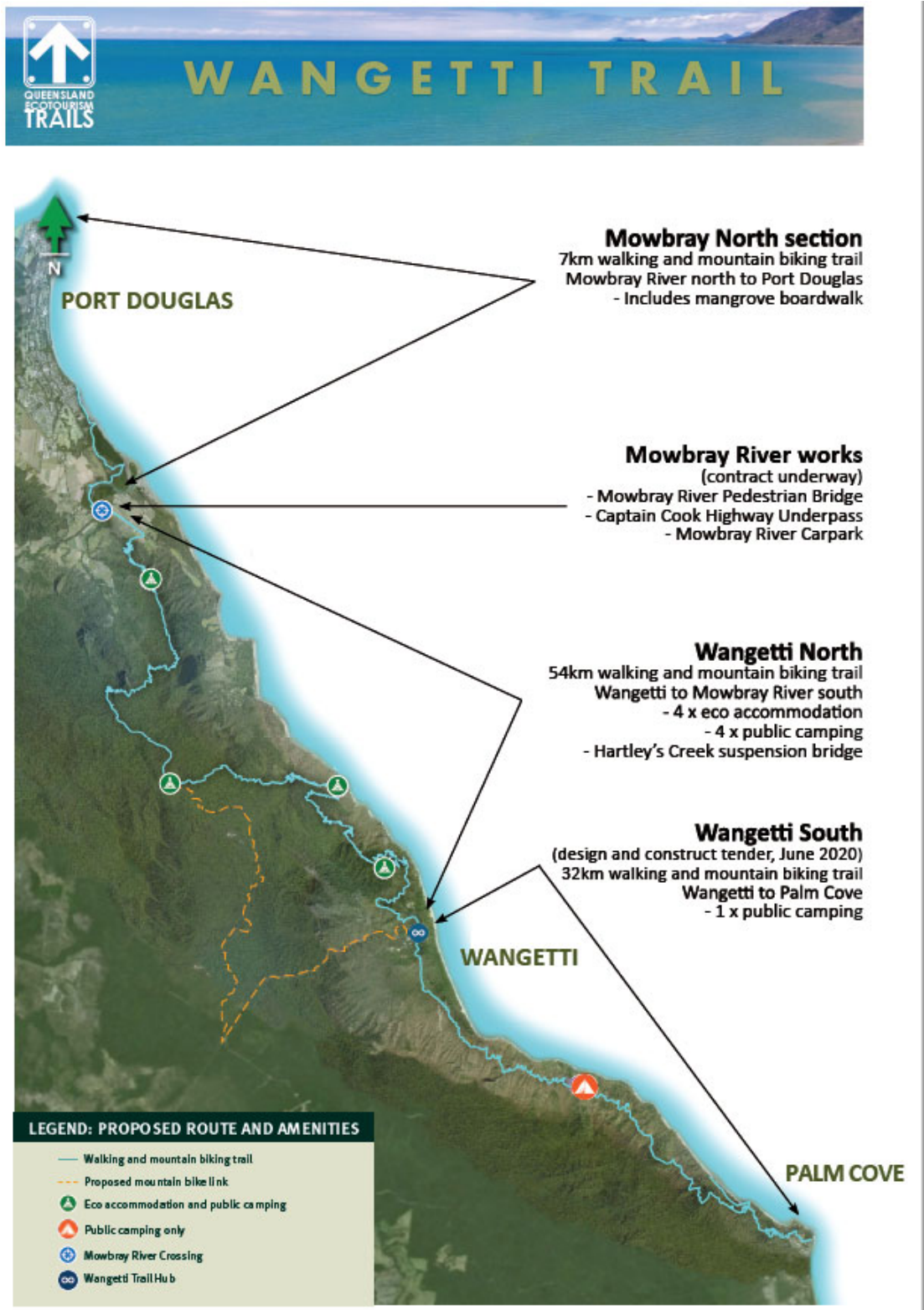
1.2 Area this Plan Covers

This Plan covers the entirety of the works associated with the construction, operation and maintenance of the Wangetti Trail. This includes:

- The 40m wide proposed corridor construction area
- All aspects of construction including construction access trails, laydown and stockpile areas, temporary camps (if required) and any other infrastructure related area.
- The alignment of the Wangetti Trail, North and South, as shown in the GHD report (2020) and reproduced as **Figure 1** (following).
- All camping grounds along the trail.
- All service access tracks and roads to trail facilities.
- Carparks, registration areas/trailheads and other locations.

This Plan is applicable to parts of the Project Area, however where there are existing policy, planning and regulatory commitments that include gazetted public roads, recreation reserves, timber/forestry reserves, private property and their access roads these must be addressed within the context of this Plan. This Plan does not cover the Mowbray River works, comprising the Mowbray River pedestrian bridge, Captain Cook Highway underpass, or the Mowbray River carpark.

Figure 1 Wangetti Trails Project Extent



.Source: Wangetti Trails Project: (GHD report 2020)

1.3 Description of Works

A full description of the proposed works is to be found in documentation on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* ('EPBC Act') project referrals portal at:

<http://epbcnotices.environment.gov.au/referralslist/> Referrals no: [2020/8722](#) and [2020/8723](#).

The following is a summary of the information presented in the *Wangetti Trail North Section (South Mowbray to Wangetti), Matters of National Environmental Significance Baseline Ecology and Impact Assessment Report* (GHD July 2020) and in the *Wangetti Trail South Section (Wangetti to Palm Cove) Matters of National Environmental Significance Baseline Ecology and Impact Assessment Report* (GHD July 2020).

1.3.1 Wangetti North Trail Section

The Wangetti North trail section is proposed to comprise the following components.

- 54 km shared use trail (preliminary survey alignment) to accommodate both mountain bike users and hikers. Trail will comprise both natural ground and built surface sections, to a maximum width of 1.5m when formed, with allowance for an additional 0.5m of disturbance either side during construction. A 40m wide construction corridor has been identified (GHD 2020) to allow flexibility of minor realignments and infrastructure aspects during construction.
- Built structures proposed as part of the trail include reinforcement of gully crossings, bridges, staircases, platforms, rock armouring and signage.
- A number of waterway crossings along the shared use trail will require armouring, boulder crossings, suspension bridge crossing (Hartley Creek only) and low-level bridges for minor waterway crossings.
- A dedicated mountain bike track of approximately 17 km in length using existing Twin Bridges Road (Black Mountain East) and Wangetti-South Edge road ("Quaid's road") with upgrades of five waterways crossings in poor condition along Twin Bridges Road.
- Four public camping nodes and four eco-accommodation nodes along the shared use trail. Each public camping node comprise:
 - 0.25 ha site footprint
 - 10 x 4 m diameter elevated camping decks
 - 1 x 2.5 m x 2.5 m toilet block
 - 1 communal gathering area including bike rack, table and seating, cooking and bench area and shelter
 - Interconnecting pathways, boardwalks and access tracks.
- The eco-accommodation nodes will comprise:
 - 0.25 ha site footprint with 100 m nature buffer to separate the eco-accommodation site from the public camping nodes.
 - 10 small basic huts/glamping tents constructed on elevated platforms
 - 1 common building for dining, food preparation and bathrooms
 - shower/toilet block

- Interconnecting pathways, boardwalks and access tracks.
- Associated infrastructure such as solar panels, generators and water tanks
- The upgrading of existing access tracks into service tracks to provide restricted access to the shared use trail and the camp sites for construction purposes, operational purposes, maintenance purpose and for emergency purposes.

1.3.2 Wangetti South Trail Section

The proposed infrastructure includes:

- A 29.7km shared use trail (preliminary survey alignment) to accommodate both mountain bike users and hikers. Trail will comprise both natural ground and built surface sections, to a maximum width of 1.5m when formed, with allowance for an additional 0.5m of disturbance either side during construction. A 40m wide construction corridor has been identified (GHD 2020) to allow flexibility of minor realignments and infrastructure aspects during construction.
- Built structures proposed as part of the trail include reinforcement of gully crossings, bridges, staircases, platforms, rock armouring and signage.
- A number of waterway crossings along the shared use trail will require armouring, boulder crossings and low-level bridges for minor waterway crossings.
- Public camping node and amenities block, with a footprint of 0.25 ha and comprising
 - 10 x 4 m diameter elevated camping decks
 - 1 x 2.5 m x 2.5 m toilet block
 - One communal gathering area including bike rack, table and seating, cooking and bench area and shelter
 - Interconnecting pathways, boardwalks and access tracks.
- The upgrading of existing access tracks into service tracks to provide restricted access to the shared use trail and the camping node for construction purposes, operational purposes, maintenance purpose and for emergency purposes. Upgrading will include vegetation trimming and ongoing maintenance, stabilisation of track surfaces, installing drainage controls where required.

2. Application of this Plan

2.1 Understanding Cassowaries

2.1.1 Description and Ecology

The southern cassowary (*Casuarius casuarius*) is found in Indonesia, Papua New Guinea and Australia, with the Australian population being considered a subspecies, *Casuarius casuarius johnsonii*. The Australian population has disjunct populations represented on Cape York Peninsular and in the north Queensland wet tropics. Population estimates in Australia vary, with the Cape York populations poorly understood, and previous estimates for the wet tropics population widely varying. The most current estimate is approximately 4,400 (Westcott *et al* 2014).

The origin of the name 'cassowary' has several sources but is considered most likely to derive from Papuan languages referring to the 'horned (kasu) head'(weri) (Boles 1987). In the language of the Eastern Kuku-Yalanji traditional owners the cassowary is "kurrangi" (Hershberger, 1986) and "punta:raa" to the Yirrganydji traditional owners (Biggs, 2013). The cassowary is a totemic animal to traditional owners, and is an iconic emblem of the Wet Tropics World Heritage Area.

The southern cassowary ('cassowary' in this Plan) is a member of the ratites, a grouping of large flightless birds that includes other cassowary species in Melanesia, but also African ostriches, Australian emus, New Zealand kiwis and South American rheas. Cassowaries are large and heavy birds, females being the larger, and may reach heights of 1.8m and weigh 65kg (Biggs 2013). They are a polyandrous species, generally solitary in nature with variable size home ranges, although these ranges are fluid and may overlap the territory of adjacent birds (Crome and Moore 1990, Kutt *et al* 2007, Westcott *et al* 2014). Breeding occurs between June to October/November, with the male alone responsible for incubation and rearing of chicks for between 9 to 18 months after hatching. During the approximately 50 days of incubation males rarely leave the nest.

Cassowaries are primarily frugivorous, their core habitat being rainforest communities that are characterised by a wide diversity of fleshy fruited species. Cassowaries have been documented as being the primary dispersal agent of at least 238 plant species (Mack *et al* 2006).

Cassowaries will however feed on a variety of invertebrates (including crustaceans), carrion, and small vertebrates (Buosi and Burnett 2006, Bentrupperbäumer 1998).

Of importance to this plan is that cassowaries are not restricted to rainforest areas, but require a mosaic of habitats that offer resources, e.g., fruiting plants, that are seasonally only available outside of rainforests (Crome and Moore 1990,). Their foraging is also strictly diurnal, meaning that cassowaries will not be active in the evenings (Crome 1976) and being bipedal, their habitat preference is for areas of milder terrain and flatter land. Subsequently the most significant wet tropics populations are to be found in the coastal lowlands (Westcott *et al* 2014) where preferential habitat is most at risk from development.

2.1.2 Conservation Status

The southern cassowary (*Casuarius casuarius johnsonii*) is listed nationally as 'endangered' under the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act). The southern population (wet tropics) is listed as 'endangered' under Schedule 1 of the Queensland *Nature Conservation (Animals) Regulation 2020* and Cape York Peninsular

populations are listed as 'vulnerable' under Schedule 2 of the *Nature Conservation (Animals) Regulation 2020*. Internationally the species (*Casuarus casuaris*) is listed under the IUCN Red List as 'vulnerable- declining population trend'.

Habitat loss and fragmentation of remaining habitat is recognised as the primary threat to cassowary populations, and has been most extensive in the coastal lowlands where cassowary densities are the highest (Moore 2003, Latch 2007, Westcott *et al* 2014). Other factors identified in the decline of cassowary populations include road death by vehicle strikes, dog attacks and avian diseases e.g., avian tuberculosis and *Aspergillosis* (Moore 2003). Degradation of habitat through logging, feral pig activity, weed invasion and altered fire regimes is also considered a key factor in reducing resource availability for cassowaries (Kutt *et al* 2009).

2.1.3 Behavioural Aspects

The behaviour of cassowaries is not well understood. They are a cryptic species, and captive individuals rarely exhibit the full range of behavioural aspects that have been observed of cassowaries in the wild (Biggs 2013). The behaviour of individuals to the same stimulus may vary from individual-to-individual bird, and conversely, the same bird may respond differently to the same stimulus at different times.

There is consensus in published literature (e.g., Crome 1976, Crome and Moore 1990, Bentrupperbäumer 1998, Buosi and Burnett 2006) that changes in behavioural aspects are a significant factor in cassowary mortality and injury. In particular hand feeding of cassowaries, or other ready availability of anthropogenic food sources, e.g., organic rubbish, is directly responsible for attracting cassowaries to road sides, where vehicle strike is the single most direct cause of cassowary mortality and injury (Moore 2003) or into urban, rural/residential areas and into conflict with dogs and urban traffic (Bentrupperbäumer 1998).

Kofron (1999, 2003) assessed the pattern of negative cassowary interactions with people (i.e. attacks) and of the 150 documented cases reported to 1999, 73% of these were in situations where cassowaries were soliciting or expecting food from humans. Other attacks occurred where birds were reacting in response to threat perceptions including defending food sources (5%), defending themselves (15%) or their eggs and chicks (7%). Eight of the attacks resulted in serious injury, and there is one historical mortality in a situation where a cassowary was defending itself from dogs and their handler.

Access to anthropogenic food sources and/or hand feeding appears to increase the changes of negative interactions with cassowaries (Kofron 2003). Behavioural changes relevant to the Wangetti Trails project may include:

- Persistent access to camp areas as a result of availability of anthropogenic food sources e.g., rubbish bins, food left in untended open areas, or hand feeding.
- Persistent occupation of trail areas in home ranges resulting from hikers/riders leaving food scraps or hand feeding birds, and subsequent potential confrontation with users on the trail.
- An increase in aggressive behaviour towards hikers/riders in defending chicks and nest areas in proximity to the trail/camp areas.
- An increase in aggressive behaviour towards hikers/riders in defending food sources, e.g., particular fruiting trees, adjacent to the trail/camp areas.

Other, more generally behavioural responses noted with cassowaries that may arise as a direct result of the Wangetti Trails Project include the following.

- Response to noise (and light at night). Cassowaries are a reclusive species, relying on vocal communication for finding mates, husbanding chicks, and as warning response. Noise has the potential to adversely impact their behaviour which may include abandoning or limiting access to part of their range which may include water sources (permanent and seasonal), important staple food sources (e.g., access to fruiting trees). At the most extreme noise may preclude cassowaries from finding breeding partners in situations over large home ranges. Construction noise may result in only temporary displacement of the cassowary to other parts of their range, however operationally Camp 4 (the most significant locality in terms of implementing cassowary management measures) may accommodate up to 40 people (20 campers, 20 eco-accommodation guests) per night which has a high potential for noise generation and subsequent stress and permanent displacement.
- Cassowaries will readily adopt clearings into their movement patterns, and will use available paths, trails and minor roads to traverse their ranges. Scats observed in the middle of Twin Bridges Road, Black Mountain Road and Southedge road in the 2019 and 2020 surveys confirmed cassowary utilisation of these roads. Sections of the proposed alignments using these roads had high proportions of cassowary food plant species (see Appendix A for the full list recorded). The volume of hikers and mountain bike riders is not known, however there is a high likelihood that in some localities users of the trail will come into contact with cassowaries, and the behavioural responses are unknown and will largely depend on the site-specific circumstances (e.g., adults with chicks, fruiting trees present, blind corners on fast moving mountain bikes, etc.)

2.2 Abundance and Distribution in the Project Area

2.2.1 Database records, Published Literature and Anecdotal Information

While there have been intensive surveys for specific localities in the Wet Tropics, for example Mission Beach (e.g., Moore 2007), specific information on the abundance and distribution of cassowaries in the project area is extremely limited. The most substantive recent work is that of Westcott *et al* (2014), who in the period 2012 to 2014 undertook an extensive survey of the Wet Tropics using information obtained through direct observation and faecal-DNA analysis of dung samples and feathers collected. Subsequent complexing modelling utilizing a number of tools, and including habitat condition and type (identified as essential habitat through Kutt *et al.* 2004) were used to obtain an estimate of cassowary density and population based on sub-regional areas.

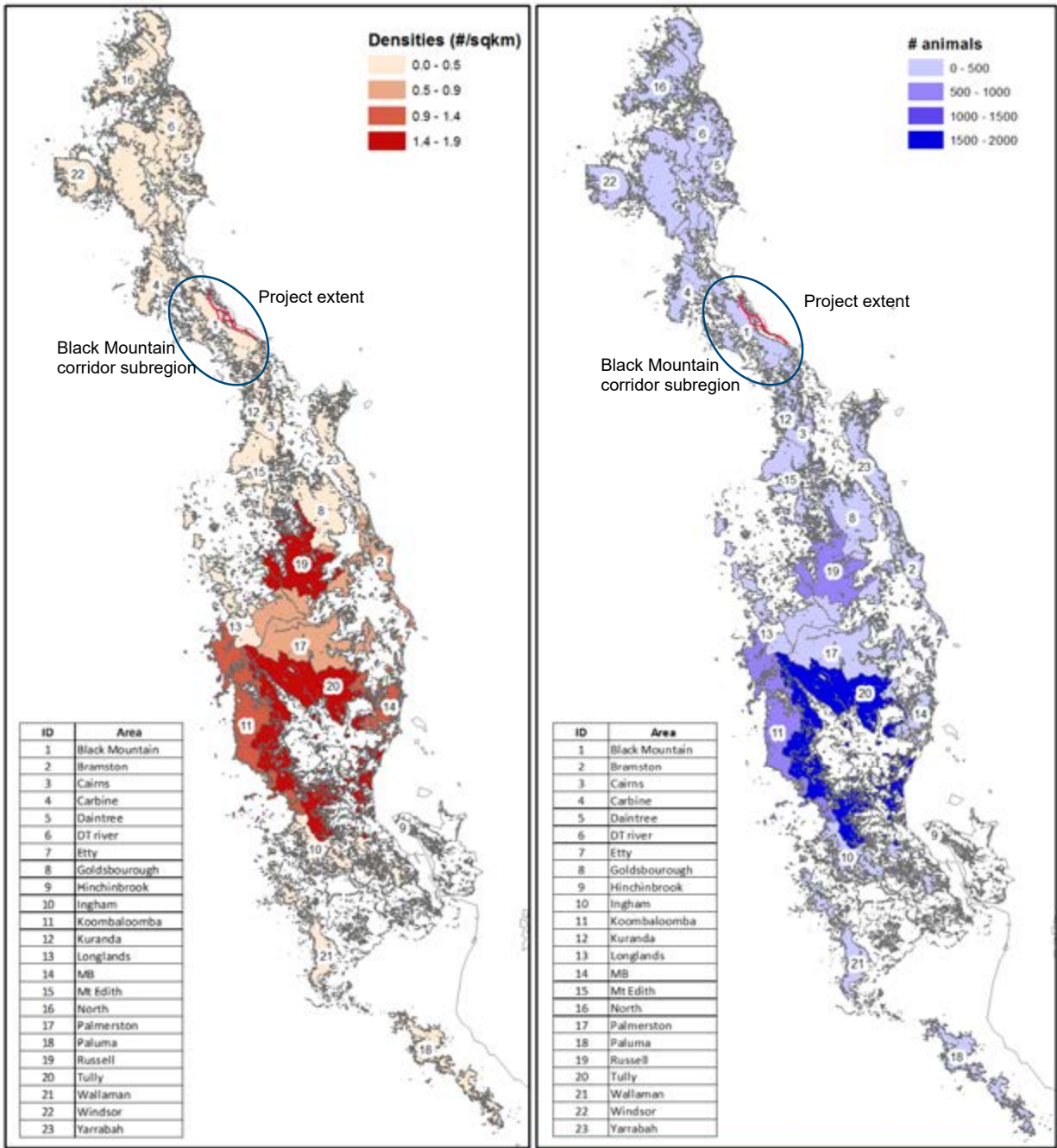
The Wangetti Trail project area is located within the northern section of the Black Mountain corridor, one of the subregional categories used in the study. Essential habitat in this corridor (Kutt *et al.* 2004) is mapped as 29,962ha between Kuranda and Julatten. This however includes substantive areas immediately north of Kuranda in the Black Mountain/Myola locality, approximately 17km southeast from the closest portion of the Wangetti North trail (intersection of Southedge Road with Black Mountain Road) and 7km south west of the Wangetti South trail head at Palm Cove. Refer **Figure 3**

There is a high variability of habitat conditions and quality associated with the Black Mountain corridor, and actual observations are clustered in the southern section of the Black Mountain corridor, in the Kuranda/Myola locality. A lesser number of records were collected in the most northern end, closest to Julatten along Black Mountain road. No surveys were undertaken along Twin Bridges Road (undriveable) and hence the large area through the upper catchments of Spring Creek and Hartleys Creek in which sections of the Wangetti North Trail are sited, were not sampled.

Figure 2 CSIRO Black Mountain Study Corridor and Wangetti Trails Project Area



Figure 3 Modelled cassowary density and population



Source: Westcott *et al* (2014), Estimation of the population size and distribution of the southern cassowary, *Casuarius casuarius*, in the Wet Tropics Region of Australia.

2.2.2 Field Survey Data

Ecology surveys of the majority of the shared use trails for the Wangetti North trail, and the entirety of the Wangetti South shared use trail of were undertaken in 2019. Some sections of the Wangetti North trail and the mountain bike only trail was not surveyed (refer GHD 2020 reports and mapping), owing to access and logistical difficulties. These un-surveyed sections of the Wangetti North trail and the mountain bike only trail (comprising Southedge Road ('Quaid' Road) from the Wangetti hub location to the intersection with Black Mountain Road, and

subsequent branch of the Twin Bridges Road), were subsequently surveyed in October 2020 in support of this report.

Scats were located during the 2019 surveys in two locations along the Wangetti North share-use trail along section D and in 2020 scats were located along Section C (Wangetti North trail), sections S, V and X along the Mountain Bike trail, and an adult female was photographed in the vicinity of the planned Camp 4 (**Figure 2**). There is no evidence of cassowary utilisation of any part of the Wangetti South trail, and the majority of this trail is outside mapped essential cassowary habitat (**Figure 5**).

Plate 1 Adult cassowary, Camp 4 locality



Without the benefit of direct observations of the birds, or of DNA faecal analysis of the scats, it is not possible to say how exactly how many cassowaries actually have home ranges that intersect the Wangetti North shared use trail and the Mountain Bike trail. This determination would be part of ongoing monitoring of the project in conjunction with a partner research organisation. The size and configuration of the home range of individual birds may also vary seasonally and from year to year, depending on environmental conditions and patterns of food abundance (Crome and Moore 1990; Bentrupperbäumer 1998; Moore 2003).

Under optimal conditions of permanent water availability, rainforest with a high representation of food plant species and availability of habitat mosaics to provide seasonal resources, home ranges may vary between around 0.52km² to 2.35km² (Moore 2003) with an average of approximately 0.8km² (Bentrupperbäumer 1998). These optimal conditions are primarily represented in lowland coastal areas, but in upland areas with less favourable habitat conditions cassowaries have been observed with home ranges of up to approximately 7km² (Bentrupperbäumer 1998; Campbell *et al.* 2012).

Westcott *et al* (2014) modelled an estimated total population of 37 cassowaries in the Black Mountain corridor, with an overall average density of 1 bird every 8.3km² between Kuranda and Julatten (end of Black Mountain Road). The Wangetti North shared use trail and the Mountain Bike trail section west of the Macalister Range encompasses approximately 70km² of mapped essential habitat. Based on the modelled density of 1 bird/8.3km², this equates to approximately 8 to 9 cassowaries with home ranges potentially intersecting these trails.

Based on the field survey data, it is expected that this modelled density would vary across the project area as the majority of scats recorded were along Twin Bridges Road shared use trail

section east and north of Camp 4 with an adult female identified near Camp 4, and on the mountain bike trail section of Twin Bridges road south of Camp 4. Possibly the density would be higher in these locations i.e., home ranges may be smaller, but further monitoring and survey would be required. Sparse records and field data survey results supports the modelling estimate by Westcott et al 2014 of approximately 8 to 9 cassowaries in the project area. Cassowaries in the project area overall are expected to be of low abundance with populations primarily centred on the upper catchments of Hartleys, Big Rooty, Allen and Spring Creek i.e., along the Wangetti North trail between a point immediately west of the Macalister range and Spring Creek falls, and in the vicinity of Southedge Road, near the intersection with Black Mountain Road and the start of Twin Bridges Road.

2.2.3 Field Habitat Observations

A number of environmental aspects considered important in the abundance and distribution of cassowaries in the project area were noted during the 2019 and 2020 surveys.

- Permanent water is less available along or immediately adjacent the trail sections than wetter coastal areas of known higher cassowary abundance and distribution, e.g., Mission Beach, Daintree. Many of the watercourses in the project area are ephemeral, and permanent water is restricted to a few major creek systems.
- There is a high level of disturbance within the rainforest areas, with intensive logging having been undertaken over many years. Large areas of rainforest are dominated by successional species e.g., *Acacia celsa*, reducing the overall supply of key rainforest fruiting species. However, field surveys observed that a high number of species important to cassowaries, e.g., including those in the Elaeocarpaceae, Myrtaceae, Arecaceae, and Lauraceae family, are recruiting into these areas and habitat quality would appear to be improving.
- Significant rainforest areas are notophyll vine forest types, i.e., these are drier-type rainforests that are generally characterised by floristic assemblages with a lesser representation of core foodplant species, with a higher representation of families that include genera with non-fruity seeds, e.g., *Flindersia*, *Agathis*, *Agyrodendron*.
- The availability of complex habitat mosaics, e.g., wetlands/swamps, littoral environments, is very limited. These habitat mosaics provide seasonal resources that may not be available in core rainforest habitats, and subsequently cassowary home ranges may be larger than recorded in the lowlands to accommodate this disparity. While some habitats may be important only briefly in the annual cycle of food production, they may be crucial to the survival of cassowaries whose home range encompasses them (Bentrupperbäumer 1998). Crome and Moore (1990) suggest food resources in non-rainforest habitats may be more important at times of food stress in the rainforest, such as after cyclones.

The above field observations of habitat quality would be consistent with the estimated low population numbers and clustered distribution of the cassowary field observations. Locations of cassowary scats and direct cassowary observations are shown in **Figure 2** and **Figure 6**.

3. Habitat Management Areas

3.1 Derivation of Management Areas

The Wangetti North and South trails, and the Mountain Bike trail, have been broken down into various habitat management areas based on the presence of core habitat factors located either directly along the trails and camp areas, and/or within an estimate home range of 500m to 1000m radius. The home range area adopted is larger than estimated for cassowary habitat in the coastal lowlands in accordance with the research literature which suggests cassowary ranges in the uplands are larger than optimal coastal habitats owing to the less favourable environmental conditions, i.e., lesser complex habitat, lesser permanent water availability and higher topographical constraints (Bentrupperbäumer 1998; Campbell *et al.* 2012). These larger home ranges for upland cassowaries are reflected in the low abundance, and wide distributions as identified in field observations.

The mapping units (habitat management areas) indicate the intersections between camp and trail infrastructure/human presence with cassowary habitat conditions. The habitat management areas essentially represent a probability map of where people/infrastructure will interact with cassowaries. Basically, the higher the quality of habitat (presence of habitat mosaics, integrity, water availability etc), supported by evidence of utilisation (scats or observations), the more likely interactions between cassowaries and people/infrastructure will occur. Camp 4 is a special case as it represents a concentration of people/infrastructure.

The difference between highest priority and low priority management areas is the threshold of impact on cassowaries or their habitat (either directly or indirectly) in not implementing the suggested management measures. In a low, or lowest priority area, the reduced scope of management measures (financial, practical, resource availability etc) would have a lesser potential impact on cassowaries or their habitat than if these measures were not adopted in a moderate or high priority area.

The areas of likely highest occupation and resource utilisation by cassowaries were used to prioritise habitat management areas. These areas were determined through a qualitative weighted criteria analysis undertaken using a spatial query in a GIS platform and supported through evidence of birds observed during field work and of anecdotal records. This analysis also includes the areas of the proposed camps, as users of these facilities, and the operation/maintenance of camps, have a high potential to affect cassowary behaviour. The outcome of this analysis identifies the location of the most probable area of interaction with cassowaries, and forms the basis for habitat management priority areas and actions.

The criteria, their relative importance, and notes used for identifying priority management areas are presented in **Table 1**.

The management areas were subsequently qualitatively allocated a ranking from Highest Priority to Lowest Priority based on:

- Quality of environmental factors sustaining cassowary habitat.
- Verifiable evidence (scats, observation, reliable witness accounts) of cassowary utilisation.
- Proposed infrastructure type, nature, and location.
- Existing habitat modelling and available data sources.

These were collectively mapped based on the 40m wide construction corridor identified in the GHD 2020, taking into account the potential abundance and density of cassowaries as modelled through Westcott et al (2014) within the Black Mountain corridor.

3.2 Habitat Management Areas Summary

A summary of the derived habitat management areas is presented in the following subsections. The boundaries of these areas and priority rankings should be reviewed following a period of establishment and operation of the trails, indicatively two years, when further data will have been collected on cassowary interactions with trail users and trail/camp operators. The mapping of these habitat management areas is shown in **Figure 2**, **Figure 5**, and **Figure 6** and described in the following.

3.2.1 Highest Priority Habitat Management Areas

These are localities within and/or immediately adjacent to essential habitat factors (core foodplant resources, permanent water availability) and supported by direct evidence of resource utilisation (actual birds or scats). Highest priority areas provide critical resources to the survival of cassowaries where seasonal or permanent occupation is supported by habitat components needed for the survival and recovery of the species, or a localised portion of the population.

There is a high to very high probability that interactions between cassowaries and users of the infrastructure in these localities will occur within the construction, operation and maintenance phase of the project.

3.2.2 High Priority Habitat Management Areas

These areas are allocated to infrastructure locations where the majority of the essential habitat factors are represented within an estimated home range area of 500 to 1000m radius of the infrastructure and supported by direct evidence of resource utilisation (actual birds or scats). Some habitat factors e.g., forest structure integrity, may be diminished but still provide critical resources to the survival of cassowaries where seasonal or permanent occupation is supported by habitat components needed for the survival and recovery of the species, or a localised portion of the population.

The probability is moderate to high that interactions between cassowaries and users of the infrastructure in these localities will occur within the project construction operation and maintenance phases.

3.2.3 Moderate Priority Habitat Management Areas

Moderate priority areas are localities in which there are habitat factors that may provide important seasonal resources but potential core habitat features are either diminished or lacking. There are no records of cassowaries, or observations of scats in these areas. These areas may provide important seasonal resources, or resources in the event of a cyclonic damage to core habitat.

Birds may use these areas on a seasonal, transitory and opportunistic basis, however the probability of interactions with users of the facilities is moderate to low and would only occur over a longer timespan during the operational and maintenance phase of the trails.

3.2.4 Low Priority Habitat Management Areas

These areas have greatly reduced habitat factors, and any factors present are small in extent, usually isolated from key habitat resources by topography, and/or large distances of intervening unsuitable habitat types (e.g., rocky sclerophyll woodlands). There are no recent verifiable records of cassowaries in these areas.

Published literature/research also identifies these areas as non-preferential cassowary habitat and the likelihood of interactions between cassowaries and trail users is very low to nil.

3.2.5 Lowest Priority Habitat Management Areas

Locations within developed areas, extensively cleared or with existing infrastructure with no supporting habitat for cassowaries. No likelihood of interactions between cassowaries and trail users.

3.3 Notes on Mapping

The mapping has been derived from a number of sources as cited in this plan. The alignments for the trail/road infrastructure were surveyed in the field for previous reports (e.g., GHD 2020) using a hand-held GPS. This has resulted in a number of anomalies arising from the practical need to traverse rough and steep terrain, areas of impassable vegetation, avoidance of large rock outcrops, safe crossings of waterways and similar field obstructions. Subsequently there are discrepancies in distances between original preliminary alignment GPS survey distances (as quoted in the GHD reports), and the distances as identified in this plan in **Table 2**, **Table 3** and **Table 4**. Specifically, the distances used in this plan for the various management sections reflect the approximate centre line median of the 40m wide construction corridor along the GPS field survey alignment. That is, the quoted distances in this plan are shorter than those of the surveyed alignment as the approximate median centreline of the construction corridor does not include the various deviations made during the field surveys.

Table 1 Management Area Derivation

Criteria	Relative Importance	Data Source	Notes and relevance to Wangetti Trail (north and south) and Wangetti Mountain Bike Trail
Direct observation (cassowaries or their scats)	Very high	Field survey data 2019, 2020 RRRC surveys 2012-2014 Anecdotal information, QPWS, WTMA and Qld Forestry	<p>The presence of scats indicates that a cassowary utilising resources in that area and is within the home range of at least one bird. While though scats provide evidence of presence, they do not reflect the probable density of distribution without further work, e.g., DNA analysis, to identify individual birds.</p> <p>There are no verifiable records of cassowaries in the steep coastal section between Palm Cove and the descent to Wangetti along the Wangetti South trail alignment. Most of this trail section is outside of the essential habitat mapping (DERM 2009) for the wet tropics. Anecdotal information has identified that Wangetti coastal areas may have once hosted a cassowary population, however this population is no longer extant. There have been direct sightings of cassowaries (and scats) on the mountain bike trail section of the Southedge road (Quaid's road) immediately east of the intersection with Black Mountain road, and west of the Macalister Range divide.</p> <p>All current reliable records are along the mountain bike trail section (Twin Bridges Road) between approximately the intersection of Black Mountain Road/ Southedge Road (map section S) and north along Twin Bridges road (sections U and X) and on the Wangetti North trail sections D (including Camp 4) and C. All of these records are within approximately 700m of permanent water. The largest number of scats were along section D where the trail parallels or is adjacent to upper Allen Creek and tributaries (including the Camp 4 area on Twin Bridges Road). A cassowary was photographed in October 2020 on Twin Bridges Road within the Camp 4 footprint.</p>
Existing habitat modelling	Moderate	DERM Essential habitat overlay 2009	<p>Essential habitat has been mapped for cassowaries based upon direct, and verifiable evidence of cassowary utilisation of various regional ecosystem (RE) vegetation types across the Wet Tropics (Kutt <i>et al</i> 2004, DERM 2009). This does not mean that every mapped location of the relevant RE has a verifiable record. Of the 28.8km of the Wangetti South shared use trail, approximately 2.9km is within mapped essential habitat. The majority of this essential habitat has historically no cassowary records, and represent patches which are isolated from core habitat areas. The only significant area is near Wangetti hub, where no cassowaries have been sighted since tin mining began in 1907.</p> <p>Approximately 80% (15.1km of the total 18.6km) of the mountain bike trail is within mapped essential habitat, all of this being west of the crest of the Macalister Range, in the upper catchment of Big Rooty Creek and Hartleys Creek. Of the 52.1km of the Wangetti North trail, approximately 15.5km is within mapped essential habitat, primarily all in the upper catchments of Spring Creek, Veiver Creek and Allen Creek.</p>
Complexity and type of habitat	High	RE mapping v.11 Field survey data 2019, 2020 WTWHA mapping, Stanton 2009	<p>Whilst cassowaries are dependent on rainforests, they require a mosaic of habitat types which can provide a year-round supply of flesh fruits. The distribution of cassowaries is constrained by the availability of habitat which can provide a year-round supply of fleshy fruits and access to permanent freshwater for daily drinking and bathing (Buosi & Burnett 2006). Cassowaries are subsequently not exclusively found in rainforest but will venture into vine forest, sclerophyll forest and wetland communities for resources that are seasonally not available in rainforest. Subsequently a home range typically will include ready access to other vegetation types.</p>

Criteria	Relative Importance	Data Source	Notes and relevance to Wangetti Trail (north and south) and Wangetti Mountain Bike Trail
			Within the context of the project the availability of suitable vegetation complexes that provide seasonal resources and mapped as essential habitat (other than rainforest types), is limited. The poor representation of such seasonal resources is identified as a limiting factor to the abundance of cassowaries and their distribution in the project area.
Proximity to permanent water	High	Field survey data 2019, 2020 Watercourse mapping (Water Act) Qld Watercourse data	Cassowaries must have daily access to permanent water for drinking and bathing (Buosi & Burnett 2006). Typically, this implies a radius of less than a kilometre from permanent water within the average home range of a cassowary. Permanent water sources on the Wangetti South trail are present only on the coastal plain near the Captain Cook Highway. These locations have no contiguous connection with rainforest habitats, and with the exception of the Wangetti area, no historical records of cassowary occupation. The most significant permanent water along the Wangetti North shared-use trail is associated with the upper catchment of Spring Creek, including Allen and Veiver Creek. Most of the Wangetti North trail north of Camp 4 (map section C) and the mountain bike trail along Twin Bridges Road is parallel to permanent water. The majority of direct cassowary scat observations and cassowary foodplants present were in these locations.
Cassowary foodplants	Moderate	REDD database WildNet/Herbrecs database Field survey data 2019, 2020 WTWHA mapping, Stanton 2009	The relative abundance and diversity of cassowary foodplants is a significant determinant in their distribution. Cassowaries are reliant on fleshy fruit from a number of rainforest habitat types, but must have access to seasonal resources from adjacent vegetation types. Cassowary foodplants are relatively well documented, and readily identifiable in the data sources cited. Areas with higher abundance of cassowary foodplants are more likely to provide resources and hence habitat utilisation and potential occurrence. Within the project area the highest proportion of cassowary foodplants were represented within mesophyll vine forests of the upper Spring Creek, Allen Creek and Veiver Creek catchment (Wangetti North trail, sections C and D), with smaller areas along Southedge Road (section S) and along mountain bike trail (sections U and X). Logging history has very much determined the integrity of the mesophyll vine forests, however many of the recruiting successional species, e.g., those in the Elaeocarpaceae family, provide key resources. Cassowary foodplants are less common in notophyll vine forests, and only seasonal resources would be obtained from adjoining ecotones with sclerophyll forest.
Location of camps	High	GHD report and data 2020	The location of the camps is important for prioritising management actions. There is potential for some locations with both camping and eco-accommodation facilities, to host up to 40 people per night. This infers a high degree of management of the camp/accommodation areas to ensure that cassowary habitat, and activities that may impact on cassowary behaviour (e.g., permanent water present, food availability) are appropriately managed.
Topography	Moderate	QTopo database	Cassowaries, being bipedal, are primarily a species with preference for flat/ mild to moderate terrain, and do not typically have extensive areas of steep, rocky, or otherwise difficult to traverse terrain in their home ranges. Such areas of the project area are primarily limited to the coastal eastern ridges and foot slopes of the Macalister Range and are suboptimal as habitat for cassowaries. A significant proportion of the Wangetti South shared use trail alignment is within steep, rocky areas along the Macalister Range that are not considered suitable for cassowaries.

Figure 4 Wangetti North cassowary management areas



Figure 5 Cassowary management areas, Wangetti South shared-use trail



Figure 6 Cassowary management areas, Mountain Bike only trail

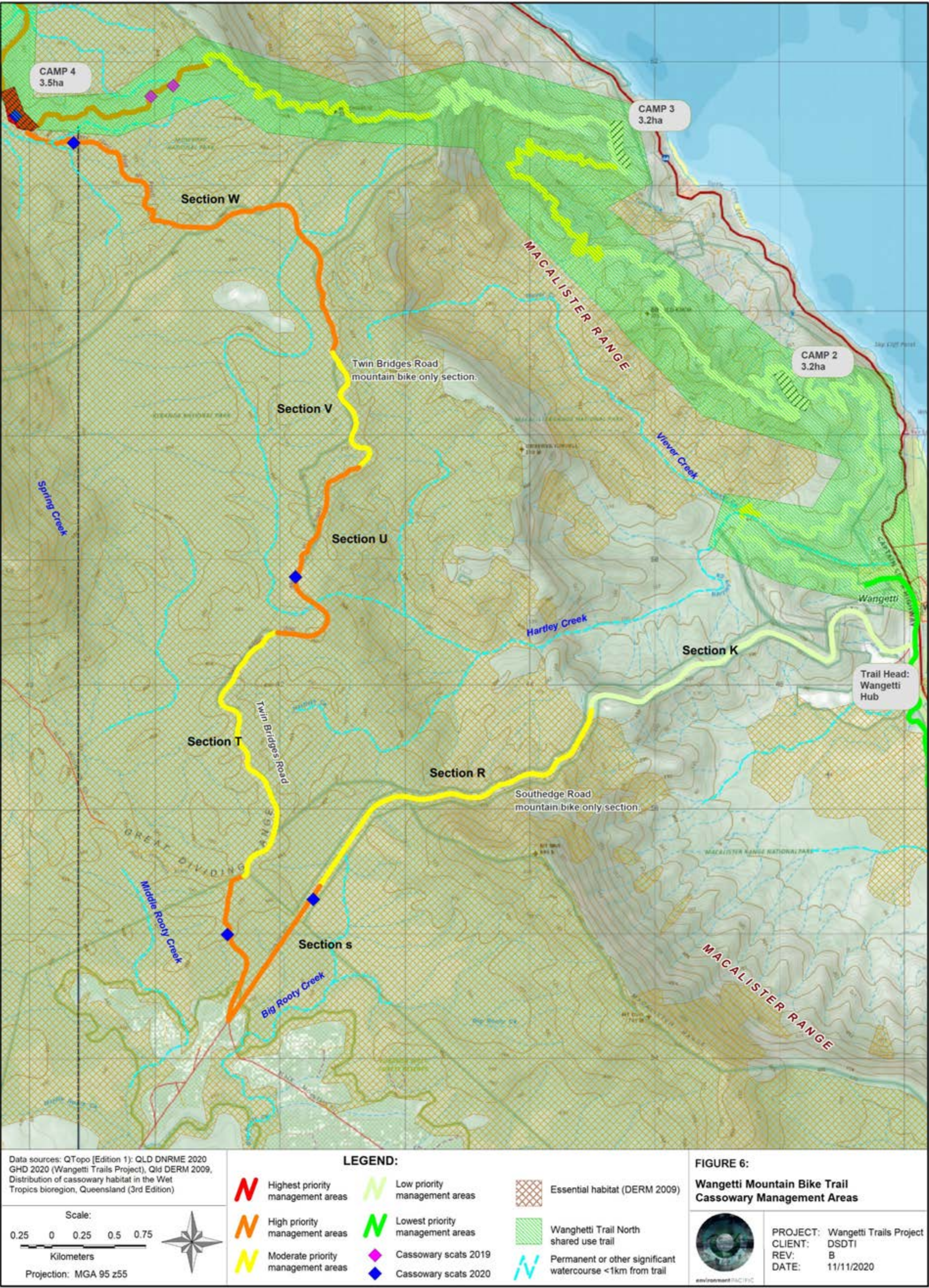


Table 2 Description of Management Areas, Wangetti North Trail

Location	Distance (construction corridor centre line)	Habitat Factors	Summary Description
Highest Priority			
Camp 4 16.623441°/ 145.499302° Refer Figure 4.	Footprint of 3.5ha	<ul style="list-style-type: none"> Location is within 200m of permanent water (Allen Creek and tributaries) Whilst vegetation includes Acacia dominated vine forest, there is a wide variety of cassowary rainforest foodplants present that form the major part of the cassowary diet. The camp area occupies a major local cassowary movement corridor, i.e., is parallel to and within the Spring Creek valley There are no topographic restrictions to cassowary movement. No immediate major sclerophyll or other community types (excluding closed Acacia regrowth) within 1km of site and thus may limit overall abundance. Area has been previously logged, but is not subject to any going anthropogenic pressures. A female cassowary (photographed) and scats were recorded in this location in October 2020. 	<p>This locality comprising both hiking accommodation and eco-accommodation has a potential maximum occupancy of 40 people per night. This is a high density in a location that is within key cassowary habitat resources with a subsequent high potential for interactions with cassowaries.</p> <p>A mitigating factor is the lack of nearby (within 1km) of other vegetation types that would offer seasonal variation. Subsequently cassowary ranges may be larger than usual for more habitat varied locations and overall abundance less than coastal areas.</p>
High Priority			
Shared use trail from above Spring Creek Falls to Camp 4, between -16.6001°/ 145.4827° to -16.6234°/ 145.4993° Refer Figure 4, Map Section C	4.1 km	<ul style="list-style-type: none"> Entirety of alignment is within 200m of permanent water (Allen Creek tributary), an alignment which is considered to be within the most significant cassowary movement corridor in the local area. Vegetation types along trail are primarily complexes of rainforest types characterised by a wide diversity of known staple diet cassowary foodplants in the families Myrtaceae, Lauraceae, Sapotaceae and Arecaceae. Sclerophyll mosaics offering seasonal variations in food sources are within 1km (potential cassowary home range) of alignment but are on steep topography that may limit seasonal access for cassowaries. Topography is generally mild to moderately undulating, offering 	<p>This high priority section of the Wangetti North Trail begins approximately from the valley above Spring Creek Falls south to the major camp at intersection of Twin Bridges Road with the mountain bike loop from Black Mountain Road. Vegetation is primarily notophyll/mesophyll vine forest types, historical logging has resulted in extensive Acacia regrowth however many of the recruiting species, e.g., Calamus ('wait-a while') provide foraging resources, and overall, the level of disturbance does not provide a significant reduction in cassowary habitat values.</p> <p>While there are sclerophyll communities within 1km of the alignment, these may not be readily accessible</p>

Location	Distance (construction corridor centre line)	Habitat Factors	Summary Description
		<ul style="list-style-type: none"> no physical constraints to easy movement. Area has been previously isolated from vehicle traffic, dogs and other significant anthropogenic disturbances. Verified current cassowary presence (scats) and historical anecdotal records (Qld Forestry). 	(being associated with steep topography).
<p>Shared use trail from Camp 4 to western fall of Macalister Range between -16.6234° / 145.4993° and -16.619300° / 145.5132°.</p> <p>Refer Figure 4, Map Section D</p>	1.8km	<ul style="list-style-type: none"> Approximately 1.2km is within 200m of permanent water, the balance of the section within 500m of permanent water. Vegetation characterised by many Families known to be staple rainforest dietary components including Myrtaceae, Sapotaceae, Lauraceae. Topography varies from mild to moderate/steep in eastern section on western fall of Macalister Range. Vegetation is mostly homogenous disturbed rainforest, offering little habitat variation Sclerophyll mosaics present on ridge tops, but in steep terrain not considered optimal for cassowary access. Cassowaries know to use this section of alignment, verified scats (GHD 2019). 	<p>This section continues from Camp 4 eastwards to the western fall of the crest of the Macalister Range. Cassowary scats were recorded by GHD during 2019 surveys. Approximately half this section is within 200m of permanent water. Sclerophyll mosaics are within 1km of alignment, but are in steep locations that preclude easy access. Vegetation along this section represents core rainforest habitat values with a degree of disturbance evident.</p> <p>Cassowaries are known to be present but most probably in low abundance with a sparse distribution.</p>
Moderate Priority			
<p>Shared use trail from western fall of Macalister Range along range crest to start of descent to Wangetti. Between -16.6193° / 145.5132° and -16.6226° / 145.5306°.</p> <p>Refer Figure 4, Map Section E</p>	2.8km	<ul style="list-style-type: none"> Section of trail follows the crest of the Macalister Range for approximately 2.8km along a forest ecotone. Permanent accessible water is approximately 1km to the west but not found on the range crest. Vegetation increasingly characterised by species not favourable to cassowaries, e.g., those with winged seeds, primarily Proteaceae, Rutaceae (<i>Flindersia</i> genera), Sterculiaceae (<i>Agyrodendron</i> spp) and numerous Acacia present. Vegetation mosaics, e.g., sclerophyll/wetland mosaics are not accessible, being on the eastern fall of the Macalister Range primarily on steep and rock slopes. Topography of the top of the range is moderate to strongly 	<p>This section is located at the extreme eastern edge of vegetation that is considered to have some cassowary habitat values. The section is literally on the divide between rainforest and sclerophyll communities, however is along a ridgetop with the sclerophyllous elements being located on steep rocky slopes on the eastern fall of the Macalister Range and would not be accessible to cassowaries.</p> <p>While there is some possibility that cassowaries may include this section of trail in their range, it would be on an opportunistic and transitory basis. This section was not surveyed in GHD in 2019, but was traversed by ecologists for this project in October 2020.</p>

Location	Distance (construction corridor centre line)	Habitat Factors	Summary Description
		undulating, however the eastern fall is very steep and provides a significant barrier to the coast.	
Shared use trail on eastern ridge of Macalister Range between - 16.6276°/145.5446° and - 16.6328° / 145.5425° Refer Figure 4, Map Section G	3.76km	<ul style="list-style-type: none"> Section of trail is through notophyll rainforest on the eastern side of the Macalister Range. Vegetation is characterised by drier rainforest type (e.g., kauri pine, <i>Agathis robusta</i>) with a limited representation by cassowary foodplants. Approximately 2 km of this section has no access to permanent water within 500m of the trail. The trail does cross a permanent stream (Turtle Creek) and provides year-round access from approximately a 1.5 km section of the trail. Terrain is sharply undulating; however, the overall gradient is moderate, with some restrictions to ready movement for cassowaries. General habitat area is limited in connectivity to core rainforest habitats further to the west by the steeply divided upper catchment of Hartleys Creek. Limited to no connectivity with favourable habitat mosaics that would offer seasonal variability in dietary resources. 	<p>This section of the trail traverses a drier rainforest type (notophyll) with a low representation of key cassowary foodplant families, such as Lauraceae, Myrtaceae, Sapotaceae. There is limited access to permanent water, this being restricted to a small section of the southern alignment. Connectivity of habitat with core habitat factors (mesophyll vine forest) further to the west is constrained by the steep divide of the upper Hartleys Creek catchment.</p> <p>Cassowaries, if they utilise this area, would do so only on opportunistic and transitory basis.</p>
Section 4, Hartleys Creek shared use suspension crossing. -16.6523° / 145.5532° Refer Figure 4, Map Section I	In a radius of approx. 150m about the crossing	<ul style="list-style-type: none"> Crossing below Hartleys Creek represents easternmost potential limit of cassowary utilisation. Permanent water present. A wide variation in vegetation types within a small radius (500m) of the crossing. Creek area itself is steep and rocky, and provides some restrictions to cassowary movement. A limited number of staple food plants present and outside of what is considered to be core mesophyll rainforest habitat. 	<p>The shared trail crossing below Hartleys Creek falls represents the easternmost potential range for cassowaries and is at the juxtaposition of a number of favourable cassowary habitat requirements. These include ready access to permanent water (Hartleys Creek), a mosaic of vegetation types in close association, habitat connectivity with upper creek catchment and western side of Macalister Range.</p> <p>Whilst there are no confirmed sightings of cassowaries in this immediate area, there are anecdotal records for the area about the Hartley Creek falls 400m upstream from the crossing. The immediate area about the crossing is steep and rocky and presents some</p>

Location	Distance (construction corridor centre line)	Habitat Factors	Summary Description
			obstruction to easy cassowary access. Area is most likely to be accessed on an opportunistic and transitory basis only and not within core habitat areas.
Low Priority			
Mowbray Section from bottom of range to top of Spring Falls between - 16.5603°/ 145.4901° and - 16.6001°/ 145.4827° Refer Figure 4, Map section B	9.65km	<ul style="list-style-type: none"> Permanent water is absent along the entirety of the section. Nearest permanent water (Spring Creek) is in a gorge on western side of this section and cannot be accessed from habitat along the trails. A limited number of staple food plants present and outside of what is considered to be core mesophyll rainforest habitat. Vegetation primarily sclerophyll woodlands on steep rocky slopes on the eastern fall, offering few resources. Small patches of vine forest in upper section are notophyll rainforests characterised by Agathis (kauri pine) and many plants with winged (not fleshy) seeds e.g., <i>Agyrodendron</i>, <i>Flindersia</i>, some Proteaceae. Topography in areas is steep to precipitous, offering substantial impediment to cassowary bipedal movement. Seasonal resources, e.g., access to wetlands, are absent. 	<p>This is a long section of the Wangetti Trail North with extremely limited to no capacity to support cassowaries. Most habitat elements are absent, the few areas of rainforest present are at the southernmost limit of the trail above Spring Creek falls and have been intensely logged (primarily for kauri pine) and regrowth is dominated by Acacia and other species which are not part of the core diet of the cassowary.</p> <p>Importantly, there is no access to permanent water, the nearest permanent water being Spring Creek, which in most places is in excess of a kilometre from the trail, and in upper sections near the falls is in a steep and inaccessible gorge.</p> <p>Topography varies, but is primarily steep, to very steep as it ranges from sea level to 400m and in itself is a substantial impediment to local cassowary movement. It is not expected that cassowaries would utilise any resources on this section of trail, with the exception of possibly opportunistic visits to the extreme southwestern section above Spring Creek falls.</p>
Camp 5, along Map Section B (above) -16.5700°/ 145.4940° Refer Figure 4	Footprint of 3.0ha	<ul style="list-style-type: none"> No permanent water within 1km of the camp Core mesophyll rainforest > 5km from camp Notophyll vine forest elements in locality do not have a high representation of cassowary food plant species. Topography in locality has steep to very steep ridge slopes 	Camp site is within a sclerophyll ecotone that includes notophyll vine forest components. No core habitat features within 1km of the camp site, which is located on the crest of a steep ridge. There are no cassowary records, either anecdotal or formally recorded, and is not expected that cassowaries would utilise any resources in the camp area or along this trail section.

Location	Distance (construction corridor centre line)	Habitat Factors	Summary Description
Descent from top of Macalister Range down northern ridge towards Turtle Cove and start of notophyll vine forest on eastern slope between -16.6226°/145.5306° and 16.6276°/145.5446° Refer Figure 4, Map section F	2.98km	<ul style="list-style-type: none"> Rocky, steep and precipitous in areas along range ridgetop with mobility restrictions for cassowaries. Trail follows ecotone between dry notophyll vine forest and sclerophyll woodlands with low representation of cassowary foodplants. Permanent water is not accessible from this section of trail. There is no access to habitat mosaics that offer seasonal variability in food resources. 	Trail follows an ecotone between dry rainforest types and rocky sclerophyll woodlands on a descending ridge of the Macalister Range for approximately half the way before entering entirely sclerophyll grassy woodlands on steep slopes. Essentially very few habitat resources for cassowaries are present, with substantial issues for movement related to steep and rocky slopes. Water is absent along the trail.
Camp 3, ridge of Macalister Range 16.6250°/145.5440° Refer Figure 4	Footprint of 3.2ha	<ul style="list-style-type: none"> See notes above, camp is located within this section, but is adjacent to notophyll rainforest types that may offer seasonal resources. 	Camp site is located on the crest of a ridge of the Macalister Range. Habitat factors essential to cassowaries are absent, and permanent water is not present within 1km of the site. Cassowaries are not anticipated to access the camp area for any key resources.
Wangetti North shared-use trail from the top of the Macalister Range down the eastern fall between -16.6328° / 145.5425° and Wangetti township, but not including area around Hartley Creek crossing. Refer Figure 4, Map Section H	10.86km	<ul style="list-style-type: none"> Permanent water is limited to the crossing of Hartley Creek and in areas close to Wangetti township. Otherwise, permanent water is absent for most of the section, the nearest permanent water is Viever Creek (a tributary of Hartley Creek) located >700m to the west of the range in a steep sided valley. Vegetation is primarily sclerophyll woodlands on steep rocky slopes on the eastern fall, offering few resources. Small patches of vine forest in upper section are notophyll rainforests characterised by Agathis (kauri pine) and many plants with winged (not fleshy) seeds e.g., <i>Agyrodendron</i>, <i>Flindersia</i>, some Proteaceae. Topography in varies from moderate to very steep, offering substantial impediment to cassowary bipedal movement. Seasonal resources, e.g., access to wetlands, are absent. 	As above. Trail follows an ecotone between dry rainforest types and rocky sclerophyll woodlands on a descending ridge of the Macalister Range for approximately 5.4km half the way before entering entirely sclerophyll grassy woodlands on steep slopes. Essentially very few habitat resources for cassowaries are present, with substantial issues for movement related to steep and rocky slopes. Water is absent along the trail, except for the Hartley Creek crossing.

Location	Distance (construction corridor centre line)	Habitat Factors	Summary Description
Camp 2, ridge of Macalister Range 16.6430°/145.5570° Refer Figure 4	Footprint of 3.2ha	<ul style="list-style-type: none"> See notes above, camp is located within this section, but is adjacent to notophyll rainforest types that may offer seasonal resources. 	Camp site is located on the crest of a ridge of the Macalister Range. Habitat factors essential to cassowaries are absent, and permanent water is not present within 500m of the site. Cassowaries are not anticipated to access the camp area for any key resources.
Lowest Priority			
Wangetti North shared-use trail from Mowbray River along Cook Highway to base of range between - 16.5536°/145.4823° (Mowbray River on the Cook Highway) and - 16.5607°/145.4903° Refer Figure 4, Map section A	1.4km	Nil. Highly modified landscape.	Trail is within Cook Highway road reserve, and rural open land (primarily sugar cane production) and does not cross any watercourses or any other habitat features.
Shared-use trail in coastal area at Wangetti township between -16.6571° / 145.5632° and -16.6630° / 145.5657° including the trail head / administration / office area. Refer Figures 4/5, Map Section J	920m	Trail does not traverse any core habitat factors.	Trail is within Cook Highway road reserve, and rural residential areas of Wangetti township. There are no habitat resources utilised by cassowaries in this area. Historically cassowaries were known to be present at Wangetti, however none have been sighted since the settlement of Wangetti and tin mining operations <i>circa</i> 1907.

Table 3 Description of Priority Areas, Wangetti South Trail

Location	Distance (construction corridor centre line)	Habitat Factors	Summary Description
Highest Priority			
No areas along the Wangetti South trail meet these criteria Refer Figure 4	-	-	-
High Priority			
No areas along the Wangetti South Trail meet these criteria Refer Figure 5	-	-	-
Moderate Priority			
A section of notophyll vine forest approximately 800m SW of Simpsons point between -16.7163° / 145.6285° and -16.7195° / 145.6339° Refer Figure 4, Map Section N	1.06km	<ul style="list-style-type: none"> • Notophyll vine forest community noted to be heavily disturbed during field surveys with vegetation characterised by mostly non-palatable species e.g., winged seeds. • No permanent water present within 1km and nearest permanent water and core mesophyll habitat is over 2km to the west in upper Flaggy Creek. • There are no suitable habitat mosaics adjacent this section that would provide seasonal resources to cassowaries. • Topography is steep (being on the eastern side of the Macalister Range), and is a significant barrier to cassowary movement. • Seasonal resources are only available in littoral coastal vegetation around the Ellis Beach area itself but alienated by Captain Cook Highway 	The habitat along this section is marginal and may include some seasonal opportunities. However, given the lack of permanent water, the distance from core mesophyll forest habitat and difficult access down steep to very steep slopes, cassowary utilisation (if at all) would be transitory and opportunistic and at best is considered to be extremely unlikely.
A small section of notophyll vine forest in a gully behind Ellis Beach between -16.7291° / 145.6419° and -16.7282° / 145.6437°	630m	<ul style="list-style-type: none"> • Small area of notophyll vine forest with a number of mesophyll vine forest elements present with a variety of staple fleshy fruits present (Lauraceae and Myrtaceae). 	Habitat is marginal, but may offer seasonal resources. The entirety of the vegetation is within a steep to very steep gully on the eastern fall of the Macalister Range that may significant obstructions to ready cassowary movement. Any cassowary utilisation (if at all) would

Location	Distance (construction corridor centre line)	Habitat Factors	Summary Description
Refer Figure 4, Map Section P		<p>Dislocated from preferable core habitat areas (>1km) on western side Macalister Range by steep escarpment.</p> <ul style="list-style-type: none"> • Permanent water present, but is within a steep sided gully and difficult to access. • Topography generally steep and trail inaccessible from habitat areas further west. 	be transitory and opportunistic and at best is considered to be extremely unlikely
Low Priority			
<p>Shared use trail on eastern side of Macalister Range from Wangetti to Simpson Point between 16.7012°/ 145.6077° and -16.7163°/ 145.6285°</p> <p>Refer Figure 4, Map section M</p>	4.93km	<ul style="list-style-type: none"> • No core habitat represented within 1km of the trail, and then only on the western fall of Macalister Range in the Flaggy Creek catchment. • Habitat is primarily rocky open/grassy sclerophyll woodland with few to no resources for cassowaries. • Minor areas of notophyll vine forest along gullies are discontinuous with core mesophyll vine forest and other suitable habitat mosaics. These dry notophyll vine forests are not characterised by cassowary foodplant species. • There is limited access to permanent water sources on the eastern side of the Macalister Range, with core habitat features in these localities being >1km from the trail • Most of the trail section is < 500m to the west of the Captain Cook Highway. • Topography is steep and rocky in places, and the steep sided gullies would represent substantial challenges to cassowary movement. 	<p>A long section of the trail that is almost exclusively through rocky sclerophyll woodland on ridges above the Captain Cook Highway. Resources for foraging cassowaries are negligible and there are no historical records of cassowaries in this section of the WHA.</p> <p>Small gullies with notophyll vine forest are present across the trail, some mapped as having permanent water however this is unlikely given the small catchments and rain shadow effect of the Macalister Range. Core mesophyll vine forest habitat is represented only in the upper Flaggy Creek catchment, over 1km to the western side of the Macalister Range. The trail is only accessible via steep to very steep gullies and drainage line from these areas. Cassowaries are not anticipated to use any resources along this section of trail.</p>
<p>Camp 1 -16.7008° / 145.6092°</p> <p>Refer Figure 4</p>	Footprint of 0.25ha	<ul style="list-style-type: none"> • Camp site is on the cusp between lowest and low priority between sections L and M. • No permanent water within 1km of the camp • Core mesophyll rainforest > 5km from camp • Notophyll vine forest elements in locality do not have a high representation of cassowary food plant species. • Topography in locality has steep to very steep slopes 	<p>Camp area is located at the top of a ridge overlooking a notophyll vine forest series of gullies and permanent water is absent. The camp site however is more than 1km from core contiguous mesophyll vine forest, and accessible from the west only by a precipitously steep (in places) valley. Cassowaries would not be expected to access this section for any resources.</p>

Location	Distance (construction corridor centre line)	Habitat Factors	Summary Description
<p>Eastern side of Macalister Range through to Ellis Beach between - 16.7195° / 145.6339° and -16.7291° / 145.6419°</p> <p>Refer Figure 4, Map Section O</p>	2.07km	<ul style="list-style-type: none"> No core habitat (contiguous mesophyll vine forest) represented within 1km of the trail, and then only on the western side of the range in the upper Flaggy Creek catchment. Dominant habitat along this section comprises areas of Acacia woodland, open sclerophyll woodlands on rocky slopes and grassy sclerophyll forest. None of these are characterised by cassowary foodplants and have little habitat value as seasonal foraging areas. Trail section connects two watercourses identified as significant Most of the trail section is < 500m to the west of the Captain Cook Highway. Topography is steep and rocky, with deeply dissected gullies across the trail. 	<p>Majority of this section on the eastern side of the Macalister range is through sclerophyll woodlands on rocky and steep topography. Core mesophyll vine forest habitat is represented only in the upper Flaggy Creek catchment, over 1km to the western side of the Macalister Range. The trail is only accessible via steep to very steep gullies and drainage line from these areas. Cassowaries are not anticipated to use any resources along this section of trail.</p>
Lowest Priority			
<p>Shared use trail between Wangetti township trail head and approximately southern end Wangetti Beach (service road access near Camp 1). Between - 16.6629° / 145.5657° and 16.7012° / 145.6077°</p> <p>Refer Figure 4, Map Section L</p>	9.88km	<ul style="list-style-type: none"> No core rainforest habitat is present within 2km of the trail Large areas of habitat mosaics are restricted to the eastern side of the highway. The majority of the trail in the Wangetti coastal lowlands is through grassy sclerophyll forest which offer few to no resources for cassowary foraging Proximity to busy highway (mostly less than 150m) and the Wangetti firing range (within 150m at closest point) are strong deterrents to cassowary using resources in this area. Despite being mapped as Essential Habitat, Cassowaries are presumed locally extinct with no records since 1907. 	<p>A long section of coastal walk, most of it within 150m of the Captain Cook Highway. Essential habitat features are present in the form of seasonal littoral swamp mosaics, but are separated from the trail by the highway. Essential habitat captures regional ecosystems types within which there are verified cassowary records. However there have been no confirmed cassowary sightings in the Wangetti lowlands since European settlement (circa 1907), presumed locally extinct. Hence despite being mapped as essential habitat the probability of cassowaries using any resources along the trail in this section is negligible. There is no core mesophyll rainforest habitat within 2km of the trail, as this is restricted to the uplands Mona Mona / Black Mountain corridor.</p>

Location	Distance (construction corridor centre line)	Habitat Factors	Summary Description
<p>Ellis Beach to Palm Cove trail head between -16.7282° / 145.643725° and -16.7391° / 145.6634°</p> <p>Refer Figure 4, Map Section Q</p>	3.98km	<ul style="list-style-type: none"> • No core habitat (contiguous mesophyll vine forest) represented within 1km of the trail, and then only on the western side of the range in the upper Flaggy Creek catchment. • There is a small area of mesophyll and notophyll vine forest near the Palm Cove trailhead, however this area is fragmented and isolated from other habitat areas and would not be part of any cassowaries' range. • There are no permanent water resources along this section of trail • Most of the trail section is < 200m to the west of the Captain Cook Highway. • Topography is steep and rocky in areas, with deeply dissected gullies across the trail. 	<p>This section of trail between Ellis Beach and Palm Cove trail head is on the lower slopes of the Macalister range, mostly less than 200m from the Captain Cook Highway. Habitat values for cassowaries are negligible, with the primarily Acacia and other sclerophyll forests having very limited to no representation by cassowary foodplants, and no access to permanent water. A small section of mesophyll / notophyll vine forest is isolated from core rainforest habitats represented over 1km to the west in the Flaggy Creek catchment (which discharges to the Barron River). Topography in the area is steep to very steep, and presents a significant impediment to cassowary movement.</p> <p>Cassowaries would not be expected to access any part of the trail in this section for core or seasonal resources.</p>

Table 4 Description of Priority Areas, Mountain Bike Trail

Location	Distance (road centre line)	Habitat Factors	Summary Description
Highest Priority			
Camp 4 16.623441° / 145.499302° Refer Figure 4 and 6, Camp 4	Includes all of camp area footprint (3.5ha)	<ul style="list-style-type: none"> Location is within 200m of permanent water (Allen Creek) Cassowary photographed near this camp area in October 2020. Whilst vegetation is primarily Acacia dominated vine forest, there is a wide variety of cassowary rainforest foodplants present that form the major part of the cassowary diet. The camp area occupies a major local cassowary movement corridor, i.e., is parallel to and within the Allen Creek valley in the upper Spring Creek catchment). There are no topographic restrictions to cassowary movement. No immediate major sclerophyll or other community types (excluding closed Acacia regrowth) offering seasonal resources within 1km of site and thus may limit overall abundance. Area has been previously logged, but is subject to limited ongoing anthropogenic pressures. 	<p>This locality comprising both hiking accommodation and eco-accommodation has a potential maximum occupancy of 40 people per night. This is a high density in a location that is within key cassowary habitat resources with a subsequent high potential for interactions with cassowaries.</p> <p>A mitigating factor is the lack of nearby (within 1km) of other vegetation types that would offer seasonal resource variability. Subsequently cassowary ranges may be larger than usual for more habitat varied locations and overall abundance less than coastal areas. i.e., basically, fewer cassowaries occupying wider home ranges.</p>
High Priority			
A section of rainforest between Southedge Road, Black Mountain Road and Twin Bridges Road intersection. Between -16.6786° / 145.5214° and -16.6780° / 145.5153° Refer Figure 6, Map Section S	2.65km	<ul style="list-style-type: none"> Cassowaries known to utilise resources in this section, with numerous reports of cassowary scats in this area, and occasional sightings by mountain bike clubs riding the Southedge Road. Permanent water present within 1km of the road in Big Rooty and Middle Rooty Creeks and main tributaries. Core habitat mesophyll vine forest present, albeit heavily disturbed with existing and active Qld Forestry pine plantation operations at the intersection between Southedge Road and Black Mountain Road. Cassowaries have been observed on occasion by Qld Forestry workers in pine plantations in this location. 	<p>The majority of this section comprises heavily disturbed mesophyll vine forest with actively managed pine plantations at the intersection of Southedge/Black Mountain Road. Notwithstanding, cassowaries appear to use the pine plantations as part of their movement corridor with habitat mosaics further to the west associated with the upper catchment of Middle Rooty Creek. Permanent water is available both north and south of the alignment at Big Rooty and Middle Rooty Creek, and scats are regularly noted by mountain bike riders on the Southedge Road in this location. The high level of habitat disturbance would suggest that</p>

Location	Distance (road centre line)	Habitat Factors	Summary Description
		<ul style="list-style-type: none"> Topography is generally mild to moderately undulating and presents no obstruction to cassowary movement. Extensive variability in habitat mosaics for seasonal resources within 1km of this section. 	cassowary abundance is probably low, with a small number of birds present with a wider range than within suitable coastal habitats.
<p>A section of Twin Bridges Road south of Camp 4, between -16.6399° / 145.5224° and Camp 4 intersection with shared use trail -16.6236° / 145.4992°</p> <p>Refer Figure 6, Map Section W</p>	4.0km	<ul style="list-style-type: none"> Multiple permanent water sources present, being located between Allen Creek and Hartley Creek tributaries, both of which have permanent water crossing the road in this section. Mosaic of core mesophyll vine forest, heavily logged with widespread Acacia regrowth dominant but still with a high representation of core food plant families including Elaeocarpaceae, Lauraceae and Arecaceae. Habitat variability within 1km represented by various vegetation mosaics with seasonal resources. Topography mild to moderately undulating presents no obstacles to cassowary movement. Cassowary scats present, and cassowary observed October 2020 near Camp 4. 	Cassowaries known to utilise resources in this area with numerous scats and one bird (photographed) adjacent this section near Camp 4. While habitat has been degraded through extensive logging, there are numerous patches of core mesophyll vine forest, particularly associated with shallow valleys in upper catchments of Hartley Creek and Allen Creek. Probable area of highest density of cassowary occupation centred on the approximately north/south alignment of Allen Creek and Hartley creek almost parallel to Twin Bridges Road continuing northward past Camp 4. The only reason this section is not modelled as "highest priority" is that Camp 4 and associated disturbance potential, is just outside this section.
<p>A section of Twin Bridges Road between -16.6605°/145.5179° and -16.6486° / 145.5242°</p> <p>Refer Figure 6, Map Section U</p>	2.07km	<ul style="list-style-type: none"> Permanent water is not present along the trail section, but is present within 1km with Hartley Creek catchment tributaries to the east and west of the section. A small area of sclerophyll habitat with limited seasonal resources within 1km of the track. A core area of unlogged mesophyll vine forest is within a km of this section of the trail, with resources subsequently not apparent along the trail. Topography is mild to strongly undulating, with localised area of steep gullies that may limit easy traverse for cassowaries. Cassowaries known to utilise this area, with scats noted October 2020. 	A section of disturbed mesophyll vine (high Acacia representation) along the Twin Bridges Road that parallels permanent water in the upper headwaters of the Hartley Creek catchment. Cassowary scats in low abundance were observed in the one location in October 2020. Habitat features suggest cassowary utilisation is probably based on a large home range and opportunistic foraging over a wide area.

Location	Distance (road centre line)	Habitat Factors	Summary Description
Moderate Priority			
Southedge Road from range crest at start of rainforest communities. Between -16.6659° / 145.5417° and -16.6786°/145.5214° Refer Figure 6, Map Section R	2.96km	<ul style="list-style-type: none"> Habitat grades from notophyll to mesophyll vine forest at the crest of the Macalister Range and dipping towards Black Mountain Road. Area is heavily logged, and some key foodplant genera e.g., in the Elaeocarpaceae and Lauraceae families, are poorly represented. There is no permanent water within 500m to 1km from this section of road. Topography is moderate to mildly undulating, and of no significant impairment to cassowary movement. Habitat mosaics for seasonal resources are poorly represented and not readily accessible, being located on steep slopes or in deep ravines on range crest. 	Despite core habitat in the form of mesophyll vine forest being present (albeit highly disturbed), the absence of permanent water in proximity to this section of the Southedge Road appears to be the major determinant in distribution, with few anecdotal records. By comparison, areas closest to Big Rooty Creek further towards the intersection of the Southedge Road with Black Mountain Road appear to have a higher level of noted cassowary activity with scats regularly observed in this section. The area has been extensively logged, and high levels of disturbance with high Acacia regrowth degrades potential habitat quality.
A section of Twin Bridges Road between -16.6780° / 145.5153° and -16.6605° / 145.5179° Refer Figure 6, Map Section T	2.46km	<ul style="list-style-type: none"> No permanent water within 1km of the road. Habitat heavily disturbed mesophyll rainforest with a high representation by Acacia and other successional species. Topography is mild to moderately undulating with some steep areas of gullies west and east of the road with some localised steep gullies restricting ready traverse. No habitat variability within 1km that may offer seasonal resources outside of core habitat areas. 	Highly disturbed mesophyll vine forest with limited core resources (permanent water, and limited abundance of food plant genera) noted. Given proximity to other areas mapped as high priority habitat areas, it is probably that this area (along with other moderate habitat areas along Twin Bridges Road) are probably only accessed in an opportunistic manner within a wide home range area.
A section of Twin Bridges Road between -16.6486° / 145.5242° and -16.6399° / 145.5224° Refer Figure 6, Map Section V	1.23km	<ul style="list-style-type: none"> No permanent water within 1km of the road. Habitat heavily disturbed mesophyll rainforest with a high representation by Acacia and other successional species. Topography is mild to moderately undulating with some steep areas of gullies west and east of the road with some localised steep gullies restricting ready traverse. Key resource variability within 1km of the section 	Comments as above. Given proximity to high priority areas north and south, it is highly likely that cassowaries would access this area for foraging on opportunistic basis as part of wide home range area.

Location	Distance (road centre line)	Habitat Factors	Summary Description
Low Priority			
Wangetti trailhead to crest of Macalister Range between -16.6629° / 145.5657° and -16.6659° / 145.5417° Refer Figure 6, Map Section R	3.41km	<ul style="list-style-type: none"> Permanent water is not present along the road, nor is found within 500m of the alignment. Vegetation has limited to no resources for cassowaries, being comprised entirely of sclerophyll eucalypt/bloodwood and acacia mosaics. Road section is on the top of ridge, with very steep topography on either side. There are no foraging or other resources along the road that would attract cassowaries on a seasonal basis, nor any such habitat resources within 500m of the road. 	This section follows the Southedge Road from the Wangetti trailhead along a ridge spur of the Macalister Range with steep to precipitous slopes on either side. Permanent water is not available on the road, nor accessible within 500m. Vegetation is not core or secondary habitat, comprising entirely sclerophyll communities. There is only the most remote probability of encounters with cassowaries, with this area limited to the extreme western end of this section where the vegetation grades to rainforest and the topography is less severe.
Lowest Priority			
Wangetti hub area -16.6629° / 145.5657° Refer Figure 56, Map Section K	-	<ul style="list-style-type: none"> Site is primarily developed. Isolated from core habitat areas (>5km) No known observations within 7km of the site. 	While there are historical anecdotal records pre-tin mining and European permanent settlement 1907, cassowaries have not been recorded in the Wangetti area within the last century. No cassowaries anticipated to use any resources in this area. Operations at the Wangetti hub will have no impact on cassowaries.

4. Wangetti Trails Management Aspects

4.1 Introduction

The following management aspects are specific to the management of cassowary habitat, and of potential interactions between cassowaries and humans. This includes all aspects related to the design, construction, operation and maintenance of the Wangetti Trail (north and south), the mountain bike only trail and the camp areas that have the potential to direct or indirectly impact on cassowary habitat, individual birds or on their behaviour. These management aspects are not intended to cover all environmental aspects of the project, but are to be considered and included where appropriate, in the detailed Environmental Management Plan (EMP) for the various phases of the Wangetti Trail (north and south), including camp and eco-accommodation areas and the mountain bike trail.

These management aspects are also not to be considered in isolation, and any EMP must also cross reference the regulatory/permitting conditions of any approvals issues, mandatory requirements of any existing legislative management plan (e.g., Wet Tropics Management Plan) or policy that is currently extent in part or all of the areas covered in this document. Various government agencies have legislative jurisdiction and management requirements for various tenures and localities within the broader area, and where these directly impact on the project area must also be considered in the EMP, e.g., road maintenance practices.

Of particular note is that the aspects implemented in regard to management of cassowary habitat and of cassowary interactions must align with those of the *Recovery plan for the southern cassowary* *Casuarius casuarius johnsonii* (Latch 2007), which forms the cornerstone of current conservation policy.

4.2 Management Area Summaries

Summaries of the management sections of each of the proposed trails are set in the following. The detailed management aspects for each section is shown in **Table 5**.

Note that the distances in the following reflect the median centreline of the construction corridor, and not the actual field GPS trail (refer 3.3 of this plan for clarification). The Wangetti mountain bike only distances are based on the existing roads and track alignments.

4.2.1 Wangetti North Trail

The Wangetti North shared-use trail encompasses the following:

- One area of Highest Priority, being Camp 4, with a proposed development footprint of 3.5ha
- Two High Priority shared-use trail sections totalling approximately 5.9km.
- Three Moderate Priority areas, including two shared-use trail sections of approximately 6.6km and an area of approximately 7ha about the proposed Hartley Creek suspension bridge crossing.
- Three sections of Low Priority shared-use trail of approximately 23.5km.
- Three camp sites (2, 3 and 5) of Low Priority varying between 3.0ha (Camp 5) and 3.2ha (Camps 2 and 3) in size

- Two sections of Lowest Priority shared-use trail totalling 2.3km.

4.2.2 Wangetti South Trail

The Wangetti South shared-use trail includes the following;

- No highest priority habitat management areas.
- No high priority habitat management areas.
- Two moderate priority habitat management areas of approximately 1.64km.
- One camp, Camp 1, with a proposed development footprint of 0.25ha, located within a low priority section (L).
- Two sections of Low Priority shared-use trail of approximately 7.0km.
- Two sections of Lowest Priority shared-use trail totalling 13.61km.

4.2.3 Wangetti Mountain Bike Only Trail

The Wangetti South shared-use trail includes the following;

- No highest priority habitat management areas.
- Three high priority habitat management areas totalling 8.72km.
- Three moderate priority habitat management areas of approximately 6.65km
- One section of Low Priority shared-use trail of 3.41km
- A lowest priority area being the Wangetti Hub.

NOTE: The Wangetti Mountain Bike Trail traverses a private road (Southedge Road), and a section of the Black Mountain Road. The Southedge Road is subject to a maintenance permit issued by the Wet Tropics Management Authority (WTMA). As a condition of this permit an Environmental Management Plan (EMP) for the maintenance of the road has been approved by the WTMA. Subsequently, any works on this road must be in accordance with agreement with the permit holder, and the conditions attached to that permit. The Black Mountain Road section (to the boundary with the Kuranda National Park) is managed by the Department of Agriculture and Fisheries through Qld Forestry. The section within the Kuranda National Park is managed by QPWS in conjunction with requirements under the *Wet Tropics Plan 1998* administered by the WTMA. Relevant provisions under the plans and policies of these agencies will continue to apply to the Black Mountain Road sections.

Table 5 Management Aspects Wangetti Trails (North and South) and Mountain Bike Trail

Aspect	Management Measures	Wangetti North Shared Use Trail APPLICABLE TRAIL SECTIONS & CAMPS					Wangetti South Shared Use Trail APPLICABLE TRAIL SECTIONS & CAMPS					Mountain Bike Trail APPLICABLE TRAIL SECTION					Project Phase Applicable		
		Highest Priority	High Priority	Moderate Priority	Low Priority	Lowest Priority	Highest Priority	High Priority	Moderate Priority	Low Priority	Lowest Priority	Highest Priority	High Priority	Moderate Priority	Low Priority	Lowest Priority	Design	Construction	Operation
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Habitat management 1. Infrastructure layout and design – camp areas (includes eco- accommodation)	Camp and eco accommodation areas must be located and designed such that their development footprint and impact on habitat values is minimised. This is particularly important for this project as cassowary habitat quality is already diminished in most areas owing to logging and cyclones. Retention of existing habitat, and where practical, avoidance of cassowary resource areas altogether, must be a key component of the design aspects. Concurrently, the design must be such that cassowaries will not seek resources that may be present (e.g., water and food sources) at the camps.																		
	Site clearance survey of camp areas by experienced ecologist to be undertaken prior to any construction with the following requirements: <ul style="list-style-type: none">- Location of potentially important cassowary foodplant trees within and immediately adjacent development footprint- Location and orientation of permanent water in relation to development footprint. Assessment of likely cassowary access routes to any of the above resources identified (tracks, pads etc)	X	-	-	X	-	-	-	-	X	-	-	-	-	-	-	X	X	
	<ul style="list-style-type: none">• Survey outcomes to be used in design of the layout of camp and eco-accommodation infrastructure, including construction access routes, location of buildings, water and sewage requirements, waste management requirements	X	-	-	X	-	-	-	-	-	-	-	-	-	-	-	X		
	<ul style="list-style-type: none">• No infrastructure to be located west of Twin Bridges Road Section C, nor south of Trail Section D (refer Figure 4).	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	
	<ul style="list-style-type: none">• All infrastructure is to be located such that natural corridors of vegetation facilitating movement through the area are retained across the camp development footprint in an east west direction (towards Allen Creek tributary), preferably with minimum practical widths of 50m.	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	X		
	<ul style="list-style-type: none">• Provisions to be made to ensure that no open water is provided at the camps (e.g., basins, taps, laundry facilities, tanks, etc) that can be accessed by cassowaries, thus providing an attractant to the camp areas.	X	-	-	X		-	-	-	X	-	-	-	-	-	-	X	X	X
	<ul style="list-style-type: none">• Any grey water discharge is to go to a sump, and not to irrigation or any surface drain accessible by cassowaries.		-	-		-	-	-	-	X	-	-	-	-	-	-	X	X	
	<ul style="list-style-type: none">• Signage for camp and eco accommodation users at strategic locations advising of the requirements to ensure that cassowaries cannot access food,	X	-	-	X	--	-	-	-	X	-	-	-	-	-	-	X		X

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	<ul style="list-style-type: none"> Signage for camp and eco accommodation users at all water sources/disposal areas regarding water management and security from cassowary access 	X	-	-	X	-	-	-	-	X	-	-	-	-	-	-	X		X
	<ul style="list-style-type: none"> Lighting (where required) to be confined to directional and subdued lighting and address Australian Standard AS/NZS 4282:2019. Control of the obtrusive effects of outdoor lighting, which provides information in Appendix C about the impact of artificial light on biota 		-	-	-	-	-	-	-	X		-	-	-	-	-	X	X	X
	<ul style="list-style-type: none"> No surface water is to be abstracted from watercourses in proximity to Camp 4. The primary water source will be rainfall and/or groundwater. Groundwater abstraction will only be allowed if can be demonstrated that the source is sustainable, and will have no quantifiable impact on the recharge capacity and environmental flows of adjacent permanent watercourses. 	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X
	<ul style="list-style-type: none"> An audit of listed/declared weed species must be undertaken at the proposed camp sites prior to construction. This audit will provide the baseline for future monitoring of weed incursions and/or introduction of new weeds. Species, abundance and distribution need to be recorded. 	X	-	-	X	-	-	-	-	X	-	-	-	-	-	-	X	X	
Habitat management 2. Infrastructure layout and design – trails	The trails primarily utilise existing tracks and roads for the Wangetti North and Wangetti Mountain Bike trail sections. Both these trails include high and moderate priority habitat management areas, and design aspects that do not disadvantage cassowaries in these localities must be implemented. The Wangetti South trail requires a higher level of construction than other trails, but does not traverse any identified highest, high or moderate habitat management areas. Notwithstanding, where practical, the basic precepts as set out below should be followed.																		
	<ul style="list-style-type: none"> Trails in highest, high priority and moderate priority sections are to have clear line of sight for a minimum of 20m from any significant (permanent or ephemeral) watercourse crossing to enable hikers to have a clear view of key cassowary utilisation areas. 	X	X	X	-	-	-	-	X	-	-	-	X	X	-	-	X	X	X
	<ul style="list-style-type: none"> Signage at all such locations warning of cassowary crossing and their potential use of riparian areas. 	-	X	X	-	-	-	-	X	-	-	-	X	X	-	-		X	X
	<ul style="list-style-type: none"> Steep descents with sharp changes in angle of direction where the opposite side cannot be seen on the approach should not occur in high priority or moderate priority trail sections. Realignment to obtain clear line of sight to avoid blind corners is the preferred option. 	-	X-	-X	-	-	-	-	X	-	-	-	X	X	-	-	X	X	
	<ul style="list-style-type: none"> With the exception of the required repair of bridges, the Hartleys Creek suspension bridge and existing Twin Bridge Road drainage systems (e.g., culverts), all constructed watercourse crossings will be at bed level, will not obstruct waterflow, and to be comprised primarily of natural material, e.g., laid stone pavements. Bed level crossings must be 	-	X	X	-	-	-	-	X	-	-	-	X	X	-	-	X	X	

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	undertaken in consideration of the requirements of aquatic species with migratory breeding requirements, e.g., opal cling goby																		
	<ul style="list-style-type: none"> No clearing to be undertaken in highest, high or moderate priority shared use trail areas until site survey identifies potentially significant cassowary foodplants or high-quality habitat areas. 	X	X	X	-	-	-	-	X		-	-	X	X	-	-	X	X	
	<ul style="list-style-type: none"> An audit of listed weed species along the proposed alignments and must be undertaken prior to construction. This audit will provide the baseline for future monitoring of weed incursions and/or introduction of new weeds. Species, abundance and distribution need to be recorded. 	X	X	X	X	X	-	-	X	X	X	-	X	X	X	-	X	X	X
	<ul style="list-style-type: none"> Warning signs and speed limiting signs on approaches to bridges over permanent water where cassowaries may be likely to be encountered. 	-	X	X	-	-	-	-	X	-	-	-	X	X	-	-	X	X	X
Habitat management 3. Vegetation clearing and rehabilitation	The vegetation through the rainforested sections of the Wangetti North trail include the most important representative cassowary habitat in the project area. The vegetation has been impacted by past logging and cyclones and habitat has been subsequently diminished. Subsequently the retention of existing vegetation, and minimising the vegetation to be removed is essentially in ensuring that habitat recovery is not compromised.																		
	<ul style="list-style-type: none"> Vegetation clearing is to be restricted to that as only required for the safe construction, operation and maintenance of camp and eco accommodation infrastructure. 	X	-	-	X	-	-	-	-	-	X	-	-	-	-	-	X	X	X
	<ul style="list-style-type: none"> As above, vegetation clearing will be restricted to the minimum required for the safe construction, operation and maintenance of trails. Note that other agencies may have responsibilities for road/track maintenance according to the tenure and gazettal status. 	X	X	X	X	X	-	-	X	X	X	-	X	X	X		X	X	X
	<ul style="list-style-type: none"> Vegetation to be cleared at camps is to be clearly demarcated on all drawings and plans, and in practice by highly visible means such as biodegradable survey tape. Obstructive visible barriers such as orange Tensar construction fencing is not to be used. 	X	-	-	X	-	-	-	-	X	X	-	-	-	-	-	X	X	
	<ul style="list-style-type: none"> Vegetation will not be cleared, nor any infrastructure located, west of Twin Bridges Road within the Allen Creek catchment riparian areas. 	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	
	<ul style="list-style-type: none"> Similarly, no vegetation is to be cleared, nor any infrastructure located south of Section D (refer Figure 2) in the upper Viever Creek catchment. 	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	
	<ul style="list-style-type: none"> Important food plant trees identified as part of the preclearance survey are to be included as components of retained vegetation e.g., within movement corridors and preferably not left as isolates within clearings. 	X	X	X	-	-	-	-	X	-	-	-	-	-	-	-	X	X	
	<ul style="list-style-type: none"> Greenfield vegetation clearing generally is to be undertaken only in accordance with protocols agreed with Traditional Owners representatives of the relevant locations and with a fauna/flora spotter 	X	X	X	X	X	-	-	X	X	X	-	X	X	X	-		X	

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	present.																		
	<ul style="list-style-type: none"> Vegetation removed along trails will be the minimum required to ensure clear line of sight for cyclists (and hikers) approaching permanent or significant ephemeral watercourses (approximately 20m prior) 	-	X	X	X	-	-	-	X	X	X	-	X	X	-	-	X	X	X
	<ul style="list-style-type: none"> Vegetation waste is not to be mulched. Waste will be cut to practical sizes to transport to edge of clearings and allowed to naturally decompose without the construction of large windrows. 						-	-	X	X		-				-		X	X
	<ul style="list-style-type: none"> All clearing is to comply with requirements of relevant permits and approval conditions, with specific reference to erosion and sediment control plans that clearly identify mechanisms to avoid the discharge of sediment during construction off site into local habitat. 	X	X	X	X	X	-	-	X	X	X	-	X	X	X	-		X	
	<ul style="list-style-type: none"> Any works involving the replanting of vegetation is not to use important cassowary food plants as found locally (refer Appendix A) within or immediately adjacent camp/eco-accommodation precincts, which may otherwise attract cassowaries into proximity with humans. 	X	-	-	X	-	-	-	-	X	-	-	-	-	-	-		X	
Construction management 4. Noise and vibration	Cassowaries use vocalisation to communicate and locate other cassowaries across sometimes large areas. This is particularly important during the breeding season June to November. They also vocalise as a stress/threat mechanism. Loud, persistent and disruptive noise will stress cassowaries, and may cause them to abandon sections of their range. Noise during construction is unavoidable, however should be minimised with regard to the following.																		
	<ul style="list-style-type: none"> Strict adherence to daytime construction times only, 7am to 5pm, and timed to avoid highest cassowary activity times. These hours may only be varied in consultation with agencies and with respect to seasonal variation. 	X	X	X	X	-	-	-	X	X	X	-	X	X	X	-		X	
	<ul style="list-style-type: none"> All machinery used in construction and operation will have exhausts and mufflers installed to manufacturers specifications and maintained to that condition. 	X	X	X	X	X	-	-	X	X	X	-	X	X	X	-		X	X
	<ul style="list-style-type: none"> Blasting of hard rock areas for construction will not be permitted in any areas. 	X	X	X	X	X	-	-	X	X	X	-	X	X	X	-		X	
	<ul style="list-style-type: none"> Use of any recreational radios, playing of music, or general broadcasting will be strictly confined to in-vehicle operation whilst transiting to and from site only and not played within any highest, high or moderate priority areas during construction. 	X	X	X	-	-	-	-	X	-	-	-	X	X	-	-		X	

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	<ul style="list-style-type: none"> Helicopters will not be used for the transport of any equipment into any sections except for lowest priority areas. Helicopters can be used for emergency evacuation at any time. 	X	X	X	X	-	-	-	X	X	-	-	X	X	X	-		X	X
Construction management 5. Vehicle movements	<ul style="list-style-type: none"> Construction vehicle movements along service tracks through moderate and high/highest priority habitat areas is not to occur 5 to 7am, and between 5 to 7pm, when cassowaries are most active. 	X	X	X	-	-	-	-	X	-	-	-	X	X	-	-		X	
	<ul style="list-style-type: none"> Transit to construction sites will be via approved and designated access routes only, and no in-field unauthorised tracks/roads will be used. 	X	X	X	X	X	-	-	X	X	X	-	X	X	X	-	X	X	
	<ul style="list-style-type: none"> Speed limits to be clearly defined and marked for sections of construction/service access roads/tracks and should be directly proportional to the condition of the track/road and visibility and risk to fauna. A maximum of 40km/hr on formed roads. 	X	X	X	X	X	-	-	X	X	X	-	X	X	X	-		X	
	<ul style="list-style-type: none"> Construction vehicles will be of the smallest practical size to access the required areas, this includes the use of quad bikes with trailers, small rubber tracked excavators, etc. 	X	X	X	X	X	-	-	X	X	X	-	X	X	X	-		X	
Construction management 6. General	Management of construction activities will be via an Environmental Management Plan (EMP) approved by relevant regulatory authorities (QPWS, WTMA, DERM, Douglas and Mareeba Shire Councils). The EMP will typically address environmental, physical and social requirements of the construction. The following should be included in all project EMPs																		
	<ul style="list-style-type: none"> Domestic animals at all times are not permitted on site, this includes animals that are restrained inside vehicles. Poultry may be a vector for the introduction of avian diseases 	X	X	X	X	X	-	-	X	X	X	-	X	X	X	-	X	X	X
	<ul style="list-style-type: none"> Temporary fencing for construction purposes at camps (e.g., around open pits, newly laid concrete areas) will not be made of wire, nor obstruct fauna movement across the general site area. No fencing of any type to be used in vegetation retained for corridor/habitat purposes. 	X	-	-	X	-	-	-	-	X	X	-	-	-	-	-		X	
	<ul style="list-style-type: none"> Fencing, with the exception of erosion and sediment control fences, are not to be installed around the banks of any of the bridges proposed to be repaired along the Twin Bridges Road. 	-	-	-	-	-	-	-	-	-	-	-	X	X	-	-		X	
	<ul style="list-style-type: none"> No organic/food waste at any time is to be disposed of on site. All waste is to be collected and removed at the end of each day. Temporary storage of non-organic waste, e.g., cutoffs from construction materials, can be stored under a cover until they can be transported from site. 	X	X	X	X	X	-	-	-	X	X	-	X	X	X	-		X	
	<ul style="list-style-type: none"> Any development adjacent permanent or significant ephemeral watercourses (e.g., bridge works) will have full erosion and sediment control measures implemented and maintained for the duration of the works as per the ESCP to be developed for the project. The ESCP is 	X	X	X	-	-	-	-	X	-	-	-	X	X	-	-		X	

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	not to be a generalised document, but will address specific infrastructure requirements for any works in moderate, high and highest priority areas.																		
	<ul style="list-style-type: none"> The induction program for all construction personnel will include a component on cassowary management measures, and will include methodologies for de-escalating confrontational interactions. 	X	X	X	X	X	-	-	X	X	X	-	X	X	X	-	X	X	
	<ul style="list-style-type: none"> On any construction work site, should a cassowary approach the works area, then works in that particular location will cease until the cassowary has left of its own accord. All construction work should have a plan for alternate work sites and tasks in this contingency. 	X	X	X	X	X	-	-	X	X	X	-	X	X	X	-		X	
	<ul style="list-style-type: none"> Construction in watercourses must include consideration of the potential for interference with cassowary movements e.g., within the creek bed, or access to riparian resources. Bridge works must allow headroom for cassowaries to pass under (2m) 	X	X	X	-	-	-	-	X	-	-	-	X	X	-	-	X	X	
	<ul style="list-style-type: none"> Biosecurity management, regular inspection of construction areas for fire ants, yellow crazy ants, potential Phytophthora infestation, and other highly invasive species that may be identified as a risk. 	X	X	X	X	X	-	-	X	X	X	-	X	X	X	-		X	X
Operational Management 7. Camp areas: waste management (includes eco-accommodation)	Cassowaries are attracted by of organic waste and are known to access compost piles, rubbish bins and unattended food in open areas (e.g., backpacks). This aspect increases the probability of human interactions with cassowaries. Waste management plan to be developed and implemented for the operation/maintenance of camps and eco accommodation. This plan should (at a minimum) adopt the following.																		
	<ul style="list-style-type: none"> Waste containers should be in a secured receptacle, e.g., wooden palisade barricaded area, that cannot be accessed by cassowaries. 	X	-	-	X	-	-	-	-	X	-	-	-	-	-	-	X		X
	<ul style="list-style-type: none"> Waste water management at camp area and eco-accommodation must take into account potential cassowary access and potential to impact on local water source quality. Waste water discharge is not to occur into a situation where the discharge can be accessed by cassowaries and should go to a sump. 	X	-	-	X	-	-	-	-	X	-	-	-	-	-	-	X		X
	<ul style="list-style-type: none"> Signage in camp and eco-accommodation must clearly identify locations of waste receptacles, and protocols in separating and disposing of waste. 	X	-	-	X	-	-	-	-	X	-	-	-	-	-	-	X		X
	<ul style="list-style-type: none"> Organic waste cannot be composted on-site and must be disposed of (preferably off site) daily in a manner / location that is not detectable or accessible by cassowaries. This includes all kitchen waste from the eco-accommodation area. 	X	-	-	X	-	-	-	-	X	-	-	-	-	-	-			X

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Operational Management 8. Camp areas: water management (includes eco-accommodation)	The camp sites and eco accommodation have the potential to have open source water areas that may include dripping taps, wash basins, water tanks, etc, that may serve as attractants to cassowaries, particularly during dry periods of the year when opportunistic ephemeral water is not available. Cassowaries are known to access urban garden ponds, sprinkler systems and other similar water sources.																		
	<ul style="list-style-type: none">Ensure that there is no cassowary accessible permanent water source within the camp and eco accommodation areas.	X	-	-	X	-	-	-	-	X	-	-	-	-	-	-	X		X
	<ul style="list-style-type: none">Signage for camp and eco accommodation users at all water sources/disposal areas regarding water management and security from cassowary access.	X	-	-	X	-	-	-	-	X	-	-	-	-	-	-	X		X
	<ul style="list-style-type: none">Rain water collection points off roofing (e.g.,, water tanks) to be sealed, with excess runoff to be directed to a sump.	X	-	-	X	-	-	-	-	X	-	-	-	-	-	-	X		X
	<ul style="list-style-type: none">Storm water discharge from eco accommodation and drains about the camp areas must not drain into any perennial water course.	X	-	-	X	-	-	-	-	X	-	-	-	-	-	-	X		X
	<ul style="list-style-type: none">Waste water discharge at the camp area and eco-accommodation similarly must take into account potential cassowary access and potential to impact on local water source quality. As for storm waste water should be directed to a sump.	X	-	-	X	-	-	-	-	X	-	-	-	-	-	-	X		X
	<ul style="list-style-type: none">Camp management to monitor condition of all potential water sources and ensure they are not available to cassowaries.	X	-	-	X	-	-	-	-	X	-	-	-	-	-	-			X
	<ul style="list-style-type: none">Any watering of rehabilitation areas for establishment purposes is to be undertaken using handheld hoses and portable tanks and not through irrigation systems.	X	-	-	X	-	-	-	-	X	-	-	-	-	-	-			X
	<ul style="list-style-type: none">The use of ground water is to be considered only after an assessment of the recharge capacity and the potential for impact on surface environmental flows of nearby watercourses.	X	-	-	X	-	-	-	-	X	-	-	-	-	-	-	X		
Operational Management 9. Camp areas: Human activities (includes eco-accommodation)	Cassowaries are a reclusive species and exclusively diurnal in their foraging activities. Cassowaries may be stressed by loud noise, lights and human movement and can exhibit varying behaviour from complete avoidance and retreat, to confrontational responses. Feeding of cassowaries is the primary cause of aggressive interactions with cassowaries and will be a core management precept for the entire project.																		
	<ul style="list-style-type: none">Domestic animals of all types are banned in all parts of the project area, even if restrained inside vehicles. This includes contractor service vehicles. Poultry has the potential to be a vector for the introduction of avian diseases (e.g.,, avian tuberculosis, aspergillus)	X	X	X	X	X	-	-	-	X	X		X	X	X		X	X	X

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		Camp 4	C, D	E, G	B, F, H, I Camps 5, 3, 2	A, J	-	-	N, P	M, O Camp 1	L, Q	-	S, U, W	R, T, V	K,	Hub only			
	<ul style="list-style-type: none"> Feeding of cassowaries is banned in all parts of the project area and is to be a prominent message at trailhead hub locations, at camp areas, and in eco-accommodation areas. Signage will be placed in all these locations and be part of any information package given to hikers, campers, mountain bike riders. Penalties should be considered if users of the trails and facilities are identified deliberately feeding cassowaries. 	X	X	X	X	X	-	-	-	X	X	-	X	X	X	-			X
	<ul style="list-style-type: none"> Deliberate loud noises including portable music devices, external speakers, radios etc cannot be used in any camp or along the high and moderate priority trail sections. Users may continue to use headphones with portable devices. 	X	X	X	X	-	-	-	X	X	-	-	X	X	-	-			X
	<ul style="list-style-type: none"> Security lighting may be required for some facilities, e.g., toilets, at camp areas. Lighting (where required) to be confined to directional and subdued lighting and address Australian Standard AS/NZS 4282:2019. Control of the obtrusive effects of outdoor lighting, which provides information in Appendix C about the impact of artificial light on biota. 	X	-	-	X	-	-	-	X	X	-	-	-	-	-	-	X		X
	<ul style="list-style-type: none"> Generators should not be used for power generation except as an emergency resource. Power generation should be reliant on alternative technologies e.g., solar 12V systems, lithium battery storage and backup, and similar low intensity energy systems. 	X	-	-	X	-	-	-	X	X	-	-	-	-	-	-	X		X
	<ul style="list-style-type: none"> Vehicles will be required to service the operation/maintenance of the facilities. All drivers are to be compliant with speed directions with no travel undertaken between 5pm and 7am (overnight) on any track through moderate/high priority management sections. 	X	X	X	-	-	-	-	X	-	-	-	X	X	-	-		X	X
	<ul style="list-style-type: none"> Helicopters will only be used to access camp, eco-accommodation areas and trails in low, moderate, high and highest priority sections in the event emergency evacuation is required. 	X	X	X	X	-	-	-	X	X	-	-	X	X	X	-		X	X
Operational Management 10. Trail sections	Operation of the trail sections must consider the maintenance requirements of the use of the various trails. Sections of the various trails are within tenures where there may be pre-existing conditions related to maintenance of trails/roads, e.g., Southedge Road subject to conditions on a WTMA permit. Any conditions on those permits must be incorporated into the relevant activities and EMPs associated with the project.																		
	<ul style="list-style-type: none"> Warning and speed limiting signs on approaches to crossings over permanent water where cassowaries may be likely to be encountered. 	-	X	X	-	-	-	-	-	-	-	-	X	X	-	-			X
	<ul style="list-style-type: none"> Cyclists and hikers must not use any trail before first light and after last light each day, times dependent on the season. Times to be set by camp/trail operators with consideration of seasonal visibility early morning/late afternoon. Cassowaries may settle for the evening on road/track verges. 	-	X	X	X	X	-	-	X	X	X	-	X	X	X	-			X

Aspect	Management Measures	Wangetti North Shared Use Trail APPLICABLE TRAIL SECTIONS & CAMPS					Wangetti South Shared Use Trail APPLICABLE TRAIL SECTIONS & CAMPS					Mountain Bike Trail APPLICABLE TRAIL SECTION					Project Phase Applicable		
		Highest Priority	High Priority	Moderate Priority	Low Priority	Lowest Priority	Highest Priority	High Priority	Moderate Priority	Low Priority	Lowest Priority	Highest Priority	High Priority	Moderate Priority	Low Priority	Lowest Priority	Design	Construction	Operation
		Camp 4	C, D	E, G	B, F, H, I Camps 5, 3, 2	A, J	-	-	N, P	M, O Camp 1	L, Q	-	S, U, W	R, T, V	K,	Hub only			
	<ul style="list-style-type: none"> Maintenance vegetation clearing, e.g., for <i>Calamus</i> regrowth and fallen vegetation, will be required over the trails. Vegetation not to be mulched but sawn to manageable lengths and put in locations off the trails and allowed to decompose. 	X	X	X	X	X	-	-	X	X	X	-	X	X	-	-			X
	<ul style="list-style-type: none"> Condition of watercourse crossings in highest, high and moderate priority sections of the trails are to be inspected after major rainfall events and repaired when required. 	-	X	X	-	-	-	-	X	-	-	-	X	X	-	-			X
	<ul style="list-style-type: none"> Road/track conditions used as service road access to be inspected regularly for condition and areas of erosion off site to be repaired. 	X	X	X	X	X	-	-	X	X	X	-	X	X	-	-		X	X
	<ul style="list-style-type: none"> Monitoring of potential weed incursions must be a key requirement for the maintenance of the trails/tracks. Some agencies may have responsibility for management of listed weed species but the trail operators will be responsibility for monitoring, reporting, and contribute to actions removing if required. Monitoring responsibilities are to be identified and included in future updates of this management plan. 	X	X	X	X	X	-	-	X	X	X	-	X	X	X	-		X	X
	<ul style="list-style-type: none"> Monitoring of feral pig disturbance areas, location, size, general observations of damage Monitoring responsibilities are to be identified and included in future updates of this management plan. 	X	X	X	X	X	-	-	X	X	X	-	X	X	X	-			X
	<ul style="list-style-type: none"> Biosecurity management, regular inspection of facilities for fire ants, yellow crazy ants, potential Phytophthora infestation, and other highly invasive species that may be identified as a risk. 	X	X	X	X	X	-	-	X	X	X	-	X	X	X	-		X	X

4.3 Other Management Aspects

4.3.1 Roles and Responsibilities

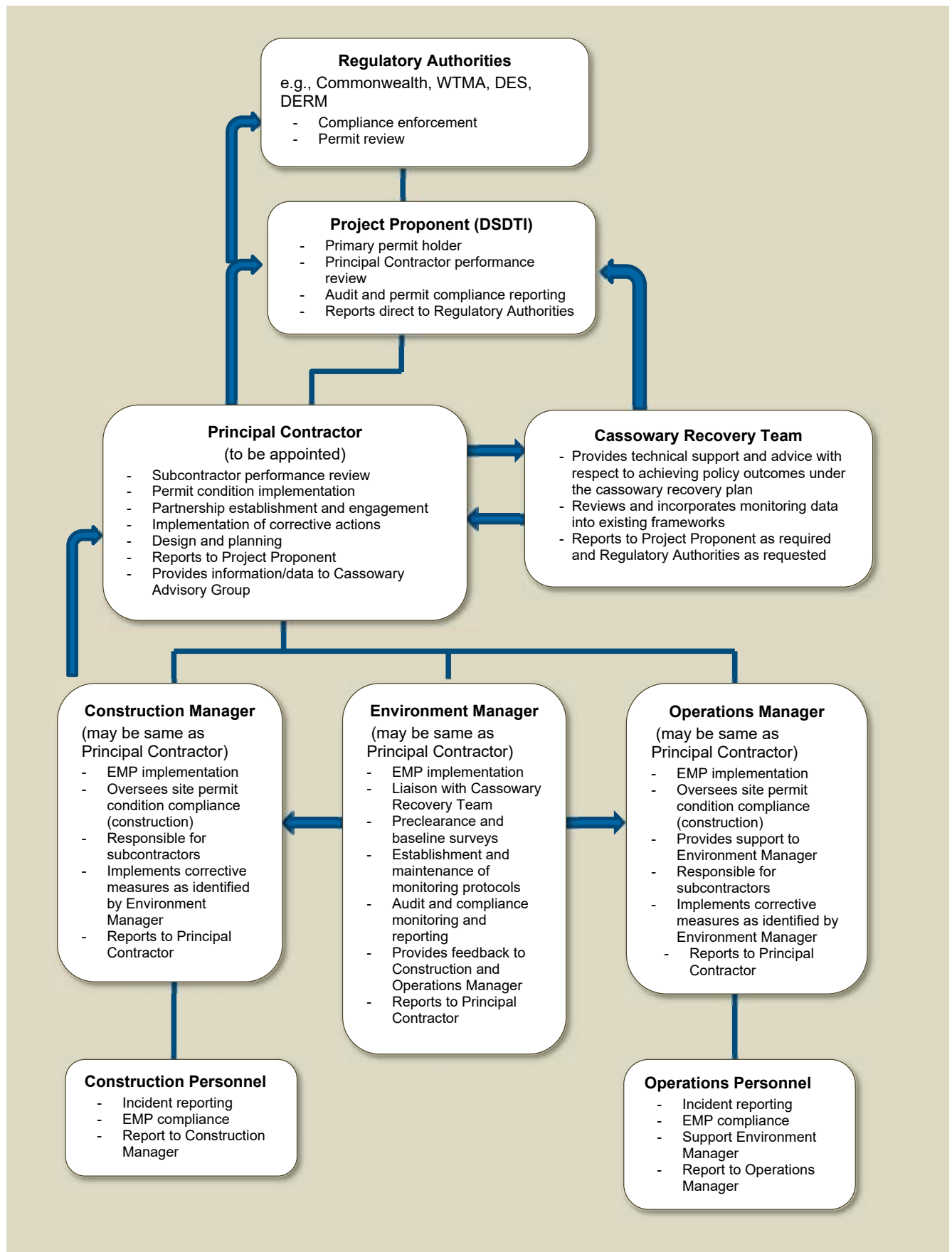
Management of the Wangetti Trails Project will require a clearly demarcated hierarchy of management to ensure that management of cassowaries and their habitat is effective, and meets the overarching requirements of the Commonwealth and State adopted *Recovery Plan for the Southern Cassowary* (Latch 2007). The Recovery Plan's overall objective is "to secure the long-term protection of cassowary populations through improved planning mechanisms supported by robust monitoring, threat abatement and community engagement programmes". Recovery Plan specific objectives and actions include to "institute a more coordinated and stronger planning response to development issues in cassowary habitat" and "help develop better planning scheme mechanisms to protect cassowary habitat". The Recovery Plan does not cover all the particular circumstances for this project, i.e. a private, commercial venture will be responsible for the construction, operation and maintenance (within the context of the permitted activities) of the Wangetti Trails Project.

The Wangetti Trails Project traverses' tenures where government agencies have various legislative and policy obligations in relation to fulfilling environmental management responsibilities. Additionally, a significant section of the Wangetti Mountain Bike Trail utilises a private road (Southedge Road) that is subject to permit conditions under the *Wet Tropics Plan 1998* for the maintenance (but not use of) this particular road.

Multiple regulatory requirements and permit conditions will be required to be met by the project. In the first instance, the Queensland Department of State Development, Tourism and Innovation has applied for and will hold overarching authorities under the Commonwealth EPBC Act and the Wet Tropics Plan (permit through the WTMA) that will consolidate approvals and conditions for the Wangetti Trails with consensus from other stakeholder groups, e.g., other government agencies (such as QPWS) and Traditional Landholders. Additional approvals will be required, including those over tenure where other regulatory/policy requirements must be met. For example, use of Forestry managed roads for commercial activities, use of Southedge Road by agreement with the landholder and in accordance with the administering authority of the maintenance permit on use of the road for commercial activities.

Management of cassowary habitat, and cassowary interactions, will be integral to the Wangetti Trails. The following figure identifies a suggested framework roles and responsibilities in ensuring that no long-term, cumulative or adverse impacts on cassowary habitat and cassowary populations arises from the project.

Figure 7 Suggested Cassowary and Habitat Management Framework



4.3.2 Project Monitoring

There is currently no information on the commercial, management or other arrangements for the Wangetti Trails Project available. Subsequently any directive on responsibilities for the implementation of Monitoring Program as part of this management plan would be totally speculative.

As this management plan is intended to be a live document, it is recommended that this plan be updated into the future when further information becomes available. This would include detailed responsibilities and recording mechanisms.

The monitoring program to be implemented will ensure that any direct, indirect, and cumulative impacts on cassowaries and their habitats are able to be detected and management actions undertaken at the earliest opportunity. The monitoring program would not be necessarily unique to cassowaries, as those factors potentially affecting cassowary habitat also would be more widely affecting habitats/ecosystems for fauna/flora generally. Notwithstanding there are a number of aspects to monitoring that would be particular to cassowaries owing to their ecology and behavioural characteristics.

Three monitoring components are recommended.

1. Habitat condition and integrity
2. Recording of cassowary interactions (including direct observations of birds, scats, etc)
3. Facilities management

The primary aim of the monitoring program would be to collect verifiable data that can be used to review, modify or implement any additional management requirements that support the Recovery Plan for the southern cassowary.

Habitat condition and integrity

The condition of the natural environment may be classically defined by the abundance and distribution of naturally occurring functional ecological communities and diversity of natural ecological processes (DEE 2017). In the context of this monitoring program, ecological communities include vegetation types, their floristic composition, and their extent areas.

While condition refers to the quality of that vegetation defined by the abundance and distribution of natural vegetation types, 'integrity' is an indicator of likely long-term viability or sustainability of ecological processes (DEE, 2017). This considers the extent to which these processes have been affected by past or present condition, the ability of the community subject to these processes to rebound (or be rehabilitated) and a time frame for any restorative process.

Simplistically, a complete monitoring program encompassing all of the above is neither practical, nor effective in applying to a project and site-specific scale. Both the condition and integrity of cassowary habitat in the project area have been impacted to varying degrees. These include anthropogenic factors (e.g., logging) and natural factors (including cyclonic events). The surveys by GHD in 2019, and further surveys specific to cassowary habitat in 2020 have confirmed that habitat values for cassowaries have been significantly diminished by these factors. Logging has been intense in many areas and altered fire regimes in sclerophyll/rainforest ecotones and cyclonic damage has resulted in a patchy habitat landscape that is difficult to monitor on-ground. Climate change may also have longer term impacts on habitat but are beyond the scope of this project to monitor.

There are many models in deriving a monitoring program for habitat condition and integrity. The suitability and applicability of a particular model should be derived in consultation and partnership with the Cassowary Recovery Team. Regardless of the model and methodologies

to be used, there are a number of basic precepts for a monitoring program that should be observed. These include:

Establishing the purpose of the monitoring: what is the data to be used for, how is to be collected, who will undertake the analysis, how will this be used to manage cassowary habitat.

Defining the sampling unit: what attributes exactly are to be monitored? What is the practicality in collection and analysis of these units.

Scope and extent of the program: determine a realistic scale for monitoring, extent, time factors, statistical accuracy.

Identification of threshold levels: deciding on a minimum detectable change that is biologically meaningful.

Type of data analysis: the appropriate level of data analysis will depend on the first point, purpose of the monitoring.

Budget and resources: who is paying for it, time and resource commitments in reporting and implementing recommended actions

Some potential indicators could be:

- Using available Landscape scale monitoring undertaken through the State-wide Landcover and Trees Study (SLATS), a scientific monitoring program undertaken through the Department of Environment and Science in partnership with a number of other institutions. On a broad scale over the project area this may be a useful indicator of changes in vegetation type and extent.
- Simple site level indicators, e.g., disturbance by feral pigs, location of activity, relative intensity and general observations.
- Weed presence: - baseline surveys pre-construction of existing weeds along the alignment and within the camp areas, assessment of their extent, abundance and potential invasiveness. Weeds would be continued to be monitored as part of the operational program of the Wangetti Trails Project and would be expected to be part of the ongoing operational EMP.
- Phenology of cassowary foodplants. A list of cassowary foodplants known to occur within the project facility areas is included in Appendix A. A preconstruction survey of the location of significantly important individual trees may identify particular resources utilised by cassowaries. An understanding of the phenology (flowering and fruiting patterns) of these resources may assist in developing management responses for resources that may be impacted by project activities.
- Plot based studies on recruitment and recovery of cassowary habitat. For areas that are identified as within a cassowary home range, and subject to impacts from project activities, it may be useful to establish plot-based studies to determine forest recruitment and successional processes. The outcomes of these may be used in rehabilitation or other offset programs over the longer term that would benefit improving forest recovery.
- Water quality monitoring. Cassowaries are critically dependent on the availability and access to permanent water. A water quality monitoring program for permanent water courses in proximity to facility infrastructure in habitat areas (e.g., Camp 4, trails along Twin Bridges Road parallel and adjacent to permanent water) may provide threshold indicators suitable for habitat analysis.

Cassowary Interactions

Cassowary interactions includes any aspect of direct dealings, observation of cassowaries or evidence of cassowaries. The exact population and distribution of cassowaries in the project area is unknown. While it is predicted that they are in low abundance over a relatively wide area, verifiable quantitative information is limited to observations from two surveys. Only one direct observation of a cassowary has been made to date: a female in the vicinity of the proposed Camp 4 locality on the Wangetti North Trail. Scats observed along a linear transect (i.e., the trail alignment) is not a reliable mechanism for determining population. Scats indicate utilisation of an area, and a formal field survey specific to cassowaries is time consuming, logistically extremely difficult, and ultimately of limited use as cassowaries are a naturally cryptic species and field surveys may well underestimate a population.

Westcott *et al* (2014) implemented the use of DNA analysis of faecal material for their surveys between 2012 and 2014 to identify individual birds. The technology and cost of faecal DNA monitoring is prohibitive and requires expert analysis. The project area is in a “black hole” with regards to quantitative data. It would be to the advantage of the project if collaborative partnerships could be made with research agencies through the Cassowary Recovery Team, whereby field work could be undertaken by Wangetti Trails project staff, with direction and sampling methodologies provided through a research partner. This may involve:

- A database of direct cassowary observations, including date, location, general description of the bird, identifying features (e.g., bent casque) etc. This database could be established at Hub areas or at the eco-accommodation centres, with provision for hikers and trail bike riders to enter observations. Responsibility for the maintenance and distribution of the database will be determined as this plan is updated with further information on commercial and administrative arrangements for the Wangetti Trails Project.
- Establishment of motion triggered remote trail cameras in key locations.
- Sand traps to record footprints, e.g. along watercourses, under bridges, and similar locations to record frequency of utilisation of these areas
- Collection of scats, feathers, other organic material from cassowaries, under direction from the research partner with methodologies about sampling, collection, storage requirements.
- Results from the habitat condition and integrity monitoring.
- Any other records, observations (e.g., what cassowaries may have been observed foraging).

Facilities Management

Management of facilities *per se* is not a specific monitoring program. Rather, the purpose of including facilities (trails, camp, eco-accommodation areas) is to ensure a rigorous approach to complying with requirements of the EMP for the project. Primarily the monitoring would be a series of checklists against the specific elements of the EMP which may have an impact on cassowary habitat, or on cassowary behaviours. This may include:

- Ensuring water sources at the camps comply with EMP conditions, i.e., are not available to cassowaries, do not discharge to the environment, and make no demands on local environmental flows or impact on water.
- Noise and light levels at the camps, considering that up to 40 people per night may be feasible in some locations (e.g., Camp 4), this represents a substantial potential impact.

- Regular maintenance inspection of facilities e.g., trails and condition, noting erosion areas, watercourse crossing degradation and other aspects that have an impact on habitat condition and integrity arising from use of the facilities.
- Any other aspects identified during the project development (including site clearance surveys to guide design).

4.3.3 Education and Communication

Education and communication will be a core component in ensuring that negative interactions with cassowaries are minimised or do not occur in the first instance. Negative interactions include adverse impacts on cassowary habitat, and changes in cassowary behavioural aspects as a result of anthropogenic influences (e.g., access to food, hand feeding, access to artificial water sources, noise/light, general human presence) that may cause stress to the birds.

The Cassowary Recovery Team (CRT) is a partnership of organisations working together to implement the Recovery Plan for Southern Cassowaries. The CRT is sponsored and coordinated through the Wet Tropics Management Authority and is the peak body engaged in the dissemination of information and providing support to organisations and individuals engaged in the protection of cassowaries and their habitats through planning, monitoring and community engagement. The Wangetti Trails Project should, as a matter of high importance, engage with and be involved with the CRT.

Cassowary Recovery Team.

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Email: [cassowary_recovery_team](mailto:cassowary_recovery_team@wta.qld.gov.au)

Website: <http://cassowaryrecoveryteam.org>

Many non-government community groups such as Kuranda EnviroCare, Trees 4Life etc, are active in cassowary conservation and management and may be contacted through the CRT or through their own websites. Research organisations are also active within the CRT and can provide specific advice related to technical monitoring and reporting. The development of partnerships with these organisations would be a favourable outcome for the Wangetti Trails Project. Traditional Owner inputs would similarly benefit the Wangetti Trails Project in aspects related to cassowary habitat management (as well as a host of other management aspects).

This Cassowary Management Plan has highlighted that informing the design team of site-specific factors related to cassowary habitat and utilisation is a key early step in the education process. Early information requirements include baseline surveys, assessment of cassowary utilisation areas, identification of water sources, key movement/corridor areas, key foraging locations etc, will assist in ensuring that design of facilities is sympathetic to the management of cassowary habitat and interactions.

At the construction phase, all contractors must enter into a vigorous induction program as part of the EMP which would include specific elements such as:

- Vehicle movements, traffic speed and limitations
- Working hours
- Noise and lights
- Biosecurity (yellow crazy ants, electric ants, weeds, avian disease potential)

- Protocols for dealing with cassowaries at work sites, including de-escalating confrontations
- Enforce the no feeding, no external water, no rubbish work ethic.

The appointment of an Environmental Manager (or similar) for the Wangetti Trails Project could also include duties related to information, communication and education. Various mechanisms for different means of communication and their efficacy in getting the message across re: cassowaries, could be implemented with consideration of the target audience. Education / communication would range across various media, from booking offices, to signage, to social media/digital platforms. The program of education can also include commercial and non-commercial promotional material including on-line resources such as social media, at booking offices, the Wangetti Hub, government partner agency offices, local government offices, brochures at tourism information centres/etc.

Education material could also include signage at the Wangetti Hub, all camps/eco accommodation areas, on approaches to watercourse crossings in highest, high and moderate priority areas, and any other areas identified during the project's operation.

Prospective educational material can canvass:

- Cassowary behaviour and management, e.g., highlight no feeding, no deliberate approaches etc
- Ways to de-escalate unexpected interactions between cyclists, hikers and campers with cassowaries.
- Curfew times in relation to travel on the trails.
- Lights and noise minimising requirements.
- General camp/eco-accommodation cassowary habitat management protocols
- Biosecurity issues.
- Provision for hikers/cyclists to enter cassowary observation data (either scats or interactions) through web-based media, physical hardcopy at camp/eco-accommodation areas and telephone hotline (e.g., <http://www.daintreecassowary.org.au/index.php/submission>)

Much of the information for education and communication is already available through various government agencies, community groups and online resources. The Wangetti Trails Project, can adapt material to be specific to the requirements of the project, and the Cassowary Recovery Team, in the first instance, would be the most applicable contact in this regard.

5. Summary

5.1 Abundance and Distribution

Based on the modelling of Westcott et al (2014), survey results in 2019 and 2020, and field habitat assessments in 2020, cassowaries are believed to be in low abundance (possible as few as 8 to 9 individuals) over an area of approximately 4,000 ha, centred on the upper Spring Creek, Allen Creek catchments in the Wangetti North Trail sections, and in the Big Rooty and Hartleys Creek catchments in the Wangetti Trail mountain bike sections. There are no records of cassowaries within the majority of Wangetti South trail area, nor does suitable habitat exist over most of this trail. The only exception is the Wangetti coastal plain, however cassowaries have not been recorded in this area since 1907 and are locally extinct.

Cassowaries are a cryptic species, and simple counts of observed scats indicates utilisation of an area but does not indicate specific individuals. DNA faecal analysis and/or long-term intense area surveys are required to determine more accurately the numbers of cassowaries and their home range extent within the Wangetti Trails project area.

5.2 Key Threatening Processes and Impacts

The primary threatening process to cassowaries within the Wangetti Trails project area is believed to be anthropogenic interactions that result in behavioural impacts. Notably, this includes the potential for cassowaries to access resources e.g., rubbish, litter or other potential food sources and/or being hand fed along trails and in camps and eco-accommodation areas. Available permanent surface water in core rainforest habitat areas is restricted in the project area by comparison with coastal lowlands habitats. Subsequently there is also the potential for cassowaries to access permanent water sources that may be present in camps/eco-accommodation areas, particularly during drier times of the year. Cassowaries use vocalisation over large distance to locate and communicate with other cassowaries, and noisy camp/eco-accommodation areas in cassowary habitat may stress and cause animals to abandon parts of their ranges, potentially putting them into conflict with the home ranges of neighbouring cassowaries.

Habitat degradation as a result of the project will be minimal, with trails in the highest, high and moderate mapped priority habitat management areas primarily using existing tracks, roads and infrastructure (e.g., Southedge Road, Black Mountain Road, Twin Bridges Road). Most habitat removal will be along the Wangetti South Trail, the majority of which is not within mapped essential cassowary habitat. While habitat condition and integrity as a result of logging, cyclones and altered fire regimes do not represent optimal habitat conditions for cassowaries, ecosystems are in a state of advancing restoration, and there is minor potential for degradation to water quality and soil/water processes as a result of the construction/operational phases. These are expected to be addressed through the EMP for the project.

Table 6 following, sets out a detailed summary of the likely impacts various project elements on cassowary behavioural aspects, the nature of the interactions and summary of proposed management measures.

Table 6 Summary, key behavioural aspects, threatening process and general mitigation

Behaviour and Aspect	Nature of Interaction	General Mitigation (full reference Table %)
<p>Resource access, water.</p> <p>Cassowaries require daily access to permanent water for drinking and bathing within their home range, usually using the same general location that has an easy access. They will also use ephemeral streams on an opportunistic basis.</p> <p>Permanent accessible water appears to be the major determinant of cassowary distribution and potential abundance along the trails. Permanent water is found along Allen Creek and other tributaries of Spring Creek which parallel the Twin Bridges track north of Camp 2. Camp 2 is also located less than 100m from permanent water, and a cassowary was photographed here in October 2020 and scats observed within two km in 2019 field surveys.</p> <p>The camp sites and eco accommodation have the potential to have open source water areas that may include dripping taps, wash basins, water tanks, etc, that may serve as attractants to cassowaries, particularly during dry periods of the year when opportunistic ephemeral water is not available. Cassowaries are known to access urban garden ponds, sprinkler systems and other similar water sources.</p>	<p>Cassowaries may be cumulatively impacted through noise, human activity, and partial clearing of movement corridors from accessing habitual watering locations. Camp 4 has a footprint of 3.5ha, directly within a confirmed cassowary occupation area, with a potential for up to 40 campers per night (20 within camp ground, 20 at eco accommodation areas). With any open source water present there is a very high probability of interactions between cassowaries accessing open source water (if present) and camp ground users.</p> <p>Users of the trails will cross two permanent water sources in high priority management areas, and sections of trails are parallel in close proximity to permanent water. There is a high probability that cassowaries will be encountered by some users in these localities.</p> <p>Cassowary response may vary, depending largely on the site-specific situation of the interaction. Cassowaries may simply retreat from trails and areas in frequent human use, or may, depending on territorial and parental instinct, defend territory (including food tree resources) and chicks (if present) vigorously.</p>	<ul style="list-style-type: none">- Ensure that there is no cassowary accessible permanent water source within the camp and eco accommodation areas.- Signage for camp and eco accommodation users at all water sources/disposal areas regarding water management and security from cassowary access- No development west of Twin Bridge Road and south of existing east-west track at Camp 4- Warning signs and speed limiting signs on approaches to bridges over permanent water where cassowaries may be likely to be encountered.- New bridges over permanent watercourses are to allow head room of 2m to enable cassowary undercrossing via creek bed- Rain water collection points off roofing (e.g.,, water tanks) to be sealed.- Waste water management at the camp area and eco-accommodation similarly must take into account potential cassowary access and potential to impact on local water source quality. Grey water discharge, including irrigation from eco accommodation for example, is not to occur into a situation where the discharge can be accessed by cassowaries.- Abstraction of water from surface watercourses is not to occur at any location.- Storm water discharge from eco accommodation and drain about the camp areas must not drain into any adjacent perennial water course.
<p>Resource access, food resources</p> <p>While cassowaries are omnivorous, they are reliant on core rainforest types that have a high representation by suitable food plants, and also reliant on more marginal habitat areas for seasonal resources that may not be available in core habitat. The home range for cassowaries in the project area is expected to be larger than that for birds in the lowlands owing to wider and less reliable water sources and a high level of habitat disturbance. These home ranges may vary from season to season and overlap with adjoining territories A large number of cassowaries foodplants have been identified in mesophyll rainforest types in primarily high priority (and highest priority) management areas, with a significantly lower representation in more marginal habitats, e.g., notophyll vine forests, and fewer still in sclerophyll rainforests. Many of the successional species in the disturbed mesophyll areas are important cassowary food plants, e.g., those species in the Elaeocarpaceae family.</p> <p>While cassowaries are known to share communally share important fruiting trees with other cassowaries (e.g., a mast flowering/fruiting event), this is a rare event and they are more prone to defend key food plants than share them. This includes vigorous intimidation of other animals, and humans, that may be in the vicinity and considered a threat to their food source.</p>	<p>Access to important foraging areas may be treated in a similar manner as access to water. Cassowaries have an internal 'map' for locations of important food plants in their home range and have been documented as accessing an important food source despite clearance of vegetation leaving a particular tree behind. That is, if an important food plant/tree is left within the boundary of a camp area/eco accommodation area, then in the absence of any significant hindrance (infrastructure, human activity/noise) cassowaries would reasonably be expected to continue accessing that resource. In this instance they would come into contact with camp users, with varying behaviour responses that may include defending that resource from a perceived threat, simply ignoring human presence, or retreating.</p> <p>Conversely, if the cassowary can no longer access that resource, e.g., clearing, infrastructure obstruction, then that is a direct impact on habitat resources supporting that bird (and potentially offspring), within that home range. If a particular tree is an important annual seasonal resource, then the loss of that tree, either through obstruction, human activity or clearing, may have significant impacts on an individual/offspring.</p> <p>Important fruiting trees beside the trails may attract seasonal visitation and cassowaries may regard users of the trail as threats, and either defend their resource, or abandon it for the duration that people are present.</p> <p>Rehabilitation/revegetation may be required in some localities post-construction and/or during operation. The planting of cassowary foodplants in locations close to high use trail and camp areas is strongly not recommended as it may encourage cassowaries into situations where interaction with humans and trail/camp activities (e.g., servicing/maintenance) may be unavoidable.</p>	<ul style="list-style-type: none">- Site based planning of camp and eco – accommodation must take into account location and importance of potential cassowary food plant resources. Any significant (e.g.,, a large fruiting tree) within the camp area should be retained within buffering vegetation or vegetated corridor through the camp and not be an isolate.- Cassowary food plants are not to be used in revegetation/rehabilitation in high use human activity areas, e.g., around the camps.- Rubbish at camp and eco accommodation area must in be situations that cannot be accessed by cassowaries.- Organic waste cannot be composted on-site and must be disposed of (preferably off site) daily in a manner / location that is not detectable or accessible by cassowaries. This includes all kitchen waste from the eco-accommodation area.- Permanent barrier fencing, of any sort, is not be employed in any situation. Any secured areas e.g., around waste disposal locations, should use wooden palisade fencing. Temporary fencing for construction purposes (e.g., around open pits, newly laid concrete areas) will not be made of wire, nor obstruct movement across the general site area. No fencing of any type to be used in vegetation retained for corridor/habitat purposes within the Camp 4 general site.- General educational signage at trail heads, Wangetti Hub, at all eco accommodation areas, camps and potential rest areas, must directly identify that feeding of cassowaries is not to occur under any circumstance, the appropriate rubbish disposal protocols while hiking/cycling, and waste management requirements at camp and eco accommodation areas.- General education on cassowaries as per the following notes should also be pursued.
<p>Territorial and threat perception</p> <p>Cassowaries are known to have home ranges which are largely determined by habitat quality, including variability in habitat for seasonal resources, access to permanent water, and core habitat with staple food plants present. Cassowaries have various documented responses to incursions to their home ranges and perceived threats, either to resources in their home range, themselves, or chicks. Individual birds have varying responses to</p>	<p>As noted, the responses of individual cassowaries to the same perceived threat/activity are not consistent and will vary from bird to bird. Also, the response of the same bird cannot be taken for granted to be predictable. The same individual may respond differently to the same territorial/perceived threat at different times (e.g., males with chicks present).</p> <p>For all interactions, the constant response must be from users of the trail and</p>	<ul style="list-style-type: none">- Education on ways to de-escalate unexpected interactions between cyclists, hikers and campers (either camps or eco accommodation areas) is the singularly most important element in managing encounters with cassowaries.- Education can begin with all commercial and non-commercial promotional material including on-line resources such as social media, at booking offices, the Wangetti Hub, government partner agency offices, local government offices, brochures at

Behaviour and Aspect	Nature of Interaction	General Mitigation (full reference Table %)
<p>these aspects, with individual birds having responses to the same perception in different manners. Cassowaries have no fixed behavioural response, which may vary from indifference to vigorous (and aggressive) defence.</p> <p>Particular aspects to this project may include food trees adjacent to trail (or in camp areas), which may lead to interactions between feeding cassowaries and hikers/ mountain bike users, cassowaries with chicks on the trail being startled or approached by hikers/ mountain bike users, adult cassowaries themselves being startled e.g., by fast moving mountain bikes on sections on the trail where birds cannot be seen on the trail, e.g., on sharp bends. The presence of dogs (particularly) are seen as a threat, or any other unexpected interaction generally where the cassowary has no forewarning of the approach of people.</p>	<p>the camping/eco accommodation areas. This will be to de-escalate the potential for threatening interactions by withdrawal from the location at the earliest opportunity.</p> <p>Mountain bike users, at speed, present a challenge in addressing this issue where the rider cannot see forward around blind corners on descents, and particularly on approaches to water courses and gully areas, which are key cassowary utilisation areas. There is a probability albeit low, that cassowaries in in these trail “blind spots” may have a very vigorous response and/or be injured when surprised/encountered by a fast-moving bike.</p>	<p>tourism information centres/etc.</p> <ul style="list-style-type: none">- Existing information from QPWS, WTMA, and other agencies and community groups on how to respond to a cassowary interaction are already available. Leverage could be made of these existing sources, coupled- The operator of the facilities and trail should have an information officer or similar position to support education, cassowary interactions and the monitoring program. This may be part of a wider environmental role for this position.- Domestic animals, under no circumstances, are to be taken into any part of the project area, trails, or camp grounds, nor to accompany service/maintenance vehicles during operation (even if they stay in the vehicle).- Cyclists and hikers must not use any trail before first light and after last light each day, times dependent on the season. Times to be set by camp/trail operators with consideration of seasonal visibility early morning/late afternoon.- Alignment of the mountain bike only trail, and shared use trail should include consideration of clear line of sight when approaching watercourses and “blind corners” in high and highest priority areas. The distance of clear line of sight should consider the speed factor (e.g., slope, for cyclists) and the ability to respond to a cassowary. No minimal distance is suggested at there are no known standards, but the distance should be enough for a downhill cyclist to come to a safe stop on sighting a cassowary on a bend.
<p>General disturbance, construction and operation aspects</p> <p>As has been noted, the behavioural response of individual birds will vary, and an individual’s response to the same disturbance may also vary from event to event. Some behavioural aspects however have been observed to be generally consistent. For example, cassowaries will avoid situations of high activity associated with construction at the eco accommodation areas. This may be temporary and reversible, depending on the nature of the vegetation cleared, and restrictions to site resources, e.g., notable food plants cleared, or access to permanent water restricted.</p> <p>Vegetation clearing and chainsaws are a high disturbance issue as are generators for electrical tools and other equipment in use during construction. These are generally deterrents to cassowaries, with birds retreating to other sections of their range. Other noise: humans talking, vehicles, hammering, using tools, etc during construction are less intrusive, but similarly will result in birds retreating to other areas of their home range. This is applicable to both trail construction and camp / eco-accommodation areas.</p> <p>This may be problematic in those situations where key resources, such as permanent water, are not accessible during construction or important food trees may be lost.</p> <p>Cassowaries use vocalisation to communicate and locate other cassowaries across sometimes large areas. This is particularly important during the breeding season.</p> <p>Operationally, noise and traffic (including maintenance and service traffic) along the trail areas are not anticipated to have a measurable effect on cassowary behaviour, excepting for those general notes under Territory and Threat Perception (point previously). Cassowary abundance and distribution in key habitat areas (those mapped as high and highest priority) is considered to be sparse, and the numbers of hikers and trail riders will be capped and subject to quotas. Camp 4 and immediate surrounds is the only location with a very high probability of cassowaries at some stage interacting with people, with the probability increased if there are obvious resources, such as permanent water or food resources present (both natural sources and anthropogenic sources).</p> <p>Noise at the camp areas during the day is anticipated to be a minimal disturbance and unlikely to be a deterrent to cassowaries accessing those areas if resources are present. However excessive and disruptive noise, e.g., radios, media devices, generator equipment have the potential to stress cassowaries in proximity to these impacts as it effectively renders them incapable of communicating/locating other cassowaries.</p>	<p>Primarily, direct interactions between cassowaries and human activity are not anticipated during construction owing to the high level of noise and human presence related to certain activities (e.g., vegetation clearing and building construction). Cassowaries in these situations generally respond through withdrawal to other parts of their home range, and will only resume their utilisation area post disturbance. If key resources (including removed food plants or access to permanent water) in the activity area (construction areas along trails or camps) are permanently removed, then re- occupation of that part of their home range may not occur (other than traversing).</p> <p>Provided cassowaries have visual or audible warning of cyclists or hikers approaching, then similarly the normal expected response would be for cassowaries to withdraw into adjoining habitat (temporarily). On occasions they may hold their ground if the interaction is unexpected/unannounced.</p> <p>As noted, cassowaries are diurnal, most active earlier in the mornings and later in afternoons. They are seldom active in the evenings. The minimal lights and noise at the camps in the evenings are not anticipated to result in any human/cassowary interactions unless cassowaries are attracted by some aspect, e.g., water availability. Night time trail use by cyclists/hikers will not occur. Minor camp noise during the day will not deter cassowaries from accessing camp areas, particularly if there are anthropogenic sources of water and food resources accessible. However, continued disruptive loud noise during the day and in the evenings, has a high potential to stress cassowaries in the locality who may abandon part of their range as a result.</p> <p>Eco-accommodation, and general camp areas and trail will require maintenance and servicing by mechanised vehicles. Access roads and trails to all but Camp 4 and the high priority trail areas are not in localities where cassowaries are known to occur, nor predicted to occur in other than inverly rare transitory and opportunistic circumstances. In most cases not at all. Vehicle access to Camp 4 will require traverse of high priority cassowary management areas. Vehicle type, speed and driver education are the primary determinant in the nature of any type of interaction with cassowaries along the service road.</p>	<p>The Environmental Management Plan (construction and operation/maintenance) will have a clearly defined element that specifically addresses the potential for impacts on cassowaries arising from the project, and will identify the mitigation mechanisms that must be implemented to address these. These will include the following as a minimum</p> <ul style="list-style-type: none">- Helicopters cannot be used for transport/construction in any low, moderate, high and highest priority areas. The only exception for helicopter access to these areas will be for emergency situations.- Domestic animals, under no circumstances, are to be taken into any part of the project area, trails, or camp grounds, nor to accompany service/maintenance vehicles during operation (even if they stay in the vehicle).- Any development adjacent permanent or significant ephemeral watercourses (e.g., bridge works) will have full erosion and sediment control measures implemented and maintained for the duration of the works as per the ESCP to be developed for the project. The ESCP is not to be a generalised document, but will address specific infrastructure requirements for any works in moderate, high and highest priority areas.- On any construction work site, should a cassowary approach the works area then works in that particular location will cease until the cassowary has left of its own accord. All construction work should have a plan for alternate work sites and tasks in this contingency.- As per the EMP for the project, all machinery used in construction and operation should be silenced to manufacturers specifications and maintained to that condition. Lighting and electrical supply to the eco-accommodation and emergency lighting should be reliant on alternatives to fuel generators.- Lighting (where required) to be confined to directional and subdued lighting and address Australian Standard AS/NZS 4282:2019. <i>Control of the obtrusive effects of outdoor lighting</i>, which provides information in Appendix C about the impact of artificial light on biota.- Vehicles will be required to service the construction and operation/maintenance of the facilities. Motorised vehicles may range from quad bikes (or similar) to 4WD vehicles and light trucks. All drivers are to be aware of speed limits for the varying sections of road/track.

Behaviour and Aspect	Nature of Interaction	General Mitigation (full reference Table %)
<p>Monitoring and management responses</p> <p>Monitoring of cassowary habitat, individual birds and of encounters with cyclists/hikers and service providers (e.g., maintenance contractors for eco-accommodation areas) will form the cornerstone of determining management responses to habitat maintenance and in dealing with individual birds where intervention is deemed necessary. Monitoring will require a multi-task approach, as cassowaries in the project area are considered to have a low population density with a sparse distribution.</p> <p>Monitoring of cassowary activity, habitat status and interactions will be the responsibility of the trail/camp operator in cooperation with members of the Cassowary Recovery Team.</p> <p>The key element to monitoring will be having multiple mechanisms whereby cyclists, hikers and campers (and staff servicing the trail/infrastructure) are able to communicate encounters and observations. Scientific monitoring methodologies e.g., use of DNA to identify individual birds through scat collection and analysis, will depend on the inputs and requirements from research members of the Cassowary Recovery Team.</p>	<p>The Queensland National Parks and Wildlife Service (QPWS) under the Qld <i>Nature Conservation Act 1992</i> has the final responsibility in determining any management response that involves direct manipulation of cassowaries, or their habitat. In order to determine an appropriate response to any negative interaction (e.g., territorial cassowary within campgrounds), it will be necessary for the management authority to have full access to all data, information and other relevant factors collected during the monitoring program relevant to that situation.</p> <p>Management responses may vary from measures that can be implemented by trail and camp/eco-accommodation operators, e.g., altering speed limits, temporary restrictions on access to certain areas, modifying water source availability within camp areas; to direct intervention by QPWS that may include (at the extreme) relocation of a bird following problematic, repeat negative interactions that cannot be managed at the operator level.</p>	<ul style="list-style-type: none">- Clearly defined reporting mechanisms and responsible agencies/authorities are to be enacted for the project. A range of reporting situations are to be covered that reflect compliance with permit conditions and recommendations from Cassowary Recovery Team- Provision for hikers/cyclists to enter cassowary observation data (either scats or interactions) through web-based media, physical hardcopy at camp/eco-accommodation areas and telephone hotline.- Cassowary data to be shared with the Cassowary Recovery Team, who will have access to all observation data. This may be through direct access to online data, including the data recording portal being set up within one of the existing CCT cassowary information portals, reporting mechanisms on a regular basis by the trail/camp operator or on as needs basis (e.g., on negative interactions being recorded).- Education on ways to de-escalate unexpected interactions between cyclists, hikers and campers (either camps or eco accommodation areas) is the singularly most important element in managing encounters with cassowaries.- Education will include signage at the Wangetti Hub, all camps/eco accommodation areas, on approaches to watercourse crossings in highest, high and moderate priority areas, and any other areas identified during the ongoing operational monitoring program.- The program of education will also be implemented through online and digital media resources acting as a promotional vehicle, with booking agencies, social media or any other media that acts as a commercial mechanism for the operator.

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APPENDIX A:

Cassowary Foodplants Recorded within the Project Area

Cassowary foodplants recorded within the project area, including field observations, regional ecosystem detailed descriptions, HERBREC, WildLife OnLine. This does not necessarily represent all foodplants present. Detailed audits of the construction footprints would be required to establish those of significance in the habitat areas. Revegetation within areas of high human utilisation locations, e.g., camp areas, should avoid using the following in rehabilitation efforts.

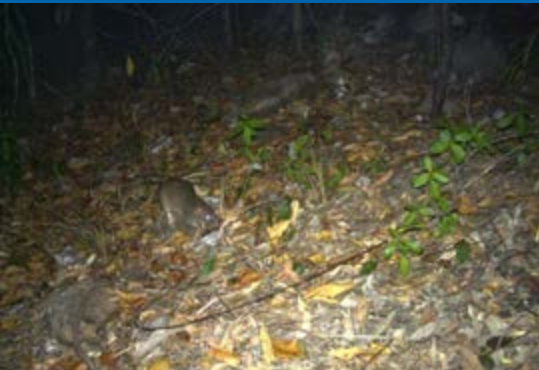
Family	Species	Common Name
Anacardiaceae	<i>Pleiogynium timorense</i>	Burdekin Plum
Annonaceae	<i>Cananga odorata</i>	Ylang Ylang
Apocynaceae	<i>Cerbera floribunda</i>	Cassowary Plum
Araliaceae	<i>Leea indica</i>	Bandicoot berry
Araliaceae	<i>Polyscias australianum</i>	Ivory Basswood.
Arecaceae	<i>Archontophoenix alexandrae</i>	Alexandra Palm.
Arecaceae	<i>Licuala ramsayi</i>	Fan palm
Arecaceae	<i>Ptychosperma elegans</i>	Solitaire Palm.
Asparagaceae	<i>Cordyline cannifolia</i>	Cordyline
Asparagaceae	<i>Cordyline petiolaris</i>	Palm Lily.
Burseraceae	<i>Canarium australianum</i>	Mango bark
Burseraceae	<i>Canarium muelleri</i>	Scrub Turpentine
Combretaceae	<i>Terminalia sericocarpa</i>	Damson Plum
Cunoniaceae	<i>Davidsonia pruriens</i>	Davidsons plum
Elaeocarpaceae	<i>Aceratium megalospermum</i>	Bolly carabeen
Elaeocarpaceae	<i>Elaeocarpus bancroftii</i>	Kuranda quandong
Elaeocarpaceae	<i>Elaeocarpus eumundii</i>	Eumundii Quandong
Elaeocarpaceae	<i>Elaeocarpus grandis</i>	Blue Quandong

Family	Species	Common Name
Lamiaceae	<i>Gmelina dalrympleana</i>	White beech
Lamiaceae	<i>Gmelina fasciculiflora</i>	White beech
Lauraceae	<i>Beilschmiedia obtusifolia</i>	Blush walnut
Lauraceae	<i>Beilschmiedia bancroftii</i>	Yellow walnut
Lauraceae	<i>Beilschmiedia recurva</i>	Ivory walnut
Lauraceae	<i>Beilschmiedia tooram</i>	Brown walnut
Lauraceae	<i>Cryptocarya clarksoniana</i>	Clarkson's laurel
Lauraceae	<i>Cryptocarya grandis</i>	Cinnamon laurel
Lauraceae	<i>Cryptocarya hypospodia</i>	Purple laurel
Lauraceae	<i>Cryptocarya laevigata</i>	Glossy laurel
Lauraceae	<i>Cryptocarya mackinnoniana</i>	Rusty laurel
Lauraceae	<i>Cryptocarya murrayi</i>	Murrays laurel
Lauraceae	<i>Cryptocarya triplinervis</i> var. <i>riparia</i>	Three vein laurel
Lauraceae	<i>Endiandra compressa</i>	Greenheart
Lauraceae	<i>Endiandra hypotephra</i>	Rose Walnut
Lauraceae	<i>Endiandra sankeyana</i>	Sankeys walnut
Lauraceae	<i>Endiandra wolfei</i>	Black Mountain laurel
Lauraceae	<i>Litsea leefeana</i>	Brown Bollywood
Lauraceae	<i>Neolitsea dealbata</i>	Grey Bollywood
Lecythidaceae	<i>Barringtonia calyptrata</i>	Cassowary Pine
Moraceae	<i>Ficus benjamina</i>	Weeping fig
Moraceae	<i>Ficus congesta</i>	Red Leaf Fig
Moraceae	<i>Ficus copiosa</i>	Plentiful fig
Moraceae	<i>Ficus drupacea</i>	Red fig
Moraceae	<i>Ficus hispida</i>	Hairy fig
Moraceae	<i>Ficus racemosa</i>	Cluster Fig
Moraceae	<i>Ficus septica</i>	White stemmed fig
Moraceae	<i>Ficus variegata</i>	Variegated fig
Myrtaceae	<i>Archirhodomyrtus beckleri</i>	Small leaf myrtle
Myrtaceae	<i>Decaspermum humile</i>	Brown myrtle
Myrtaceae	<i>Gossia bidwillii</i>	Python tree
Myrtaceae	<i>Gossia dallachiana</i>	Lignum
Myrtaceae	<i>Rhodamnia sessiliflora</i>	Iron mallet
Myrtaceae	<i>Syzygium alliligneum</i>	Onionwood

Family	Species	Common Name
Myrtaceae	<i>Syzygium angophoroides</i>	Yarrabah satinahs
Myrtaceae	<i>Syzygium australe</i>	Creek lily pilly
Myrtaceae	<i>Syzygium cormiflorum</i>	Bumpy satinash
Myrtaceae	<i>Syzygium cryptophlebium</i>	Powderpuff lily pilly
Myrtaceae	<i>Syzygium divaricata</i>	Cassowary Satinash
Myrtaceae	<i>Syzygium fibrosum</i>	Sour satinash
Myrtaceae	<i>Syzygium forte ssp forte</i>	White apple
Myrtaceae	<i>Syzygium graveolens</i>	Cassowary Satinash
Myrtaceae	<i>Syzygium gustavioides</i>	Watergum
Myrtaceae	<i>Syzygium hemilampra</i>	Broad leaf lilly pilly
Myrtaceae	<i>Syzygium kuranda</i>	Kuranda satinash
Myrtaceae	<i>Syzygium leuhmanii</i>	Small leaf lilly pilly
Myrtaceae	<i>Syzygium suborbiculare</i>	Lady apple
Myrtaceae	<i>Syzygium tierneyanum</i>	River Cherry
Myrtaceae	<i>Syzygium wilsonii</i>	Powderpuff lily pilly
Oleaceae	<i>Chionanthus ramiflorus</i>	Northern Olive
Phyllanthaceae	<i>Breynia sp. Black Mountain</i> (B.Hyland 25658RFK)	Breynia
Phyllanthaceae	<i>Breynia stipitata</i>	Breynia
Podocarpaceae	<i>Podocarpus grayae</i>	Brown pine
Rhamnaceae	<i>Alphitonia whitei</i>	Red Ash
Rhizophoraceae	<i>Carallia brachiata</i>	Corky bark
Rosaceae	<i>Prunus turneriana</i>	Almondbark
Rubiaceae	<i>Atractocarpus fitzalanii</i>	Native gardenia
Rubiaceae	<i>Atractocarpus sessilis</i>	Brown gardenia
Rubiaceae	<i>Cyclophyllum coprosmoides</i>	Coffee canthium
Rubiaceae	<i>Morinda citrifolia</i>	Cheese fruit
Rubiaceae	<i>Nauclea orientalis</i>	Leichardt Tree
Rutaceae	<i>Acronychia acidula</i>	Lemon Aspen
Rutaceae	<i>Acronychia acronychioides</i>	White aspen
Rutaceae	<i>Acronychia vestita</i>	Hairy aspen
Salicaceae	<i>Scolopia braunii</i>	Flintwood
Sapindaceae	<i>Agelia sapindina</i>	Boodyarra
Sapindaceae	<i>Castanospora alphanthii</i>	Brown Tamarind

Family	Species	Common Name
Sapindaceae	<i>Diploglottis diphylostegia</i>	Northern tamarind
Sapindaceae	<i>Diploglottis smithii</i>	Smith's Tamarind
Sapindaceae	<i>Ganophyllum falcatum</i>	Scaley Ash
Sapotaceae	<i>Niemeyera prunifera</i>	Boxwood
Sapotaceae	<i>Palaquium galactoxylon</i>	Pencil cedar
Sapotaceae	<i>Planchonella chartacea</i>	Thin leaf coondoo
Sapotaceae	<i>Planchonella myrsinodendron</i>	Yellow boxwood
Sapotaceae	<i>Planchonella pohlmaniana</i>	Boxwood
Thymelaeaceae	<i>Phaleria clerodendron</i>	Scented daphne
Zingerberaceae	<i>Alpinia caerulea</i>	Native ginger

Appendix C – Preliminary Weed, Pest, and Disease Management Plan



Department of State Development, Tourism, and Innovation

Wangetti Trail South Section (Wangetti to Palm Cove)

Preliminary Weed Pest and Disease Management Plan

February 2021



Abbreviation and acronyms

Abbreviation/acronym	Definition
AS	Australian Standards
AWTGS	Australian Walking Track Grading System
Biosecurity Act	<i>Biosecurity Act 2014</i>
DAF	Department of Agriculture and Fisheries
DAWE	Department of Agriculture, Water and the Environment
DES	Department of Environment and Science
DSDTI	Department of State Development, Tourism and Innovation
EMP	Environmental Management Plan
EP Act	<i>Environmental Protection Act 1994</i>
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
GBO	General Biosecurity Obligation
GED	General Environmental Duty
IPAC	Invasive Plants and Animals Committee
MNES	Matters of National Environmental Significance
MSES	Matters of State Environmental Significance
MTBA TDRS	Mountain Bike Trail Guidelines Trail Difficulty Rating System
PMST	Protected Matters Search Tool
PSTR	Pre-Start Trail Review
QLD IPAS	Queensland Invasive Plants and Animals Strategy 2019-2024
QPWS	Queensland Parks and Wildlife Service
TDPD	Tourism Development Projects Division
Wet Tropics	Wet Tropics of Queensland
WHD	Weed Hygiene Declarations
WoNS	Weeds of National Significance
WPDMP	Weed, Pest and Disease Management Plan
WTMA	Wet Tropics Management Authority
WTWHA	Wet Tropics World Heritage Area

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Appendices

Appendix A – Map showing distribution of weeds, pests and pathogen
Appendix B – Factsheets about the identification and treatment of high risk weeds, pests and pathogens

1. Introduction

1.1 Project background

The Department of State Development, Tourism and Innovation (DSDTI) – Tourism Development Projects Division (TDPD) is proposing to establish the Wangetti Trail – Wangetti South (Project) Section, a 29.7 kilometre (km) shared use trail to accommodate both mountain bike users and hikers from the southern boundary Lot 2 SP309094 in the township of Wangetti, to Palm Cove (refer to Figure 1-1).

The Wangetti South Section will comprise of the following components:

- 29.7 km shared use trail to accommodate both mountain bike users and hikers, consisting of natural ground and surface treatments, which will be a maximum of 1.5 m wide. The 1.5 m wide trail will be located within a 40 m survey corridor, referred to as the construction allowance corridor, to allow flexibility for the placement of infrastructure during the construction phase. The trail has been designed to be a 'Mountain Biking – intermediate (blue square with blue outline) as defined in the Australian Mountain Bike Trail Guidelines Trail Difficulty Rating System (MTBA TDRS) and grade 3 for hikers, as defined in the Australian Walking Track Grading System (AWTGS), which also equates to Class 3 in the Australian Standard for Walking Tracks, Part 1: Classification and Signage (AS 2156.1-2001). The trail will have an average gradient of <10% and a maximum gradient no greater than 15% (for short distances only). Built structures proposed as part of the trail include gully crossings, bridges, staircases, platforms, rock armouring and signage, where appropriate and required.
- A number of waterway crossings along the shared use trail that will comprise of the following: rock armouring, boulder crossings and low-level bridge (minor water crossing).
- Dark Jungle (public camping node and amenities block).
- The formalisation of existing access tracks into service tracks to provide restricted access to the shared use trail and Dark Jungle for construction purposes, operational purposes, maintenance purpose and for emergency purposes.

The Wangetti South Section is being proposed over four properties located within the Douglas Shire Council and Cairns Regional Council local government areas. The project area intersects both the Macalister Range National Park and the Wet Tropics World Heritage Area (WTWHA).

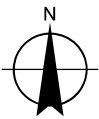
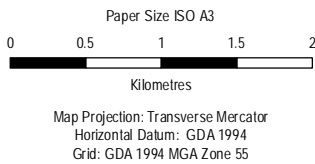
The project is being delivered by TDPD as part of an adventure-based ecotourism development in north Queensland. The shared use trail will provide walkers and mountain bike riders with a unique experience to traverse through natural areas of north Queensland covering bushland and coastal areas, including the Wet Tropics of Queensland (Wet Tropics), and national parks.

Development of a Weed, Pest and Disease Management Plan (WPDMP) is required to demonstrate the management of weeds, pest and disease during the construction and operational phases of the Wangetti South section. This report is based on desktop information available at the time of preparation. A detailed weed survey was not carried out during previous ecological surveys of the project area, however general observations were made of weed and pest species within the project area.

It forms part of a sub-plan in the Environmental Management Plan (EMP) for the Wangetti South Section. This document, and focuses on the management of weeds, pests and diseases throughout the Project.



Based on or contains data provided by the State of QLD (DNRME) 2020. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for marketing or be used in breach of the privacy laws.



DITID
Environment Assessment Stage 2 Wangetti Trail

Project No. 41-32458
Revision No. 5
Date 1/12/2020

Wangetti South Section Project Locality Plan

FIGURE 1-1

1.2 Purpose, objectives, and structure of this report

TDPD and the operator of the Wangetti South Section Project have both a legal and social reasonability to manage existing weeds, pests and disease within the Wangetti South Section and to prevent the further spread of biosecurity matters as a result of project activities during the construction phase and operational phase. This WPDMP has been prepared to satisfy the obligations and complements the overarching Wangetti South Section Environmental Management Plan.

The objectives of the WPDMP is to:

- Protect the biodiversity of the surrounding landscape of the adverse impacts from weeds.
- Reduce weed infestations by integrating control methods and cost-effective management.
- Manage weeds in disturbed areas and to protect rehabilitated areas.
- Manage the weed species that are currently present on the site as well as off-site work areas.
- Prevent introduction of new weed infestations to the Project area and adjoining areas.
- Increase on-site awareness about the major weed species and manage pest species through strategic management, where possible.
- Avoid and effectively manage impacts associated with weeds, pests and diseases.

The WPDMP provides an overview of the strategy, methods and controls implemented as part of the Wangetti South Section Project to manage the issue of weeds, pests and diseases.

Specifically, this WPDMP:

- Identifies weeds, pests and potential diseases within the Wangetti South Section project area; and
- Describes the weeds, pests, and disease management strategy, to identify, avoid and, prevent/minimise and control the introduction of and spread of weeds, pests and diseases within the Wangetti South Section and to neighbouring areas.

The WPDMP is to be implemented at the project area and is applicable to all activities that have the potential to introduce and/or spread of weeds, pests or disease throughout the construction and operational phases of the Project.

1.3 Limitations

This report has been prepared by GHD for Department of State Development, Tourism and Innovation and may only be used and relied on by Department of Innovation & Tourism Industry for the purpose agreed between GHD and the Department of Innovation & Tourism Industry as set out in Section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other Department of State Development, Tourism and Innovation arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

1.4 Acronyms, Terms and Definitions

This section provides definition of terminology used throughout this report.

Clean means free from any pest plant and pathogen reproductive material.

For vehicles, plant and equipment, 'clean' means that no soil and/or, organic matter that may contain pest plant and pathogen reproductive material, is on or in areas that are accessible during cleaning and maintenance work. A vehicle is considered to remain clean if it leaves its point of origin clean and only travels on sealed roads or well-maintained unsealed roads.

Contractor is any person undertaking work for or on behalf of the Project.

Pathogen includes any disease-causing organism such as bacteria, parasites, viruses or fungi.

Pest means any animal, plant, parasite or disease causing organism (such as bacteria, virus or fungus) capable of causing adverse impacts to environmental, economic or social values, whether or not it is declared and listed in the *Biosecurity Act 2014* (Biosecurity Act) and *Biosecurity Regulation 2016* (Biosecurity Regulation).

Pest management includes all activities involved in the planning, detection, control, monitoring or eradication of pests in QPWS managed areas.

Pest plant means any plant capable of causing adverse impacts to environmental, economic or social values whether or not it is a declared plant listed in the Biosecurity Act and Biosecurity Regulation.

QPWS managed areas include protected areas (State land) managed under the *Nature Conservation Act 1992* and other areas managed by QPWS including a range of freehold lands, *Land Act 1994* reserves and other tenures.

QPWS Pest Management System refers to a system to facilitate pest management planning and reporting which guides operational implementation, including monitoring, on all QPWS managed areas.

Reproductive material is any part of a pest plant or pathogen that is capable of sexual or asexual reproduction. Examples include, but are not limited to:

- Seed;
- Spores;
- Roots, bulbs, rhizomes, stolons, tubers, or parts thereof;
- Stem or leaf pieces; and
- Whole plants or fungi.

Surrounding area or surrounding environment area adjoining the 40 m construction corridor

Transport or utility corridor includes any formed or unformed road or track (gazetted or not), power line or pipeline (regardless of whether an easement exists) and associated access tracks.

Vehicle, plant and equipment includes, but is not restricted to, any car, motorcycle, truck, tractor, grader, tracked earthmoving equipment, boat, vessel, airplane or helicopter.

Visitor is any person who is not an employee that visits QPWS managed areas, for recreational or scientific purposes.

Weed and Seed Hygiene Declaration is the written declaration that may be required before supplying anything that is, or could be, contaminated with weeds and/or organic matter.

WoNS Weeds of National Significance

1.5 Site specific background documents

WPDMP has been prepared for both the construction phase and the operational phase of the Project and outlines measures to prevent the introduction of new weed species, pest species and diseases into the project area and minimise the spread of declared weeds, pests and disease within the surrounding area of the project area.

The Wet Tropics bioregion has diverse and complex flora and fauna protected within the Wet Tropics World Heritage Area and surrounding regions. Invasive species and diseases can have significant impacts on the bioregion. According to the Wet Tropics Management Authority – Invasive Pests - A threat to the WTWHA brochure dated 2016, the tropical climate of the WTWHA offers favourable growing conditions for exotic tropical plants and animals. There are a broad range of habitats offering varied temperatures and rainfall. The Wet Tropics has frequent cyclones, floods and droughts which can disrupt ecosystems and help spread weeds, diseases and, occasionally, feral animals such as tramp ants. For instance, cyclones can move weed seeds great distances via wind and water and destroy the rainforest canopy, allowing weeds to flourish.

This WPDMP has been developed in consultation with TDPD and the Department of Environment and Science (DES) and has considered QPWS operational policies, procedural guides, guidelines, information sheets, technical manuals, procedures and checklists associated with pest, weed and disease management and has also considered the information in the Wangetti South Section Baseline Ecology and Impact Assessment Report 2020 prepared by GHD.

2. Roles and responsibilities

This section outlines parties associated with the Wangetti South Section and the responsibilities regarding weeds, pests and disease management. All personnel are responsible for ensuring they comply with the EMP, their General Environmental Duty (GED) and Duty to Notify in accordance with the EP Act. Table 2-1 outlines the responsible parties for managing weeds, pests and pathogens.

Table 2-1 Environmental roles

Responsible parties	Responsibilities
TDPD	<p>TDPD is responsible for taking all reasonable and practical steps to minimise the risks associated with invasive plants under control within the project area. This is known as the General Biosecurity Obligation (GBO).</p> <p>The Project Manager shall support all project personnel in the implementation of the WPDMP. The Project Manager may delegate responsibilities to appropriately qualified personnel where appropriate.</p> <p>The Project Manager's responsibilities are to:</p> <ul style="list-style-type: none"> • Ensure that all personnel are familiar with the WPDMP and are aware of their environmental responsibilities. • Ensure that all personnel operate in accordance with the WPDMP, statutory approvals and legislative requirements. • Ensure necessary guidance and advice is provided to all personnel with regard to biosecurity management requirements. • Ensure that all relevant licenses/permits/approvals are in place prior to any works being undertaken (if required). • Undertake audits of the WPDMP and review environmental performance once a construction segment has been completed during the construction phase. Undertake audits of the WPDMP on a monthly basis during the operational phase of the project. • Where necessary, coordinate and/or assist in the response to environmental incidents through implementation of corrective actions. • Report environmental incidents to relevant Administering Authority.
Contractor's Project Manager Contractor's Trail Designer/Builder	<p>Implementation of the provisions relating to construction phase of this WPDMP during the construction phase including:</p> <ul style="list-style-type: none"> • Complying with the EMP, statutory approvals, legislative requirements, Australian Standards and any relevant Code of Practice and/or Industry Standard. • Provide the resources and training systems to develop, schedule and deliver induction to all staff and contractors including site induction and any relevant site-specific biosecurity training. • Record training events and maintain personnel records.

Responsible parties	Responsibilities
	<ul style="list-style-type: none"> • Provide portable toilets onsite if required and ensure that maintenance and disposal of waste is conducted by a licensed contractor as required. • Ensure all vehicles arriving onsite utilise the designated entry/exit points and parking area. Ensure that all equipment is fuelled, maintained and 'fit for purpose' for the required task prior to arriving at the site. • Notify the Project Manager of environmental incidents and corrective actions taken (if any). • Record and maintain a database detailing environmental incidents and non-conformances including corrective actions taken.
Operator in Partnership with DES/ QPWS	<ul style="list-style-type: none"> • Develop, implement, monitor, and maintain effectiveness of the WPDMP. • Liaise with relevant organisations in relation to biosecurity approvals. Identify, record, report (as required) and rectify non-compliances. Investigate and report biosecurity related incidents to TPDP/DES. Report biosecurity related incidents to regulatory agencies. • Complying with the EMP, statutory approvals, legislative requirements, Australian Standards and any relevant Code of Practice and/or Industry Standard. • Provide the resources and training systems to develop, schedule and deliver induction to all staff and trail users including site induction and any relevant site-specific biosecurity training. • Record training events and maintain personnel records.
All Personnel	<p>Adhere to the general biosecurity obligation as specified under the Biosecurity Acts. Implement the provisions of this plan where they apply to their day to day activities. Report any biosecurity non-compliances to operational management. Raise non-compliances with this WPDMP. Participate in biosecurity training as relevant.</p>

3. Legal and other requirements

3.1 Legislative framework

Applicable legislation, regulations, guidelines and strategies enacted by the Commonwealth, State of Queensland and local governments for weed, pest and disease management in the Wangetti South Section are described in the following sections.

3.2 Commonwealth, State and Local Government Legislation and Strategies

An overview of Commonwealth, State Government and local government legislation and strategies considered in the development of the WPDMP is presented in Table 3-1.

Table 3-1 Summary of applicable Commonwealth legislation and strategies

Act or Strategy	Summary of Act of Strategy
Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act)	The purpose of the EPBC Act is to provide a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities, and heritage places.
Australian Weeds Strategy 2017-2027 (AWS)	The purposed of the AWS is to provide a national guideline, outlining the principles that underpin weed management in Australia. The AWS aims to guide a coordinated effort for all jurisdictions and affected stakeholders, informing plans and actions by state and local governments, industry, landholders and communities (DAWE, 2017). The Invasive Plants and Animals Committee (IPAC) is responsible for reviewing the list of Weeds of National Significance (WoNS), all of which have individual national strategic management plans.
Biosecurity Act 2014 (Biosecurity Act)	<p>The purpose of the Biosecurity Act is to provide a framework for an effective biosecurity system and manage risks associated with emerging, endemic and exotic species. All individuals and organisations have a GBO under Biosecurity Act, which means that they are responsible for managing biosecurity risks that are under their control and that they know about, or should reasonably be expected to know about. Under the GBO, individuals and organisation whose activities pose a biosecurity risk must:</p> <ul style="list-style-type: none">• Take all reasonable and practical steps to prevent or minimise each biosecurity risk• Minimise the likelihood of causing a biosecurity event, and limit the consequences if such an event is caused• Prevent or minimise the harmful effects a risk could have, and not do anything that might make any harmful effects worse. <p>The Biosecurity Act takes a risk-based approach to biosecurity threats which allows greater flexibility and more responsive approaches to manage each specific circumstance focussing on biosecurity risks that are, or are</p>

Act or Strategy	Summary of Act of Strategy
	<p>likely to become, a significant problem for human health, social amenity, the economy or the environment. For example, a biosecurity risk exists where a person or organisation is moving soil, vegetation, machinery and/or equipment that could carry a weed or contaminant. Terms used under the Biosecurity Act are defined under legislation and can also be viewed on the Department of Agriculture and Fisheries (DAF) website. For the purpose of this CWMP, key terminology includes prohibited matter and restricted matter as defined within the Biosecurity Act 2014, as follows:</p> <ul style="list-style-type: none"> • Prohibited Matter is biosecurity matter not currently present or known to be present in Queensland. It is prohibited because it may have a significant adverse effect on a biosecurity consideration if it did enter Queensland. • Restricted Matter is biosecurity matter found in Queensland that may have adverse effects on a biosecurity consideration if conditions or restrictions under the Act were not imposed. Restricted invasive plants may fall into 1, a combination or all of Categories 2 to 5 (listed below). • Invasive plants are not prohibited or restricted invasive plants. Everyone is obligated to take all reasonable and practical steps to minimise the risks associated with invasive plants under their control.
<p>Department of Environmental and Science, 2013. Operational policy Pest plant and pathogen spread prevention QPW/2013/746 v1.03</p>	<p>The policy provides guidance for staff of the DES, QPWS on minimising pest plant and pathogen spread into, within and from QPWS managed areas.</p>
<p>Vehicle and machinery cleandown procedures 2019</p>	<p>The purpose of this procedure is to provide consistent approaches across Queensland to vehicle and machinery cleandown procedures and reduce risk of invasive species spread via transportation of vehicle and machinery across Queensland (DAF 2019a). Suitable Weed Hygiene Declarations (WHD) should be developed by the Contractor as appropriate to reflect Project activities and risks (e.g. vehicle inspections, vehicle wash/brush down, etc.).</p>
<p>Environmental Protection Act 1994 (EP Act)</p>	<p>The purpose of the EP Act is to protect Queensland environment while allowing for ecologically sustainable development. Under the EP Act, a person has a GED to not undertake activities that cause or are likely to cause environmental harm unless the person takes all reasonable and practicable measures to prevent and minimise the harm.</p>

Act or Strategy	Summary of Act of Strategy
	<p>General Environmental Duty</p> <p>Section 319 of the EP Act states that every person has a GED. This GED requires that a person must not carry out an activity that causes or is likely to cause environmental harm unless the person takes all reasonable and practicable measures to prevent or minimise the harm. In deciding measures to be undertaken to fulfil the GED the following must be considered:</p> <ul style="list-style-type: none"> • The nature of the harm or potential harm. • The sensitivity of the receiving environment. • The current state of technical knowledge for the activity. • The likelihood of successful application of the different measures that might be taken. • The financial implications of the different measures as they would relate to the type of activity.
Invasive pests - a threat to the Wet Tropics World Heritage Area prepared by Wet Tropics Management Authority	The Wet Tropics Management Authority has produced a brochure which highlights the importance of biosecurity and management of invasive pests in the Wet Tropics. The brochure also stresses the need for education, research and community participation to help control a range of weeds, feral animals and diseases in the Wet Tropics
Queensland Invasive Plants and Animals Strategy 2019-2024 (QLD IPAS)	<p>The QLD IPAS is a state-wide strategic planning framework that addresses the impacts caused by invasive plants and animals. The QLD IPAS aims to direct and facilitate strategic and targeted actions to reduce the impacts of invasive species and identifies the shared responsibility of state and local government, landholders, industry and community (DAF 2019b).</p> <p>This can be accessed from the DAF at:</p> <p>https://www.daf.qld.gov.au/business-priorities/biosecurity/policy-legislation-regulation/queensland-invasive-plants-animals-strategy</p>
Wet Tropics Management Plan 2020	The Wet Tropics Management Plan 2020 lists undesirable plants and regulates bringing them into the World Heritage Area
Wet Tropics Conservation Strategy 2004	<p>The Wet Tropics Conservation Strategy was developed by Wet Tropics Management Authority and the Queensland Parks and Wildlife Services. Conservation Strategy outlines actions to achieve the conservation, rehabilitation and transmission to future generations of the Wet Tropics World Heritage Area.</p> <p>The strategy identifies the need to address the many direct and underlying threats to the integrity of the Area. Integrated regional planning and cooperation with industry and the community will be necessary to minimise underlying threats to</p>

Act or Strategy	Summary of Act of Strategy
	<p>World Heritage such as population growth, agriculture and other farming, urban development, community infrastructure, water use, tourism and recreation. The strategy also addresses direct threats to the Area such as habitat loss and fragmentation through vegetation clearing, altered water flows and drainage, changed fire regimes and the spread of weeds, feral animals or pathogens.</p>
<p>Local Council Biosecurity Plans</p> <p>Cairns Region Biosecurity Plan 2019-2024</p> <p>Douglas Shire Biosecurity Plan 2017-2021.</p>	<p>Two local government areas are traversed by the trail. Each of these areas employ's its own biosecurity plan based on the Biosecurity Act. These plans prioritise Council's management of weeds based on the level of national and local significance of the impact (environmentally, economically and socially) and the capacity to manage. Scores are determined through a combination of scored risk assessments and consultations. Depending on the council, the plans may use differing labels for 'high', 'medium' and 'low' priorities. Higher priority species are primarily targeted with intense and on the ground control strategies, while low priority species will generally have education/awareness programs or no control. Proposed management techniques and control strategies are assessed for each species and include prevention, eradication, reduction, containment, education and impact/asset protection.</p> <p>The Cairns Region Biosecurity Plan 2019-2024 and the Douglas Shire Biosecurity Plan 2017-2021 noted the following priority weeds in the region:</p> <ul style="list-style-type: none"> • Gamba grass (<i>Andropogon gayanus</i>) • Hiptage (<i>Hiptage benghalensis</i>) • Miconia tree (<i>Miconia calvescens</i>) • Senegalia spp. • Parthenium weed (<i>Parthenium hysterophorus</i>) • Salvinia/Water fern (<i>Salvinia molesta</i>) • Olive hymenachne (<i>Hymenachne amplexicaulis and hybrids</i>) • Glush weed (<i>Hygrophila costata</i>) • Thunbergia (<i>Thunbergia grandiflora syn. T. laurifolia</i>) • Pond apple (<i>Annona glabra</i>) • Water lettuce (<i>Pistia stratiotes</i>) • Mexican bean tree (<i>Cecropia pachystachya, C. palmata and C. peltata</i>) • Siam weed (<i>Chromolaena odorata</i>) • Opuntoid cacti • Water hyacinth (<i>Eichhornia crassipes</i>) • Brillahtaisia (<i>Brillahtaisia lamium</i>) • Water Mimosa (<i>Neptunia oleracea and N. plena</i>) • Lantana (<i>Lantana camara and L. montevidensis</i>)

Act or Strategy	Summary of Act of Strategy
	<ul style="list-style-type: none"> • Giant rat's tail grass (<i>Sporobolus pyramidalis</i> and <i>S.natalensis</i>) • Cabomba (<i>Cabomba caroliniana</i>) • Amazon frogbit (<i>Limnobium laevigatum</i>) • Kudzu (<i>Pueraria montana</i> var. <i>lobata</i> syn. <i>P. lobata</i>, <i>P. triloba</i>) • Sicklepods (<i>Senna obtusifolia</i>, <i>S. hirsute</i> and <i>S. tora</i>) • Panama Rubber tree (<i>Castilla elastica</i>) • Venezuelan Pokeweed (<i>Phytolacca rivinoides</i>) • Tobacco Weed (<i>Solanum mauritianum</i>) <p>Priority pest animals in the region includes:</p> <ul style="list-style-type: none"> • Electric Ants (<i>Wasmannia auropunctata</i>) • Feral Deer (all species) • Yellow Crazy Ants (<i>Anoplolepis gracilipes</i>) • Feral Pig (<i>Sus Scrofa</i>) • Wild Dog (<i>Canis familiaris</i>) <p>In addition, the plan identified a number of weeds that are considered to be high risk for the region:</p> <ul style="list-style-type: none"> • Red-eared slider turtle (<i>Trachemys scripta elegans</i>) • Alligator weed (<i>Alternanthera philoxeroides</i>) • Fire weed (<i>Senecio madagascariensis</i>) • Mikania vine (<i>Mikania micrantha</i>) • Koster's curse (<i>Clidemia hirta</i>) • Bog moss (<i>Mayaca fluviatilis</i> Aubl.) • Sagittaria (<i>Sagittaria platyphylla</i>) • Limnocharis, yellow burrhead (<i>Limnocharis flava</i>) • Candyleaf (<i>Stevia ovata</i>) • Aleman grass (<i>Echinochloa polystachya</i>) • Madras thorn (<i>Pithecellobium dulce</i>) • High biomass grasses (such as thatch grass, Guinea grass, molasses grass and giant rat's tail grass)

4. Existing environment

4.1 Overview

The Wangetti South Section is to be located within an area of high natural and cultural value. The area is visually appealing due to the location between the reef and the rainforest. High biodiversity is present in the local area and therefore the introduction of pathogens, weed and pest species has the potential to cause significant impacts such as disrupting the ecological integrity of the ecosystems within the Wangetti South Section area. MNES and MSES values including habitat and vegetation types are discussed within the document and appropriate mitigation measures have been prioritised to prevent and reduce impact on this area.

Weeds, pests, and pathogens can be introduced/transported to new areas via a range of methods. Key vectors for weeds and pest translocation within the Wangetti South Section project area include:

- Transportation into and across the project area – via vehicles, equipment, construction material, maintenance equipment, construction and operational personal and trail users (parts attached to footwear, bikes, clothing etc).
- Contaminated materials and produce – from raw materials such as gravel, sand and mulch may contain or carry weed seed or other biosecurity risks like invasive ants, pathogens or diseases.
- Natural methods of dispersion – via wind, waters (including flood water) and wildlife.

Recognising and managing potential vectors within the Wangetti South Section is an important step for minimising the spread of weeds, pests, diseases. Translocation by vehicles and construction equipment presents the highest risk for assisting the spread of weed species across the Wangetti South Section project area. Factsheets regarding the identification and treatment of high-risk weeds, pests and pathogens are provided in Appendix B. If treatment is required, methods used are to be approved by WTMA, DES, TDPD and QPW, as applicable.

4.2 Weed species

Table 4-1 summarises the declared weeds considered to be known or potentially present within the Wangetti South Section Project area. This information has been sourced from the EPBC Act Protected Matters Search Tool (PMST), the DES WildNet database search, Wet Tropics Management Authority (WTMA) website, discussions with WTMA, Cairns Region Biosecurity Plan 2019-2024 and Douglas Shire Biosecurity Plan 2017-2021. The species presented in Table 4-1 are found to be on the priority list of each Biosecurity Plan and has a specific Biosecurity Action Plan.

A detailed weed survey was not carried out during previous survey events, however general observations were made of weed and pest species within the project area. Weeds were noted in areas previously disturbed by storm events where tree canopy had been disturbed. In addition, information was sourced from the Wet Tropics Management authority website. The aim of this WPDMP is to prioritise management and control efforts in relation to statutory status of weeds in Table 4-1. Even though many weeds are mapped as occurring in the area based on MNES databases, using local Biosecurity information (Cairns Regional and Douglas Shire Council Biosecurity documents) and the online weed map distributed by the Department of Agriculture and Fisheries, weeds that are of local significance can be identified.

In the fourth column of Table 4-1, a ranking has been assigned to those weed species that are considered to have a greater impact on the existing environment based from the information

contained with the Douglas Shire Biosecurity Plan 2017 – 2021 and the Cairns Region Biosecurity Plan 2019 – 2024. The ranking has considered the following:

- potential to impact on native plants, animals, waterways, and ecosystem
- potential to impact on human health
- potential impact to community values and cultural values

The weed species that are considered to have major or significant impact to native plants, animals, waterways, and ecosystem, community values, cultural values and/or on human health have been flagged as **high risk** (Cairns Regional Council, 2019 and Douglas Shire Council, 2017).

The weed species that are considered to have a moderate impact to native plants, animals, waterways, and ecosystem, community values, cultural values and/or on human health have been flagged as **medium risk** (Cairns Regional Council, 2019 and Douglas Shire Council, 2017).

The weed species that are considered to have a minor or insignificant impact to native plants, animals, waterways, and ecosystem, community values, cultural values and/or on human health have been flagged as **low risk** (Cairns Regional Council, 2019 and Douglas Shire Council, 2017).

In the fifth column of Table 4-1 weed species have been identified as either likely or unlikely to occur (but is present in surrounding areas) or unlikely to occur (due to a lack of suitable habitat and / or environmental conditions). The criteria used to determine this is outlined in Table 4-2. Some of these weeds are notifiable, meaning Biosecurity must be contacted within 24 hours of sighting on 13 25 23.

In the last column of Table 4-1 a ranking has been assigned to those weed species that require priority management (including monitoring, management and intervention).

Table 4-1 Invasive Plants identified in Wangetti South Section

Common Name	Scientific Name	Notifiable weed	Potential impact/ consequences of invasion	Likelihood to occur on site	Overall priority for management (monitoring, management, intervention)
Miconia	<i>Miconia calvenscens</i>	✓	High	Medium	Medium
Limnocharis	<i>Limnocharis flava</i>	✓	High	Medium	Medium
Pond Apple	<i>Annona glabra</i>	×	Medium	Low	Low
Kudzu vine	<i>Pueraria montana var lobata</i>	×	Low	Low	Low
Parthenium Weed	<i>Parthenium hysterophorus</i>	×	Medium	Low	Low
Salvinia	<i>Salvinia molesta</i>	×	High	Low	Low

Common Name	Scientific Name	Notifiable weed	Potential impact/ consequences of invasion	Likelihood to occur on site	Overall priority for management (monitoring, management, intervention)
Senegalia spp,	<i>Senegalia</i>	×	Low	Low	Low
Hymenachne	<i>Hymenachne amplexicaulis</i>	×	High	Low	Low
Glush weed	<i>Hygrophila costata</i>	×	High	Low	Low
Blue thunbergia	<i>Thunbergia grandiflora</i> syn. <i>T. laurifolia</i>	×	High	High	High
Water lettuce	<i>Pistia stratiotes</i>	×	Low	Low	Low
Mexican bean tree	<i>Cecropia pachystachya</i> , <i>C. palmata</i> and <i>C. peltata</i>	✓	Medium	Medium	Medium
Siam weed	<i>Chromolaena odorata</i>	×	High	Medium	Medium
Water hyacinth	<i>Eichhornia crassipes</i>	×	Medium	Medium	Medium
Brillantaisia	<i>Brillantaisia lamium</i>	×	High	Low	Low
Water mimosa	<i>Neptunia oleracea</i> and <i>N. plena</i>	✓	Medium	Medium	Medium
Lantana	<i>Lantana camara</i> and <i>L. montevidensis</i>	×	Medium	High	High
Giant rat's tail grass	<i>Sporobolus pyramidalis</i> and <i>S. natalensis</i>	×	Medium	High	High
Cabomba	<i>Cabomba caroliniana</i>	×	Medium	Low	Low
Amazon frogbit	<i>Limnobium laevigatum</i>	×	Medium	Low	Low

Common Name	Scientific Name	Notifiable weed	Potential impact/ consequences of invasion	Likelihood to occur on site	Overall priority for management (monitoring, management, intervention)
Sickepods	<i>Senna obtusifolia</i>	×	High	High	High
Rubber Vine	<i>Cryptostegia grandiflora</i>	×	High	Low	Low
Cat's Claw Vine	<i>Dolichandra unguis-cati</i>	×	High	High	High
Prickly Pears	<i>Opuntia spp.</i>	×	Low	Low	Low
Hiptage	<i>Hiptage benhalensis</i>	×	Medium	Low	Low
Gamba grass	<i>Andropogon gayanus</i>	×	High	Low	Low
Invasive grasses such as thatch grass, guinea grass and molasses grass	<i>Megathyrsus maximus var maximus</i> , <i>Hyparrhenia rufa</i> and <i>Melinis minutiflora</i>	×	High	Medium	Medium
Venezualan pokeweed	<i>Phytolacca rivinoides</i>	×	Low	High	Low
Delta Arrowhead	<i>Sagittaria platyphylla</i>	×	Low	Low	Low
Ivy Gourd	<i>Coccinia grandis</i>	×	Low	Medium	Low
Tobacco weed	<i>Solanum mauritianum</i>	×	Low	High	Medium

Key to table: High = highest priority, Medium = medium priority, Low = lowest priority

Table 4-2 Risk category for onsite occurrence

Classification	Description
High risk	Priority ONE treatment The weed is known to be distributed in the project area or has been assessed as present on desktop mapping. It has been identified as a priority weed species by Cairns Regional Council and Douglas Shire Council and listed as an undesirable plant in the Wet Tropics World Heritage.
Medium risk	Priority TWO treatment Unlikely to currently occur within the project area, but localised distribution is known to occur in surrounding areas. Increased surveillance and prevention methods would be required to prevent further infestation of these weeds. It has been identified as weed species by Cairns Regional Council, Douglas Shire Council and Wet Tropics Management Authority. Increased on site vigilance is required.
Low risk	Priority THREE treatment Unlikely to occur due to a lack of suitable habitat and / or environmental conditions.

According to Table 4-1, the weed species that have a medium to high risk of occurring within Wangetti South Section and have a moderate to significant impact on the existing environment within Wangetti South Section include:

- Miconia
- Limnocharis
- Blue thunbergia
- Mexican bean tree
- Siam weed
- Water hyacinth
- Water mimosa
- Lantana
- Giant rat's tail grass
- Sickepods
- Cat's Claw Vine
- Invasive grasses such as thatch grass, guinea grass and molasses grass.
- Tobacco weed

To eliminate the risk of any of the weeds outlined in the Cairns Regional Council and the Douglas Shire Council's biosecurity information, site surveys in the project area would be

required. If treatment is required, methods used are to be approved by WTMA, DES, TDPD and QPW, as applicable. Further information regarding the identification and treatment of high-risk weeds are provided in Section 5 and Appendix B.

4.3 Pest species

Table 4-3 summaries the pest species considered to be present or have the potential to occur within the Wangetti South Section project area. This information has been sourced from the EPBC Act PMST, WTMA website, discussions with WTMA and the DES WildNet database search that were completed for Wangetti South as part of the Wangetti South Section Baseline Ecology and Impact Assessment Report 2020 prepared by GHD.

A detailed pest survey was not carried out during the three survey events in 2019, however general observations were made of weed and pest species within the project area. In addition, information was sourced from the Wet Tropics Management authority website.

Feral animals are known to have a negative impact on native flora and fauna, through competition for resources, killing of native fauna, or degradation and damage to fauna habitats. Yellow crazy ants, electric ants and Asian honey bees have all been discovered in the Wet Tropics since 2000 (WTMA, 2020) (refer to Appendix A). Yellow crazy ants can have severe impacts on native animals and plants and human health and quality of life. Checking for the presence of yellow crazy ants can help prevent further spread of this pest. Check the project area and any materials that could harbour yellow crazy ants. This includes soil, timber, timber products and other construction materials, and other potential vectors of spread.

In the third column of Table 4-3, a ranking has been assigned to those pest species that are considered to have a greater impact on the existing environment based from the information contained with the Douglas Shire Biosecurity Plan 2017 – 2021 and the Cairns Region Biosecurity Plan 2019 – 2024. The ranking has considered the following:

- potential to impact on native plants, animals, waterways, and ecosystem
- potential to impact on human health
- potential impact to community values and cultural values

The pest species that are considered to have major or significant impact to native plants, animals, waterways, and ecosystem, community values, cultural values and/or on human health have been flagged as **high risk** (Cairns Regional Council, 2019 and Douglas Shire Council, 2017).

The pest species that are considered to have a moderate impact to native plants, animals, waterways, and ecosystem, community values, cultural values and/or on human health have been flagged as **medium risk** (Cairns Regional Council, 2019 and Douglas Shire Council, 2017).

The pest species that are considered to have a minor or insignificant impact to native plants, animals, waterways, and ecosystem, community values, cultural values and/or on human health have been flagged as **low risk** (Cairns Regional Council, 2019 and Douglas Shire Council, 2017).

In the fourth column of Table 4-3 pest species have been identified as either likely or unlikely to occur (but is present in surrounding areas) or unlikely to occur (due to a lack of suitable habitat and / or environmental conditions). The criteria used to determine this is outlined in Table 4-4.

In the last column of Table 4-3 a ranking has been assigned to those pest species that require priority management (including monitoring, management and intervention).

Table 4-3 Pest Species associated with the project area

Common Name	Scientific Name	Potential impact/ consequences of invasion	Likelihood to occur on site	Overall priority for management (monitoring, management, intervention)
Common Myna	<i>Acridotheres tristis</i>	Low	High	Low
Mallard	<i>Anas platyrhynchos</i>	Low	Medium	Low
Domestic Cattle	<i>Bos taurus</i>	High	Low	Low
Domestic Dog	<i>Canis lupus familiaris</i>	Medium	High – known to occur within the WTWHA	High
Rock Pigeon	<i>Columba livia</i>	Low	High	Low
Horse	<i>Equus caballus</i>	Medium	Low	Low
Cat	<i>Felis catus</i>	Medium	High – known to occur within the WTWHA	Medium
Feral Deer species in Australia	<i>Feral deer</i>	High	Low – known to occur within the WTWHA	Low
Asian House Gecko	<i>Hemidactylus frenatus</i>	Low	High	Low
Mourning Gecko	<i>Lepidodactylus lugubris</i>	Low	High	Low
Nutmeg Mannikin	<i>Lonchura punctulata</i>	Low	High	Low
House Mouse	<i>Mus musculus</i>	Medium	High	Medium
Mozambique mouthbrooder	<i>Oreochromis mossambica</i>	Medium	Medium	Medium
Rabbit	<i>Oryctolagus cuniculus</i>	Medium	Low	Low
House Sparrow	<i>Passer domesticus</i>	Low	High	Low
Flowerpot Blind Snake	<i>Ramphotyphlops braminus</i>	Low	Low	Low

Common Name	Scientific Name	Potential impact/ consequences of invasion	Likelihood to occur on site	Overall priority for management (monitoring, management, intervention)
Brown Rat	<i>Rattus norvegicus</i>	Medium	High - known to occur within the WTWHA	Medium
Black Rat	<i>Rattus rattus</i>	Medium	High - known to occur within the WTWHA	Medium
Cane Toad	<i>Rhinella marina</i>	Medium	High	Medium
Spotted Turtle- Dove	<i>Streptopelia chinensis</i>	Low	High	Low
Common Starling	<i>Sturnus vulgaris</i>	Low	Low	Low
Pig	<i>Sus scrofa</i>	High	High – known to occur within the WTWHA	High
Spotted tilapia	<i>Tilapia mariae</i>	High	High – known to occur within the WTWHA	High
Yellow crazy ants	<i>Anoplolepis gracilipes</i>	High	Medium – known to occur within the WTWHA	High
Electric ants	<i>Wasmannia auropunctata</i>	High	Medium – known to occur within the WTWHA	High
Asian honey bees	<i>Apis cerana</i>	High	High – known to occur within the WTWHA	High

Key to table: High = highest priority, Medium = medium priority, Low = lowest priority

Table 4-4 Risk category for onsite occurrence

Classification	Description
High risk	<p>Priority ONE treatment</p> <p>The pest is known to be distributed in the project area or has been assessed as present on desktop mapping.</p> <p>Or,</p> <p>The pest is of high priority for eradication in the WTWHA and prevention and removal (if found) is paramount in keeping these invasive species controlled.</p>
Medium risk	<p>Priority TWO treatment</p> <p>Unlikely to currently occur within the project area, but localised distribution is known to occur in surrounding areas. Increased surveillance and prevention methods would be required to prevent further increase to the pest population.</p> <p>Increased on site vigilance is required.</p>
Low risk	<p>Priority THREE treatment</p> <p>Unlikely to occur due to a lack of suitable habitat and / or environmental conditions.</p>

According to Table 4-3, the pest species that have a medium to high risk of occurring within Wangetti South Section and have a greater impact on the existing environment within Wangetti South Section include:

- Common Myna
- Domestic Dog
- Cat
- House Mouse
- Mozambique mouthbrooder
- Rabbit
- Brown Rat
- Black Rat
- Cane Toad
- Pig
- Spotted tilapia
- Yellow crazy ants
- Electric ants
- Asian honey bees

If treatment is required methods used are to be approved by WTMA, DES, TDPD and QPW, as applicable. Further information regarding the identification and treatment of pest species are provided in Section 5 and in Appendix B.

4.4 Diseases (pathogens)

There are three environmental diseases (pathogens) that pose a high risk to the Wangetti South project area from the information collected during the desktop environmental assessment for Wangetti South as part of the Wangetti South Section Baseline Ecology and Impact Assessment Report 2020 prepared by GHD. In addition, information was sourced from the Wet Tropics Management authority website, QPWS and from the DAF biosecurity website.

- Myrtle rust (*Puccinia psidii*) – fungal disease affecting plants in the Myrtaceae family. This pathogen is known to be threat to WTWHA (WTMA, 2020). There are over 200 individual Myrtaceae species in the WTWHA. Some myrtaceous plant genera are represented in great abundance, for example, eucalypts, melaleucas and lillypillies (*syzygiums*) (WTMA, 2020). Some species are valued for being rare, endemic or endangered. Myrtle rust particularly affects new growth such as seedlings, leaf flushes and fruiting bodies. It may cause plant death (WTMA, 2020).
- Root rot fungus (*Phytophthora* fungus) – kills all plant species rooted in soil. Commonwealth listed 'key threatening process'. This pathogen is known to be threat to WTWHA (WTMA, 2020). This pathogen has generally been associated with wet notophyll vine forests on acid volcanic soils above 700m (WTMA, 2020). If treatment of is required methods used are to be approved by WTMA, DES, TDPD and QPW, as applicable. Information regarding the identification and management of this species is provided in Appendix B.
- Chytridiomycosis disease – frog disease caused by the chytrid fungus. Commonwealth listed 'key threatening process'. This pathogen is known to be threat to WTWHA (WTMA, 2020) Frog chytrid fungus has been identified as a primary cause of massive mortality of stream-dwelling frogs in the Wet Tropics bioregion (WTMA, 2020).

4.5 Biosecurity zones

There are several Queensland Biosecurity Zones which are mapped over the Wangetti South Section according to the Queensland Government -Business Queensland Maps of Queensland biosecurity zones (2020). Biosecurity zones have legal movement restrictions placed on them to limit the spread of pests and diseases within the state. Queensland has several biosecurity zones for different pests and disease:

- Electric ant biosecurity zone
- Asian honey bee infested area
- Northern banana biosecurity zone

The biosecurity zones for these pests are identified in Appendix A. This information has been sourced from the EPBC Act PMST and the DES WildNet database search that were completed for Wangetti South as part of the Wangetti South Section Baseline Ecology and Impact Assessment Report 2020 prepared by GHD. In addition, information was sourced from the Wet Tropics Management authority website and from the DAF biosecurity website.

4.6 Local Government Priorities

Review of local government biosecurity plans identified the management priority for each of the 11 weeds species likely or known to occur within the study area. Higher priority species are generally targeted with intensive management techniques compared with lower priority species. However, final control strategies are species specific. Management includes using one or more of the following strategies: prevention, eradication, reduction, containment, education and/or impact/asset protection.

5. Impact assessment and mitigation

5.1 Overview

This section provides a summary of potential impacts associated with biosecurity matters that could be generated by activities undertaken during the construction and operational phases of the project and could impact on the ecological values of the receiving environment.

This section also outlines the management strategy and the mitigation measures to prevent, reduce or control adverse environmental effects on MSES, MNES and the surrounding environment during the construction phase and operational phase.

5.2 Impact assessment

5.2.1 Construction phase

Construction activities have the potential to introduce and/or spread invasive pest and weed species, through the increased movement of people and machinery. This can cause substantial disruption to natural ecosystems by altering the balance of inter-species competition and predation.

Introduction and spread of weeds

The Wangetti South Section Baseline Ecology and Impact Assessment Report (2020) noted that earthworks and vehicle movements have the potential to facilitate the spread of weeds within the project area and export weeds to areas within the surrounding landscape. This can cause significant damage to Queensland's primary industries and undermine the ecological integrity of bushland remnants by competitively excluding native plant species that provide food, shelter and nesting resources for native wildlife. Southern cassowary habitat is likely to be particularly susceptible to impact from weed transmission, as this can reduce the quality and extent of available habitat (Commonwealth of Australia 2010c). Appropriate weed hygiene protocols will be required to control the introduction and spread of weeds during the construction period.

The spread of weeds, and specifically invasive grasses to the project area increases the biomass present. This will increase the fire hazard risk to the area if mitigation and control measures are not implemented. These measures are discussed in Table 5-1. If treatment of pest species is required methods used are to be approved by WTMA, DES, TDPD and QPW, as applicable. Further information on the identification and treatment of high risk weeds are also provided in Appendix B.

Section 5.3 identifies several construction activities that could result in adverse impacts to the project area by introducing or spreading of weeds. It also identifies the MSES and MNES within the project area that could be impacted by the introduction or spreading of weeds. It assesses the risk of no control in place and when the mitigation measure is implemented and discusses the parties responsible for implementing the mitigation measure, how it is measured and any corrective actions.

Introduction and spread of pest fauna species

The Wangetti South Section Baseline Ecology and Impact Assessment Report (2020) noted that three pest fauna species are known to occur within the project area, including the cane toad (*Rhinella marina*), pig (*Sus scrofa*), and dog (*Canis lupus*).

The Wangetti South Section Baseline Ecology and Impact Assessment Report (2020) noted that construction activities can exacerbate the effects feral predators have on local wildlife communities. Inappropriate waste disposal has the capacity to attract higher local

concentrations of feral predators, increasing the predation pressures on local wildlife. Dog attacks on the southern cassowary are known to cause injury and mortality, and their presence can affect the cassowaries' feeding and movements. Feral pigs are supposedly known to destroy nests and eat the southern cassowary eggs, as well as degrade habitat and water quality by wallowing and rooting around watercourses (Latch 2007).

Construction activities also have the potential to increase local pest fauna densities through inappropriate waste disposal. This can increase food availability for opportunistic pests such as wild dogs and pigs and increase their ability to move by opening up corridors. Smaller pest fauna species particularly can be introduced via movement of construction vehicles and contaminated fill. As the receiving environment has a high availability of water and food resources, and the movement of vehicles will be limited by terrain, the risks will be relatively low. Nevertheless, measures should be taken to reduce the risk of introducing or spreading pest fauna species.

Section 5.3 identifies construction activities that could result in adverse impacts to the project area by assist in the movement of pest species within the WTWHA. It also identifies the MSES and MNES within the project area that could be impacted by the movement of pest species. It assesses the risk of no control in place and when the mitigation measure is implemented and discusses the parties responsible for implementing the mitigation measure, how it is measured and any corrective actions. If treatment of pest species is required, methods are to be approved by WTMA, DES, TDPD and QPW, as applicable. Further information, regarding the identification and treatment of high risk fauna species are provided in Appendix B.

Introduction and spread of noxious diseases

The Wangetti South Section Baseline Ecology and Impact Assessment Report (2020) noted that the movement of machinery and plant has the potential to introduce or spread noxious diseases that can have adverse impacts on native flora and fauna or agricultural crops. Many Australian frog species have experienced significant declines and population crashes in recent decades due to the introduction and spread of the infectious disease Chytridiomycosis (Berger et al. 1998). This is spread via transmission of the Chytrid fungus (*Batrachochytridium dendrobatidis*), whose spores can be carried in infected water and soil (Berger et al. 1998; Longcore et al. 1999). Chytridiomycosis mostly affects amphibian species that breed in permanent waterbodies such as streams, moist bogs or soaks and ponds.

Myrtle rust (*Puccinia psidii*) is a fungal disease that attacks young, actively growing leaves, shoot tips and young stems, as well as fruits and flowers of plants of the Myrtaceae family (WTMA 2019). Myrtle rust produces a large number of spores that can be spread by the movement of contaminated plants and soils, and by wind, human activity and animals (Business Queensland, 2020). The long-term impact of myrtle rust is not well understood; however, it is known that some plant species are highly susceptible and are killed by the disease (Business Queensland, 2020).

Phytophthora cinnamomi is a soil borne disease causing death in susceptible plants and loss of habitat for animals (WTMA, 2020). The disease is known as a root-rot fungus, which can cause dieback amongst species of vegetation in rainforests and sclerophyll forests (WTMA, 2020) (refer to Appendix B). *Phytophthora cinnamomi* can be spread by the movement of soil and water, this includes the construction of roads and walking tracks as well as vehicles, bushwalkers and pigs (WTMA 2020).

Movement of soil during construction has the potential to introduce or spread noxious diseases throughout the project area. As a result, appropriate hygiene protocols and limiting movement of soil will be important to mitigate the spread of noxious diseases.

Section 5.3 below identifies construction activities that could result in adverse impacts to the project area by introducing or spreading of diseases. It also identifies the MSES and MNES within the project area that could be impacted by the introduction or spreading of diseases. It assesses the risk of no control in place and when the mitigation measure is implemented and discusses the parties responsible for implementing the mitigation measure, how it is measured and any corrective actions.

5.2.2 Operational phase

During the operation phase, the project impact is expected to be relatively low for most environmental matters. Nevertheless, the project will pose a risk to the introduction and spread of invasive species and disease within the project area. Project operation has the potential for introduction and spread of invasive species through the ongoing movement of hikers and mountain bike riders. If treatment is required, methods are to be approved by WTMA, DES, TDPD and QPW, as applicable. Further information, regarding the identification and treatment of high risk weed, fauna and pest species are provided in Appendix B.

Introduction and spread of weed species

The Wangetti South Section Baseline Ecology and Impact Assessment Report (2020) noted that weed species have the potential to cause damage to the ecological integrity of bushland remnants by excluding native plant species that provide food, shelter and nesting resources for native wildlife. Hikers and mountain bike riders have the potential to spread weeds along the shared use trail and within Dark Jungle. Implementation of specific operational protocols can help limit the unintentional spread of weeds into and/or throughout the project area.

Introduction and spread of pest fauna species

Pest species that are likely to be relatively common and ubiquitous within the region include the cane toad, pig and dog. The proposed shared use trail has the potential to facilitate movement of feral predators, thereby increasing predation pressures on local wildlife. Although the receiving environment is already exposed to pest infestation, mitigation measures will be required to limit any spread of pest animals that could result from operational activities.

Section 5.3.5 below identifies a number of operational activities that could result in adverse impacts to the project area by assist in the movement of pest species within the project area. It also identifies the MSES and MNES within the project area that could be impacted by the moment of pest species. It assesses the risk of no control in place and when the mitigation measure is implemented and discusses the parties responsible for implementing the mitigation measure, how it is measured and any corrective actions.

Introduction and spread of noxious diseases

The introduction and spread of noxious diseases can displace resident species and alter the local ecology. Soil from boots and mountain bike tyres can contain foreign diseases, such as Chytrid fungus, myrtle rust and Phytophthora. Movement of hikers and mountain bike riders have the potential to introduce or spread noxious diseases along the shared use trail and within Dark Jungle. As a result, appropriate hygiene protocols will be important to mitigate the spread of noxious diseases.

Section 5.3 below identifies a number of activities that could result in adverse impacts to the project area by introducing or spreading of diseases during the operational phase. It also identifies the MSES and MNES within the project area that could be impacted by the introduction or spreading of diseases. It assesses the risk of no control in place and when the mitigation measure is implemented and discusses the parties responsible for implementing the mitigation measure, how it is measured and any corrective actions.

5.3 Management strategy for construction and operational phases

An overarching weed, pest and diseases management strategy applicable to the Wangetti South Project area has been developed based on the following principles:

1. **Identify** – weeds and pest species and diseases
2. **Avoid** – traversing and placing infrastructure in areas of known infestation
3. **Prevent/Minimise** – the translocation/spread of pest and weed species by implementing sound work practices and promotion of risk awareness.
4. **Control** – Identified pest and weeds to contain, reduce or eradicate population as required.

Each of these four principles are discussed in further detail in the following sections:

5.3.1 Identify

The proper identification of pest and weed species/infestation provides a basis to actively minimise, control and manage pests and weeds and outbreaks in the project area. Identification occurs at the following levels:

- Regional scale – identifying species that have the potential to/are known to occur within the project area by reviewing weed and pest distribution maps and plan created by DAF, WTMA, DES and local government.
- Local/ work area location – Identifying pests and weeds present within a work zone by conducting desktop assessments and reviewing information and photos collected during environmental surveys of the project area.

Pest, weed and disease identification will occur at the following phases of the project:

- During the Pre-Start Trail Review (PSTR) (World Trail Pty Ltd, 2020). The purpose of the PSTR is to review and inspect the proposed alignment of the trail with the TDPD Project Manager, prior to construction starting, to confirm the exact alignment within the groundtruthed corridor, identify any specific environmental values to be protected and to discuss and agree on specific construction treatments (World Trail Pty Ltd, 2020). Pre-clearance on-ground weed, and pest surveys will be undertaken by an appropriately skilled person to confirm biosecurity matters within the project area and this will assist with determining the appropriate treatments to be used to treat weeds and pests.
- At all other time of the project – this will be part of coordinated pest, weed and disease surveys, surveys in response to sightings and/or any identification by personnel during the everyday conduct of activities.

5.3.2 Avoid

Where pest and weed populations are identified as present in a proposed location for the project infrastructure or work zone, the infrastructure/work zone these areas will be recorded for treatment. Where the weed population covers a small area within the project area this area will be treated and vegetation clearing to occur.

Other avoidance measures to be carried out for the project are outlined in Section 5.3.5.

5.3.3 Prevent/Minimise

The prevention and/or minimisation of potential weeds, pests and diseases becoming established in the project area as a result of construction and operational activities, is most critical form of management. Land transportation currently present the highest risk of introducing

and spreading weeds, pests and diseases within the project area and therefore vehicle, equipment and machinery inspection and washdown is the primary prevention/minimisation measure.

All project vehicles must carry and be able to present a current Weed Hygiene Declaration at all times. Other prevention and minimisation measures to be carried out for the project are outlined in Section 5.3.5.

5.3.4 Control

Eradication

After prevention, eradication is the most preferable management strategy for pests, weeds and diseases. Eradication is the goal through all phase of the development in the Wangetti South project area, however this may only be feasible where there is a recent pest, weed or disease incursion, or there is only a small population of limited distribution. Eradication is highly dependent on early detection and requires cooperation between the following parties: TDPD, Construction Contractors, the Operator, DES/ QPWS, WTMA and landowners. The feasibility of an eradication program will be determined on a case-by base basis.

Contain, reduce and manage

Where eradication is not a feasible option for pest, weed and disease outbreaks, containment and treatment are the most appropriate measures to management and/or reduce a population. These will typically be ongoing measures to reduce the risk of further spreading the weed, pest and/or disease.

Site-based weed, pest and disease management programs will be developed for the project to ensure compliance with legal obligations and in consultation with TDPD, Construction Contractors, the Operator, DES/ QPWS, WTMA and landowners.

5.3.5 Mitigation measures

Mitigation measures have been developed for Wangetti South Section to prevent, reduce, or control adverse environmental effects on MSES and MNES and the surrounding environment during the construction phase. The mitigation measures are outlined in Table 5-1 and have considered the following principals: identify, avoid, precent/minimise and control. The mitigation measures have also considered the Commonwealth, State and Local government legislation and strategies applicable to the project area.

Table 5-1 to Table 5-6 are broken down into the following sections:

- identifies activities that can facilitate the introduction and/or spread of weeds, pest and diseases in the project area
- identifies the MSES and MNES impacted by the introduction and/or spread of weeds, pest and diseases in the project area
- identifies the initial risk to the project with no control in place and identifies residual risk within controls in place
- identifies the mitigation measures to be implement, their timing and the parties responsible for implementation the measures
- identifies performance indicators, corrective actions, and monitoring to measure the success the of implementing the mitigation measure.

Personnel involved in the construction and operational phases will need to incorporate these measures into the environmental management documents and systems developed for the project:

Construction phase

Table 5-1 Mitigation measures to be implemented for Wangetti South Section during construction phase for weeds

Factor – weeds
Construction activities resulting in adverse impacts to the project area
Introduction or spread of weeds from construction activities and/or introduction of construction material and equipment within the project area. High risk vectors for weeds, pests and diseases include building materials, soils, packing material, field gear and clothing.
Applicable MNES & MSES
<ul style="list-style-type: none"> Wet Tropics World Heritage Area and National Heritage Site <p>MNES and MSES bird species that are known likely or may occur:</p> <ul style="list-style-type: none"> <i>Casuarus casuarius</i> (Southern cassowary) Migratory birds (e.g. eastern curlew, great sand plover) Non-migratory species (e.g. masked owl) <p>MNES and MSES amphibian species that are known, likely or may occur in the Wangetti South Section</p> <ul style="list-style-type: none"> <i>Litoria dayi</i> (Australian lace lid) <i>Litoria nannotis</i> (Waterfall frog) <i>Litoria nyakalensis</i> (Mountain mistfrog) <i>Litoria rheocola</i> (Common mistfrog) <i>Litoria serrata</i> (Tapping green eyed frog) <p>MNES and MSES mammal species that are known, likely or may occur in the Wangetti South Section</p> <ul style="list-style-type: none"> <i>Dasyurus maculatus gracilis</i> (Spotted-tailed quoll) <i>Dasyurus hallucatus</i> (Northern quoll) <i>Dendrolagus lumholtzi</i> (Lumholtz's tree-kangaroo) <i>Hipposideros semoni</i> (Semon's leaf-nosed bat) <i>Phascolarctos cinereus</i> (Koala) <i>Pteropus conspicillatus</i> (Spectacled flying-fox) <i>Rhinolophus robertsi</i> (Large-eared horseshoe bat) <i>Saccolaimus saccolaimus nudicluniatus</i> (Bare-rumped sheath-tailed bat) <i>Xeromys myoides</i> (Water mouse) <p>MNES and MSES aquatic species that are known, likely or may occur in the Wangetti South Section</p> <ul style="list-style-type: none"> <i>Stiphodon semoni</i> (Opal cling goby)

Factor – weeds

- *Stiphodon rutilarueus* (Orange cling goby)
- *Stiphodon pelewensis* (Emerald cling goby)
- *Stiphodon surrufus* (Birdsong cling goby)

MNES and MSES flora species that are known, likely or may occur in the Wangetti South Section:

- *Archontophoenix myolensis* (Myola palm)
- *Anoectochilus yatesiae* (Marbled jewel orchid)
- *Canarium acutifolium*
- *Dendrobium fellowsii*
- *Dendrobium mirbelianum* (Dark-stemmed antler orchid)
- *Diplazium cordifolium*
- *Diplazium pallidum*
- *Myrmecodia beccarii* (Ant plant)
- *Phaius pictus*
- *Phalaenopsis amabilis* subsp. *rosenstromii* (Native moth orchid)
- *Polyscias bellendenkerensis*
- *Randia audasii*
- *Rhomboda polygonoides*
- *Toeckima pterocarpum* (Orange tamarind)
- *Vappodes lithocola* (Dwarf butterfly orchid) (also known as *Dendrobium lithocola*, and the Queensland Flora Census 2019 groups this species into *Dendrobium biggibum*)
- *Vappodes phalaenopsis* (Cooktown orchid) (Also known as *Dendrobium phalaenopsis* and the Queensland Flora Census 2019 groups this species into *Dendrobium biggibum*)
- *Zeuxine polygonoides* (Velvet jewel orchid) (also known as *Rhomboda polygonoides*)

Initial risk with no control

In the absence of project-specific mitigation measures, major but recoverable impacts to a factor of significance are likely.

Mitigation measure	Targeted weeds	Timing	Party responsible
Undertake a pre-clearing weed survey treatment and management and report areas of existing weed infestation. Pre-clearance on-ground weed, and pest surveys will be undertaken by an appropriately skilled person to confirm biosecurity matters within the project area	Priority invasive plant species rated medium to high and that have a medium to high risk of occurring on site	Prior to construction commencing	Contractor's Project Manager Site Supervisor

Factor – weeds			
and this will assist with determining the appropriate treatments to be used to treat weeds and pests. Treatment methods to be approved by WTMA, DES, TDPD and QPW, as applicable. Further information regarding the treatment of high risk pest species is provided in Appendix B.	as outlined in Table 4-1.		
Equipment and shoe wash down areas will be in place prior entering the site (serves as a single entry point) to avoid the spread of weeds and pathogens. Construction crews required to disinfect clothing, footwear, equipment and other personal items through wash down areas. Signage will also be in place as a form of information dissemination to encourage the use of wash down areas. Wash down and disinfecting procedures will be included in the site induction training.	All weed species	At all times	All personnel
All machinery and vehicle hygiene protocols to be followed at all times to prevent the introduction of weeds and pathogens. Vehicles, plant and equipment to be used for the project would be required to be clean. Vehicles, plant and equipment to be inspected prior to being used to ensure they are clean. Disinfecting vehicles and machinery. This will be undertaken during the construction phase of the project and maintained throughout.	All weed species	Prior to construction commencing At all times during the construction phase	All personnel
Weed identification to be included in the site induction training and conducted by a suitably trained person.	All weed species, particularly priority invasive plant species rated medium to high and that have a medium to high risk of occurring on site as outlined in Table 4-1.	Prior to construction commencing	Contractor's Project Manager Site Supervisor

Factor – weeds			
Any significant weed populations identified during construction are to be marked on site and the location recorded for reporting	All weed species	Prior to construction commencing During pre-start	All personnel
Trail construction will minimise disruption of forest canopy wherever possible to avoid additional sunlight that can promote weed growth on forest floor.	All weed species	At all times	Contractor's Project Manager Site Supervisor
Toolbox talks with the construction crew will occur prior construction to educate them about the weeds, pests and diseases likely to be present in the area.	All weed species, particularly priority invasive plant species rated medium to high and that have a medium to high risk of occurring on site as outlined in Table 4-1.	Prior to Construction	TDPD Contractor's Project Manager Site Supervisor
Any weed infestation shall be treated at earliest stage while small and manageable. Treatment methods to be approved by WTMA, DES, TDPD and QPW, as applicable. Further information regarding the treatment of high risk weed species is provided in Appendix B.	All weed species, particularly priority invasive plant species rated medium to high and that have a medium to high risk of occurring on site as outlined in Table 4-1.	At all times	Contractor's Project Manager Site Supervisor
Vehicle access will be restricted to existing roads and tracks.	All weed species.	At all times	Contractor's Project Manager Site Supervisor
Weed material that is cleared within the project area must be disposed of appropriately. Any weed removal as part of the construction phase will be cleared and disposed of at an approved waste disposal facility. Any infestations that subsequently establish during the	All weed species.	At all times	Contractor's Project Manager Site Supervisor

Factor – weeds			
construction period will be treated, and post-construction weed management of rehabilitated areas will be undertaken.			
Movement of vegetation and soils between the impacted areas and areas of significantly lower weed infestation will be avoided, where possible.	All weed species.	At all times	Contractor's Project Manager Site Supervisor
At the outset of the construction phase, works should be undertaken to identify suitable surfacing materials that are locally available and that can be certified to weed/pathogen free status for land manager approval. Imported materials will only be used where absolutely required and materials cannot be found within the construction corridor. Imported materials are to be procured from a suitable supplier and check for weeds prior to importing to site. All material brought onto site must be accompanied by a certificate indicating that it is pathogen and weed free.	All weed species.	At all times	Contractor's Project Manager Site Supervisor
No waste will be stockpiled during the construction phase and trail builders will be responsible for removing all of their own personal waste daily.	All weed species.	At all times	All personnel
Limit vegetation clearing, where practical to protect/improve habitat in the area and limit/avoid spread of weeds and pests.	All weed species.	At all times	Contractor's Project Manager Site Supervisor
Residual risk with control in place			
Implementation of recommended mitigation measures will not introduce and/or spread weeds within the project area, therefore have negligible impact on MNES and MSES species and their habitats.			
Performance indicator			
Existing weed species are identified and controlled onsite.			
No new weed outbreak on site.			
Corrective actions			
Weed outbreaks within the project area to be documented and reported to regulatory authority including WTMA, DES and QPWS and rectified immediately.			

Factor – weeds
Monitoring
All plant/machinery washdown checklists to be recorded. Records demonstrating that personnel associated with the construction and operational phases have undertaken weed, pest and pathogen induction training.
Daily visual weed and pest inspections within the works area under active construction. Monthly visual weed and pest inspections within the works area where works are completed.
Liaison with WTMA regarding existing monitoring strategies for weed species within the WTWHA
Completed construction segments to be monitored for weeds. Maintaining a register for weeds, pests and pathogens recorded within the project area.

Table 5-2 Mitigation measures to be implemented for Wangetti South Section during construction phase for pests

Factor – pests
Construction activities resulting in adverse impacts to the project area
<ul style="list-style-type: none"> • Introduction or spread of pests from construction activities and/or introduction of construction material and equipment within the project area. • The spread of pest Interference of local wildlife by domestic animals • Waste generation by construction crew within the project area providing food to pest species • Spread of pest species such as electric ants and yellow crazy ants within the project area from the movement of equipment, vehicle and material from affected areas outside of the project area leading to increase pest activities • When moving electric ant carriers (soil, gravel, mulch, etc.) from a property within the restricted zone to a property within the restricted zone to a property outside the restricted zone, Biosecurity Queensland dictates that operators must hold a biosecurity instrument permit.
Applicable MNES & MSES
<ul style="list-style-type: none"> • Wet Tropics World Heritage Area and National Heritage Site <p>MNES and MSES bird species that are known likely or may occur:</p> <ul style="list-style-type: none"> • <i>Casuarus casuaris</i> (Southern cassowary) • Migratory birds (e.g. eastern curlew, great sand plover) • Non-migratory species (e.g. masked owl) <p>MNES and MSES amphibian species that are known, likely or may occur in the Wangetti South Section</p> <ul style="list-style-type: none"> • <i>Litoria dayi</i> (Australian lace lid) • <i>Litoria nannotis</i> (Waterfall frog) • <i>Litoria nyakalensis</i> (Mountain mistfrog) • <i>Litoria rheocola</i> (Common mistfrog) • <i>Litoria serrata</i> (Tapping green eyed frog) <p>MNES and MSES mammal species that are known, likely or may occur in the Wangetti South Section</p> <ul style="list-style-type: none"> • <i>Dasyurus maculatus gracilis</i> (Spotted-tailed quoll) • <i>Dasyurus hallucatus</i> (Northern quoll) • <i>Dendrolagus lumholtzi</i> (Lumholtz's tree-kangaroo) • <i>Hipposideros semoni</i> (Semon's leaf-nosed bat) • <i>Phascolarctos cinereus</i> (Koala) • <i>Pteropus conspicillatus</i> (Spectacled flying-fox) • <i>Rhinolophus robertsi</i> (Large-eared horseshoe bat) • <i>Saccolaimus saccolaimus nudicluniatus</i> (Bare-rumped sheath-tailed bat) • <i>Xeromys myoides</i> (Water mouse)

Factor – pests

MNES and MSES aquatic species that are known, likely or may occur in the Wangetti South Section

- *Stiphodon semoni* (Opal cling goby)
- *Stiphodon rutilarueus* (Orange cling goby)
- *Stiphodon pelewensis* (Emerald cling goby)
- *Stiphodon surrufus* (Birdsong cling goby)

MNES and MSES flora species that are known, likely or may occur in the Wangetti South Section:

- *Archontophoenix myolensis* (Myola palm)
- *Anoectochilus yatesiae* (Marbled jewel orchid)
- *Canarium acutifolium*
- *Dendrobium fellowsii*
- *Dendrobium mirbelianum* (Dark-stemmed antler orchid)
- *Diplazium cordifolium*
- *Diplazium pallidum*
- *Myrmecodia beccarii* (Ant plant)
- *Phaius pictus*
- *Phalaenopsis amabilis* subsp. *rosenstromii* (Native moth orchid)
- *Polyscias bellendenkerensis*
- *Randia audasii*
- *Rhomboda polygonoides*
- *Toeckima pterocarpum* (Orange tamarind)
- *Vappodes lithocola* (Dwarf butterfly orchid) (also known as *Dendrobium lithocola*, and the Queensland Flora Census 2019 groups this species into *Dendrobium biggibum*)
- *Vappodes phalaenopsis* (Cooktown orchid) (Also known as *Dendrobium phalaenopsis* and the Queensland Flora Census 2019 groups this species into *Dendrobium biggibum*)
- *Zeuxine polygonoides* (Velvet jewel orchid) (also known as *Rhomboda polygonoides*)

Initial risk with no control

In the absence of project-specific mitigation measures, major but recoverable impacts to a factor of significance are likely.

Mitigation measure	Pest species targeted	Timing	Party responsible
<p>The contractor will be required to complete a pre-clearing pest survey and report documenting areas of existing electric ant infestation and identifying treatment and management requirements.</p> <p>Pre-clearance on-ground pest surveys will be undertaken by an appropriately skilled person.</p>	<p>Common Myna</p> <p>Domestic Dog</p> <p>Cat</p> <p>House Mouse</p> <p>Mozambique mouthbrooder</p> <p>Rabbit</p> <p>Brown Rat</p>	<p>Prior to construction commencing</p> <p>During the construction phase</p>	<p>Contractor's Project Manager</p> <p>Site Supervisor</p>

Factor – pests			
Before starting construction, discussions with Wet Tropics Management Authority, Douglas Shire Council and Cairns Regional Council to be undertaken during the pre-start trail review to discuss and agree on specific treatments regarding pest species including but not limited to yellow crazy ants, electric ants, pigs and dogs. Information about treatments for pest species is included in Appendix B.	Black Rat Cane Toad Pig Spotted tilapia Yellow crazy ants Electric ants Asian honey bees		
Plant/machinery to be washed down at a commercial washdown facility or washdown facility at QPWS works depot prior to construction and if they used again for the different areas of the project area.	House Mouse Brown Rat Black Rat Cane Toad Yellow crazy ants Electric ants Asian honey bees.	Prior to construction commencing During the construction phase	Contractor's Project Manager Site Supervisor
At the outset of the construction phase, works will be undertaken to identify suitable surfacing materials that are locally available and that can be certified to pest free status. Imported materials will only be used where absolutely required and materials cannot be found within the construction corridor. Imported materials are to be procured from a suitable supplier and check for weeds prior to importing to site. All material brought onto site must be accompanied by a certificate indicating that it is free of pest species.	Yellow crazy ants and electric ants.	Prior to construction Construction phase	Contractor's Project Manager Site Supervisor
Site inductions and toolbox talks with the construction crew will occur prior construction to educate them about the weeds, pests and pathogens likely to be present in the area, the process of reporting infestations and the type of measures to prevent the introduction and spread within the project area.	All pest species including: Common Myna Domestic Dog Cat House Mouse Mozambique mouthbrooder Rabbit Brown Rat Black Rat Cane Toad Pig Spotted tilapia Yellow crazy ants Electric ants	Prior to Construction	Contractor's Project Manager Site Supervisor

Factor – pests			
	Asian honey bees		
Feeding of wildlife is prohibited and food scraps to be disposed of into bins with closed/secured lids and removed from site daily to minimise vermin infestations.	Common Myna Domestic Dog Cat House Mouse Mozambique mouthbrooder Rabbit Brown Rat Black Rat Cane Toad Pig Spotted tilapia Yellow crazy ants Electric ants Asian honey bees	At all times	All personnel
Vehicle access will be restricted to existing roads and tracks, where possible.	All pest species including: Common Myna Domestic Dog Cat House Mouse Mozambique mouthbrooder Rabbit Brown Rat Black Rat Cane Toad Pig Spotted tilapia Yellow crazy ants Electric ants Asian honey bees	At all times	Site supervisor
Where trail builders are required to camp overnight along the trail due to the remoteness of the area they will be required to carry all rubbish out; bury human waste at least 100 m from streams and at least 15 cm deep, or carry it out. During construction phase the contractor to consider having a trailer mounted portable toilet or something similar to be able to service the construction crew. The setup of temporary amenities to be located in disturbed areas and outside of areas of high ecological significance.	All pest species including: Common Myna Domestic Dog Cat House Mouse Mozambique mouthbrooder Rabbit Brown Rat Black Rat Cane Toad Pig	At all times	All personnel Contractor's Project Manager Site Supervisor

Factor – pests			
	Spotted tilapia Yellow crazy ants Electric ants Asian honey bees		
Sightings or evidence of pest animals will be recorded. If increased densities of pest animals are observed, or new pest animals are identified, humane pest animal control will be used. Further information regarding the identification of pest species is provided in Appendix B.	All pest species including: Common Myna Domestic Dog Cat House Mouse Mozambique mouthbrooder Rabbit Brown Rat Black Rat Cane Toad Pig Spotted tilapia Yellow crazy ants Electric ants Asian honey bees	At all times	Contractor's Project Manager Site Supervisor
Limit vegetation clearing, where practical to protect/improve habitat in the area and limit/avoid spread of pests.	All pest species including: Common Myna Domestic Dog Cat House Mouse Mozambique mouthbrooder Rabbit Brown Rat Black Rat Cane Toad Pig Spotted tilapia Yellow crazy ants Electric ants Asian honey bees	At all times	Contractor's Project Manager Site Supervisor
No waste will be stockpiled during the construction phase and trail builders will be responsible for removing all of their own personal waste daily.	All pest species including: Common Myna Domestic Dog Cat House Mouse Mozambique mouthbrooder	At all times	All personnel

Factor – pests			
	Rabbit Brown Rat Black Rat Cane Toad Pig Spotted tilapia Yellow crazy ants Electric ants Asian honey bees		
Regular inspection of the trail and nodes to check for pest species.	All pest species including: Common Myna Domestic Dog Cat House Mouse Mozambique mouthbrooder Rabbit Brown Rat Black Rat Cane Toad Pig Spotted tilapia Yellow crazy ants Electric ants Asian honey bees	At all times	Contractor's Project Manager Site Supervisor
Minimise water ponding or build up on-site to reduce the likelihood of providing suitable environments for mosquito breeding.	All pest species including: Common Myna Domestic Dog Cat House Mouse Mozambique mouthbrooder Rabbit Brown Rat Black Rat Cane Toad Pig Spotted tilapia Yellow crazy ants Electric ants Asian honey bees	At all times	Contractor's Project Manager Site Supervisor

Factor – pests
Residual risk with control in place
Implementation of recommended mitigation measures will not introduce and/or spread pests within the project area, therefore have negligible impact on MNES and MSES species and their habitats.
Performance indicator
Existing pest species are identified and controlled onsite.
Corrective actions
Evidence of pests within the project area to be documented and reported to regulatory authority including and rectified immediately.
Monitoring
All excavator and other plant/machinery washdown checklists to be recorded.
Weekly inspection to include pests onsite
Maintaining a register for weeds, pests and pathogens recorded within the project area. Liaison with WTMA regarding existing monitoring strategies for pest species within the WTWHA.

Table 5-3 Mitigation measures to be implemented for Wangetti South Section during construction phase for pathogens

Factor – pathogens (disease)
Construction activities resulting in adverse impacts to the project area
Introduction or spread of pathogens from construction activities and/or introduction of construction material and equipment within the project area.
Applicable MNES & MSES impacted
<ul style="list-style-type: none"> Wet Tropics World Heritage Area and National Heritage Site <p>MNES and MSES flora species that are known, likely or may occur in the Wangetti South Section:</p> <ul style="list-style-type: none"> <i>Archontophoenix myolensis</i> (Myola palm) <i>Anoectochilus yatesiae</i> (Marbled jewel orchid) <i>Canarium acutifolium</i> <i>Dendrobium fellowsii</i> <i>Dendrobium mirbelianum</i> (Dark-stemmed antler orchid) <i>Diplazium cordifolium</i> <i>Diplazium pallidum</i> <i>Myrmecodia beccarii</i> (Ant plant) <i>Phaius pictus</i> <i>Phalaenopsis amabilis</i> subsp. <i>rosenstromii</i> (Native moth orchid) <i>Polyscias bellendenkerensis</i> <i>Randia audasii</i> <i>Rhomboda polygonoides</i> <i>Toechima pterocarpum</i> (Orange tamarind) <i>Vappodes lithocola</i> (Dwarf butterfly orchid) (Also known as <i>Dendrobium lithocola</i>, and the Queensland Flora Census 2019 groups this species into <i>Dendrobium biggibum</i>) <i>Zeuxine polygonoides</i> (Velvet jewel orchid) (Also known as <i>Rhomboda polygonoides</i>) <p>MNES and MSES amphibian species that are known, likely or may occur in the Wangetti South Section</p> <ul style="list-style-type: none"> <i>Litoria dayi</i> (Australian lace lid) <i>Litoria nannotis</i> (Waterfall frog) <i>Litoria nyakalensis</i> (Mountain mistfrog) <i>Litoria rheocola</i> (Common mistfrog) <i>Litoria serrata</i> (Tapping green eyed frog)
Initial risk with no control
In the absence of project-specific mitigation measures, major but recoverable impacts to a factor of significance are likely.

Factor – pathogens (disease)			
Mitigation measure	Pest species targeted	Timing	Party responsible
<p>All machinery and vehicle hygiene protocols to be followed at all times to prevent the introduction of weeds and pathogens. Vehicles, plant and equipment to be used for the project would be required to be clean with Weed and Seed Hygiene Declaration certificates. Vehicles, plant and equipment to be inspected prior to being used to ensure they are clean.</p> <p>Disinfecting vehicles and machinery. This will be undertaken during the construction phase of the project and maintained throughout.</p> <p>Chytrid fungus Spores of the chytrid fungus are transported in water and wet soil. The fungus appears to be more virulent at lower temperatures.</p> <p>Phytophthora Phytophthora is a soil-borne organism which is spread by the movement of soil and water. Information regarding the management of dieback as a result of this pest is provided in Appendix B.</p> <p>Myrtle rust Myrtle rust spreads easily through windblown spores</p>	<p>Myrtle rust (<i>Puccinia psidii</i>), root rot fungus (<i>Phytophthora fungus</i>) and Chytridiomycosis disease</p>	<p>Prior to construction commencing</p> <p>During the construction phase</p>	<p>Contractor's Project Manager</p> <p>Site Supervisor</p>
<p>Plant/machinery to be washed down at a commercial washdown facility or washdown facility at QPWS works depot prior to construction and if they used again for the different areas of the project area.</p>	<p>Myrtle rust, root rot fungus and Chytridiomycosis disease</p>	<p>Prior to construction commencing</p> <p>During the construction phase</p>	<p>Contractor's Project Manager</p> <p>Site Supervisor</p>
<p>At the outset of the construction phase, works should be undertaken to identify suitable surfacing materials that are locally available and that can be certified to pathogen free status for land manager approval.</p>	<p>Myrtle rust, root rot fungus and Chytridiomycosis disease</p>	<p>Prior to construction</p> <p>Construction phase</p>	<p>Contractor's Project Manager</p> <p>Site Supervisor</p>
<p>Imported materials will only be used where absolutely required and materials cannot be found within the construction</p>	<p>Myrtle rust, root rot fungus and</p>	<p>Prior to construction</p>	<p>Contractor's Project Manager</p> <p>Site Supervisor</p>

Factor – pathogens (disease)			
corridor. Imported materials are to be procured from a suitable supplier and check for pathogens prior to importing to site.	Chytridiomycosis disease	Construction phase	
All material brought onto site must be accompanied by a certificate indicating that it is free of pathogens, unless the source has been agreed to by the TDPD Project Manager.	Myrtle rust, root rot fungus and Chytridiomycosis disease	Prior to construction Construction phase	Contractor's Project Manager Site Supervisor
Equipment and shoe wash down areas will be in place prior entering the site to avoid the spread pathogens.	Myrtle rust, root rot fungus and Chytridiomycosis disease	At all times	All personnel
Vehicle access will be restricted to existing roads and tracks, where possible.	Myrtle rust (, root rot fungus and Chytridiomycosis disease	At all times	Site supervisor
Undertaking site inductions and toolbox talks with the construction crew prior and during construction to educate them about pathogens including the <i>chytrid</i> fungus, myrtle rust and root rot fungus.	Myrtle rust (, root rot fungus and Chytridiomycosis disease	At all times	All personnel
Residual risk with control in place			
Implementation of recommended mitigation measures will not introduce and/or spread pathogens within the project area, therefore have negligible impact on MNES and MSES species and their habitats.			
Performance indicator			
Existing pathogens are identified and controlled onsite.			
Corrective actions			
Disease outbreaks within the project area to be documented and reported to regulatory authority including and rectified immediately.			
Monitoring			
All excavator and other plant/machinery washdown checklists to be recorded.			
Weekly inspection on site			
Maintaining a register for weeds, pests and pathogens recorded within the project area.			
Liaison with WTMA regarding existing monitoring strategies for pathogens within the WTWHA			

Operational phase

Table 5-4 Mitigation measures to be implemented for Wangetti South Section during operational phase for weeds

Factor – weeds
Operational activities resulting in adverse impacts to the project area
Introduction or spread of weeds from operational activities. High risk vectors for weeds, include soils, vehicles (including bicycles) and clothing.
Applicable MNES & MSES impacted
<ul style="list-style-type: none"> Wet Tropics World Heritage Area and National Heritage Site <p>MNES and MSES bird species that are known likely or may occur:</p> <ul style="list-style-type: none"> <i>Casuaris casuaris</i> (Southern cassowary) Migratory birds (e.g. eastern curlew, great sand plover) Non-migratory species (e.g. masked owl) <p>MNES and MSES amphibian species that are known, likely or may occur in the Wangetti South Section</p> <ul style="list-style-type: none"> <i>Litoria dayi</i> (Australian lace lid) <i>Litoria nannotis</i> (Waterfall frog) <i>Litoria nyakalensis</i> (Mountain mistfrog) <i>Litoria rheocola</i> (Common mistfrog) <i>Litoria serrata</i> (Tapping green eyed frog) <p>MNES and MSES mammal species that are known, likely or may occur in the Wangetti South Section</p> <ul style="list-style-type: none"> <i>Dasyurus maculatus gracilis</i> (Spotted-tailed quoll) <i>Dasyurus hallucatus</i> (Northern quoll) <i>Dendrolagus lumholtzi</i> (Lumholtz's tree-kangaroo) <i>Hipposideros semoni</i> (Semon's leaf-nosed bat) <i>Phascolarctos cinereus</i> (Koala) <i>Pteropus conspicillatus</i> (Spectacled flying-fox) <i>Rhinolophus robertsi</i> (Large-eared horseshoe bat) <i>Saccolaimus saccolaimus nudicluniatus</i> (Bare-rumped sheath-tailed bat) <i>Xeromys myoides</i> (Water mouse) <p>MNES and MSES aquatic species that are known, likely or may occur in the Wangetti South Section</p> <ul style="list-style-type: none"> <i>Stiphodon semoni</i> (Opal cling goby) <i>Stiphodon rutilarueus</i> (Orange cling goby) <i>Stiphodon pelewensis</i> (Emerald cling goby) <i>Stiphodon surrufus</i> (Birdsong cling goby)

Factor – weeds

MNES and MSES flora species that are known, likely or may occur in the Wangetti South Section:

- *Archontophoenix myolensis* (Myola palm)
- *Anoectochilus yatesiae* (Marbled jewel orchid)
- *Canarium acutifolium*
- *Dendrobium fellowsii*
- *Dendrobium mirbelianum* (Dark-stemmed antler orchid)
- *Diplazium cordifolium*
- *Diplazium pallidum*
- *Myrmecodia beccarii* (Ant plant)
- *Phaius pictus*
- *Phalaenopsis amabilis* subsp. *rosenstromii* (Native moth orchid)
- *Polyscias bellendenkerensis*
- *Randia audasii*
- *Rhomboda polygonoides*
- *Toechima pterocarpum* (Orange tamarind)
- *Vappodes lithocola* (Dwarf butterfly orchid) (also known as *Dendrobium lithocola*, and the Queensland Flora Census 2019 groups this species into *Dendrobium biggibum*)
- *Vappodes phalaenopsis* (Cooktown orchid) (Also known as *Dendrobium phalaenopsis* and the Queensland Flora Census 2019 groups this species into *Dendrobium biggibum*)
- *Zeuxine polygonoides* (Velvet jewel orchid) (also known as *Rhomboda polygonoides*)

Initial risk with no control

In the absence of project-specific mitigation measures, major but recoverable impacts to a factor of significance are likely.

Mitigation measure	Weed species targeted	Timing	Party responsible
All machinery and vehicle hygiene protocols to be followed at all times to prevent the introduction of weeds and pathogens. Operational staff and maintenance staff disinfecting clothing, footwear, equipment and other personal items. Disinfecting vehicles during the operational phase of the project and maintained throughout.	All weed species.	At all times	Operator in Partnership with DES/ QPWS

Factor – weeds			
Vehicle access will be restricted to existing roads and tracks, where possible.	All weed species.	During operational phase	Operator in Partnership with DES/ QPWS
Providing boot wash facility at both ends of the trail to ensure users do not track pest weeds onto the trail.	All weed species.	During operational phase	Operator in Partnership with DES/ QPWS
Regular inspection of the trail and nodes, as per existing QPWS procedures (Operational policy QPW/2013/746 v1.03 - Pest plant and pathogen spread prevention) during operation.	All weed species, particularly priority invasive plant species rated medium to high and that have a medium to high risk of occurring on site as outlined in Table 4-1.	During operational phase	Operator in Partnership with DES/ QPWS
Recreational users of the trail will be educated on the sensitive nature of the local landscape and the importance of avoiding introduction and spread of weeds through the use of appropriate signage.	All weed species, particularly priority invasive plant species rated medium to high and that have a medium to high risk of occurring on site as outlined in Table 4-1.	During operational phase	Operator in Partnership with DES/ QPWS
Signage to encourage trail users to clean clothing, shoes and equipment before entering trail.	All weed species, particularly priority invasive plant species rated medium to high and that have a	During operational phase	Operator in Partnership with DES/ QPWS

Factor – weeds			
	medium to high risk of occurring on site as outlined in Table 4-1.		
Signage to discourage trail users from picking or carrying flowers or plants from one area to another.	All weed species	During operational phase	Operator in Partnership with DES/ QPWS
Providing pamphlets and information on the booking website as part of booking paperwork to hikers and mountain bikers using the trail and operation staff to educate them about pathogens, weeds and pests within Wangetti Trail.	All weed species, particularly priority invasive plant species rated medium to high and that have a medium to high risk of occurring on site as outlined in Table 4-1.	During operational phase	Operator in Partnership with DES/ QPWS
Residual risk with control in place			
Implementation of recommended mitigation measures will not introduce and/or spread weeds within the project area, therefore have negligible impact on MNES and MSES species and their habitats.			
Performance indicator			
Existing weed species are identified and controlled onsite.			
No new weed outbreak on site.			
Corrective actions			
Weed outbreaks within the project area to be documented and reported to regulatory authority including and rectified immediately.			
Monitoring			
Regular inspections to include weeds onsite and to target high risk areas.			
All maintenance vehicle washdown checklists to be recorded. Records demonstrating that personnel associated with the operational phases have undertaken weed, pest and pathogen induction training.			

Factor – weeds

Liaison with WTMA regarding existing monitoring strategies for weed species within the WTWHA

Maintaining a register for weeds, pests and pathogens recorded within the project area.

Table 5-5 Mitigation measures to be implemented for Wangetti South Section during operation phase for pests

Factor – pests
Operational activities resulting in adverse impacts to the project area
<ul style="list-style-type: none"> • Introduction or spread of pests from operational activities within the project area. • Interference of local wildlife by domestic animals • Waste generation by users of the trail within the project area providing food to pest species • Spread of pest species within the project area from the movement of equipment, vehicle and material from affected areas outside of the project area leading to increase pest activities
Applicable MNES & MSES impacted
<ul style="list-style-type: none"> • Wet Tropics World Heritage Area and National Heritage Site <p>MNES and MSES bird species that are known likely or may occur:</p> <ul style="list-style-type: none"> • <i>Casuarus casuaris</i> (Southern cassowary) • Migratory birds (e.g. eastern curlew, great sand plover) • Non-migratory species (e.g. masked owl) <p>MNES and MSES amphibian species that are known, likely or may occur in the Wangetti South Section</p> <ul style="list-style-type: none"> • <i>Litoria dayi</i> (Australian lace lid) • <i>Litoria nannotis</i> (Waterfall frog) • <i>Litoria nyakalensis</i> (Mountain mistfrog) • <i>Litoria rheocola</i> (Common mistfrog) • <i>Litoria serrata</i> (Tapping green eyed frog) <p>MNES and MSES mammal species that are known, likely or may occur in the Wangetti South Section</p> <ul style="list-style-type: none"> • <i>Dasyurus maculatus gracilis</i> (Spotted-tailed quoll) • <i>Dasyurus hallucatus</i> (Northern quoll) • <i>Dendrolagus lumholtzi</i> (Lumholtz's tree-kangaroo) • <i>Hipposideros semoni</i> (Semon's leaf-nosed bat) • <i>Phascolarctos cinereus</i> (Koala) • <i>Pteropus conspicillatus</i> (Spectacled flying-fox) • <i>Rhinolophus robertsi</i> (Large-eared horseshoe bat) • <i>Saccolaimus saccolaimus nudicluniatus</i> (Bare-rumped sheath-tailed bat) • <i>Xeromys myoides</i> (Water mouse) <p>MNES and MSES aquatic species that are known, likely or may occur in the Wangetti South Section</p> <ul style="list-style-type: none"> • <i>Stiphodon semoni</i> (Opal cling goby) • <i>Stiphodon rutilarueus</i> (Orange cling goby)

Factor – pests

- *Stiphodon pelewensis* (Emerald cling goby)
- *Stiphodon surrufus* (Birdsong cling goby)

MNES and MSES flora species that are known, likely or may occur in the Wangetti South Section:

- *Archontophoenix myolensis* (Myola palm)
- *Anoectochilus yatesiae* (Marbled jewel orchid)
- *Canarium acutifolium*
- *Dendrobium fellowsii*
- *Dendrobium mirbelianum* (Dark-stemmed antler orchid)
- *Diplazium cordifolium*
- *Diplazium pallidum*
- *Myrmecodia beccarii* (Ant plant)
- *Phaius pictus*
- *Phalaenopsis amabilis* subsp. *rosenstromii* (Native moth orchid)
- *Polyscias bellendenkerensis*
- *Randia audasii*
- *Rhomboda polygonoides*
- *Toeckima pterocarpum* (Orange tamarind)
- *Vappodes lithocola* (Dwarf butterfly orchid) (also known as *Dendrobium lithocola*, and the Queensland Flora Census 2019 groups this species into *Dendrobium biggibum*)
- *Vappodes phalaenopsis* (Cooktown orchid) (Also known as *Dendrobium phalaenopsis* and the Queensland Flora Census 2019 groups this species into *Dendrobium biggibum*)
- *Zeuxine polygonoides* (Velvet jewel orchid) (also known as *Rhomboda polygonoides*)

Initial risk with no control

In the absence of project-specific mitigation measures, major but recoverable impacts to a factor of significance are likely.

Mitigation measure	Pest species targeted	Timing	Party responsible
Feeding of wildlife is prohibited and food scraps to be disposed on into bins at the camp area with closed/secured lids and removed from site regularly to minimise vermin infestations.	All pest species in particular yellow crazy ants, electric ants, cats, pigs, and dogs	At all times	Operator in Partnership with DES/ QPWS
General waste will be removed from the project camp area.	All pest species in particular yellow crazy ants, electric	During operational phase	Operator in Partnership with DES/ QPWS

Factor – pests			
	ants, cats, pigs, and dogs		
Users of the trail will be educated about not feeding the wildlife through 'no feeding wildlife' signage.	All pest species in particular yellow crazy ants, electric ants, cats, pigs, and dogs	During operational phase	Operator in Partnership with DES/ QPWS
Recreational users of the trail will be educated on the sensitive nature of the local landscape and the importance of avoiding introduction and spread of pests through the use of appropriate signage.	All pest species in particular yellow crazy ants, electric ants, cats, pigs, and dogs	During operational phase	Operator in Partnership with DES/ QPWS
Regular inspection of the trail and nodes, to check for pests.	All pest species in particular yellow crazy ants, electric ants, cats, pigs, and dogs	During operational phase	Operator in Partnership with DES/ QPWS
Providing pamphlets and information on the booking website as part of booking paperwork to hikers and mountain bikers using the trail and operation staff to educate them about pathogens, weeds and pests within Wangetti Trail.	All pest species in particular yellow crazy ants, electric ants, cats, pigs, and dogs	At all times	Operator in Partnership with DES/ QPWS
Residual risk with control in place			
Implementation of recommended mitigation measures will not introduce and/or spread pests within the project area, therefore have negligible impact on MNES and MSES species and their habitats.			
Performance indicator			
Existing pest species are identified and controlled onsite.			
No new pests species recorded on site.			
Corrective actions			
Pest outbreaks within the project area to be documented and reported to regulatory authority including and rectified immediately.			
Monitoring			
Weekly inspection to include pests onsite			
Maintaining a register for weeds, pests and pathogens recorded within the project area. Liaison with WTMA regarding existing monitoring strategies for pest species within the WTWHA.			

Table 5-6 Mitigation measures to be implemented for Wangetti South Section during operation phase for pathogens

Factor – pathogens
Operational activities resulting in adverse impacts to the project area
<ul style="list-style-type: none"> • Introduction or spread of pathogens from operational activities within the project area. • Spread of pathogens within the project area from the movement of equipment, vehicle and material from affected areas outside of the project area.
Applicable MNES & MSES impacted
<ul style="list-style-type: none"> • Wet Tropics World Heritage Area and National Heritage Site <p>MNES and MSES flora species that are known, likely or may occur in the Wangetti South Section:</p> <ul style="list-style-type: none"> • <i>Archontophoenix myolensis</i> (Myola palm) • <i>Anoectochilus yatesiae</i> (Marbled jewel orchid) • <i>Canarium acutifolium</i> • <i>Dendrobium fellowsii</i> • <i>Dendrobium mirbelianum</i> (Dark-stemmed antler orchid) • <i>Diplazium cordifolium</i> • <i>Diplazium pallidum</i> • <i>Myrmecodia beccarii</i> (Ant plant) • <i>Phaius pictus</i> • <i>Phalaenopsis amabilis</i> subsp. <i>rosenstromii</i> (Native moth orchid) • <i>Polyscias bellendenkerensis</i> • <i>Randia audasii</i> • <i>Rhomboda polygonoides</i> • <i>Toecharia pterocarpum</i> (Orange tamarind) • <i>Vappodes lithocola</i> (Dwarf butterfly orchid) (also known as <i>Dendrobium lithocola</i>, and the Queensland Flora Census 2019 groups this species into <i>Dendrobium biggibum</i>) • <i>Vappodes phalaenopsis</i> (Cooktown orchid) (Also known as <i>Dendrobium phalaenopsis</i> and the Queensland Flora Census 2019 groups this species into <i>Dendrobium biggibum</i>) • <i>Zeuxine polygonoides</i> (Velvet jewel orchid) (also known as <i>Rhomboda polygonoides</i>))))) <p>MNES and MSES amphibian species that are known, likely or may occur in the Wangetti South Section</p> <ul style="list-style-type: none"> • <i>Litoria dayi</i> (Australian lace lid) • <i>Litoria nannotis</i> (Waterfall frog) • <i>Litoria nyakalensis</i> (Mountain mistfrog) • <i>Litoria rheocola</i> (Common mistfrog)

Factor – pathogens			
<ul style="list-style-type: none"> <i>Litoria serrata</i> (Tapping green eyed frog) 			
Initial risk with no control			
In the absence of project-specific mitigation measures, major but recoverable impacts to a factor of significance are likely.			
Mitigation measure	Targeted pathogens	Timing	Party responsible
Providing boot/ bike wash facilities at both ends of the trail to ensure users do not track pest weeds onto the trail.	Myrtle rust, root rot fungus and Chytridiomycosis disease	At all times	Operator in Partnership with DES/ QPWS
Signage to be placed at entrances to national parks informing users of the chytrid fungus.	Myrtle rust, root rot fungus and Chytridiomycosis disease	At all times	Operator in Partnership with DES/ QPWS
<p>Educating trail users about Phytophthora Dieback Management Procedures through:</p> <ul style="list-style-type: none"> appropriate signage; installing signposted clean-down points at appropriate points on the track (including the start of the track) encouraging trail users to carry a hard brush and bottle of methylated spirits to use in cleaning and disinfecting boots. <p>Treatment methods are to be approved by WTMA, DES, TDPD and QPW, as applicable. Further information regarding the treatment and management of dieback is provided in Appendix B.</p>	Root rot fungus	At all times	Operator in Partnership with DES/ QPWS
Providing pamphlets and information on the booking website as part of booking paperwork to hikers and mountain bikers using the trail and operation staff to educate them about pathogens, weeds and pests within Wangetti Trail.	Myrtle rust, root rot fungus and Chytridiomycosis disease	At all times	Operator in Partnership with DES/ QPWS
Recreational users of the trail will be educated on the sensitive nature of the local landscape and the importance of avoiding introduction	Myrtle rust, root rot fungus and Chytridiomycosis disease	At all times	Operator in Partnership with DES/ QPWS

Factor – pathogens			
and spread of disease through the use of appropriate signage.			
Regular inspection of the trail and nodes, as per existing QPWS procedures during operation.	Myrtle rust, root rot fungus and Chytridiomycosis disease	At all times	Operator in Partnership with DES/ QPWS
Residual risk with control in place			
Implementation of recommended mitigation measures will not introduce and/or spread pathogens within the project area, therefore have negligible impact on MNES and MSES species and their habitats.			
Performance indicator			
Existing pathogens are identified and controlled onsite.			
No new pathogens are introduced to the project area.			
Corrective actions			
Disease outbreaks within the project area to be documented and reported to regulatory authority including and rectified immediately.			
Monitoring			
Maintaining a register for weeds, pests and pathogens recorded within the project area.			
Liaison with WTMA regarding existing monitoring strategies for pathogens within the WTWHA			

5.4 Induction training

All personnel working during the construction and operational phases of the Wangetti South Project will be required to undergo site specific induction which includes an outline of pest and weed prevention, minimisation and management requirements (other environmental sites) on site. Appropriate training as part of inductions suiting the different roles and responsibilities is to be undertaken in accordance with appropriate standards and conditions of approvals as advised by DES, QPWS, WTMA and TDPD, and other regulatory authorities.

Regulator toolbox meetings and pest and weed awareness sessions are also conducted. Topics addressed by these sessions include key weed, pest and disease management principles to maintain compliance with regulatory requirements and to reinforce solutions or increase awareness or any pest and weed-related issues that arise during the course of construction and operations.

Identification material provided by DES, QPWS, WTMA relating to weeds, pests and disease that may be present within the project area will be made available to all personnel working during the construction and operational phases of the Wangetti South Project including trail users.

5.5 Monitoring

Monitoring is an essential component of any WPDMP as it provides a means of identifying the following:

- Changes in the extent of weed population and pest population
- Changes in the cover density of weed populations
- Any new weed, pests and disease that may become established
- Documentation of any unexpected impacts of weeds, pests and disease control activities (i.e. unplanned damage to native vegetation)
- Changes in the extent and condition of native vegetation
- Changes in any conditions that have the potential to impact on site restoration works
- How well control methods are working

Personnel will be nominated during the construction phase and the operational phases of the project to undertake visual inspections and to identify any weeds, pests or disease in accordance with an established schedule for the project.

5.6 Corrective actions

The Project Manager during each phase (construction and operational) is responsible for ensuring that on receipt of a weed/pest/pathogen notification form or trail inspections relating to weeds or pests, an investigation should be undertaken promptly, and appropriate actions undertaken. Additionally, following identification of restricted/declared weeds and pests, a revision to this management plan should be undertaken, and further controls implemented as necessary. Corrective action controls may include the use of contracted licensed weed eradicator or pest exterminator. All corrective actions will be implemented to meet the required outcomes of the Administering Authorities.

6. Reporting, auditing and review

6.1 Reporting and auditing

Reporting incidents relating to weed, pests and diseases are the responsibility of all personnel onsite at all times and are to be recorded and managed in a complaints register with the corrective actions undertaken. The contractor in the construction phase and operational phase will be required to develop a complaints management system and register and seek approval from TDPD, DES and QPWS.

As part of an onsite environmental workplace inspection program, an environmental workplace inspection is to be carried out to assess environment performance and weed management. Records and related documents will be audited periodically to ensure that work that has been laid out in this plan has been undertaken and captured. Management documentation, for example plans and procedures, will be reviewed periodically to ensure that they remain applicable to current operations and compliant with requirements set by regulatory authorities.

6.2 Review

WPDMP is a living document and shall be reviewed against the following performance criteria to determine the effectiveness of this procedure:

- No introduction or spread of new (declared) weeds and pests.
- No complaints are received from regulatory authorities or the community.
- Works undertaken in accordance with the Biosecurity Act
- All machinery to have a certified weed hygiene certificate issued by an authorised person/department.
- No new pest/weed species introduced and no increase to existing pest/weed species abundance and distribution
- Site rehabilitated after construction
- No unapproved clearing to occur beyond the required limits for construction
- Identified sensitive areas are demarcated and managed appropriately with minimal impacts
- No incidents of death or injury to native fauna

It should also be reviewed if any of the following occur:

- The WPDMP is not adequately managing the issue
- Legislative requirement changes
- A previously unidentified declared or weed species if found within the area of activity
- New procedures relating to weed, pest and disease management are developed.

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Appendices

Appendix A – Map showing distribution of weeds, pests and pathogen



Asian Honey Bee Known Infested Area

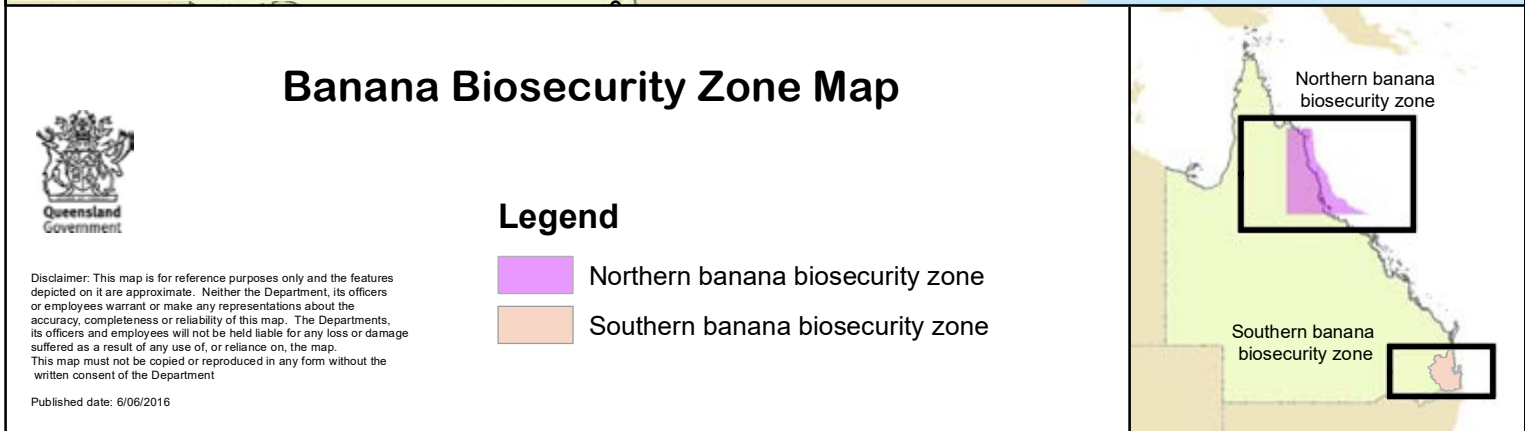
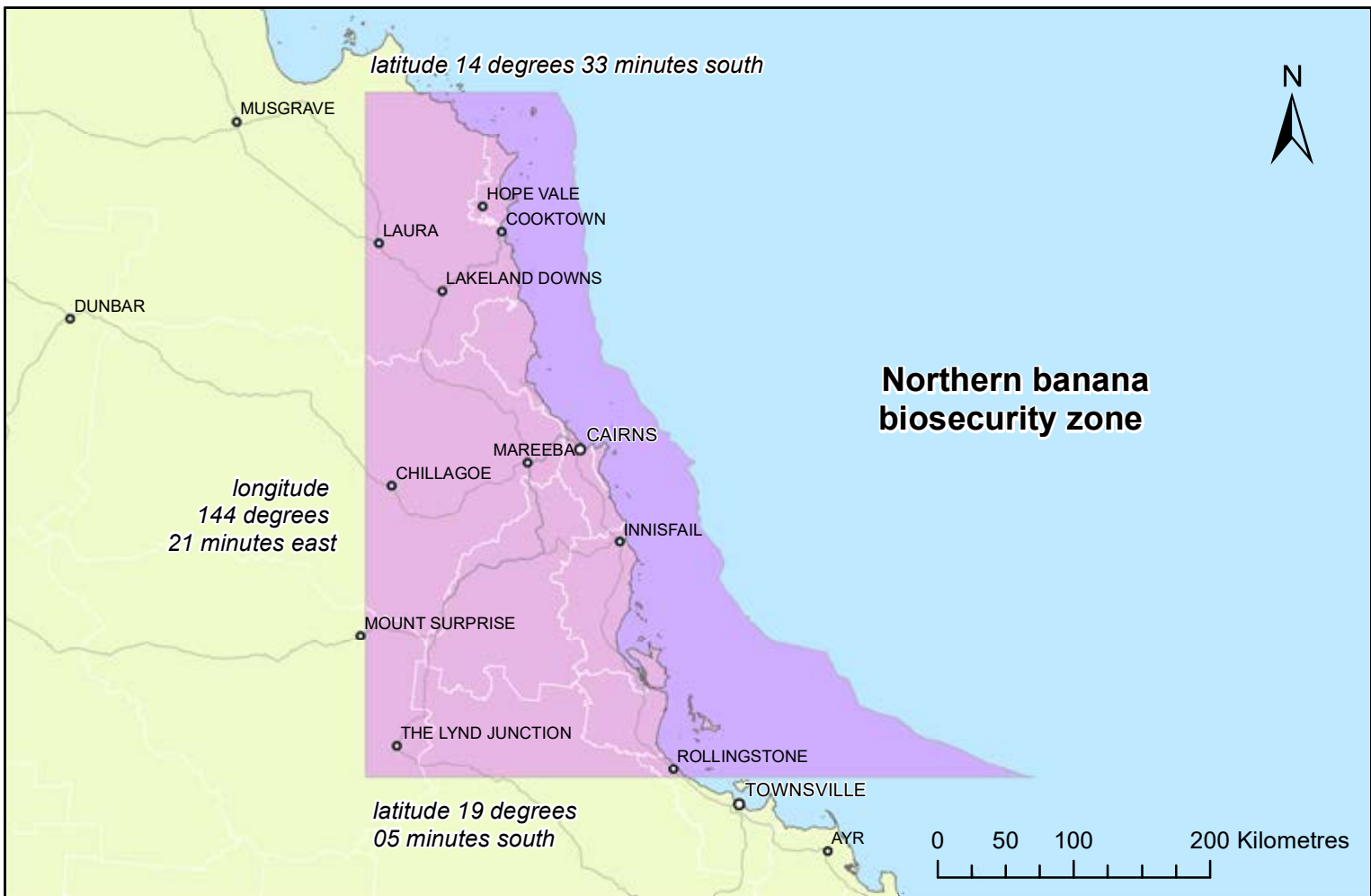


- Extension confirmed 06/01/2020
- Known infested area

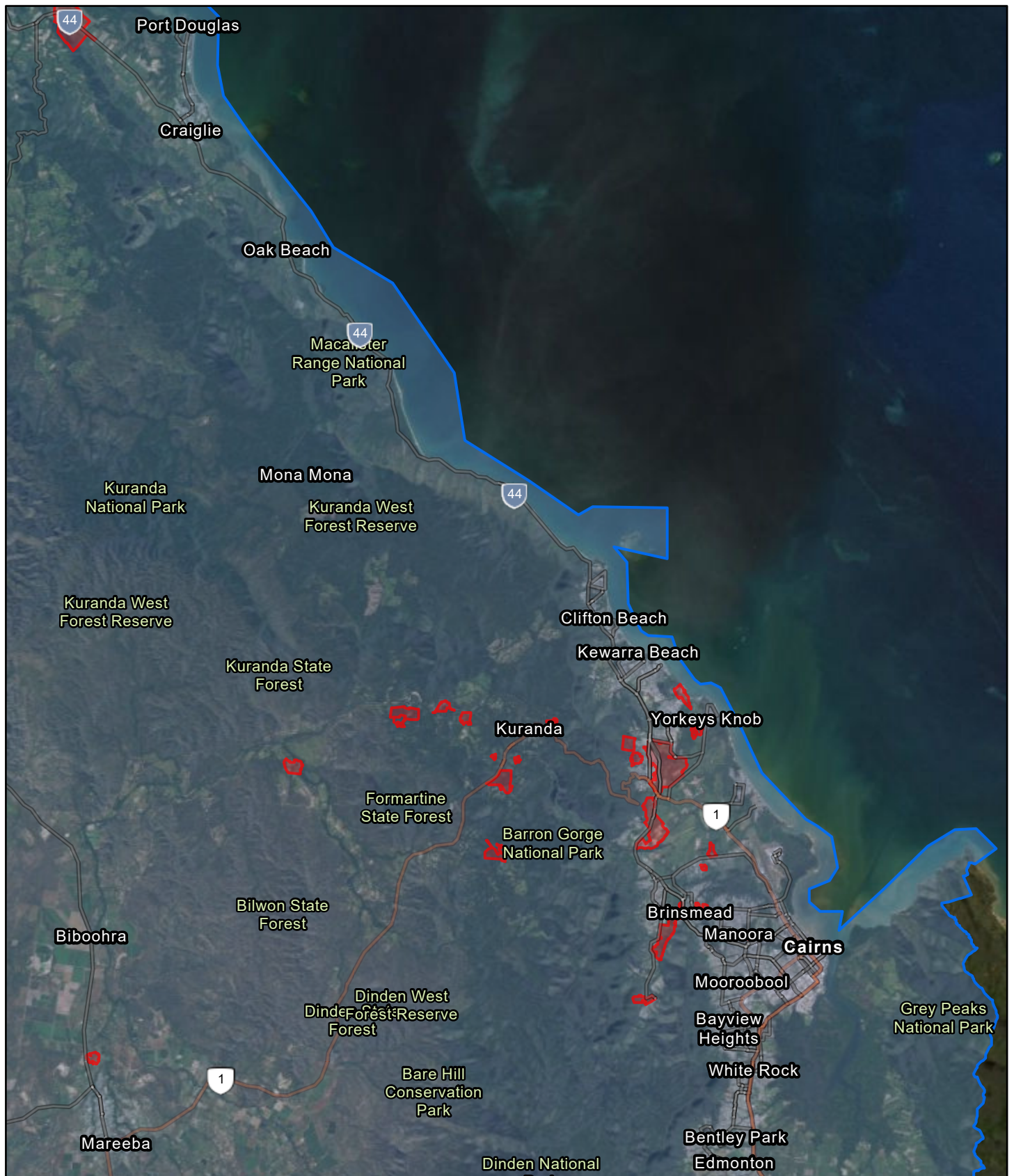
0 10 20 Kilometres

Disclaimer: This map is for reference purposes only and the features depicted on it are approximate. Neither the Department, its officers or employees warrant or make any representations about the accuracy, completeness or reliability of this map. The Department, its officers and employees will not be held liable for any loss or damage suffered as a result of any use of, or reliance on, the map. This map must not be copied or reproduced in any form without the written consent of the Department.

Published date: 6/01/2020

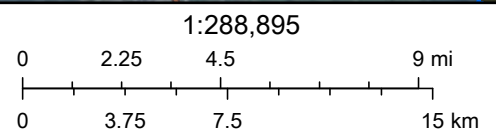


Electric Ant Biosecurity Zone Map EA02 – 15 June 2018



11/16/2020, 11:22:21 AM

- Electric ant restricted zone
- Electric ant biosecurity zone EA02



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Electric Ant Biosecurity Zone Map EA02 – 15 June 2018
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Appendix B – Factsheets about the identification and treatment of high risk weeds, pests and pathogens

Miconia (*Miconia calvenscens*)

Human Health Social Amenity Economy Environment Achievability Local Impact/Values Declaration Status National priority

Priority



Details

Description Small tree (up to 15 m) with large leaves up to 70 cm long. The underside of the leaves is a distinct, deep iridescent purple. Produces clusters of small white flowers followed by red/purple berries.

Distribution Current incursions and infestations occur in Babinda, Deeral, Frenchman's Creek, Harvey Creek, Russell River and Whitfield. Miconia was typically introduced as a garden plant and then spread into neighbouring rainforest and creek lines by birds.

Impacts Miconia produces hundreds of small berries every year which are attractive to birds and are spread long distances. It forms dense thickets in rainforest understoreys, potentially replacing native plants and affecting wildlife populations.

Key projects Target of the National cost-shared Tropical Weeds Eradication Program led by Biosecurity Queensland. All plants should be reported to Biosecurity Queensland immediately on 13 25 23.

Background

Miconia is a serious weed in Tahiti and Hawaii, where it forms dense thickets in rainforests and displaces native flora and fauna. Miconia was initially brought into Australia via botanic gardens, and was sold in some nurseries and markets between 1978 and the mid-1990s. Dispersal to new locations has been mainly via cultivation – gardeners and plant collectors. Fruit eating birds are then the primary mechanism of dispersal into surrounding forests and gardens.

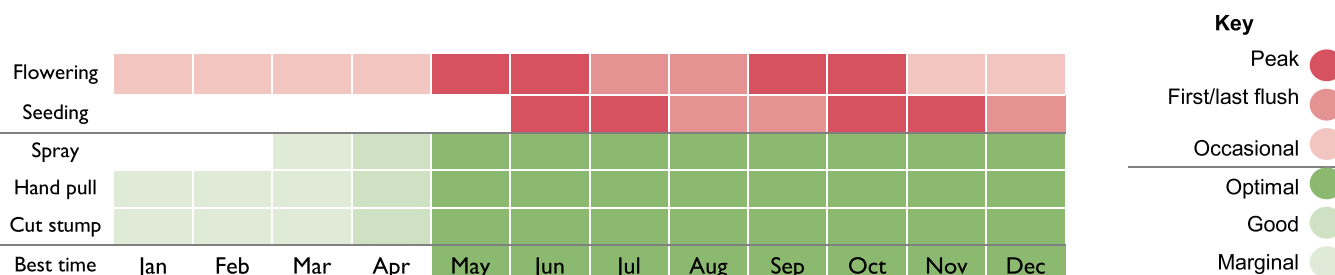
A community education and awareness program is an important part of the eradication program. Managing the risk of spread to new areas through hygiene protocols for impacted nurseries and growers play an important role in preventing new infestations establishing. Hygiene protocols are also in place for survey and control operations.

Miconia calvenscens was first discovered in Cairns Regional Council in 1997 at the Flecker Botanical Gardens. Miconia has been detected at 14 locations in the CRC area since 1997.

A National eradication program is underway and is targeting survey, control and monitoring of all known infestations. Bi-annual surveys are conducted to monitor all known infestations and to ensure no new outbreaks have gone undetected; and that plants do not produce seed.

Birds can disperse the small seeds out to many hundreds of metres. The seed of Miconia can remain viable for at least 16 years so it is important to not disturb areas where mature plants have occurred in the past.

Control calendar

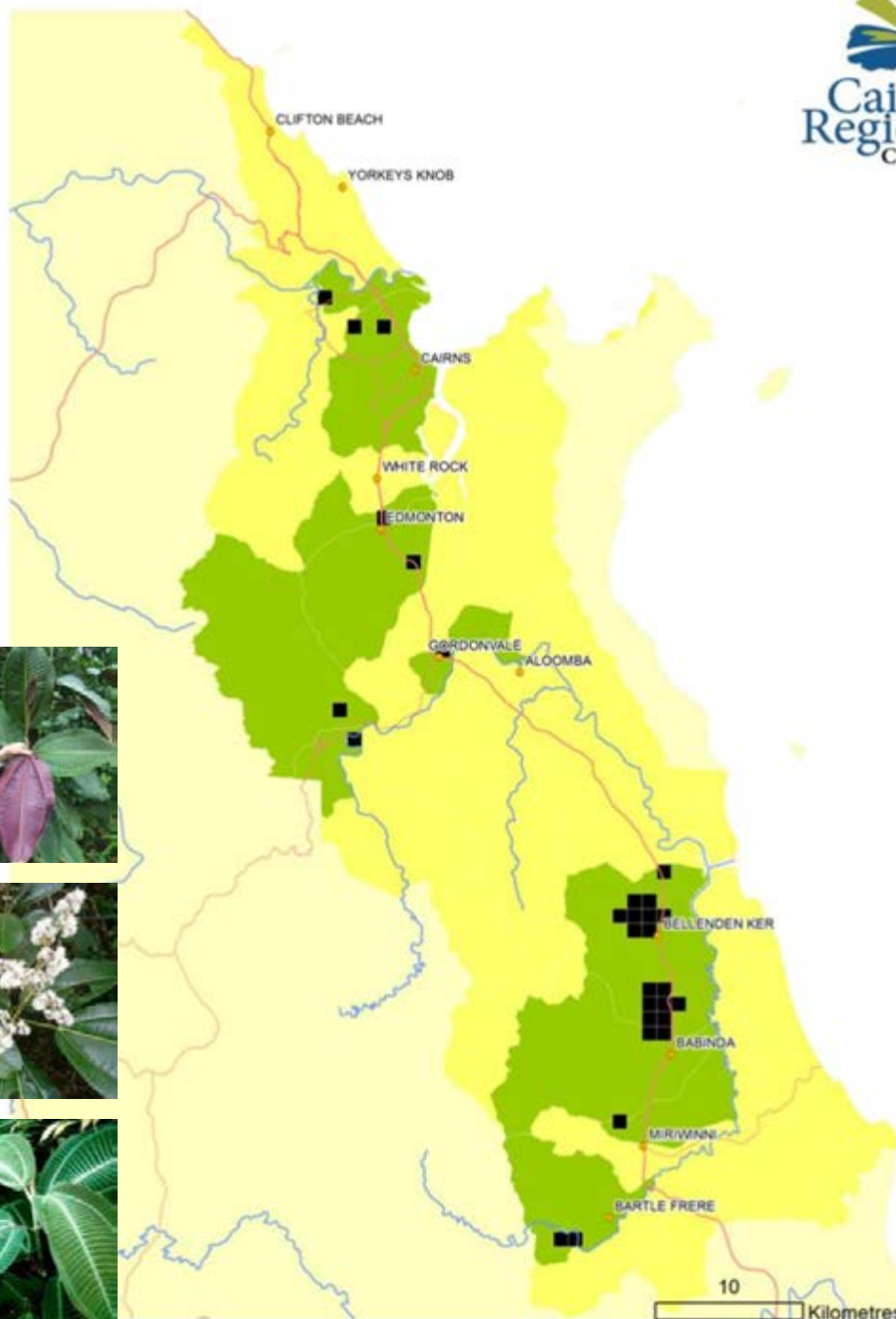


Key



For more information on using this biosecurity action plan fact sheet, and further information on control tools, refer to the Cairns Biosecurity Plan available at cairns.qld.gov.au and customer service centres.

Miconia (*Miconia calvenscens*)



Woody

Terrestrial

Perennial

Biosecurity Act
Restricted
matter
category

2

Must be
reported

3

Do not
distribute

4

Do not
move

5

Do not
keep

6

Do not
feed

Control



What is my biosecurity obligation?

**In the
prevention
zone**

Currently the target of the National cost-shared Tropical Weeds Eradication Program. Landholders are required to report suspected infestations immediately to Biosecurity Queensland on 13 25 23. For more information refer to the biosecurity programs of the Tropical Weed Eradication Program.

**In the
eradication
zone**

If you have an active infestation on your property you can assist the survey and control team by maintaining property access points and tracks, and ensuring you do not move soil or plant material from the infestation area.

Landholders are required to report suspected infestations immediately to Biosecurity Queensland on 13 25 23. For more information refer to the biosecurity programs of the Tropical Weed Eradication Program.

Spread



Limnocharis (*Limnocharis flava*)

Human Health Social Amenity Economy Environment Achievability Local Impact/Values Declaration Status National priority

Priority



Details

Description Limnocharis is a perennial aquatic weed which can grow to a height of 1 metre. It has pale green leaves and small yellow cup-shaped flowers. Stems of leaves are triangular in cross-section.

Distribution Limnocharis can occur in natural or artificial water features and wetlands. There are active infestations in Centenary Lakes, Cairns CBD, Mirriwinni, White Rock, Smithfield and Redlynch. Historical infestations have also occurred in Manunda, Clifton Beach, Woree, East Russell and Trinity Beach.

Impacts A major weed in many countries. Limnocharis is a perennial aquatic plant which will colonise shallow wetlands and margins of deeper waterways. It competes with native plants, blocks drains and displaces native flora and fauna.

Key projects All known infestations within the Cairns Region are currently the target of the National cost-shared Tropical Weeds Eradication Program. Landholders are required to report suspected infestations immediately to Biosecurity Queensland on 13 25 23.

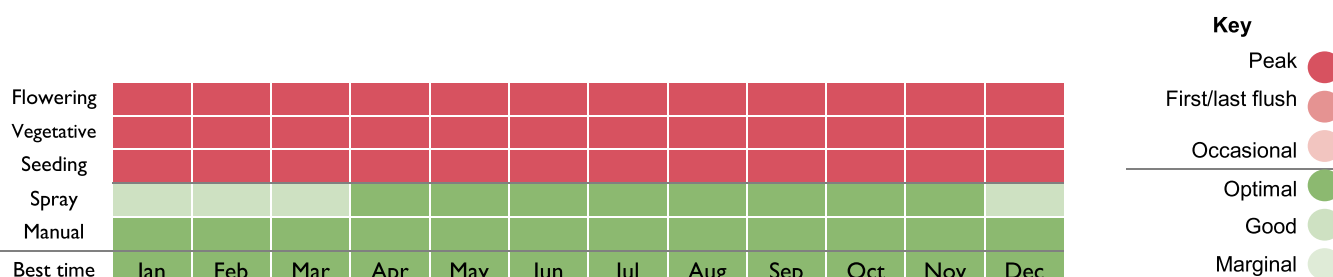
Background

Due to its scattered occurrence across the Cairns region it is important to be on the lookout for Limnocharis in natural and artificial water features and wetlands. Regular media campaigns and community displays can assist to identify new infestations. Limnocharis was first discovered in Cairns Regional Council area in 2001. Anecdotal information from the Cairns botanical gardens suggests that it may have been present there since the 1980s. Limnocharis was introduced as an ornamental wetland plant and has escaped from cultivation into drains, creeks and wetlands. Ensuring that aquatic plants are sourced from a weed free source is essential to prevent further spread of invasive aquarium plants. The seed is long-lived and can re-emerge many years after being buried in mud or soil in waterways.

The distinctive yellow flowers help distinguish it from native or introduced water hyacinth which have purple flowers. The leaf stems are also triangular on cross section. The seed longevity is at least fourteen years with plants reaching reproductive maturity in 58 days. Thus infestations must be monitored every 3 -4 weeks to stop all seeding events. Dispersal to new locations has been mainly via cultivation – gardeners and plant collectors. Local movement is via water dispersal of seed or vegetative plantlets.

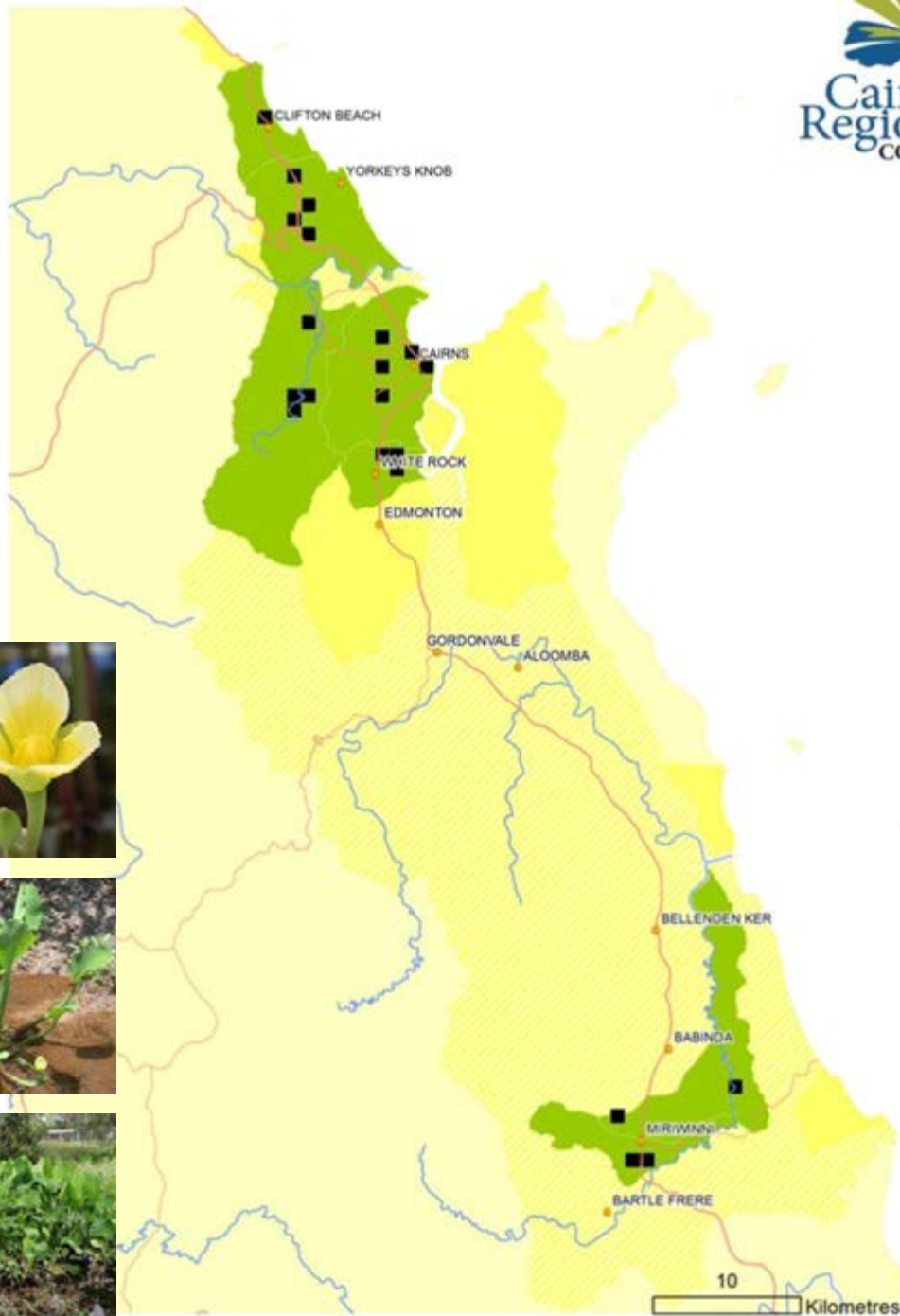
The seed can remain viable buried in mud and soil for many years so any works in the vicinity of known sites require strict hygiene protocols, contact the eradication team on 13 25 23 for more information or if unsure of the risk.

Control calendar



For more information on using this biosecurity action plan fact sheet, and further information on control tools, refer to the Cairns Biosecurity Plan available at cairns.qld.gov.au and customer service centres.

Limnocharis (*Limnocharis flava*)



Herb

Aquatic

Perennial

Biosecurity Act
Restricted matter category

2

Must be reported

3

Do not distribute

4

Do not move

5

Do not keep

6

Do not feed

Control



Spread



What is my biosecurity obligation?

In the delimitation zone

Ensure wetland and pond plants are sourced from a weed free area. Do not dump wetland, aquarium plants or fish into waterways. Landholders are required to report suspected infestations immediately to Biosecurity Queensland on 13 25 23. For more information refer to the biosecurity programs of the Tropical Weed Eradication Program.

In the prevention zone

Do not move soils and plants from infested sites. Ensure machinery and other plant operating in vicinity of the known infestation is operating under strict weed hygiene protocols.

In the eradication zone

If you have an active infestation on your property you can assist the survey and control team by maintaining property access points and tracks, and ensuring you do not move soil or plant material from the infestation area. Landholders are required to report suspected infestations immediately to Biosecurity Queensland on 13 25 23. For more information refer to the biosecurity programs of the Tropical Weed Eradication Program.

Mexican bean tree (*Cecropia peltata*, *C. pachystachya* *C. palmata*)

Human Health Social Amenity Economy Environment Achievability Local Impact/ Values Declaration Status National priority

Priority



1.0/5

1.0/5

4.0/5

3.0/5

5.5/5.5

3.0/5

2.5/5

0.0/5

Details

Description A rapidly growing tree to 20m with hollow stems and large deeply lobed leaves with flocked white undersides. The tree has distinctive leaf scars on trunk which are similar to a paw paw. *Cecropia* has separate male and female plants with the female plant producing long finger-like fruiting spikes.

Distribution There are three known infestations in the Cairns Regional Council area located at Clifton Beach, Cairns City and Garradunga which extends into Cassowary Coast Regional Council.

Impacts *Cecropia* spp. are rapid growing rainforest pioneers which can invade and dominate rainforests, urban gardens, agricultural land and riparian areas. *Cecropia* seed profusely and are spread by birds and bats and subsequently can be dispersed long distances into adjoining landscapes and forests.

Key projects All known locations are the target of a regional eradication program led by Biosecurity Queensland. *C. pachystachya*, *C. palmata* are under monitoring towards eradication as they have not been detected since early 2017.

Background

Seed longevity in *Cecropia* is short at less than 2 years. This gives great confidence in eradication programs as sites can be considered free quickly. Properties need to be free of *Cecropia* for a minimum of three years following the removal of last mature female plant to be considered clear.

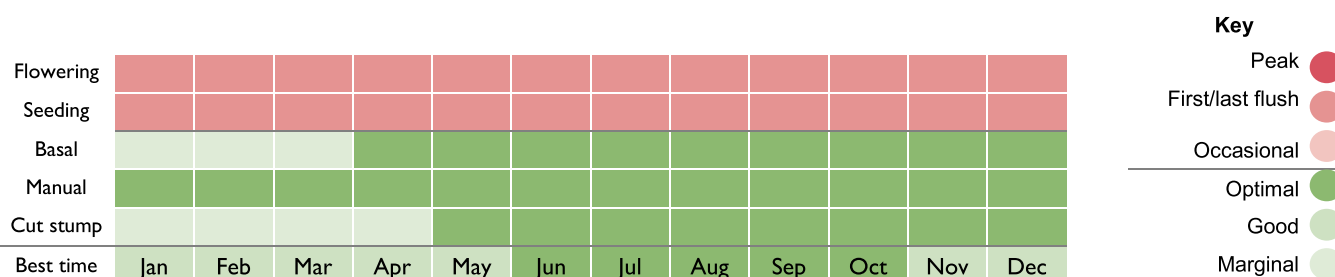
All infestations are believed to have originated from plant collections and subsequently spread and naturalised in the surrounding environment via vectors including birds, bats and water. Dispersal by birds or bats of up to 2km has been observed in Far North Queensland, however data suggests a management area which buffers 1.5km from female plants is suitable.

Due to dispersal by birds and flying fox it is important to be on the lookout for *Cecropia* in gardens, forests and riparian areas.

A community education and awareness program is an important part of the eradication program. Managing risk of spread to new areas through hygiene protocols for impacted nurseries and growers play an important role in prevention. Hygiene protocols are also in place for survey and control operations.

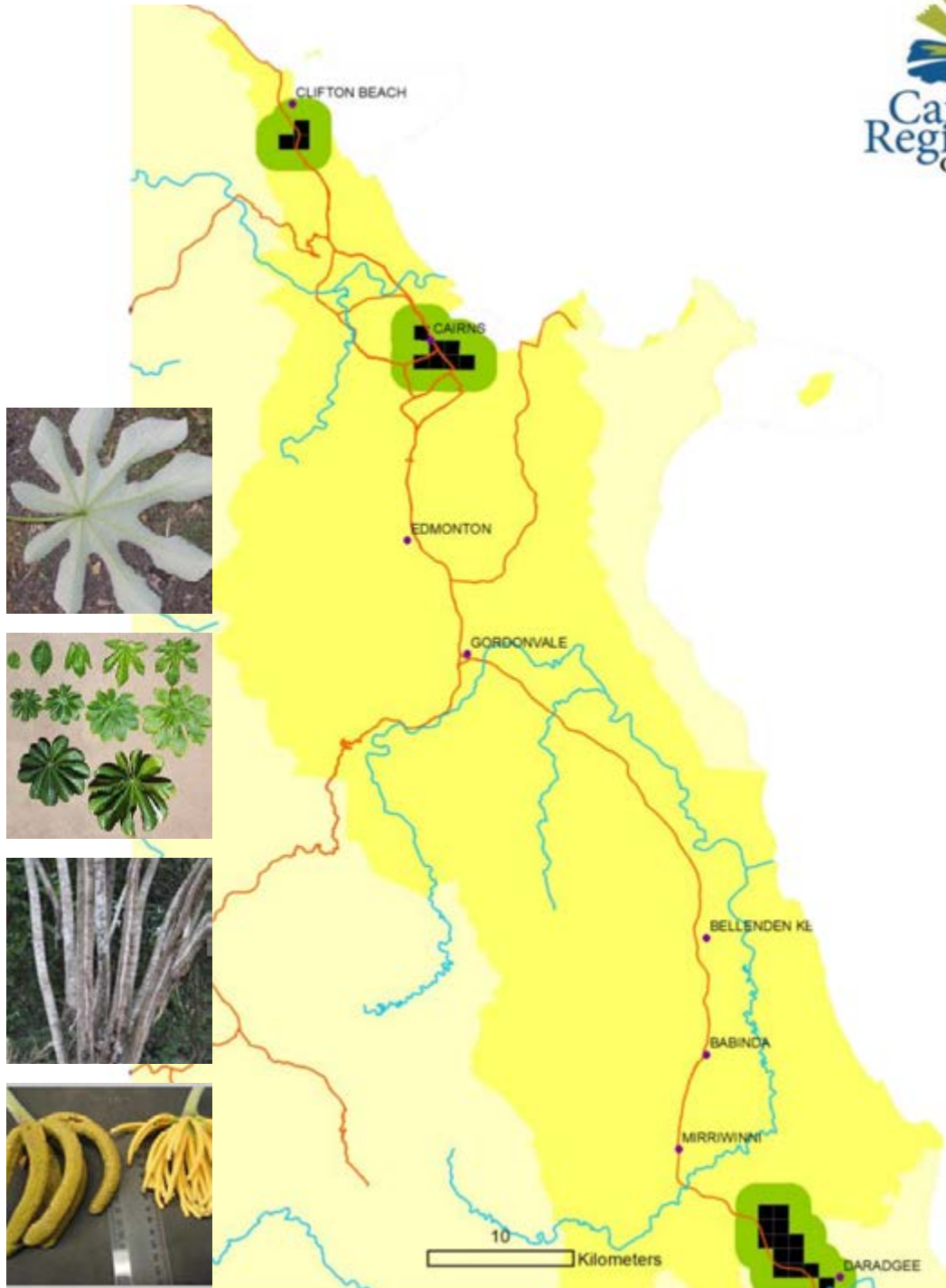
When searching for *Cecropia* in the field, programs have learnt to adopt three techniques to maximise detection success, namely; 1) look up into the canopy, searching for the unique leaf shape and the leaves' silvery/white underside; 2) look ahead for the distinctive leaf scars on the stems; and 3) look down for the large, dry, silvery grey leaves on the ground.

Control calendar



For more information on using this biosecurity action plan fact sheet, and further information on control tools, refer to the Cairns Biosecurity Plan available at cairns.qld.gov.au and customer service centres.

Mexican bean tree (*Cecropia peltata*, *C. pachystachya* *C. palmata*)



Woody

Terrestrial

Perennial

Biosecurity Act
Restricted matter category

2

Must be reported

3

Do not distribute

4

Do not move

5

Do not keep

6

Do not feed

Control



Spread



What is my biosecurity obligation?









In the
prevention
zone

All suspected sightings of this plant must be reported to Biosecurity Queensland on 13 25 23 within 24 hours. It is an offence under the Biosecurity Act 2014 to sell, distribute or give away *Cecropia* plants or seeds. If moving to a new property with a history of nursery or fruit tree production, be on the lookout for *Cecropia* plants.

In the
eradication
zone

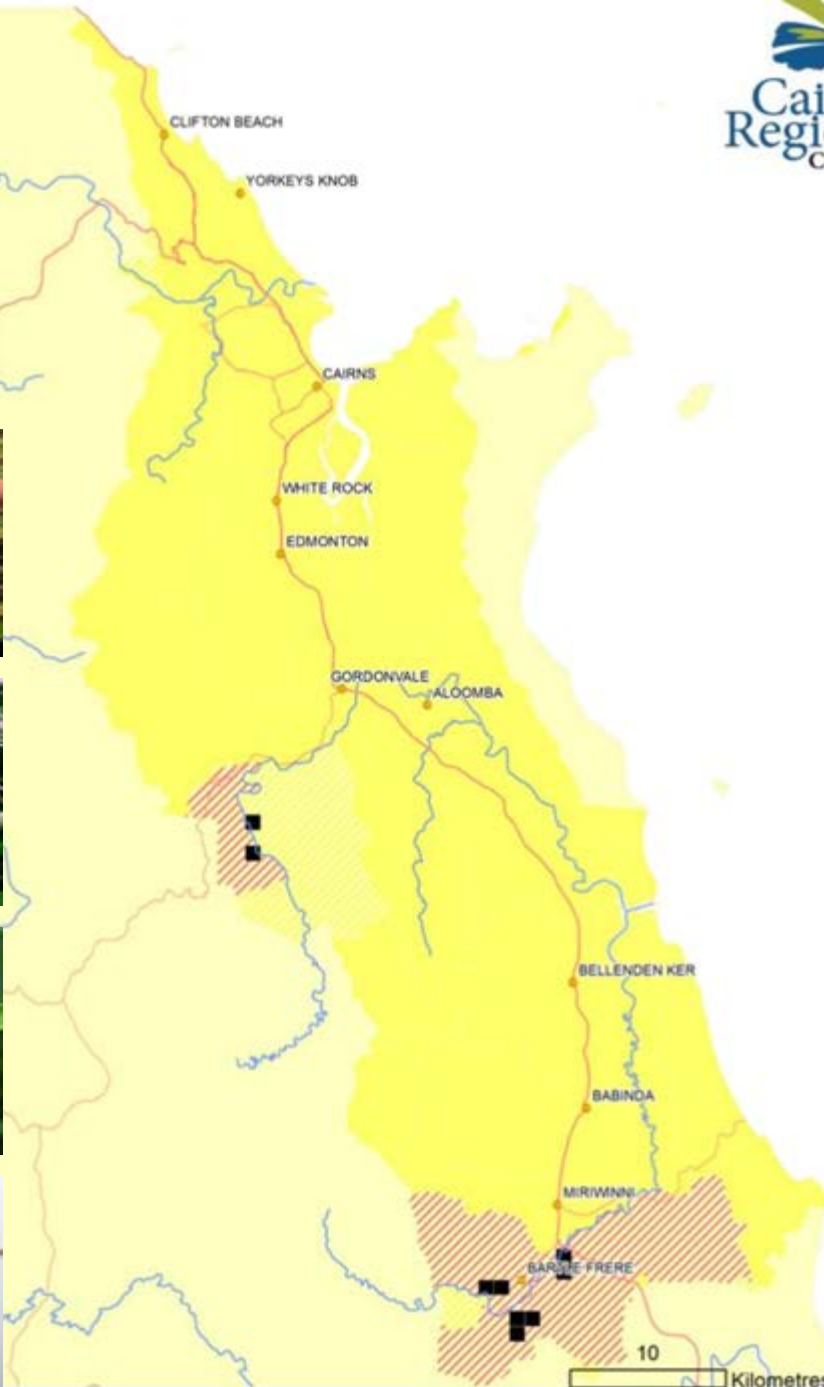
All suspected sightings of this plant must be reported to Biosecurity Queensland on 13 25 23 within 24 hours. If you have an active infestation on your property you can assist the survey and control team by maintaining property access points and tracks, and ensuring you do not move soil or plant material from the infestation area. Land managers are required to control all known infestations on their land. As plants take 3 years to reach sexual maturity land managers are required to survey their part of the management area twice in the first three years following detection and once every 2 years after until deemed eradicated by an Authorised Officer under the Biosecurity Act 2014.

Siam weed (*Chromolaena odorata*)

	Human Health	Social Amenity	Economy	Environment	Achievability	Local Impact/ Values	Declaration Status	National priority																																																																																																
Priority																																																																																																								
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Details	<p>Description A scrambling woody shrub to 3 metres, (higher as a scrambling climber), with distinctive forked leaf venation and purple flush on new leaves. Clusters of white to lilac flowers in May-June and October. Distinguish from the weeds Bluetop and Praxelis, which have short-tasselled mauve to purple flowers and different leaves.</p> <p>Distribution There are occasional infestations of Siam weed in Goldsborough Valley and Little Mulgrave. Larger infestations are throughout the Russell Catchment in Woopen Creek and Bartle Frere areas. A large infestation has recently been detected in Waugh’s pocket.</p> <p>Impacts Siam weed forms dense thickets and outcompetes native species and pasture in both disturbed and undisturbed sites. It prefers richer soils in alluvial and riparian zones but will grow in woodlands and coastal zones.</p> <p>Key projects The target of a National Eradication Program up until 2012, Siam weed was devolved to local governments for further management. Contact Cairns Regional Council to report any suspect plants on 1300 692 247. As of publication, Council has implemented a Biosecurity Prevention and Control Program for this pest.</p> <p>Areas marked for delimitation require on ground surveys to determine extent of distribution. No infestations are currently known in these areas.</p> <p>Siam weed is likely to arrive with contaminated stock, produce, vehicles or machinery from adjoining infested areas. Ensuring weed hygiene measures are in place and materials/produce are sourced from a clean site will assist to protect your property.</p> <p>Siam weed has a peak flowering period in May-June with another, less vigorous flowering in October. It is most visible at these times and this feature is used to detect plants prior to seeding. Siam weed is able to be spread by wind and water as well as machinery and vehicles.</p> <p>The seeds of Siam weed have been confirmed to remain viable in the soil for at least 7 years. Maintaining records of historical infestations and restricting disturbance and movement of soil is essential to prevent spread to new locations.</p> <p>Conducting surveys during the peak flowering time in May-June is the best way to detect any new outbreaks or to monitor previously controlled areas. Monitoring along forest edges, degraded pastures and riparian areas is a useful strategy to detect new infestations or single plants. Maintaining healthy native vegetation along watercourses and vigorous pastures will assist to reduce opportunities for Siam weed to establish in new locations.</p>																																																																																																							
Background																																																																																																								
Control calendar	<table><tr><td>Flowering</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Seeding</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Spray</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Burn</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Hand pull</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Cut stump</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Best time</td><td>Jan</td><td>Feb</td><td>Mar</td><td>Apr</td><td>May</td><td>Jun</td><td>Jul</td><td>Aug</td><td>Sep</td><td>Oct</td><td>Nov</td><td>Dec</td></tr></table>												Flowering													Seeding													Spray													Burn													Hand pull													Cut stump													Best time	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	<div>Key</div> <div><div>Peak</div><div>First/last flush</div><div>Occasional</div><div>Optimal</div><div>Good</div><div>Marginal</div></div>
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For more information on using this biosecurity action plan fact sheet, and further information on control tools, refer to the Cairns Biosecurity Plan available at cairns.qld.gov.au and customer service centres.

Siam weed (*Chromolaena odorata*)



What is my biosecurity obligation?

In the delimitation zone

Report any suspected outbreaks or detections to Cairns Regional Council on 1300 692 247. Conduct surveys during peak flowering period of May-June.

In the prevention zone

Report any suspected outbreaks or detections to Cairns Regional Council on 1300 692 247.

Ensure weed hygiene measures are in place and materials/produce are sourced from a clean site.

In the containment zone

Ensure best practice weed hygiene measures are in place to reduce risk of spread to new locations. Maintain weed free areas. Identify high value assets and protect them from impacts where possible.

Treat isolated infestations with high risk of spread.

Conduct annual surveys during peak flowering time to detect any new outbreaks or recruitment of new plants from dormant seeds in known locations.

Woody

Terrestrial

Perennial

Biosecurity Act
Restricted matter category

2

Must be reported

3

Do not distribute

4

Do not move

5

Do not keep

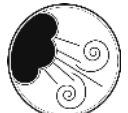
6

Do not feed

Control



Spread



Water hyacinth (*Eichhornia crassipes*)

Human Health Social Amenity Economy Environment Achievability Local Impact/Values Declaration Status National priority

Priority



Details

Description A free-floating, aquatic herb with glossy, spoon shaped leaves and distinctive purple/lilac flowers. Water Hyacinth forms dense blankets over waterways and wetlands. A similar native species occurs but can be distinguished by its yellow flowers and spear-shaped leaves

Distribution Occasional and localised in the lower Mulgrave River catchment and Caravonica suburb, within waterways.

Impacts Water Hyacinth floats on still or slow-moving water and can rapidly spread to cover the entire water surface with a thick mat of vegetation. This shades out any submerged plant life and impedes oxygen exchange, making the water unsuitable for fish and other animals.

Key projects As of publication, Council has implemented a Biosecurity Prevention and Control Program for this pest in riparian areas.

Background

Water Hyacinth is most likely to be introduced in water features and ponds or as an aquarium plant. Ensure water features and ornamental gardens do not contain Water Hyacinth. Water Hyacinth grows from seed and by division of mature plants and may be spread in contaminated soil from water features containing the weed in other areas.

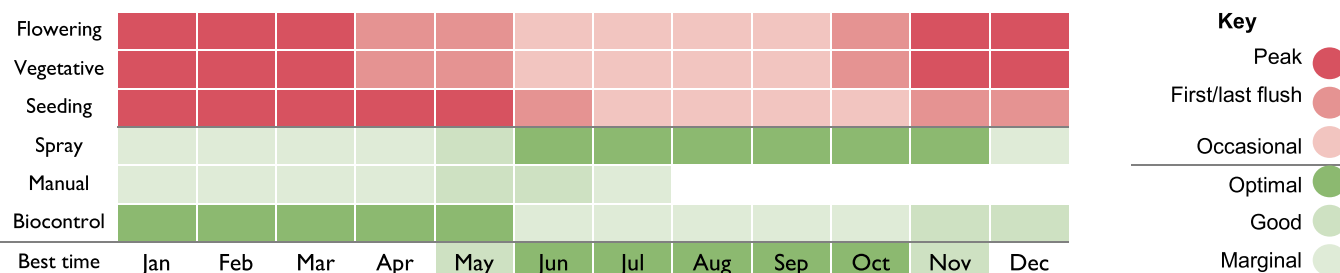
Infestations are currently controlled with herbicide and follow-up surveys to ensure all plant fragments have been treated. Treat new incursions as they are reported or found.

Water hyacinth can be moved on floodwaters, checking wetlands and water features after flooding events. Define assets to protect. As they become impacted, take reasonable measures to reduce impact on asset. Targeted maintenance of drainage and waterway systems.

Water Hyacinth is most likely to be introduced in water features and ponds or as an aquarium plant. Ensure water features and ornamental gardens do not contain Water Hyacinth. Water Hyacinth grows from seed and by division of mature plants and may be spread in contaminated soil from water features containing the weed in other areas.

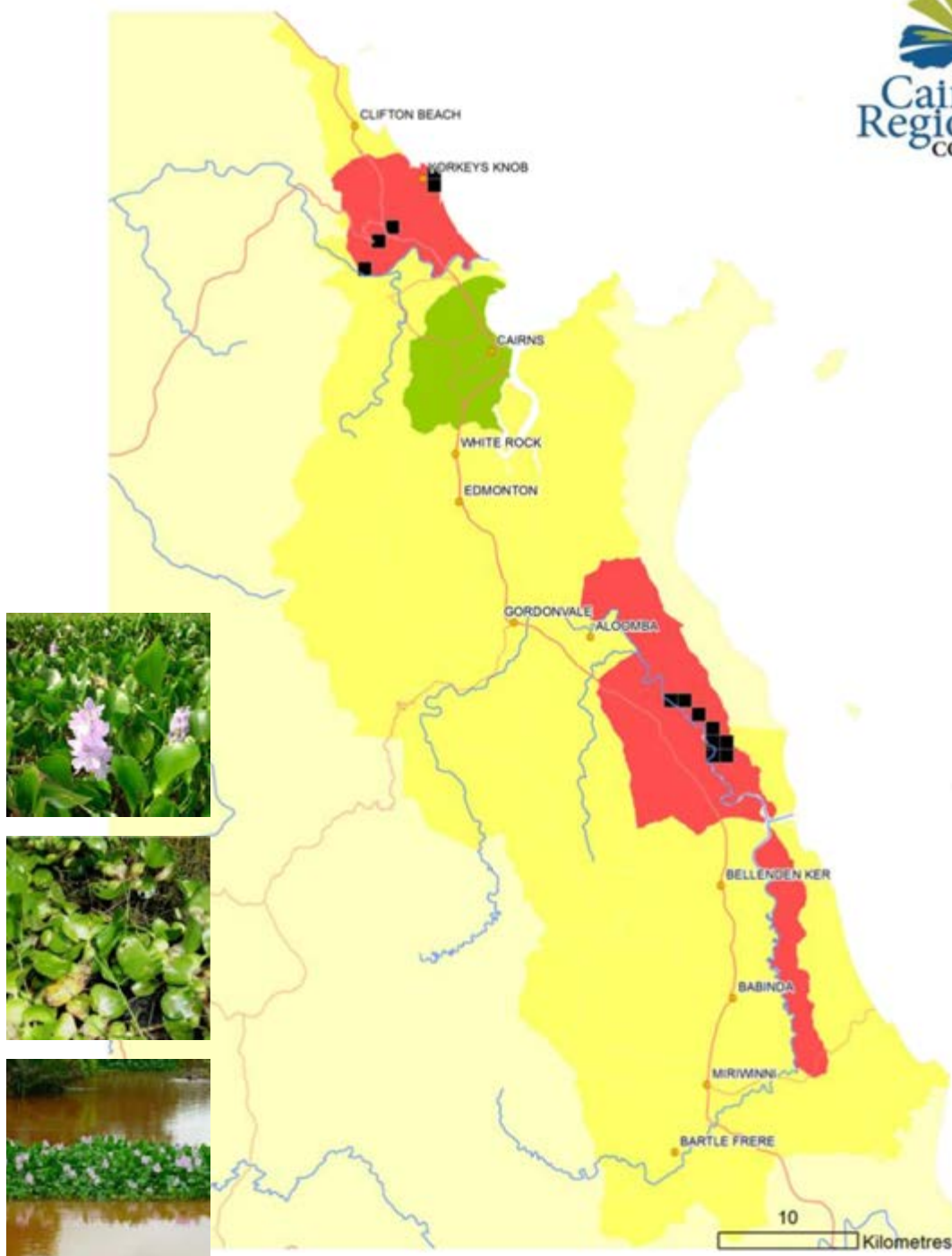


Control calendar



For more information on using this biosecurity action plan fact sheet, and further information on control tools, refer to the Cairns Biosecurity Plan available at cairns.qld.gov.au and customer service centres.

Water hyacinth (*Eichhornia crassipes*)



What is my biosecurity obligation?

In the prevention zone

It is an offence under the Biosecurity Act to move, share, give away or sell this plant. Ensure wetland and pond plants are sourced from a reliable supplier and are from a weed free area. Do not dump aquarium plants or fish into waterways. Ensure any machinery or vehicles moving from infested areas are free from plant material and soil. Contact Cairns Regional Council on 1300 692 247 to report any suspect plants.

In the eradication zone

Ensure control measures are performed prior to flooding events where spread has a higher risk of occurring. Contact Cairns Regional Council to report any suspect plants on 1300 692 247.

In the asset protection zone

Identify high value assets and protect them from impacts where possible. Maintain best practice weed hygiene measures to reduce risk of spread.

Floating

Aquatic

Perennial

Biosecurity Act
Restricted matter category

2

Must be reported

3

Do not distribute

4

Do not move

5

Do not keep

6

Do not feed

Control



Spread



Brillantaisia (*Brillantaisia lamium*)

Human Health Social Amenities Economy Environment Achievability Local Impact/Values Declaration Status National priority

Priority



Details

Description A small shrubby herb from 20cm to 2m in height. Brilliantaisia has hairy square stems with heart shaped leaves. Purple (sometimes white) pea-like flowers are held on thin stems prior to forming cigar shaped seed pods. Brilliantaisia can grow in to a dense, thick ground cover right down to the waters edge.

Distribution Localised in Freshwater Creek and becoming widespread and common from Babinda south concentrating into the Woopen Creek sub-catchment. There is also an isolated infestation in the East Russell.

Impacts Brilliantaisia forms a dense mat and outcompetes native plants in riparian zones. It can take over domestic gardens and roadsides. The small seeds spread easily on machinery, vehicles and waterways. It grows well in both full shade and/or full sunlight.

Key projects Brilliantaisia is locally declared under Cairns Regional Council local laws.

Background

Areas marked for delimitation require on ground surveys to determine extent of distribution. No infestations are currently known in these areas.

Brillantaisia spreads readily on machinery and within contaminated soils. It was introduced into the Wet Tropics via a nursery in the Mossman area from where it has been spread in garden plants. Because the plant has rapid growth and seed production it can quickly establish and become infestations which are difficult to manage. It causes impact to ground storey vegetation along riparian zones, roadsides and in pastures.

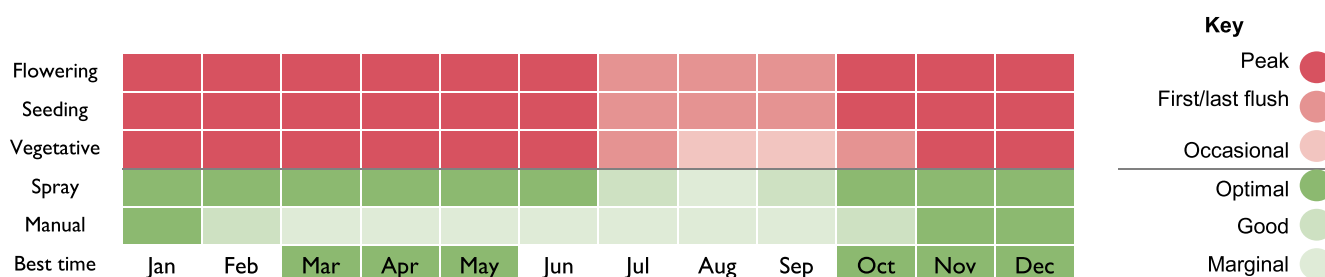
Brillantaisia grows rapidly and can flower and seed all year round requiring survey and treatment on a continual basis. Isolated outbreaks are treated every six weeks to prevent plants from seeding. Survey in and around the known infestations are conducted to ensure all locations are detected.

Small infestations can be hand pulled, however all roots and stem fragments must be removed. Plant fragments should either be double bagged and taken to the dump or preferably hung up to prevent contact with the ground and reshooting.

Larger infestations should be herbicide treated.

For any treatment to be considered effective, follow-up monitoring must occur to identify any new seedlings. Areas marked for delimitation require on ground surveys to determine extent of distribution. No infestations are currently known in these areas.

Control calendar



For more information on using this biosecurity action plan fact sheet, and further information on control tools, refer to the Cairns Biosecurity Plan available at cairns.qld.gov.au and customer service centres.

Brillantaisia (*Brillantaisia lamium*)



Herb

Terrestrial

Perennial

Local laws apply

Must not breed

Must not propagate

Must not introduce

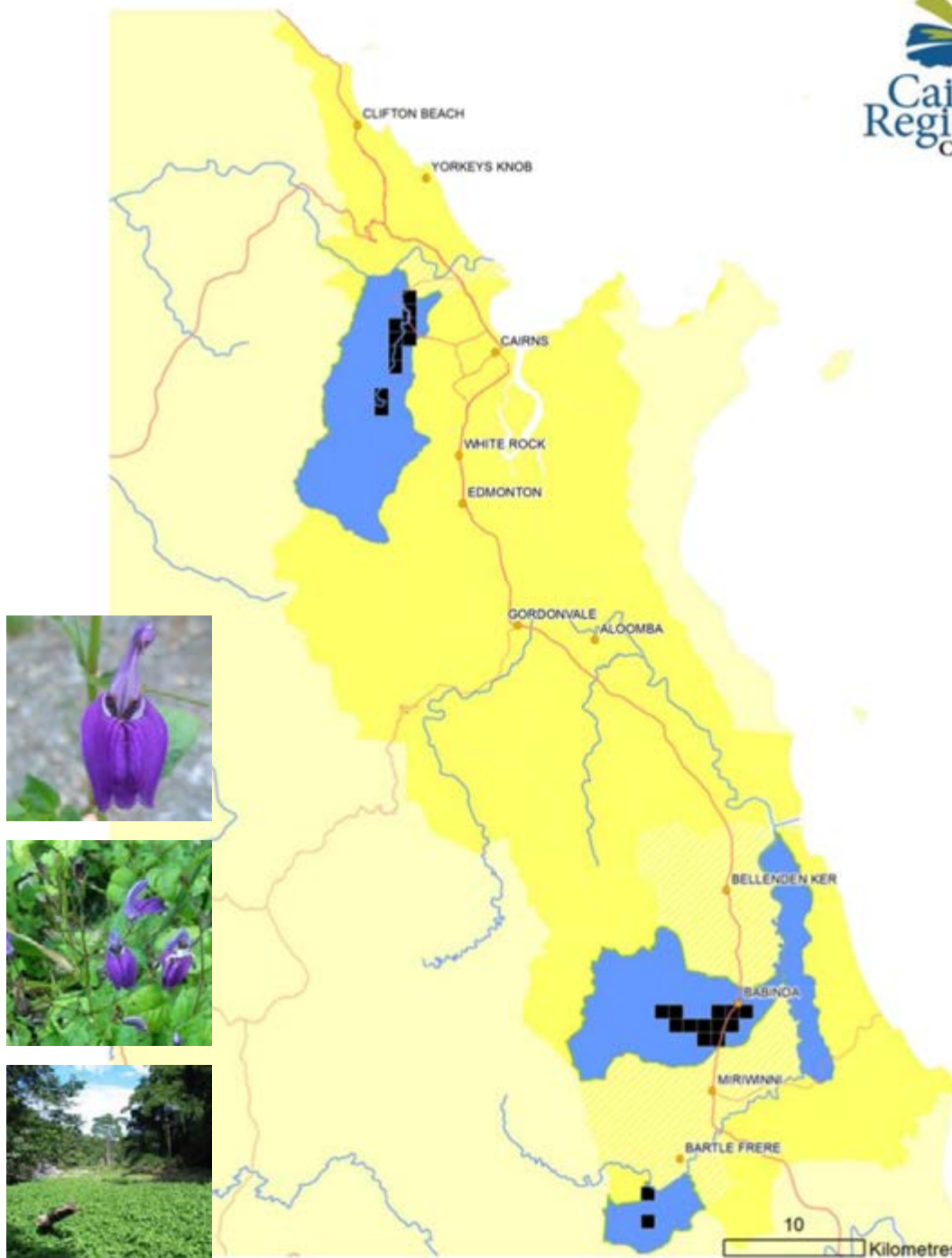
Must not sell or supply

Must not provide harbour

Control



Spread



What is my biosecurity obligation?

Keep an eye out for the distinctive purple flowers, allowing timely detection and treatment of new infestations. Contact Cairns Regional Council on 1300 692 247 to report any suspect plants.

In the delimitation zone

In the prevention zone

In the intensive control zone

Brillantaisia is a locally declared plant and under local laws cannot be distributed, given away or sold. Ensure sources of garden plants are weed free. Contact Cairns Regional Council on 1300 692 247 to report any suspect plants.

Maintaining healthy pastures and keeping an eye out for the distinctive purple flowers will assist in the timely detection and treatment of new infestations. Do not move soils and plants from infested sites. Restrict stock and machinery movements unless adequate weed hygiene measures are implemented.

Water mimosa (*Neptunia oleracea* & *N. plena*)

Human Health Social Amenity Economy Environment Achievability Local Impact/Values Declaration Status National priority

Priority



Details

Description Water mimosa is an aquatic floating perennial herb that anchors at the waters edge and sends stems out over the water where they form a spongy, fibrous covering between the nodes. Leaves are olive green and are arranged in opposite pairs along the stem. When disturbed or touched the leaflets close up. Water mimosa flowers are yellow, ball-shaped and grow from the base of the leaves.

Distribution Several isolated infestations have been detected and removed. Records occur from Lake Placid, Smithfield, Brinsmead and Babinda areas. Water mimosa is associated with South East Asian cuisine where it used as a green vegetable and so may have been introduced as a food plant.

Impacts Water mimosa forms dense, floating rafts which can impede flows, reduce light penetration and oxygen levels in the water. The physical barriers can disrupt native fish and wildlife, restrict access for recreation and provide favourable habitat for mosquito.

Key projects All known locations the target of a regional eradication program led by Biosecurity Queensland. All suspected sightings of this plant should be reported to Biosecurity Queensland on 13 25 23.

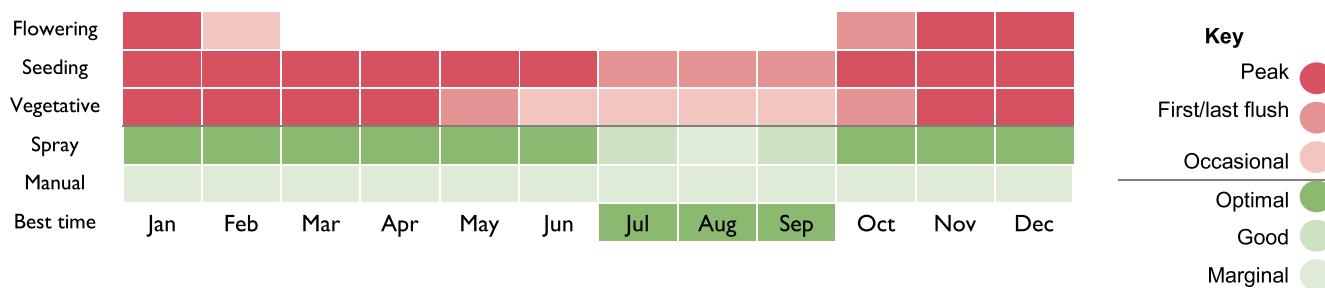
Background

Water mimosa is often used as a culinary plant in South East Asia and so is most likely to be introduced as food plant in the tropics.

The rooted land form has smaller leaves and flowers, and has no spongy floating tissue. It establishes from small plant pieces in water and from seed. Under favourable conditions, water mimosa grows out from the banks to form floating rafts of dense interwoven stems. These can be dislodged by water movement, (especially during floods), and are soon replaced by more water mimosa. These floating rafts can restrict water flow in creeks, channels and drains. It can impede recreational water sports and boating access. The rafts are so dense they can reduce water quality by preventing light penetration and reducing oxygenation of water. This creates favourable habitat for mosquitoes, reduces fish activity, and causes the death of native, submerged water plants and fish.

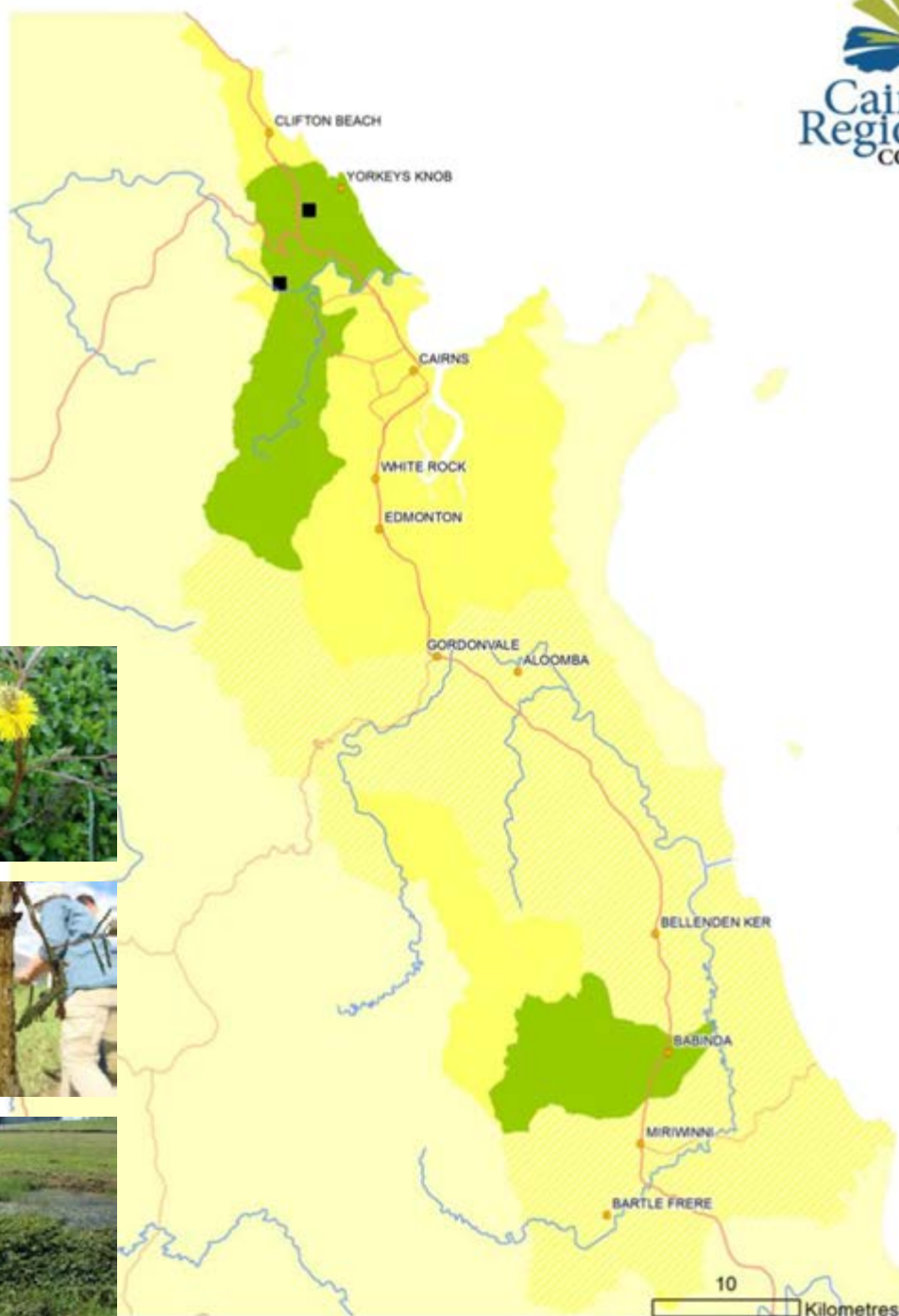
Management is targeting destruction of all known infestations and complete removal of all infestations in these areas. Infestations are currently controlled with herbicide and follow-up surveys to ensure all plant fragments have been treated.

Control calendar



For more information on using this biosecurity action plan fact sheet, and further information on control tools, refer to the Cairns Biosecurity Plan available at cairns.qld.gov.au and customer service centres.

Water mimosa (*Neptunia oleracea* & *N. plena*)



What is my biosecurity obligation?

In the delimitation zone

Keep an eye out for Water Mimosa in any natural or man-made freshwater ponds or features. All suspected sightings of Water Mimosa must be reported to Biosecurity Queensland on 13 25 23.

In the prevention zone

Keep an eye out for Water Mimosa in any natural or man-made freshwater ponds or features.

All suspected sightings of Water Mimosa must be reported to Biosecurity Queensland on 13 25 23. For more information refer to Biosecurity Queensland's Invasive Plants and Animals Biosecurity Program.

In the eradication zone

All suspected sightings of Water Mimosa must be reported to Biosecurity Queensland on 13 25 23. For more information refer to Biosecurity Queensland's Invasive Plants and Animals Biosecurity Program.

Floating

Aquatic

Perennial

Biosecurity Act
Restricted matter category

2

Must be reported

3

Do not distribute

4

Do not move

5

Do not keep

6

Do not feed

Control



Spread



Lantana (*Lantana camara*)

Human Health Social Amenity Economy Environment Achievability Local Impact/Values Declaration Status National priority

Priority



2.0/5

2.0/5

2.0/5

3.0/5

1.1/5.5

3.0/5

1.5/5

2.5/5

Details

Description Lantana is a heavily branched shrub that can grow in compact clumps, dense thickets or as a climbing vine. The stems of lantana are square with small, re-curved prickles. The small leaves (6cm) are covered in fine hairs, bright green above, paler underneath and have round-toothed edges.

Distribution Common and widespread across most land types. Lantana fruit is spread by birds so it is a common coloniser of disturbed ground, forest edges and riparian areas across the Wet Tropics.

Impacts A significant weed of natural systems and grazing areas. Lantana displaces understorey species and alters fire regimes in tropical woodlands. Lantana can cause poisoning in stock not familiar with it.

Key projects Given the spread and level of infestation across the region, no significant projects are currently primarily targeting Lantana. Lantana is one of a suite of widespread weeds managed in key environmental areas.

Background

Lantana is widespread and is considered to occur in all areas where the habitat is suitable across the Cairns region.

Integrated management to reduce impacts including strategic herbicide control and fire management are essential in key environmental areas.

Because it is bird dispersed it can quickly re-infest areas which have been cleared of the weed if no ongoing management is in place. The use of appropriate fire regimes, mechanical control and grazing practices can assist to protect both environmental and grazing assets in woodland areas.

There are a wide range of biocontrol agents present in wild populations which may assist to reduce the vigour or reproduction of lantana. Most are seasonal and will respond when conditions are suitable so they should not be relied upon as the sole management tool.

Control calendar

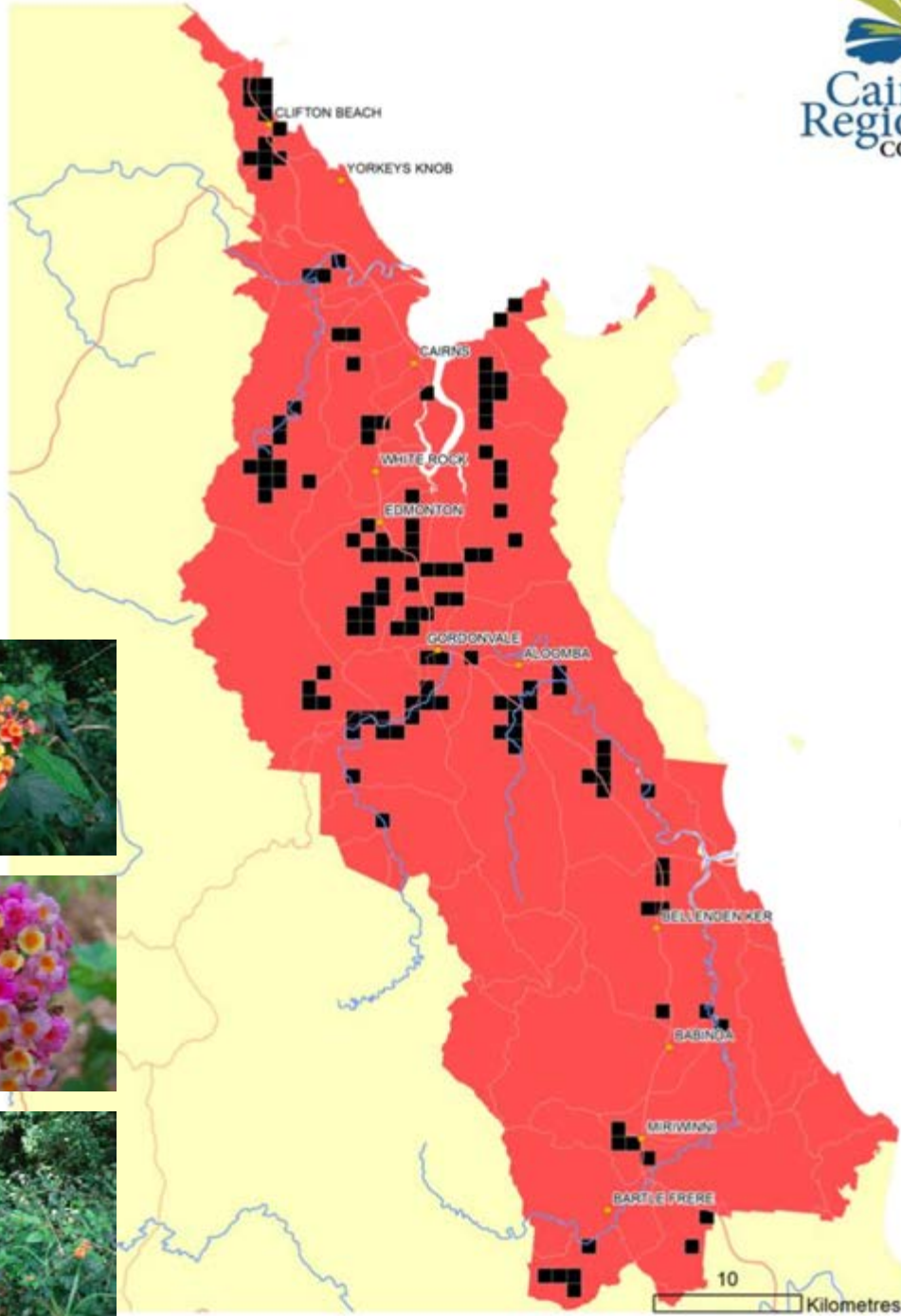
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flower	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak
Seed	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak
Spray	Marginal	Marginal	Marginal	Good	Good	Good	Good	Good	Good	Good	Good	Good
Mechanical	Marginal	Marginal	Marginal	Marginal	Marginal	Marginal	Marginal	Marginal	Marginal	Marginal	Marginal	Marginal
Manual	Marginal	Marginal	Marginal	Marginal	Marginal	Marginal	Marginal	Marginal	Marginal	Marginal	Marginal	Marginal
Burn	Marginal	Marginal	Marginal	Marginal	Marginal	Marginal	Marginal	Marginal	Marginal	Marginal	Marginal	Marginal
Best time	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Key

- Peak
- First/last flush
- Occasional
- Optimal
- Good
- Marginal

For more information on using this biosecurity action plan fact sheet, and further information on control tools, refer to the Cairns Biosecurity Plan available at cairns.qld.gov.au and customer service centres.

Lantana (*Lantana camara*)



What is my biosecurity obligation?

In the asset protection zone

Ensure best practice weed hygiene measures are in place to reduce risk of spread to new locations.

Maintain weed free areas. Identify high value assets and protect them from impacts where possible. A wide range of biocontrol agents are established in the wild to assist with management. For more information on best management tools and approaches refer to the Lantana best practice control guide produced by Weeds of National Significance.

Woody

Terrestrial

Perennial

Biosecurity Act Restricted matter category

2

Must be reported

3

Do not distribute

4

Do not move

5

Do not keep

6

Do not feed

Control



Spread



Yellow crazy ant (*Anoplolepis gracilipes*)

Human Health Social Amenity Economy Environment Achievability Local Impact/Values Declaration Status National priority

Priority



Details

Description Yellow crazy ants (YCA) are slender ants, about 4mm long, with long legs, large eyes and very long antennae. Coloured yellow to orange, they have a brown abdomen which may be faintly striped. They move in a distinctly erratic or 'crazy' manner when disturbed.

Distribution Yellow crazy ants were first introduced to Cairns in 2001. They are now found over about 1500ha in numerous infestations south of Cairns between Bayview Heights and Gordonvale. The ants have now invaded about 90ha of the adjacent World Heritage Area. They thrive in a wide range of natural and man-made environments.

Impacts Yellow crazy ants are one of the world's worst invasive species. They are a significant threat to the biodiversity of the Wet Tropics. They can inhibit the photosynthesis and pollination of plants, causing environmental and agricultural impacts. They are also a significant hazard to human health and enjoyment of the outdoors.

Key projects The Wet Tropics Management Authority operates the Yellow Crazy Ant Eradication Program which started in 2013. It is currently funded to June 2019 through the National Landcare Program and the Queensland Government.

Background

While the exact origin of Yellow crazy ants remains unclear, their current distribution extends through the tropical islands of the Indian and Pacific Oceans, where they are a major pest. This broad distribution is closely linked to human movement activities such as cargo ships and trade which has ultimately assisted them to reach Australian shorelines. In Australia, yellow crazy ants are now present in a number of sites throughout Queensland and Arnhem Land. In the Wet Tropics infestations YCA are found in a variety of habitats including residential areas, sugarcane fields and rainforest.

Delimitation surveys have defined the main infestations. However, several new infestations were found in 2017. Community and industry are being educated to identify Yellow crazy ants and asked to report any additional sightings. Yellow crazy ant queens are not known to disperse by flying; instead they move by 'budding' where a queen and accompanying workers walk to a new location, sometimes rafting on waterways to move downstream. The other key mode of dispersal is human assisted, moving as stowaways in soil, machinery, building materials, pot plants, and dry or green waste. It is crucial that high risk waste is treated on site and that any waste is disposed of at your local landfill so it can be monitored and treated if any outbreaks occur.

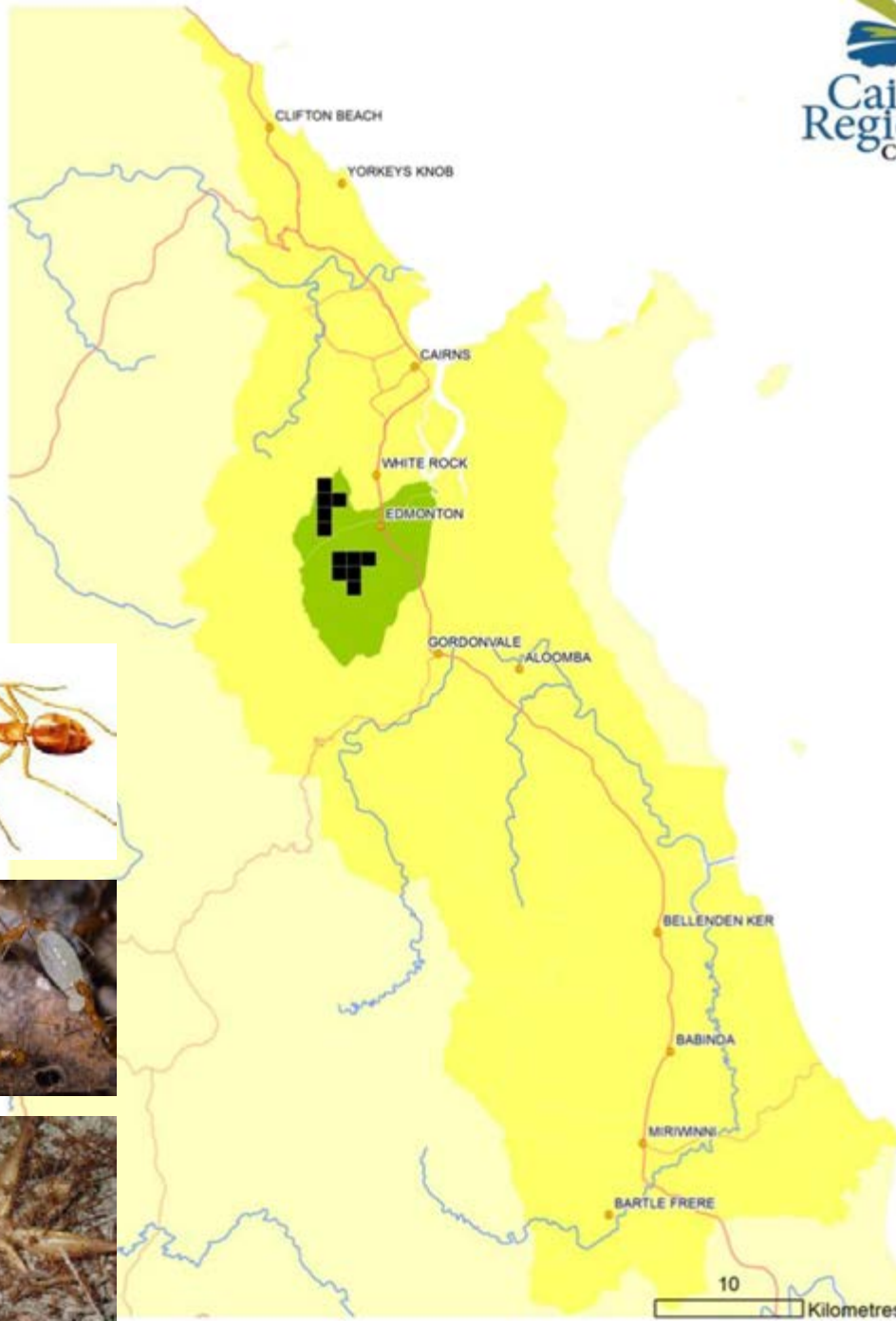
Regular treatments, about three times a year using ant specific granular baits have drastically reduced yellow crazy ant numbers in most areas. Eradication has been achieved in some small areas.

Life cycle

- Eggs hatch after 18-20 days.
- Worker larvae develop in 16-20 days
- Pupae of workers develop in 20 days, while queen pupae develop in 30-34 days.
- Total lifespan of a worker ant is approximately 76- 84 days.
- Yellow crazy ants are most active in dry weather in temperatures over 17°C.

For more information on using this biosecurity action plan fact sheet, and further information on control tools, refer to the Cairns Biosecurity Plan available at cairns.qld.gov.au and customer service centres.

Yellow crazy ant (*Anoplolepis gracilipes*)



Invertebrate

Omnivore

Biosecurity Act Restricted matter category

2 Must be reported

3 Do not distribute

4 Do not move

5 Do not keep

6 Do not feed

Control



What is my biosecurity obligation?

In the prevention zone

Dispose of all green waste and other rubbish at your local landfill. Taking your waste to the local landfill allows for the monitoring and treatment of any outbreaks.

If you are unsure of the risk posed on your property then contact the eradication program for advice or assistance in treating your waste before transporting it off site.









In the eradication zone

You can assist the eradication effort by maintaining access tracks, reducing weeds and rank grass along creek lines and providing access to your yard for any required survey or treatment operations. Yellow Crazy Ants Eradication Program - 07 4241 0525, yca@wtma.qld.gov.au

Spread

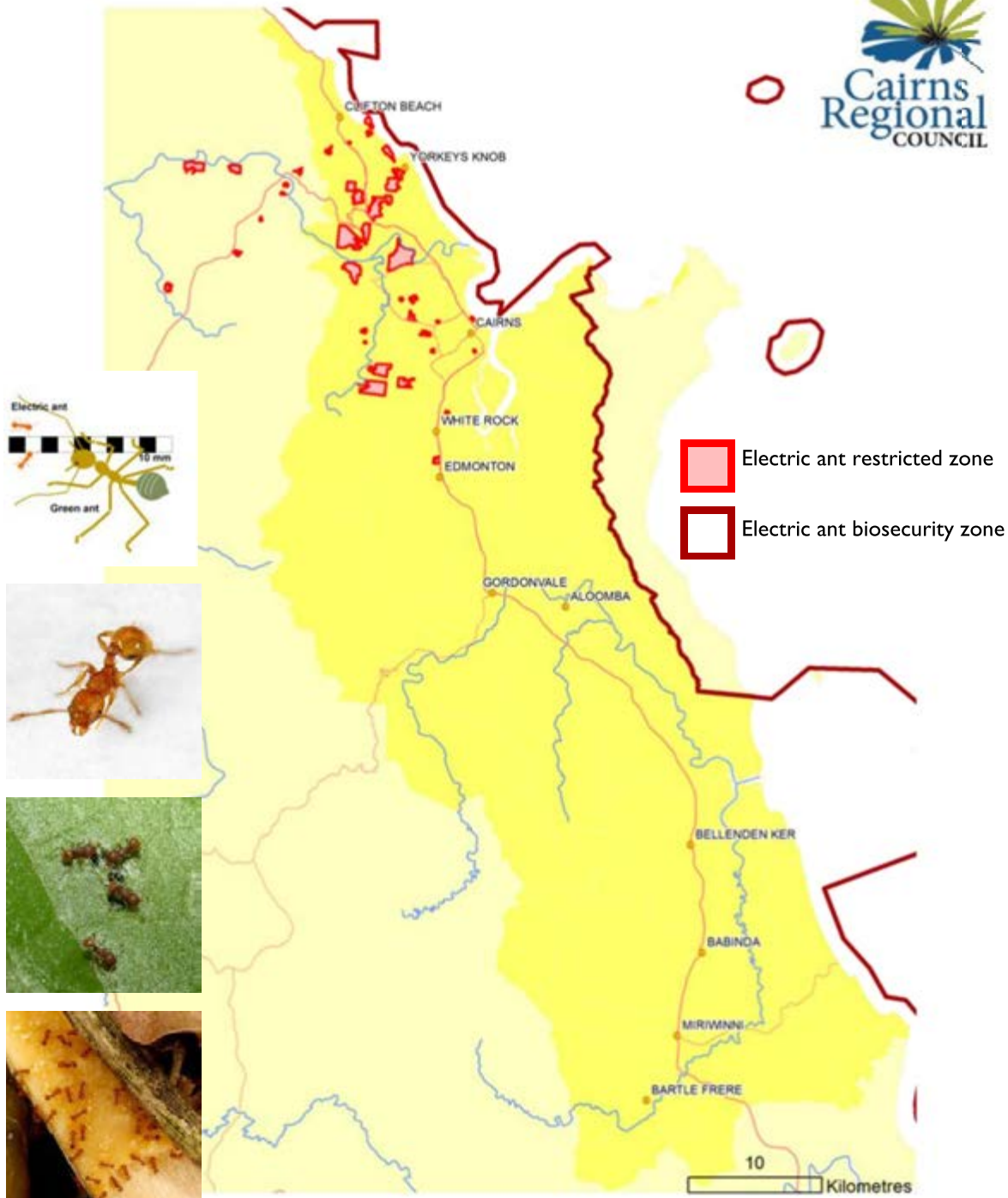


Electric ant (*Wasmannia auropunctata*)

	Human Health	Social Amenity	Economy	Environment	Achievability	Local Impact/ Values	Declaration Status	National priority
Priority								
	3.0/5	2.0/5	3.0/5	4.0/5	3.3/5.5	4.0/5	2.5/5	5.0/5
Details	<p>Description Electric ants are very small, about 1-1.5mm long. They are light brown to golden brown in colour, although the abdomen is sometimes darker. They are slow moving in comparison to many native ants and form distinctive foraging lines. They have a powerful, venomous sting.</p> <p>Distribution Electric ants were first found in the northern beach suburb of Smithfield in May 2006. They are predominantly spread by humans in pot plants, other plant material and illegal dumping of green waste and can now be found in many of the northern beach and city suburbs and one infestation in the southern suburb of Bentley Park.</p> <p>Impacts Electric ants are one of the world's worst invasive species. They have a powerful venomous sting and present a significant threat to biodiversity, agriculture and lifestyle. They are also a hazard to human health with their venomous sting providing a significant danger to sufferers of anaphylaxis.</p> <p>Key projects The National Electric Ant Eradication Program, managed by Biosecurity Queensland, operates an eradication program which began in 2006. It is currently funded by the Queensland Government while a decision on national funding is being considered.</p>							
Background	<p>Electric ants are a notifiable Category 1 pest under the Biosecurity Act 2014 and residents within infestations (restricted zones) cannot move live electric ants or electric ant carriers, such as plants, plant material and soil, without getting a Biosecurity Instrument Permit (BIP) from the Program.</p> <p>Known infestations are regularly treated with various granular pesticide products, depending on where the infestations are. The active ingredients can be either toxicants, or insect growth regulators (IGR). A gel bait has been developed for use in difficult, wetter areas and other new bait formulations are being trialled. Treatments area undertaken a minimum of 1 month apart until no more ants are found. All people within FNQ have a general biosecurity obligation (GBO) not to move electric ants.</p> <p>The longest recorded movement of electric ants was from the relocation of pot plants from Kewarra Beach to Bingil Bay. Most dispersal events occur through the movement of pot plants and plant material.</p>							
Life cycle	<ul style="list-style-type: none"> • Queens live for approximately 12 months and lay up to 70 eggs a day. • Eggs are incubated for 8-10 days. • Larvae develop for 14-16 days. • Nymphal stage lasts 13-14 days. • Adult workers live for more than 40 days. • Males live for several weeks. 							

For more information on using this biosecurity action plan fact sheet, and further information on control tools, refer to the Cairns Biosecurity Plan available at cairns.qld.gov.au and customer service centres.

Electric ant (*Wasmannia auropunctata*)



Invertebrate

Omnivore

Biosecurity Act
Restricted matter
category

1
Must be reported

3
Do not distribute

4
Do not move

5
Do not keep

6
Do not feed

Control



What is my biosecurity obligation?

In the electric ant restricted zone

Electric ants are a notifiable Category 1 pest under the Biosecurity Act 2014. New detections are required to be reported to the eradication program within 24 hours. Call Biosecurity Queensland on 13 25 23.

Residents within infestations (restricted zones) cannot move live electric ants or electric ant carriers, such as plants, plant material and soil, without getting a Biosecurity Instrument Permit (BIP) from the Program.

In electric ant biosecurity zone

All people within FNQ have a general biosecurity obligation (GBO) not to move electric ants.

Along with carefully adhering to movement control of potentially contaminated materials and items you can assist the eradication effort by providing clear access to your property for any required survey or treatment operations.

Spread



Feral pig (*Sus scrofa*)

Human Health Social Amenity Economy Environment Achievability Local Impact/Values Declaration Status National priority

Priority



Details

Description Feral pigs are usually coarsely haired and coloured black, buff or spotted black or white. They are generally nocturnal and camp in thick cover during the day. Feral pigs are omnivorous and can range from 5 to 50 square kilometres. Feral pigs breed year-round if the conditions are suitable often producing two litters a year.

Distribution Feral pigs are common and widespread in the floodplains and forests of the entire Wet Tropics region. Feral pigs occupy most suitable habitat in the Cairns region including farmland, wetlands, riparian areas, forests, reserves and peri-urban areas. Distribution is often seasonal based on the availability of food and water.

Impacts Feral pigs damage crops, stock, property and the natural environment. They transmit disease and could spread exotic diseases such as foot and mouth if this was introduced to the country. They have been identified as a likely vector of Panama Tropical Race 4 (TR4), a disease of bananas.

Key projects Council offers trapping and baiting assistance for feral pigs in the region, dependent on resources, landholder capabilities and obligations. Council also operates a series of traps along the coast to reduce the numbers of pigs.

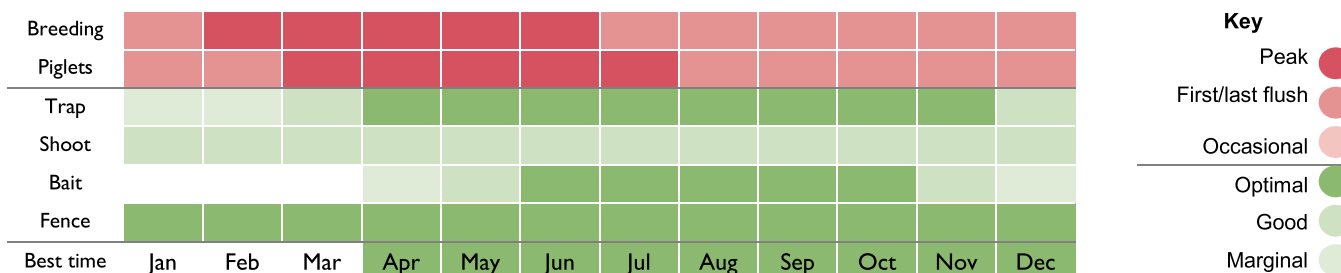
Feral pigs are thought to number around 24 million in Queensland and are one the most widespread and destructive invasive animals in the State. Their distribution and impacts are often seasonal and are heavily influenced by the availability of food, water and cover.

An individual animal or a small band of pigs can do a large amount of damage in a single night so it is important to be alert to any early signs of feral pig presence in your area; and to take steps to protect key assets like gardens, crops and vulnerable natural areas. Ensure best practice management actions are in place to reduce opportunities for feral pigs.

Pig proof fencing is by far the most effective means of reducing the impacts of feral pigs on domestic gardens and small crops. It is also a useful strategy for protecting vulnerable natural areas.

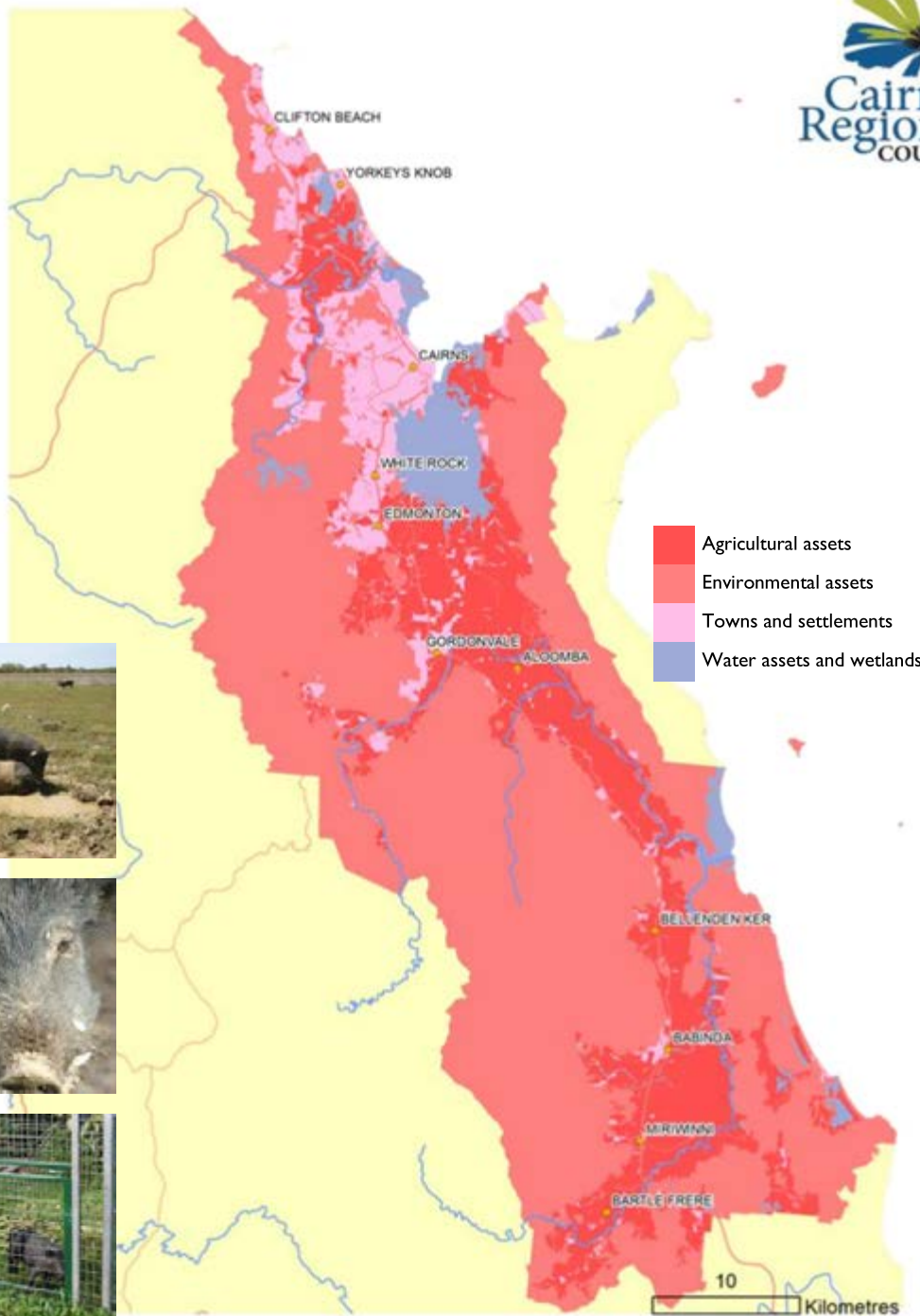
A range of control options from shooting, to trapping and baiting are used to control feral pigs when required. No individual solution leads to permanent management and feral pigs will be an ongoing management issue in the region. In the Cairns region, trapping is the preferred method of pest animal management ahead of poison baiting. This is due to the relatively higher potential for off-target risks to the community, (population and land use), and wildlife (cassowaries etc.). However, 1080 poison baiting as a control method is considered more efficient for large numbers of pest animals. Ground shooting is considered the least effective method for controlling pig populations but can be useful for controlling small populations in limited access areas. 1080 poison baiting is only available in rural agricultural areas. This is for both poison baiting requirements and risk management necessities. Additional requirements depending on property and identified risks can be discussed.

Control calendar



For more information on using this biosecurity action plan fact sheet, and further information on control tools, refer to the Cairns Biosecurity Plan available at cairns.qld.gov.au and customer service centres.

Feral pig (*Sus scrofa*)



What is my biosecurity obligation?

Ensure best practice biosecurity hygiene measures are in place to prevent spread of other biosecurity matter when controlling, trapping or hunting pigs.

Residents in rural areas should consider various management solutions including fencing, shooting, baiting and trapping, dependant on their location and capability. Residents in urban areas should consider temporary fencing, alternatives to mulching or garden arrangements and trapping.

Speak to Council on 1300 69 22 47 for best practice management advice and discuss the range of assistance options available. To be eligible for assistance, residents or community groups must be able to:

- Give permissions for activity and entry consent requirements on the land on which the problem persists. Failing that, the land in question must be Council land where permissions can be arranged.
- Be able to monitor any traps placed on land for humane requirements and to monitor against off-target native wildlife capture.
- In agricultural areas, be ready and willing to destroy and/or dispose of any trapped pest animals if practical and reasonable to do so.

In the asset protection zone

Vertebrate

Omnivore

Biosecurity Act
Restricted matter category

2

Must be reported

3

Do not distribute

4

Do not move

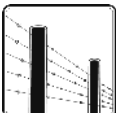
5

Do not keep

6

Do not feed

Control



Wild dog (*Canis familiaris*)

Human Health Social Amenity Economy Environment Achievability Local Impact/Values Declaration Status National priority

Priority



Details

Description Wild dogs include dingoes, wild populations of dogs and hybrids.

Distribution Wild dogs are widespread in both the agricultural and natural landscape. They also frequently exist on the outskirts of towns and even within urban areas. Small populations of feral dogs are known throughout the Cairns region.

Impacts Wild dogs can cause stock losses in calving season and often carry parasites and pathogens. Near towns they can cause nuisance and impact on domestic animals. Wild dogs will prey on native animals and may assist maintaining healthy population of animals like wallabies; however they may also impact on more vulnerable animals like cassowary.

Key projects Council offers trapping and baiting assistance for wild dogs in the region. This is dependent on resources, landholder capability and obligations.

Background

Wild dogs have defined home territories but are able to cover large distances when moving to new areas either through competition for resources or by being pushed out of areas by more dominant animals.

In urban and settled areas Council will respond to individual issues as they arise on a case by case basis. Whilst wild dogs are generally not aggressive to people, they may display threatening behaviour such as attacking domestic dogs, scavenging or stalking.

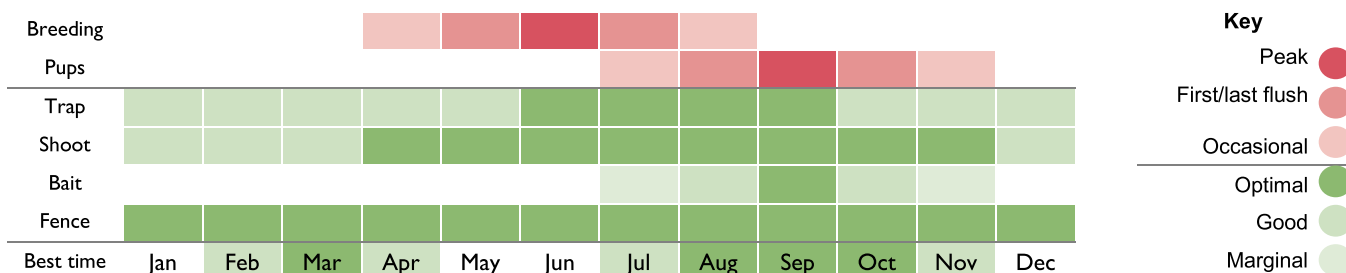
Domestic pets and poultry are best protected by dog mesh fencing. Fencing also restrains your domestic animals and may assist in preventing other animals such as wallabies or pigs entering your property. Wild dogs are opportunistic and scavenging can form a regular part of their diet. Ensuring appropriate security and disposal of domestic rubbish and food scraps will assist to reduce food sources for wild dogs.

For advice on best practice wild dog management and possible assistance, contact Council on 1300 69 22 47.

For domestic or escaped dog issues contact Council's Local Laws department on the same number.

Wild and Feral Dog trapping can be very difficult to practically achieve. As such, residents, where reasonable and practical, are encouraged to ground shoot wild dogs as the most efficient method of management. Residents are advised that this does not endorse any illegal or irresponsible actions and does not cover any advice associated with the management of stray dogs or domestic dogs.

Control calendar



For more information on using this biosecurity action plan fact sheet, and further information on control tools, refer to the Cairns Biosecurity Plan available at cairns.qld.gov.au and customer service centres.

Wild dog (*Canis familiaris*)



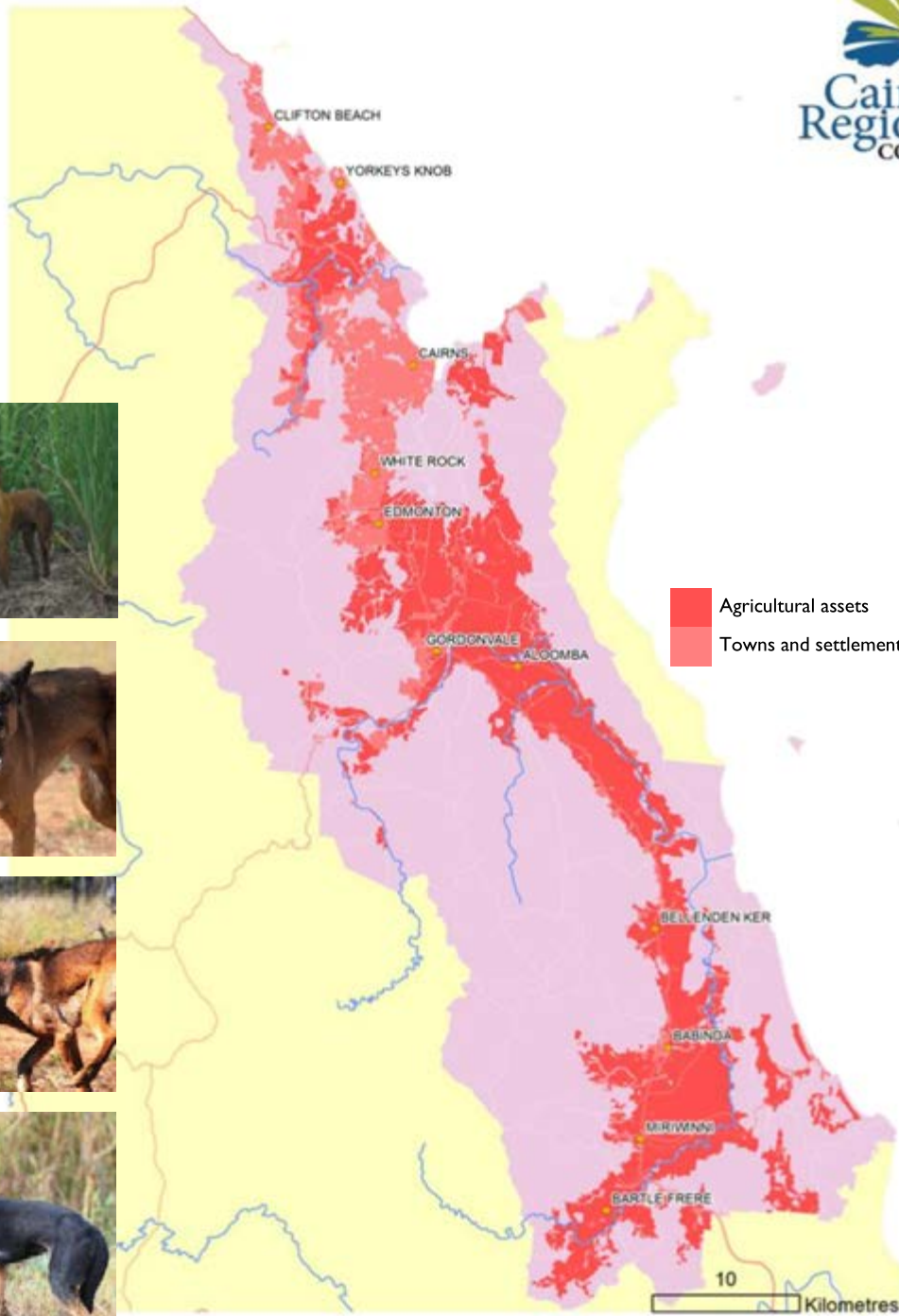
In the asset protection zone

What is my biosecurity obligation?

Wild dogs are a restricted invasive animal under the Biosecurity Act 2014. It must not be moved, kept (if a dingo), fed, given away, sold, or released into the environment without a permit.

Fencing your property is the most effective means of reducing the risk of wild dog impacts on domestic pets and poultry. Participating in cluster and district control programs is the most effective means of controlling wild dogs in grazing areas.

The coordinated management of wild dogs outlined in this plan does not include management of straying or problematic domestic dogs (including hunting dogs). These animals are domestic animals and are managed in accordance with Cairns Regional Councils Local Laws. For all requests or enquiries contact Council on 1300 69 22 47.



Vertebrate

Carnivore

Biosecurity Act
Restricted matter category

2

Must be reported

3

Do not distribute

4

Do not move

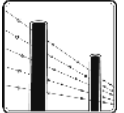
5

Do not keep

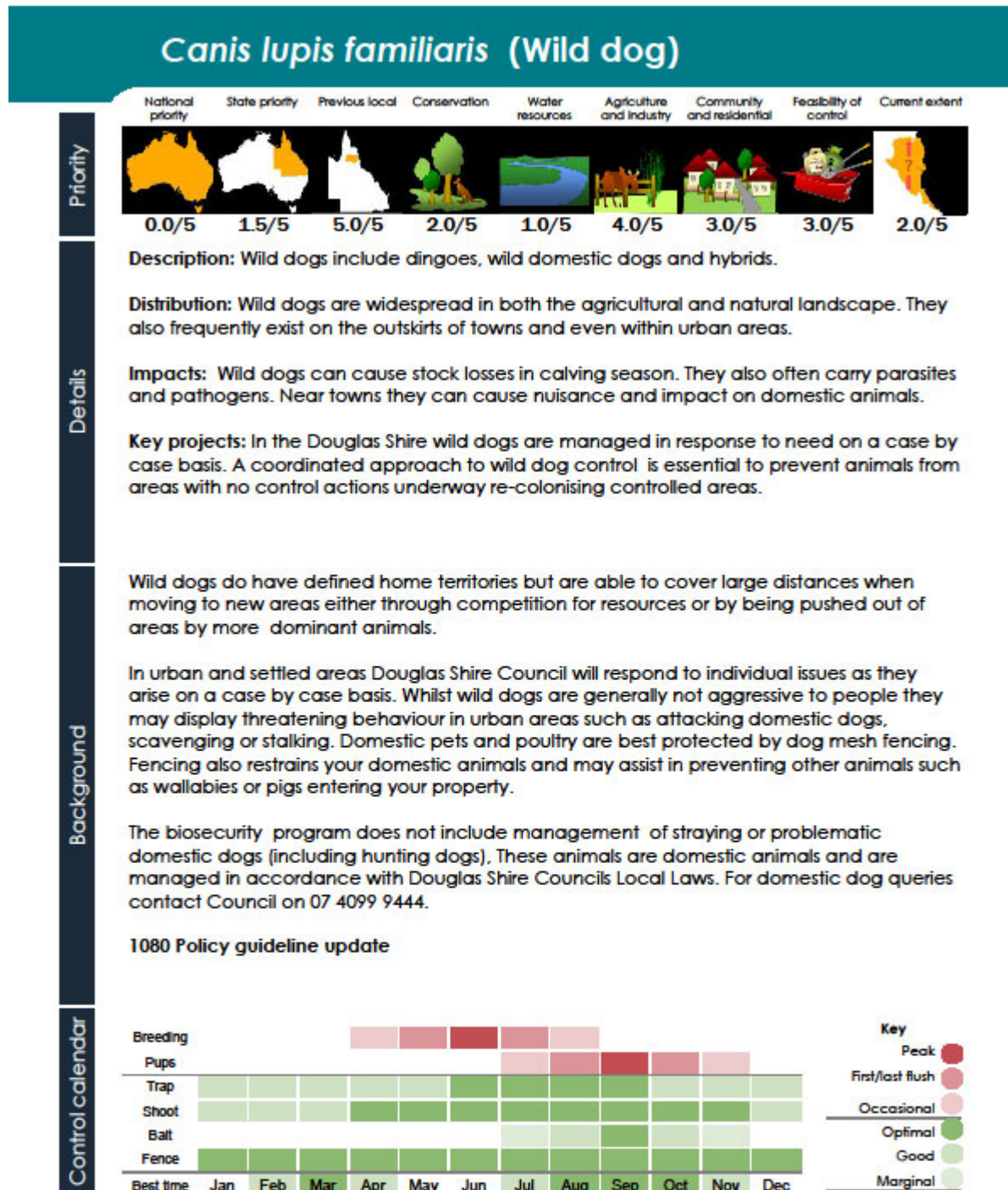
6

Do not feed

Control



Biosecurity Action Plans



For more information on using this biosecurity action plan fact sheet, and further information on control tools, refer to the Douglas Shire Biosecurity Management Plan available at douglas.qld.gov.au and customer service centres.



douglas.qld.gov.au
enquiries@douglas.qld.gov.au



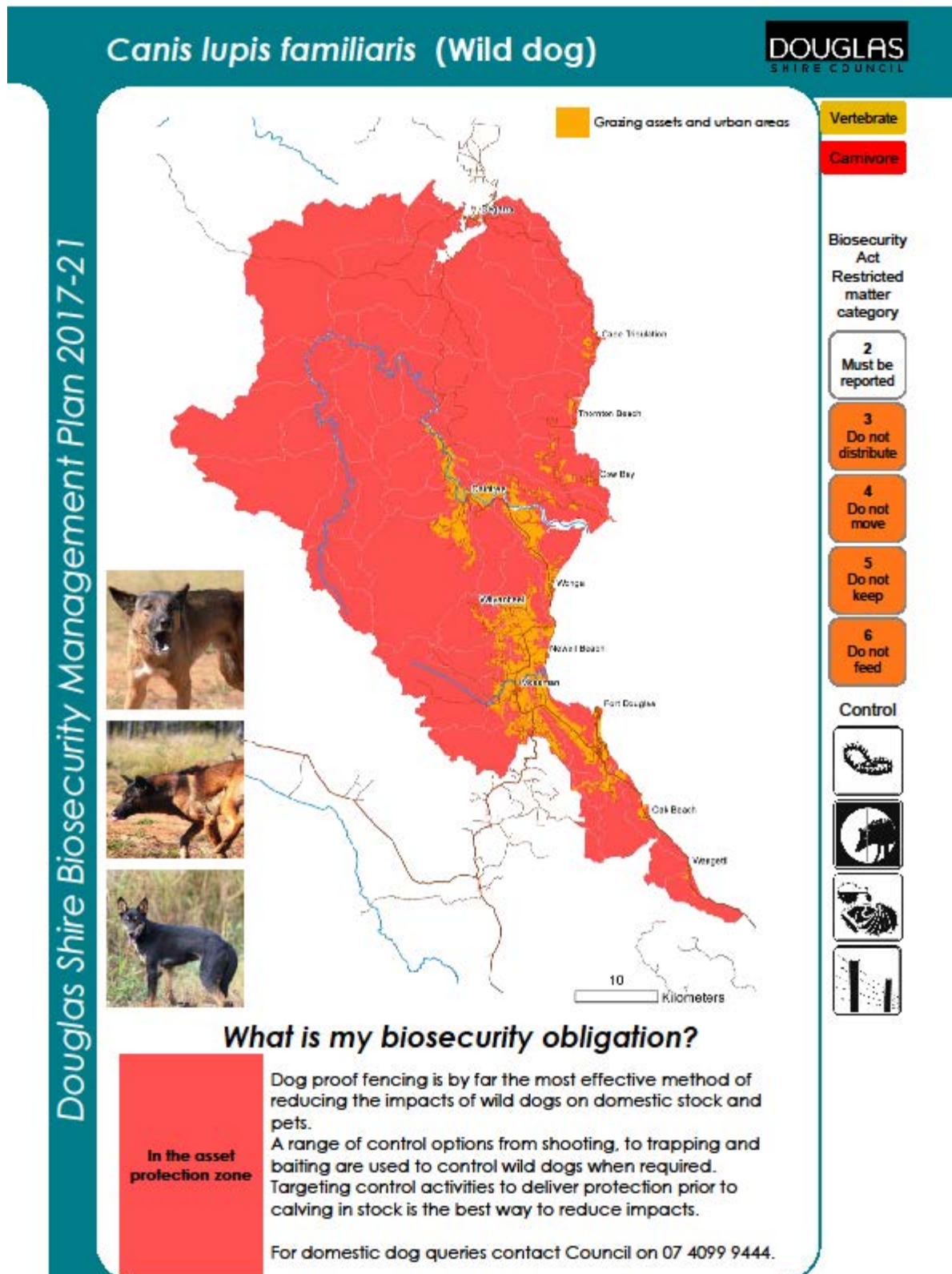
44-46 Front Street,
Mossman, QLD, 4873



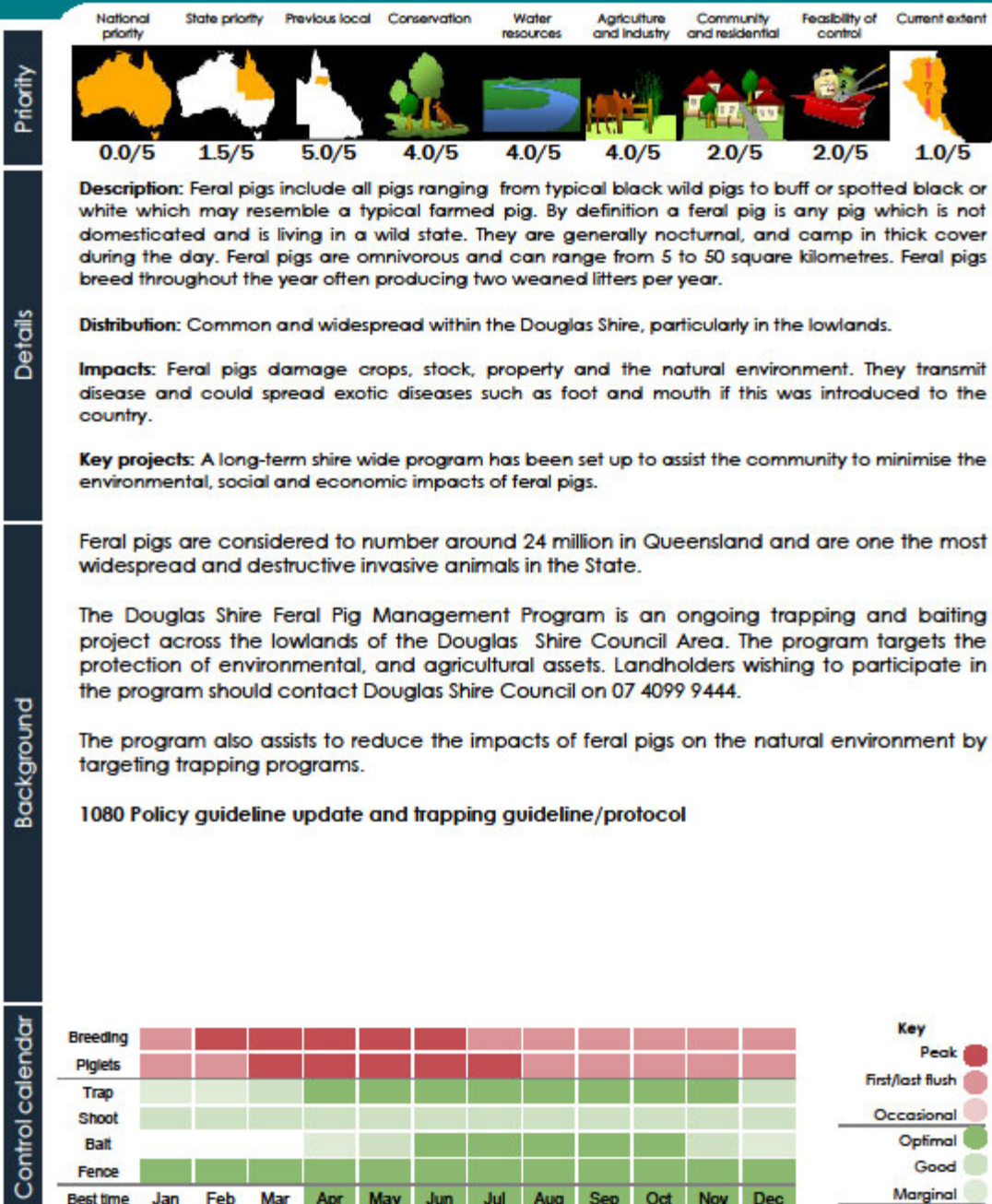
1800 026 318



@douglasshirecouncil



Sus scrofa (Feral Pig)



For more information on using this biosecurity action plan fact sheet, and further information on control tools, refer to the Douglas Shire Biosecurity Management Plan available at douglas.qld.gov.au and customer service centres.



douglas.qld.gov.au
enquiries@douglas.qld.gov.au



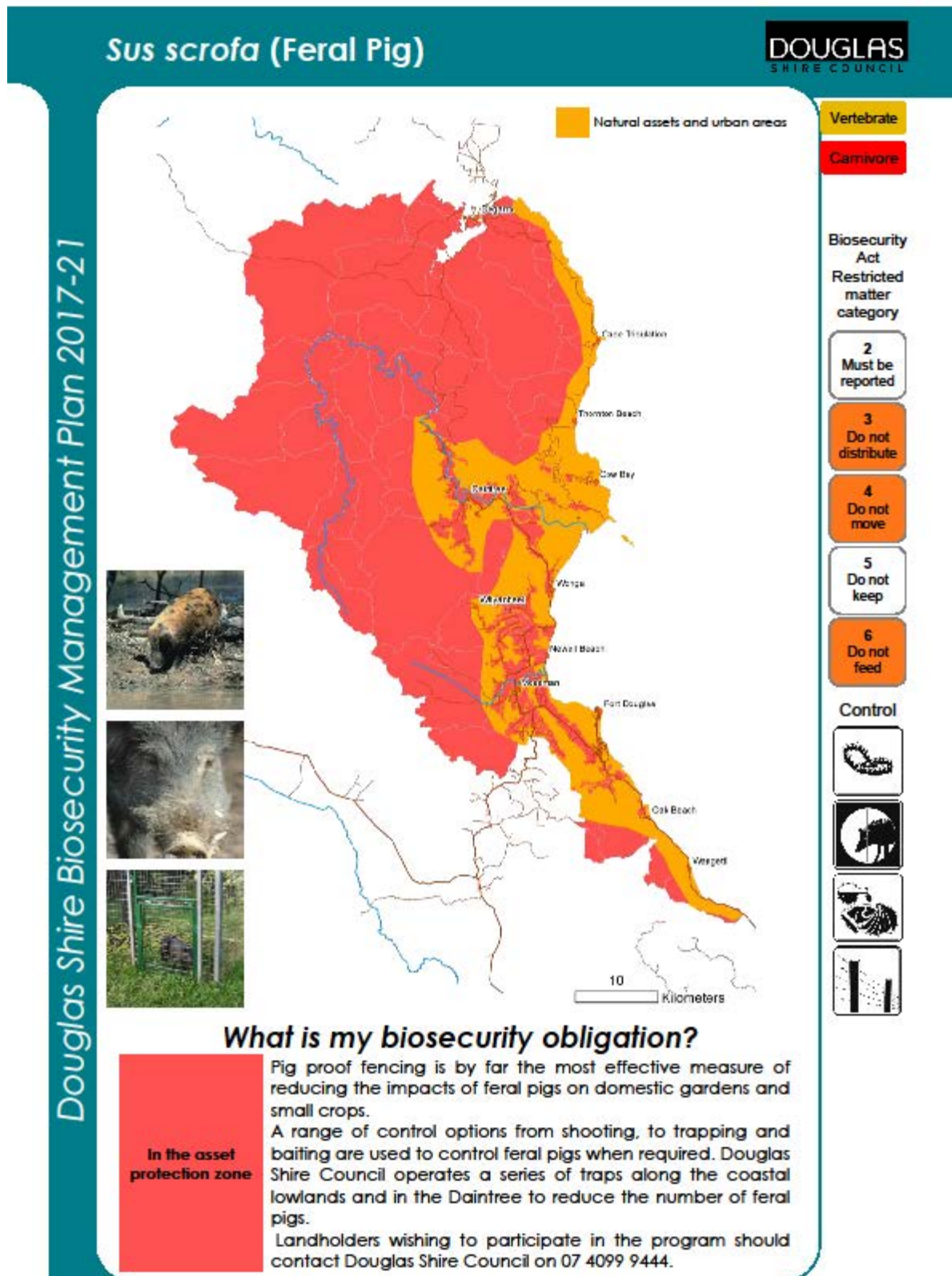
64-66 Front Street,
 Mossman, QLD, 4873



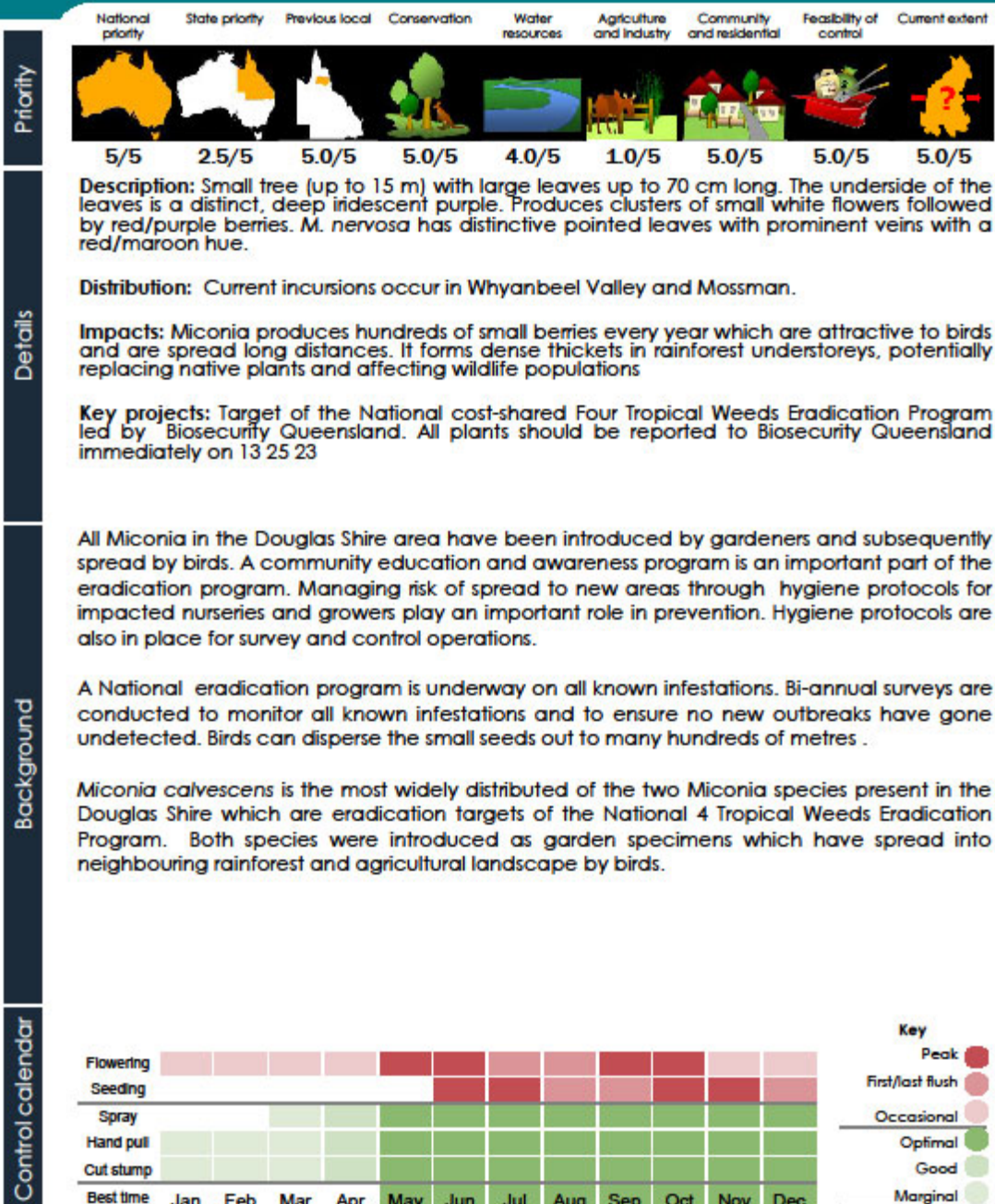
1800 026 318



@douglasshirecouncil



Miconia species (Miconia)



For more information on using this biosecurity action plan fact sheet, and further information on control tools, refer to the Douglas Shire Biosecurity Management Plan available at douglas.qld.gov.au and customer service centres.



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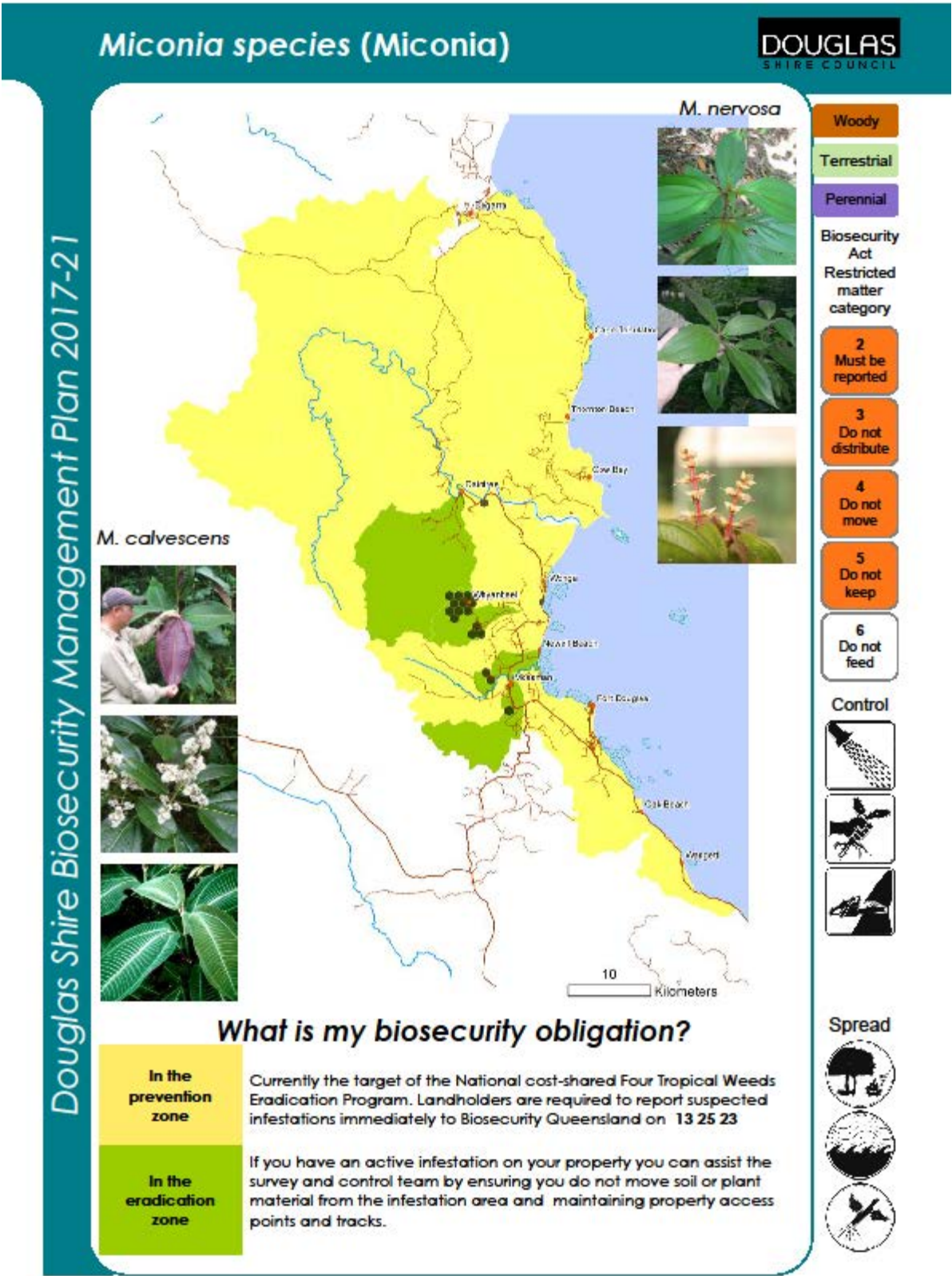
64-66 Front Street,
 Mossman, QLD, 4873


















1800 026 318



@douglasshirecouncil



Eichhornia crassipes (Water hyacinth)

	National priority	State priority	Previous local	Conservation	Water resources	Agriculture and Industry	Community and residential	Feasibility of control	Current extent																																																																																																											
Priority																																																																																																																				
	2.5/5	1.5/5	5.0/5	4.0/5	5.0/5	1.0/5	4.0/5	4.0/5	5.0/5																																																																																																											
Details	<p>Description: A free floating aquatic herb with glossy, spoon shaped leaves and distinctive purple/lilac flowers. Water hyacinth forms dense blankets over waterways and wetlands. A similar native species occurs but can be distinguished by its yellow flowers and spear-shaped leaves</p> <p>Distribution: Occurs only as isolated occurrences in drainage lines at Port Douglas and Wonga Beach</p> <p>Impacts: It floats on still or slow-moving water and can grow rapidly to cover the entire water surface with a thick mat of vegetation. This shades out any submerged plant life and impedes oxygen exchange, making the water unsuitable for fish and other animals.</p> <p>Key projects: Both known infestations are subject to eradication actions. Contact Douglas Shire Council to report any suspect plants on 1800 026 318</p>																																																																																																																			
Background	<p>Douglas Shire is conducting a community education and awareness program to prevent water hyacinth's spread to clean catchments. Water hyacinth is most likely to be introduced in water features and ponds or as an aquarium plant. Ensure water features and ornamental gardens do not contain water hyacinth. Douglas Shire is the northern most distribution of water hyacinth in the Wet Tropics and actions here will help protect wetlands and waterways to the north. Water hyacinth grows from seed and by division of mature plants and may be spread in contaminate soil from water features containing the weed in other areas.</p> <p>An eradication program is underway on the known infestations in the Port Douglas and Wonga Beach areas. Bi-annual surveys are conducted to monitor all known infestations and to ensure no new outbreaks have gone undetected.</p> <p>Contact Douglas Shire Council to report any suspect plants or infestations on 1800 026 318</p>																																																																																																																			
Control calendar	<table> <tr> <th></th><th>Jan</th><th>Feb</th><th>Mar</th><th>Apr</th><th>May</th><th>Jun</th><th>Jul</th><th>Aug</th><th>Sep</th><th>Oct</th><th>Nov</th><th>Dec</th></tr> <tr> <td>Flowering</td><td>Peak</td><td>Peak</td><td>Peak</td><td>Peak</td><td>Peak</td><td>Peak</td><td>Peak</td><td>Peak</td><td>Peak</td><td>Peak</td><td>Peak</td><td>Peak</td></tr> <tr> <td>Vegetative</td><td>Peak</td><td>Peak</td><td>Peak</td><td>Peak</td><td>Peak</td><td>Peak</td><td>Peak</td><td>Peak</td><td>Peak</td><td>Peak</td><td>Peak</td><td>Peak</td></tr> <tr> <td>Seeding</td><td>Peak</td><td>Peak</td><td>Peak</td><td>Peak</td><td>Peak</td><td>Peak</td><td>Peak</td><td>Peak</td><td>Peak</td><td>Peak</td><td>Peak</td><td>Peak</td></tr> <tr> <td>Spray</td><td>Optimal</td><td>Optimal</td><td>Optimal</td><td>Optimal</td><td>Optimal</td><td>Optimal</td><td>Optimal</td><td>Optimal</td><td>Optimal</td><td>Optimal</td><td>Optimal</td><td>Optimal</td></tr> <tr> <td>Manual</td><td>Optimal</td><td>Optimal</td><td>Optimal</td><td>Optimal</td><td>Optimal</td><td>Optimal</td><td>Optimal</td><td>Optimal</td><td>Optimal</td><td>Optimal</td><td>Optimal</td><td>Optimal</td></tr> <tr> <td>Biocontrol</td><td>Optimal</td><td>Optimal</td><td>Optimal</td><td>Optimal</td><td>Optimal</td><td>Optimal</td><td>Optimal</td><td>Optimal</td><td>Optimal</td><td>Optimal</td><td>Optimal</td><td>Optimal</td></tr> <tr> <td>Best time</td><td>Jan</td><td>Feb</td><td>Mar</td><td>Apr</td><td>May</td><td>Jun</td><td>Jul</td><td>Aug</td><td>Sep</td><td>Oct</td><td>Nov</td><td>Dec</td></tr> </table> <div> <p>Key</p> <p>Peak </p> <p>First/last flush </p> <p>Occasional </p> <p>Optimal </p> <p>Good </p> <p>Marginal </p> </div>													Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Flowering	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Vegetative	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Seeding	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Peak	Spray	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Manual	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Biocontrol	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Best time	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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64-66 Front Street,
 Mossman, QLD, 4873



1800 026 318



@douglasshirecouncil

DOUGLAS
SHIRE COUNCIL

Douglas Shire Biosecurity Management Plan 2017-21



In the prevention zone

In the eradication zone

Ensure wetland and pond plants are sourced from a reliable supplier from and are from a weed free area. Contact Douglas Shire Council to report any suspect plants on 07 40999444. Do not share water plants or dump into waterways as this is the most likely means of spread.





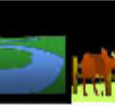








Remove and bag potted specimens from water features and contact Douglas Shire Council to arrange disposal on 07 4099 9444.

Ensure soil or vegetation from known infestations is not moved from the site or is disposed of correctly.

Spread



Chromolaena odorata (Siam weed)

	National priority	State priority	Previous local	Conservation	Water resources	Agriculture and industry	Community and residential	Feasibility of control	Current extent																																																																																																											
Priority																																																																																																																				
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Details	<p>Description: A scrambling woody shrub to 3 metres (higher as a scrambling climber) with distinctive forked leaf venation and purple flush on new leaves. Clusters of white flowers in May-June and October.</p> <p>Distribution: Localised and occasional in the Killaloe and Mossman area</p> <p>Impacts: This species can form dense thickets and outcompete native species and pasture in both disturbed and undisturbed sites. Prefers richer soils in alluvial and riparian zones but will grow in rock and escarpment.</p> <p>Key projects: The target of an National Eradication Program up until 2012, Siam weed is now in a transition to management. Siam weed remains a long term eradication target for the Douglas Shire area. Contact Douglas Shire Council to report any suspect plants on 07 40999444</p>																																																																																																																			
Background	<p>Siam weed is likely to arrive with contaminated stock, produce, vehicles or machinery from adjoining infested areas. Ensure weed hygiene measures are in place and materials/produce are sourced from a clean site.</p> <p>Siam weed has a peak flowering period in May-June with another, less vigorous flowering in October. It is most visible at these times and this feature is used to detect plants prior to seeding. Siam weed is able to be spread by wind and water as well as by machinery and An ongoing intensive control program is preparing all known infestations across the Douglas Shire area for eradication.</p> <p>Siam seed is confirmed to remain viable in the soil for at least 7 years. Maintaining records of historical infestations and restricting disturbance and movement of soil is essential to prevent spread.</p> <p>For larger infestations Douglas Shire Council will work with landholders to develop an on-farm biosecurity plan.</p>																																																																																																																			
Control calendar	<table> <tr> <th></th><th>Jan</th><th>Feb</th><th>Mar</th><th>Apr</th><th>May</th><th>Jun</th><th>Jul</th><th>Aug</th><th>Sep</th><th>Oct</th><th>Nov</th><th>Dec</th></tr> <tr> <td>Flowering</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr> <td>Seeding</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr> <td>Spray</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr> <td>Burn</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr> <td>Hand pull</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr> <td>Cut stump</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr> <td>Best time</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table> <div> <p>Key</p> <p>Peak </p> <p>First/last flush </p> <p>Occasional </p> <p>Optimal </p> <p>Good </p> <p>Marginal </p> </div>													Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Flowering													Seeding													Spray													Burn													Hand pull													Cut stump													Best time												
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For more information on using this biosecurity action plan fact sheet, and further information on control tools, refer to the Douglas Shire Biosecurity Management Plan available at douglas.qld.gov.au and customer service centres.



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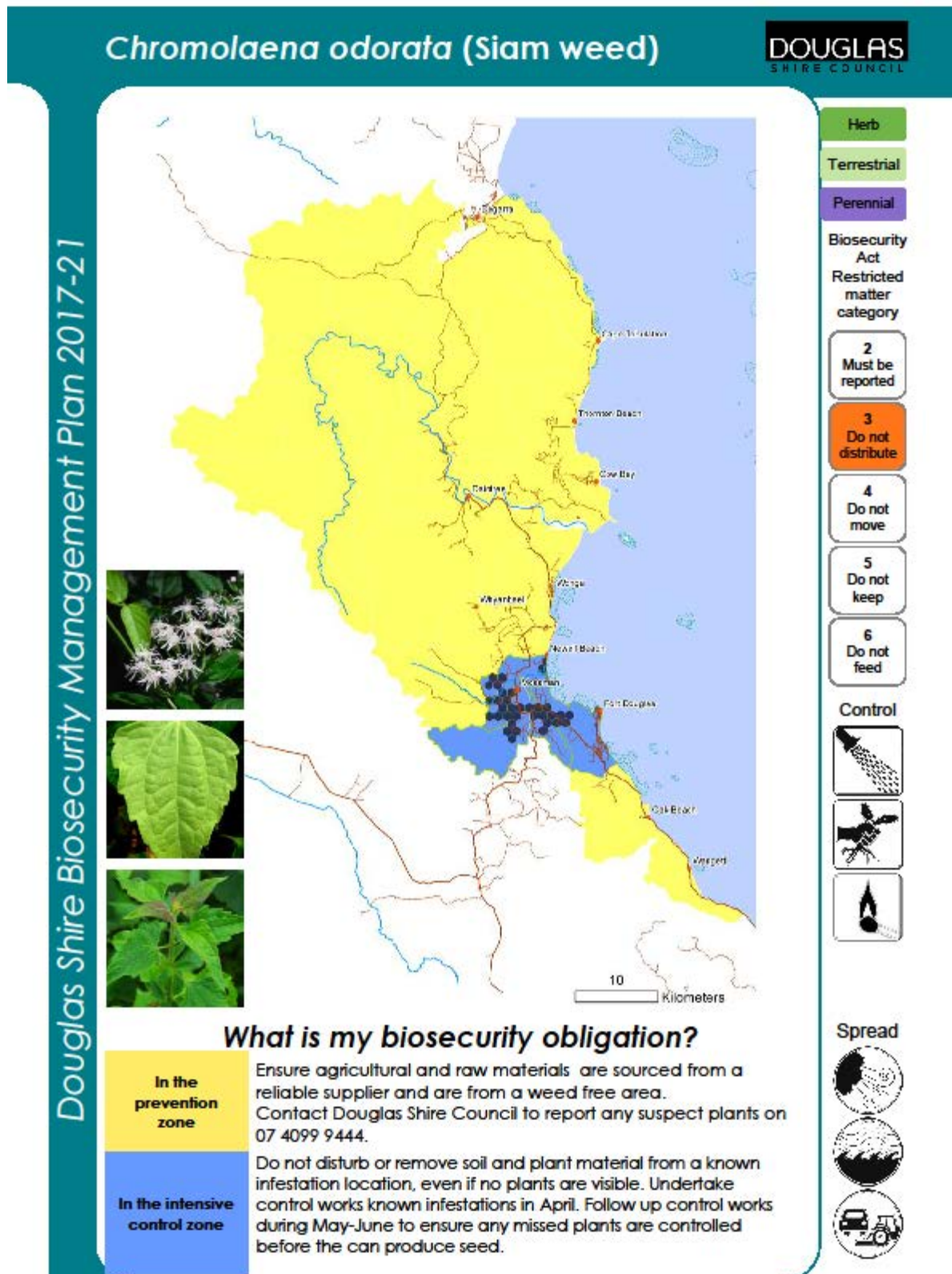
64-66 Front Street,
 Mossman, QLD, 4873



1800 026 318



@douglasshirecouncil












Cecropia spp. (Mexican bean tree)

Priority

Details

Background

Control calendar

National priority	State priority	Previous local	Conservation	Water resources	Agriculture and industry	Community and residential	Feasibility of control	Current extent
								
0.0/5	2.5/5	5.0/5	4.0/5	4.0/5	1.0/5	3.0/5	5.0/5	5.0/5

Description: Rapidly growing tree to 20m. Hollow stems, large deeply lobed leaves with flocked white undersides. Distinctive leaf scars on trunk. Female plant produces long finger-like spikes.

Distribution: Restricted to isolated outbreaks in the Whyanbeel Valley where it was introduced as a garden specimen

Impacts: A rapid growing rainforest pioneer which can invade and dominate rainforests and urban gardens. Cecropia is spread by birds and bats and so can be moved long distances into adjoining landscapes and forests.

Key projects: All known locations the target of a regional eradication program led by Biosecurity Queensland. All suspected sightings of this plant should be reported to Biosecurity Queensland on 13 25 23

A community education and awareness program is an important part of the eradication program. Managing risk of spread to new areas through hygiene protocols for impacted nurseries and growers play an important role in prevention. Hygiene protocols are also in place for survey and control operations.

Cecropia was most likely to be introduced as a garden specimen or experimental food plant over the past 2 decades. Keep an eye out in areas where plant collections or gardens have been or are situated as well as rainforest areas and disturbed sites across the Whyanbeel Valley.

All known locations the target of a regional eradication program led by Biosecurity Queensland. All suspected sightings of this plant must be reported to Biosecurity Queensland on 13 25 23

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flowering												
Seeding												
Spray												
Manual												
Cut stump												
Best time												

Key
Peak
First/last flush
Occasional
Optimal
Good
Marginal

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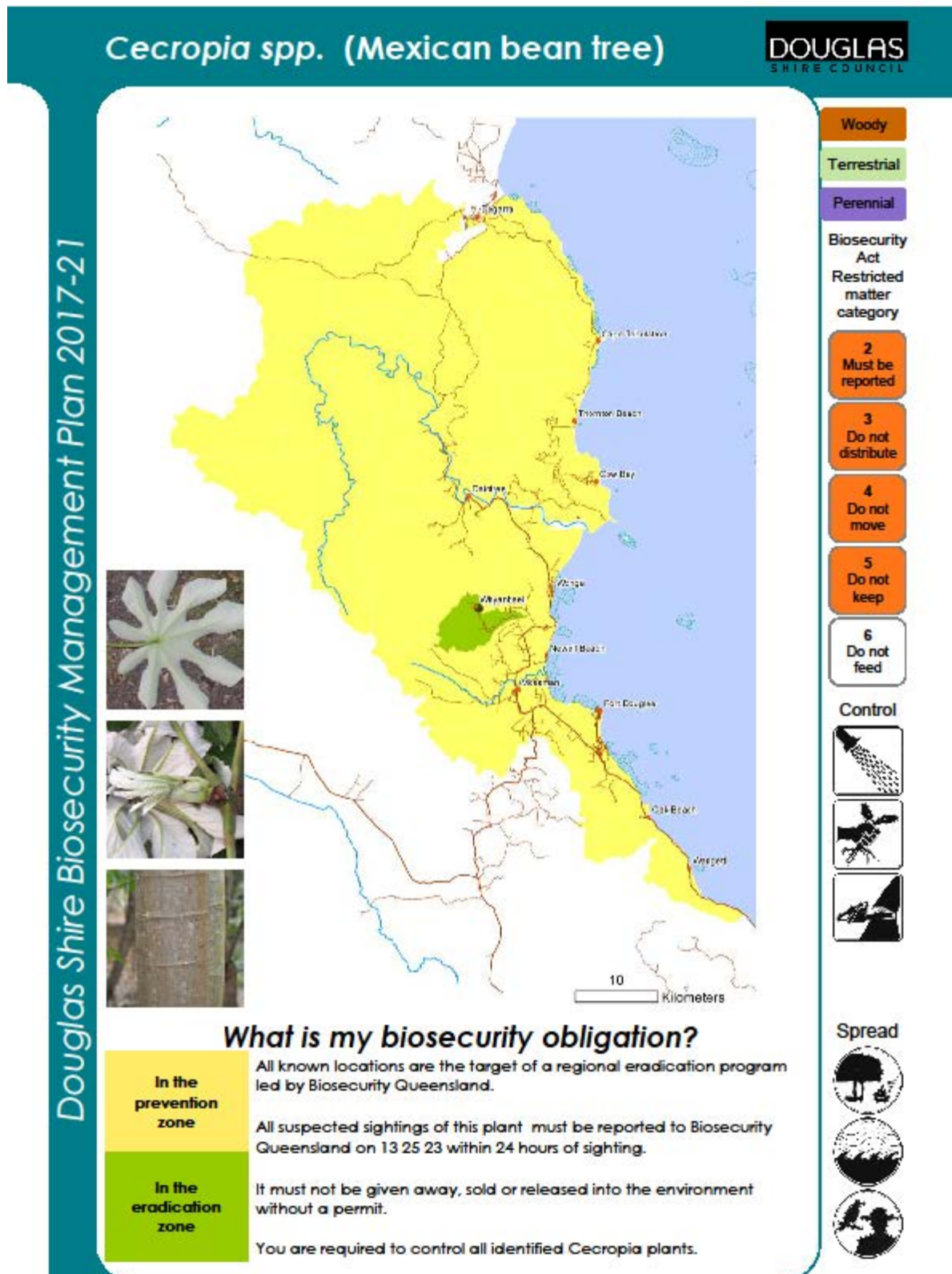
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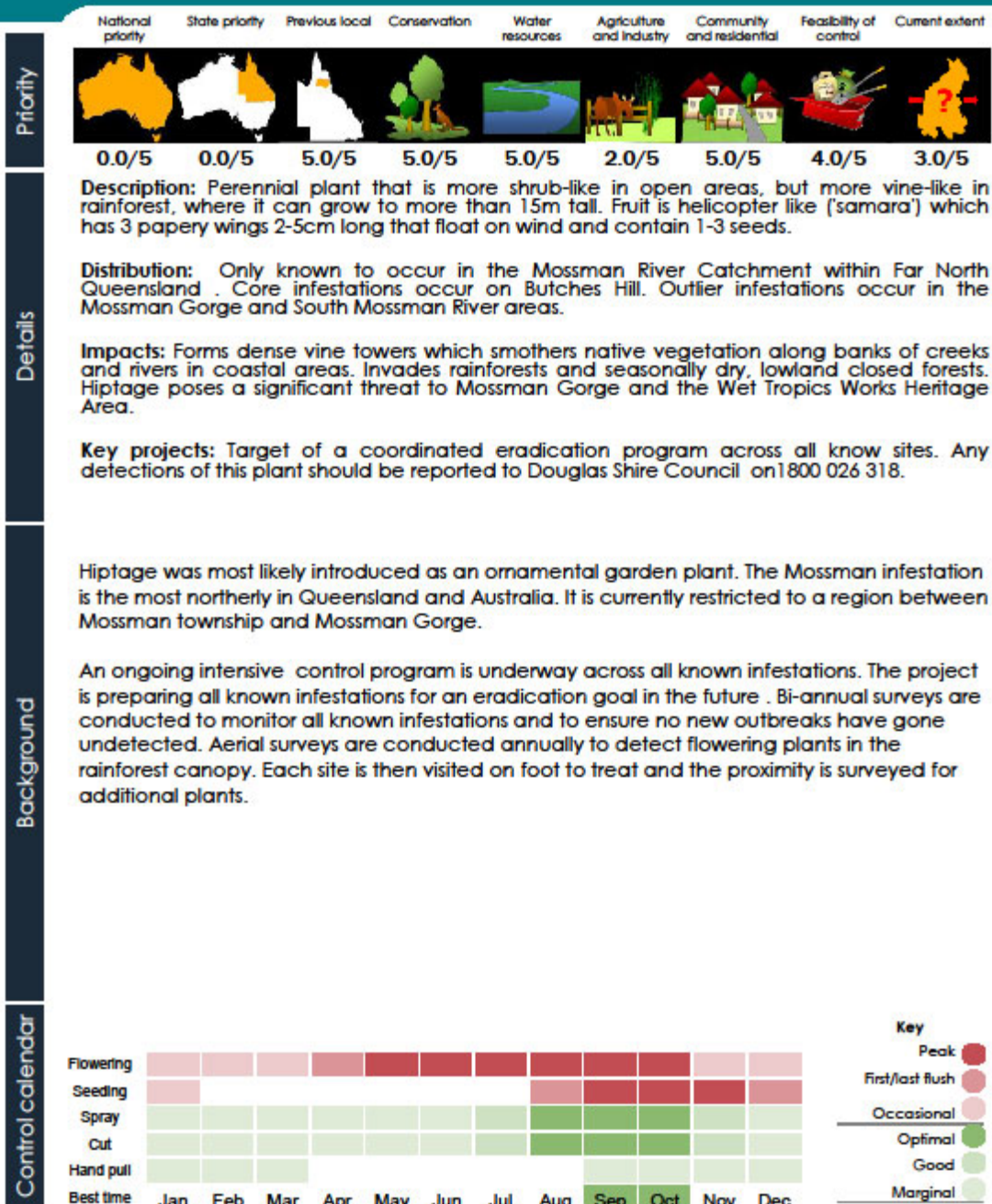
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Hiptage benghalensis (Hiptage)



Key



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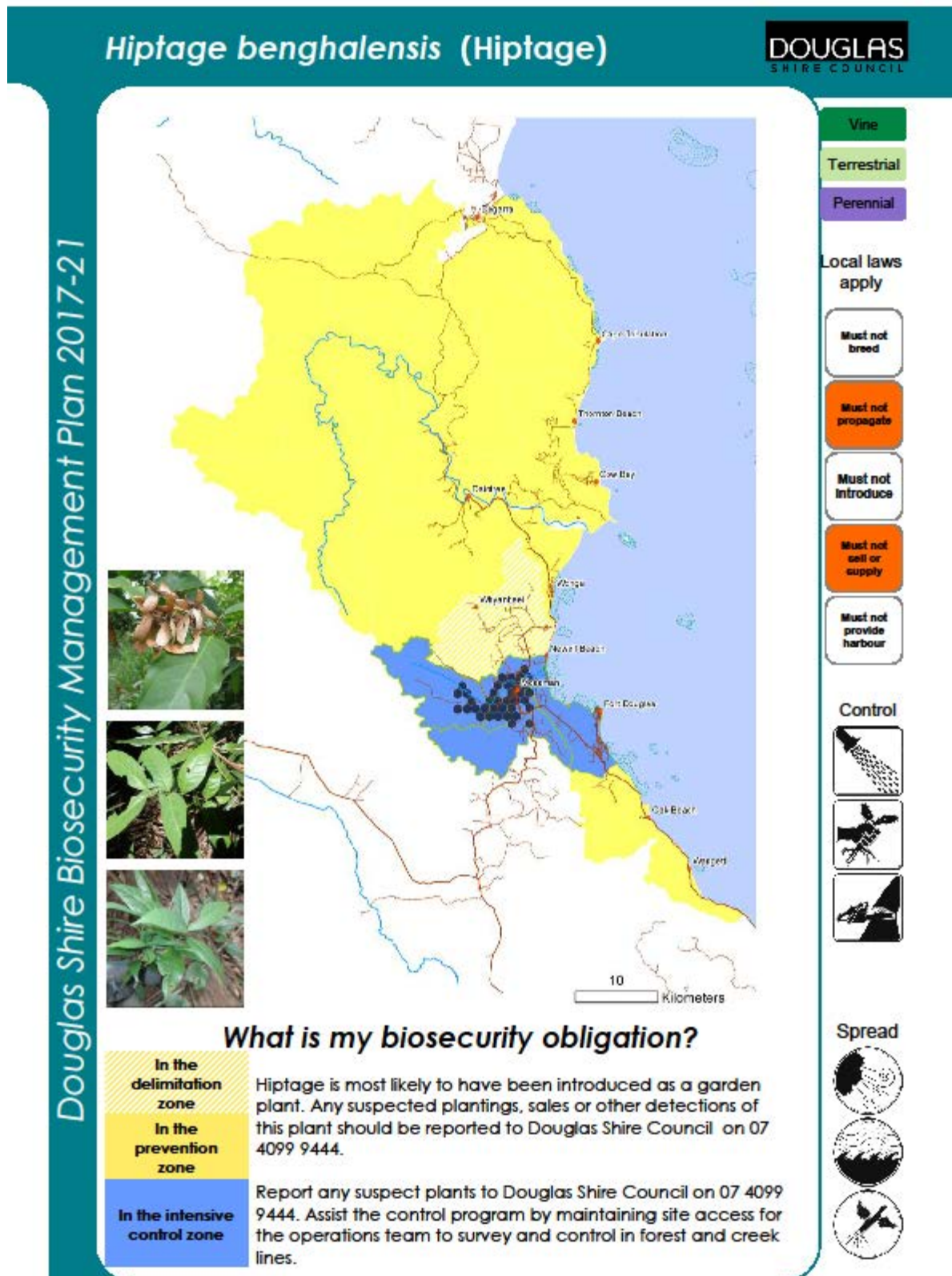
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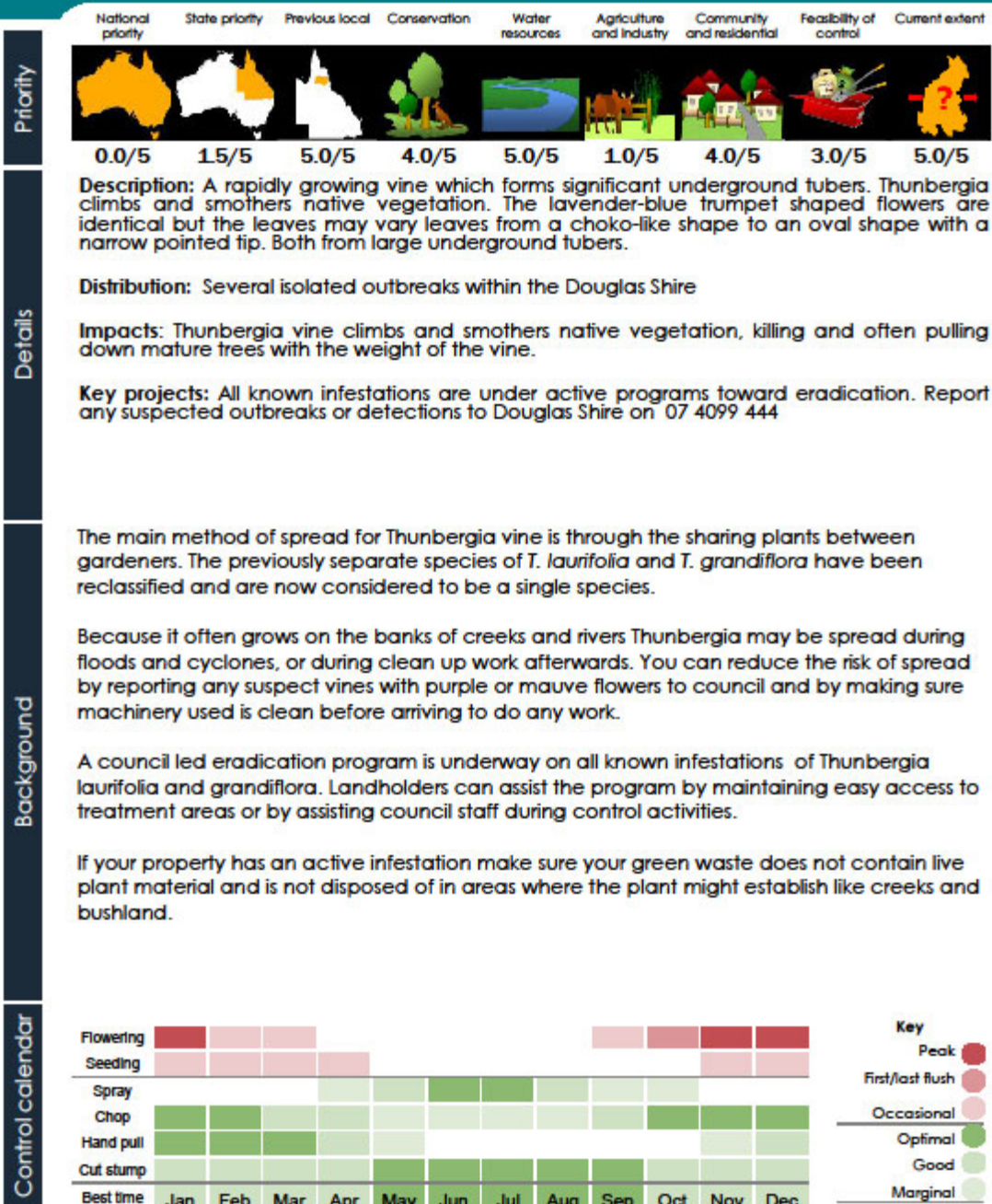
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Thunbergia grandiflora (Thunbergia vine)



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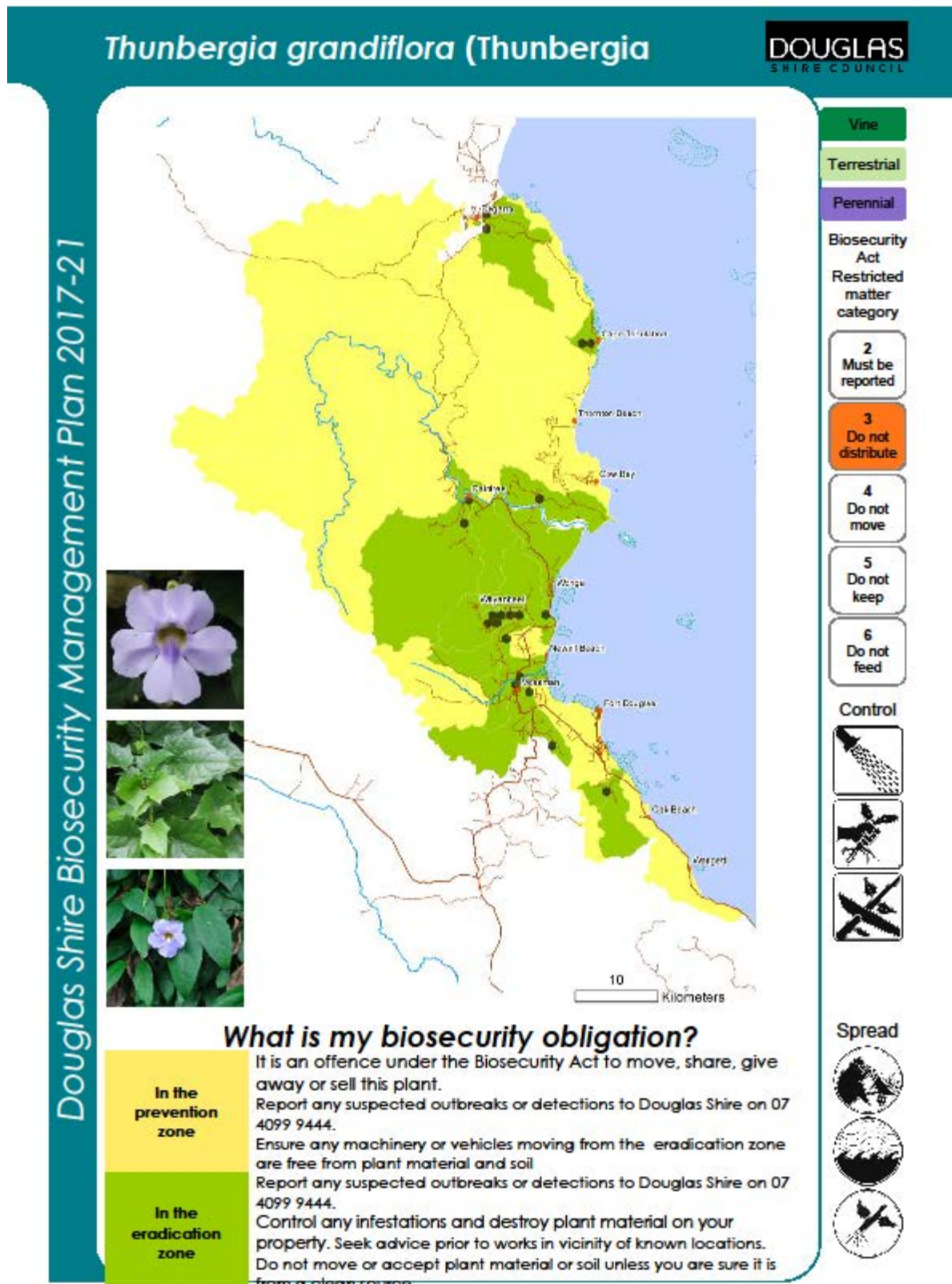
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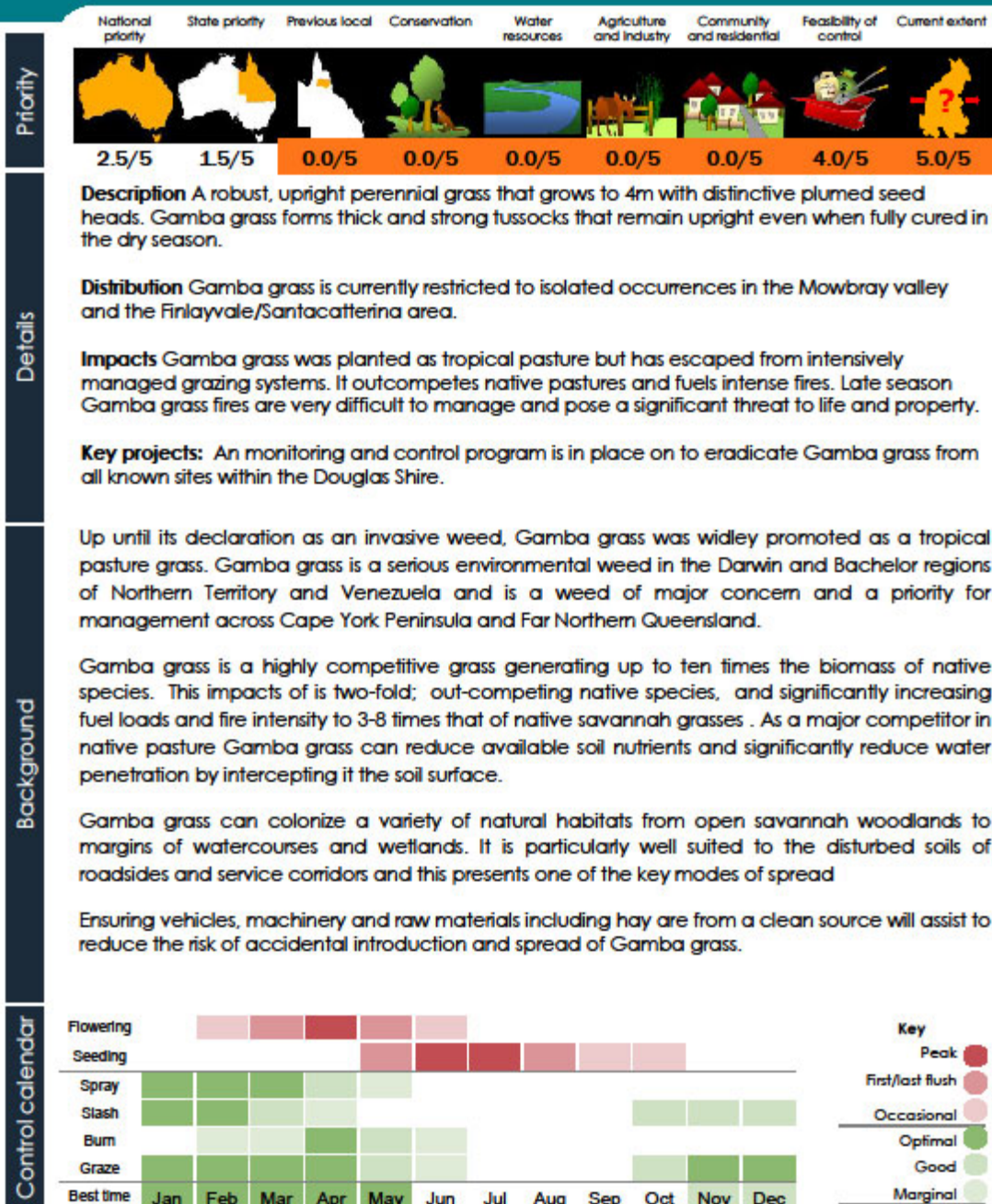
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Andropogon gayanus (Gamba grass)



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DOUGLAS
SHIRE COUNCIL

Douglas Shire Biosecurity Management Plan 2017-21



In the prevention zone

In the eradication zone

Report any suspected outbreaks or detections to Douglas Shire on 07 4099 9444. Ensure machinery and vehicles moving from the infested areas are free from plant material and soil. Do not sell, cart, introduce or transport contaminated hay or silage.

Report any suspected outbreaks or detections to Douglas Shire on 07 40999444. Ensure best practice weed hygiene measures are implemented to reduce risk of spread elsewhere. Assist in annual survey operations and control isolated plants before they seed. Do not sell, cart, introduce or transport contaminated hay or silage.



Rainforest Dieback: Risks Associated with Roads and Walking Tracks

Stuart Worboys and Paul Gadek



Rainforest CRC

Cooperative Research Centre for Tropical Rainforest Ecology and Management

RAINFOREST DIEBACK: RISKS ASSOCIATED WITH ROADS AND WALKING TRACK ACCESS IN THE WET TROPICS WORLD HERITAGE AREA

Stuart Worboys and Paul Gadek
School of Tropical Biology, James Cook University



Rainforest CRC



Established and supported under the
Australian Cooperative Research Centres Program

Table 5: *Phytophthora* Dieback Management Procedures for infrastructure construction and maintenance in *Phytophthora*-free areas.

PLANNING PHASE	<ul style="list-style-type: none"> Map the location of the planned activities, and determine the level of <i>Phytophthora</i> Dieback Management Procedures to be implemented using the flow chart in Appendix A. For catchments that are <i>P. cinnamomi</i>-free, the works plan is to incorporate the following <i>Phytophthora</i> Dieback Management Procedures.
TIMING	<ul style="list-style-type: none"> Activities to be planned for the dry season, and postponed during and following rainfall.
MATERIALS	<ul style="list-style-type: none"> Gravel, soil or sand brought onto the site is to be free of <i>P. cinnamomi</i>. If the planned activities involve the supply of a significant amount of materials, it may be more cost effective to survey the site for <i>P. cinnamomi</i> first to confirm the site isn't already infested. If a site is infested, then the materials do not need to be free of <i>P. cinnamomi</i>. Stockpile topsoil and return it to the site in preference to importing fill. Imported pipes, stone pitching materials and other construction materials to be free of mud and soil.
PROCEDURES	<ul style="list-style-type: none"> Stay within the construction zone. If moving into forest on foot, footwear is to be free of mud and soil. If it is necessary to leave the catchment, implement the <i>Phytophthora</i> Dieback Management Procedures for bushwalking. Store gravel and other materials at the work site on a hard, dry, well-drained surface that drains into the impacted catchment. When grading: <ul style="list-style-type: none"> grade from upslope to downslope (when applicable); grading equipment is to be clean before commencing work; the angle of the grader blade is to be adjusted to avoid carrying soil/gravel long distances; and do not grade wider than prescribed.
VEHICLES AND MACHINERY	<ul style="list-style-type: none"> Vehicles, machinery and equipment to be free of mud and soil when: <ul style="list-style-type: none"> transporting gravel and other construction materials; arriving at a site; and when moving to an uninfested catchment. <p>(There will be a reduced need for cleaning if the operation is completed in dry soil conditions)</p> If cleaning is to occur in the field: <ul style="list-style-type: none"> select a hard, well drained surface (e.g. road), well away from vegetation; wash down in the area in which the activities have occurred; one side of the wash down area is assumed to be infested, the other, uninfested. Operations on either side of the boundary are to be kept separate; and minimise the use of water, and attempt to remove mud and soil with a brush or stick. Park vehicles and machinery on cleared land.
SOIL MOVEMENT	<ul style="list-style-type: none"> Soil, gravel and plant material removed from any site should not be used in uninfested catchments.
WATER	<ul style="list-style-type: none"> Town water, bore water or sterilised water to be used.

REHABILITATION	<ul style="list-style-type: none"> • Rehabilitate site with <i>P. cinnamomi</i> resistant species appropriate to the local area. A preliminary list of resistant species is provided in Appendix B. • Revegetation has a high probability of introducing <i>P. cinnamomi</i>, particularly as it needs to occur during or immediately before the Wet Season, therefore: <ul style="list-style-type: none"> - consider direct seeding rather than planting seedlings; - obtain plants from a nursery with accredited hygiene procedures under the Australian Nursery Industry Accreditation Scheme; - ensure all machinery, tools and equipment are free of mud and soil when commencing works in a new catchment, and are cleaned prior to finishing or moving to another catchment; and - if using mulch, ensure that it has been sourced on site, or has been well composted (the heating part of the composting process kills <i>P. cinnamomi</i>).
STAFF	<ul style="list-style-type: none"> • Staff and contractor involved in road and drain construction and maintenance activities to receive training in <i>Phytophthora</i> dieback management. • <i>Phytophthora</i> dieback information to be include in field staff induction process.

Table 6: *Phytophthora* Dieback Management Procedures for infrastructure construction and maintenance areas where all catchments are assumed to be infested (e.g. Culpa Road, Mt Lewis Road, access track to the head of Tully Falls).

PLANNING PHASE	<ul style="list-style-type: none"> Map the location of the planned activities, and determine the level of <i>Phytophthora</i> Dieback Management Procedures to be implemented using flow chart in Appendix A. For activities that are undertaken entirely within infested catchments, the works plan is to incorporate the following <i>Phytophthora</i> Dieback Management Procedures.
TIMING	<ul style="list-style-type: none"> Activities at <i>P. cinnamomi</i>-free sites should be scheduled for dry soil conditions before undertaking works in infested areas.
MATERIALS	<ul style="list-style-type: none"> The use of materials that are free of <i>P. cinnamomi</i> is encouraged, but this is not essential. <i>P. cinnamomi</i>-free materials should be used at uninfested sites before infested sites.
PROCEDURES	<ul style="list-style-type: none"> Stay within the construction zone. If moving into forest on foot, footwear is to be free of mud and soil. If it is necessary to leave the catchment, implement the <i>Phytophthora</i> Dieback Management Procedures for bushwalking. Store gravel and other materials at the work site on a hard, dry, well-drained surface that drains into the impacted catchment.
VEHICLES AND MACHINERY	<ul style="list-style-type: none"> Vehicles, machinery and equipment to be free of mud and soil when leaving the site. <i>(There will be a reduced need for cleaning if the operation is completed in dry soil conditions)</i> If cleaning is to occur in the field: <ul style="list-style-type: none"> select a hard, well drained surface (e.g. road), well away from vegetation; wash down in the area in which the activities have occurred; one side of the wash down area is assumed to be infested, the other, uninfested. Operations on either side of the boundary are to be kept separate; and minimise the use of water, and attempt to remove mud and soil with a brush or stick. Park vehicles and machinery on cleared land.
REHABILITATION	<ul style="list-style-type: none"> Rehabilitate site with <i>P. cinnamomi</i> resistant species appropriate to the local area. A preliminary list of resistant species is provided in Appendix B. Revegetation has a high probability of introducing <i>P. cinnamomi</i>, particularly as it needs to occur during or immediately before the Wet Season, therefore: <ul style="list-style-type: none"> consider direct seeding rather than planting seedlings; obtain plants from a nursery with accredited hygiene procedures under the Australian Nursery Industry Accreditation Scheme; ensure all machinery, tools and equipment are free of mud and soil when commencing works in a new catchment, and are cleaned prior to finishing or moving to another catchment; and if using mulch, ensure that it has been sourced on site, or has been well composted (the heating part of the composting process kills <i>P. cinnamomi</i>).
STAFF	<ul style="list-style-type: none"> Staff and contractor involved in road and drain construction and maintenance activities to receive training in <i>Phytophthora</i> dieback management. <i>Phytophthora</i> dieback information to be include in field staff induction process.

Table 7: *Phytophthora* Dieback Management Procedures for environmental maintenance activities in *P. cinnamomi*-free areas.

TIMING	<ul style="list-style-type: none"> Activities such as slashing, removal of woody weeds, etc. to occur in dry soil conditions.
REHABILITATION	<ul style="list-style-type: none"> Rehabilitate sites with <i>P. cinnamomi</i> resistant species appropriate to the local area. A preliminary list of resistant species is provided in Appendix B. Revegetation has a high probability of introducing <i>P. cinnamomi</i>, particularly as it needs to occur during or immediately before the Wet Season, therefore: <ul style="list-style-type: none"> consider direct seeding rather than planting seedlings; obtain plants from a nursery with accredited hygiene procedures under the Australian Nursery Industry Accreditation Scheme; ensure all machinery, tools and equipment are free of mud and soil when commencing works in a new catchment, and are cleaned prior to finishing or moving to another catchment; and if using mulch, ensure that it has been sourced on site, or has been well composted (the heating part of the composting process kills <i>P. cinnamomi</i>).
ACCESS	<ul style="list-style-type: none"> Off road vehicles, motorcycles and horses to be kept to established roads and trails, which are likely to already be infested. Minimise the number of tracks in unaffected catchments, and ensure they have hard, dry, well-drained surfaces. When constructing tracks: <ul style="list-style-type: none"> construct in dry soil conditions; map catchments to be impacted by the proposed track – the track should not pass from infested catchments to <i>P. cinnamomi</i>-free catchments; if tracks are to be constructed in <i>P. cinnamomi</i>-free catchments, implement full hygiene procedures, as outlined in Table 5; consider construction of wooden walkways over muddy areas; and ensure materials that can be used to construct tracks include <i>P. cinnamomi</i>-free gravel, concrete, and limestone.
SOIL MOVEMENT	<ul style="list-style-type: none"> Minimise soils disturbance, for example, mow, slash or use herbicide to control weeds and keep open drains, rather than grade or plough. If soil, gravel, sand, river stones, etc. are to be imported into bushland reserves, these materials are to be free of <i>P. cinnamomi</i>.
VEHICLES, MACHINERY & TOOLS	<ul style="list-style-type: none"> All machinery and vehicles to be free of mud and soils on tyres, mudflaps, body and underbody when entering a <i>P. cinnamomi</i>-free catchment. As a matter of routine, all machinery and vehicles to be washed down prior to leaving. All tools and equipment to be free of mud and soil when entering <i>P. cinnamomi</i>-free catchment. As a matter of routine, all tools and equipment are to be washed down prior to removal.
WATER	<ul style="list-style-type: none"> Town water, bore water or sterilised water to be used.
COMMUNICATION AND EDUCATION	<ul style="list-style-type: none"> An ongoing commitment to visitor education is essential. <i>P. cinnamomi</i> awareness to be an integral part of signage and interpretive displays within the High Susceptibility zones of the WTWHA. Provide information to stakeholder groups, such as bushwalking clubs, conservation groups, ecotourism operators, etc. In High Susceptibility zones of the WTWHA, place signage to recommend avoiding access when soil is muddy (could also highlight that leech abundance is correlated with soil moisture, as an additional deterrent!) and that visitors to keep to tracks.

ROADSIDE MAINTENANCE	<ul style="list-style-type: none">• Slashers, tractors and other equipment used on roadsides to be washed down daily, as a matter of routine, when operating in the High Susceptibility zone.
STAFF	<ul style="list-style-type: none">• Land Managers and contractors involved in construction and maintenance activities to receive training in <i>Phytophthora</i> Dieback Management Procedures.

Table 8: *Phytophthora* Dieback Management Procedures for bushwalking and other recreational activities within the High Susceptibility zone.

TIMING	<ul style="list-style-type: none"> Bushwalking activities in the High Susceptibility Zone preferably to occur in dry soil conditions.
COMMUNICATION AND EDUCATION	<ul style="list-style-type: none"> An ongoing commitment to visitor education is essential. <i>P. cinnamomi</i> awareness to be an integral part of signage and interpretive displays within the High Susceptibility zones of the WTWHA. Provide information to stakeholder groups, such as bushwalking clubs, conservation groups, ecotourism operators, etc. In High Susceptibility zones of the WTWHA, place signage to recommend avoiding access when soil is muddy and recommend visitors to keep to tracks.
ACCESS	<ul style="list-style-type: none"> Consideration should be given to restricting access to walking tracks in the High Susceptibility zone during the wet season, or at least those which traverse <i>P. cinnamomi</i>-free catchments. If a walking track traverses both <i>P. cinnamomi</i>-free catchments and infested catchments, walkers should be directed to commence the walk (with clean boots) in the <i>P. cinnamomi</i>-free areas, before moving into infested catchments.
SOIL MOVEMENTS	<ul style="list-style-type: none"> Reduce the likelihood of transporting soil between infested and uninfested catchments by: <ul style="list-style-type: none"> educating walkers by appropriate signage; installing signposted clean-down points at appropriate points on the track (including the start of the track); and encouraging walkers to carry a hard brush and bottle of methylated spirits to use in cleaning and disinfecting boots.

Table 9: *Phytophthora* Dieback Management Procedures for fire management activities within the High Susceptibility zone.

HYGIENE	<ul style="list-style-type: none"> • Machinery, vehicles and equipment to arrive at site free of mud and soil: <ul style="list-style-type: none"> - to clean machinery, use a brush, spade, bar or compressed air in preference to washing down with water; - wash down at designated wash down points or on a hard, well-drained surface that does not run off into forest. - clean machinery, vehicles and equipment before moving to another area. • If you know the <i>Phytophthora</i> dieback status of the area, do not move from infested to uninfested areas unless the vehicle, machinery and equipment are free of soil and mud.
FIRE BREAKS	<ul style="list-style-type: none"> • Procedures for construction and maintenance of fire breaks to follow procedures listed for road construction and maintenance (Tables 5 and 6). The level of <i>Phytophthora</i> Dieback Management Procedures to be implemented to be determined with reference to Appendix A.
FIRE SUPPRESSION	<ul style="list-style-type: none"> • Use hand tools to suppress the fire where this method will succeed. • Use machinery only when necessary. • Use scheme or bore water for fire suppression whenever possible.
TRAINING	<ul style="list-style-type: none"> • Training and practice sessions should not occur in, or adjacent to, bushland areas or horticultural crops in wet soil conditions. • <i>Phytophthora</i> dieback information to be included in induction process for new crewmembers.

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STAMP OUT

Tramp Ants



Image courtesy of Qld Govt

Yellow crazy ant

We need YOU to help us stamp out the tramp ants!

Two species of highly invasive ants, electric ants and yellow crazy ants, are found in Far North Queensland. These tramp ants, so-called because of their tendency to hitch a ride with people, are among the world's 100 worst invasive species. They are a serious social, economic, agricultural and environmental pest, capable of inflicting devastating impacts on our tropical outdoor lifestyle, tourism and agricultural industries, pets and livestock, and the unique native plants and animals of our World Heritage landscape.

Conservation Volunteers, with funding from the Australian Government's Caring for Our Country initiative, and supported by the Wet Tropics Management Authority and Biosecurity Queensland, is conducting surveillance along the boundary of the Wet Tropics World Heritage Area, between Palm Cove and Edmonton and around Bingil Bay and Mission Beach.

Conservation Volunteers will be laying baits, talking to local residents and organising awareness-raising events in these areas. Please help by spreading the word and allowing volunteers to inspect your property. The ants are easier to eradicate if identified early, but may severely impact on your family and pets if not treated swiftly.

How you can help:

- Support Conservation Volunteers when they visit you
- Learn more about electric ants and yellow crazy ants:
http://www.daff.qld.gov.au/4790_6653.htm
- Inspect all purchases of plants and soil for tramp ants
- Check your camping equipment and picnic gear too
- Spray pot plants with insecticide when moving home
- Only dispose of vegetation, plants and soil at approved council sites
- Report illegal dump sites to :
Cairns Regional Council on 4044 3044
Cassowary Coast Regional Council on 4030 2222
Biosecurity Queensland on 13 25 23
- If you find suspected tramp ants, call:
Biosecurity Queensland 13 25 23.

*Don't delay - remember, early detection of tramp ants is vital.
The longer you wait, the harder it is to get rid of them.*

Yellow crazy ants

(*Anoplolepis gracilipes*)

- Long slender body – 5mm body length
- Very long legs and antennae
- Brownish-yellow or orange-yellow, with a brown abdomen, sometimes striped
- Looks like a small green ant but yellow
- Erratic, frantic, “crazy” movement
- Able to forage day and night but less active in intense heat and heavy rain

Yellow crazy ants are opportunistic feeders and consume both sugars and proteins (survey teams use a mix of tuna and jam as bait). They don't bite or sting, but spray formic acid to subdue and kill prey, and sometimes as a defensive mechanism when disturbed. This can irritate skin and eyes, blinding pets, livestock and native animals. Few small animals or insects survive in areas they colonise. Chicks and young animals are particularly at risk.

Yellow crazy ants have recently been found in Little Mulgrave National Park, part of the Wet Tropics World Heritage Area. To learn more, watch and share this YouTube video about yellow crazy ants:

<http://youtu.be/GgG-LDTRmkM>

Electric ants

(*Wasmannia auropunctata*)

- Tiny – about 1.5mm in length
- Light / golden brown in colour
- Active 24 hours a day in most weather conditions
- Likes moist areas, especially those close to water
- Tend to move slowly, often in distinct foraging lines
- Inflict a painful sting

Electric ants inject venom when they sting, which can result in painful, itchy pimples that take a long time to clear up, and occasionally triggering severe allergic reactions. They target the eyes and orifices of animals, repeatedly stinging and trying to blind them. They can be a serious nuisance in infected areas, stinging people around the home, the farm, and at tourist sites.

Electric ants frequently colonise people's homes, attracted to food (like peanut butter and hotdogs which are used as bait by survey teams). They have even been known to take a swim in backyard pools, and take over children's playgrounds.



Image courtesy of Qld Govt

Behaviour

Both electric and yellow crazy ants lay their eggs in damp niches, under logs, leaf litter, stones, in boxes, plant pots, furniture and even wall cavities. They also take over the burrows and nesting holes of birds and other animals (e.g. parrots, owls and gliders). They reproduce mainly in the wet season, spreading out from the source colony by 'budding', and form super-colonies with multiple queens. Yellow crazy ants are capable of spreading up to 1km per year and both species spread into new areas through movement of timber, soil, vegetation, pot plants, picnic and camping gear, etc.

Tramp ants 'farm' honeydew (a sugary liquid) by protecting sap-sucking insects (like scale and aphids), which leads to spread of sooty mould. Sooty mould weakens plants, and can lead to dieback of plants and crops (sugar cane, fruit trees, etc). In addition to sugars tramp ants require protein to breed, and in infected areas, few other invertebrates (including native ants, insects, spiders, worms, etc.) or small vertebrates (like frogs and skinks) survive. Both species forage on the ground and high up into the canopy.

Impact on the Wet Tropics

The Wet Tropics World Heritage Area is a truly exceptional place, which attracts tourists from all over the world who come to experience our spectacular scenery and unique plants and animals. This extraordinary ecosystem is a living museum containing the world's oldest continuous rainforest with over 700 species of plants and nearly 70 vertebrate animals found nowhere else in the world – a real hotspot for biodiversity. For those of us lucky enough to call it home, it also provides a unique sense of place and a stunning backdrop to our daily lives.

Tramp ants are a serious threat to the Wet Tropics World Heritage Area and the surrounding region. Our warm, humid climate is ideal for their spread. Electric and yellow crazy ants could have a devastating impact on our unique plants and animals, including iconic and threatened species like cassowaries and spotted-tailed quolls. The ants' ability to forage high in the canopy means that both ground and tree-dwelling animals are in danger. The region's tourism and agricultural industries could also be adversely affected.

If caught early enough, eradication of tramp ants in urban areas is fairly straightforward, but once they start to invade more remote, rugged natural areas, they will be almost impossible to stop.

Please help us stamp out tramp ants before they destroy the irreplaceable diversity of the Wet Tropics.



Queensland Government



CARING
FOR
OUR
COUNTRY



Yellow crazy ants

Anoplolepis gracilipes



Yellow crazy ants are an introduced species of tramp ant, thought to originate in Africa. The name 'crazy ant' refers to the ants' erratic walking style and frantic movements, especially when disturbed.

Yellow crazy ants can form densely populated super-colonies with more than one queen. These super-colonies can have a huge impact on natural environments, including both native plants and animals. Yellow crazy ants can damage crops, horticulture and honeybee hives, and can adversely impact on our outdoor lifestyle.



Legal requirements

Yellow crazy ants are category 3 restricted invasive ant under the *Biosecurity Act 2014*. They must not be given away, sold, or released into the environment. The Act requires everyone to take all reasonable and practical measures to minimise the biosecurity risks associated with tramp ants. This is called a general biosecurity obligation (GBO). This fact sheet gives examples of how you can meet your GBO.

Description

Adults have a long slender body approximately 5 mm in length and are yellow to brownish in colour. The abdomen is usually a uniform dark brown but sometimes is striped dark brown. Legs and antennae also measure approximately 5 mm in length and appear very long in comparison with the body.

Yellow crazy ants have no functional sting, but spray formic acid to subdue prey and act as a defence mechanism, especially when disturbed. In large amounts, this acid may burn or otherwise irritate the skin and eyes of animals and humans. On Christmas Island, yellow crazy ants have decimated the land crab population and radically affected the ecosystem of the island. Yellow crazy ants also protect and farm sap-sucking insects, allowing dense populations of these insects to live on native plants. The high abundance of sap-sucking insects on native plants eventually weaken them, allowing various plant diseases to take hold and decreasing plant health or resulting in premature plant death.

Life cycle

Worker ants have a life cycle of 76–84 days. Queens survive for several years. Workers are produced throughout the year, but production fluctuates.

Sexual offspring are produced at any time in the year but generally 1–2 months prior to the rainy season.

Methods of spread

Yellow crazy ants can be spread in soil and produce in the agricultural and horticultural industry; on contaminated military, mining and commercial road transport; and in sea and air freight on timber, goods, packaging material and pallets. Yellow crazy ants have been most commonly spread to industrial and transport businesses via timber, timber products and other construction materials.

Habitat and distribution

Yellow crazy ants were first discovered in Cairns, Queensland in 2001. A number of infestations have been detected in residential, industrial, commercial, agricultural and forest environments in coastal areas of Queensland and in some suburbs in south east Queensland, Hervey Bay, Cairns and Townsville. Yellow crazy ants are also present elsewhere in Australia including the Northern Territory and Christmas Island.

Yellow crazy ants prefer to nest in areas with access to water or some moisture, such as along creek banks, in utility service pits or piles of timber, or under logs, debris or leaf litter. They will also nest at the base of trees, around perimeters of buildings and within retaining walls where moisture is retained.

Control

The GBO requires a person to take reasonable and practical measures to minimise the biosecurity risks posed by yellow crazy ants. This fact sheet provides information and some control options for crazy ants.

Prevention and early detection

Checking for the presence of yellow crazy ants can help prevent further spread of this pest. Landholders and businesses should check their properties and any materials that could harbour yellow crazy ants. This includes soil, timber, timber products and other construction materials, agricultural and horticultural produce, packaging and other potential vectors of spread.

Baiting

Yellow crazy ant infestations can be treated by spraying or baiting. Landholders may choose to use insecticides that are registered for the control of ants or call a local pest control operator. Distance® Plus Ant Bait is an insect growth regulator, specifically a juvenile hormone mimic, similar to the naturally occurring insect growth hormones which control fertility, egg viability and pupation. Distance® Plus Ant Bait breaks the reproductive life cycle of ants, eventually causing starvation of the colony through lack of replacement of foraging workers.

Baits may be laid utilising either hand held spreaders, spreaders attached to motor vehicles or aerial application.

Yellow crazy ants could become resistant to Distance® Plus Ant Bait, therefore it is recommended to use a combined approach of different insecticides and integrated land management practices.

Insecticides should always be used in accordance with the label instructions. Further information about insecticides can be found on the Australian Pesticides and Veterinary Medicines Authority website www.apvma.gov.au.

Further information

Further information is available from your local government office, or by contacting Biosecurity Queensland on 13 25 23 or visit biosecurity.qld.gov.au.

Table 1. Insecticide for the control of yellow crazy ants

Situation	Insecticide	Rate	Comments
<p>Domestic and public service areas, commercial and industrial areas (including parks, golf courses, sports grounds, paths and walkways, gardens, lawns and turf)</p> <p>Cropping areas</p> <ul style="list-style-type: none"> • Plantations and orchards including olives, citrus and tropical fruits and tree nuts. • Other fruits and vegetables, herbs, spices • Pasture • Native and managed forests <p>Environmental management areas National parks and reserves where invasive ants are a threat to ecosystem values</p>	Distance® Plus Ant Bait Pyriproxyfen Group 7C Insecticide	2–4 kg per ha 2–4 g per 10 m ²	<p>Distance® Plus Ant Bait should be applied in the early spring or summer at the first sign of ant activity. Application is most effective when ants are actively foraging</p> <p>For most situations the lower rate is adequate. However, in northern Australia and where heavy infestations occur, use the higher rate. Multiple applications may also be required for heavy infestations. Multiple applications may also be required for certain species that have multiple reproductive females inhabiting the same nest, to ensure that all reproductive females are exposed to the juvenile hormone mimic. These include Argentine ant (<i>Linepithema humile</i>) and Pony ants (<i>Rhytidoponera</i>)</p> <p>DO NOT exceed three applications per year and a minimum of three months between each treatment</p> <p>Avoid exposure to terrestrial arthropods such as land crabs. Apply only in areas of high ant density with zero or low crab density</p> <p>Vegetables DO NOT apply directly to crop plants Apply to inter-row areas only</p> <p>Poultry DO NOT apply in pasture or other areas where poultry are or are intended to be feeding and/or grazing. Baits may only be laid in situations where direct access to the bait by poultry is not possible e.g. in situations with maintained caged poultry above the ground/areas to be baited</p>

Directions for use

Restraints:

- DO NOT apply direct onto water
- DO NOT apply within 20 m water when applying by aerial application
Turn off/close the granular applicator during aerial application over or near water
- DO NOT apply as a preventative measure for ant control
- DO NOT apply more than one application per year where terrestrial arthropods such as land crabs may occur
- DO NOT water treated areas for at least 24 hours after application.
- DO NOT apply directly to crop plants (excluding pastures). Apply to inter-row areas where movement to water from irrigation or rainfall is not possible.

Read the label carefully before use. Always use the herbicide in accordance with the directions on the label.



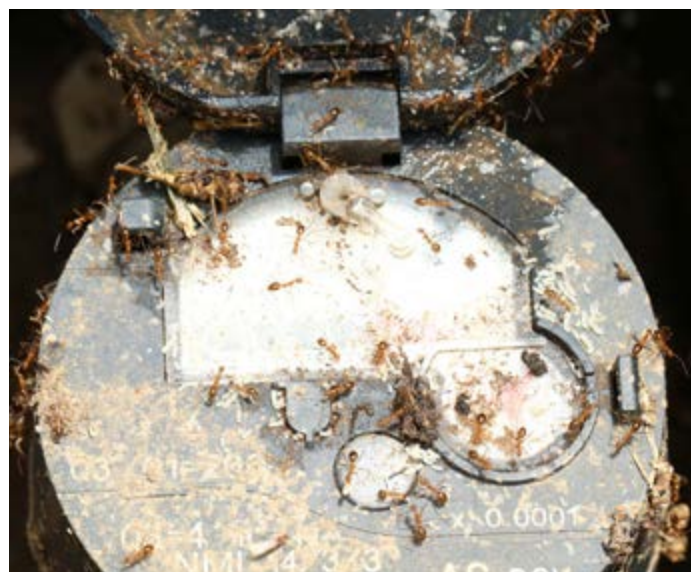
Yellow crazy ant



Yellow crazy ants smothering pipe



Yellow crazy ants pupa



Yellow crazy ants can be found on meters



Yellow crazy ant



Yellow crazy ants

This fact sheet is developed with funding support from the Land Protection Fund.

Fact sheets are available from Department of Agriculture and Fisheries (DAF) service centres and our Customer Service Centre (telephone 13 25 23). Check our website at biosecurity.qld.gov.au to ensure you have the latest version of this fact sheet. The control methods referred to in this fact sheet should be used in accordance with the restrictions (federal and state legislation, and local government laws) directly or indirectly related to each control method. These restrictions may prevent the use of one or more of the methods referred to, depending on individual circumstances. While every care is taken to ensure the accuracy of this information, DAF does not invite reliance upon it, nor accept responsibility for any loss or damage caused by actions based on it.

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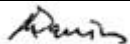
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Appendix D – Preliminary Traffic Management Plan

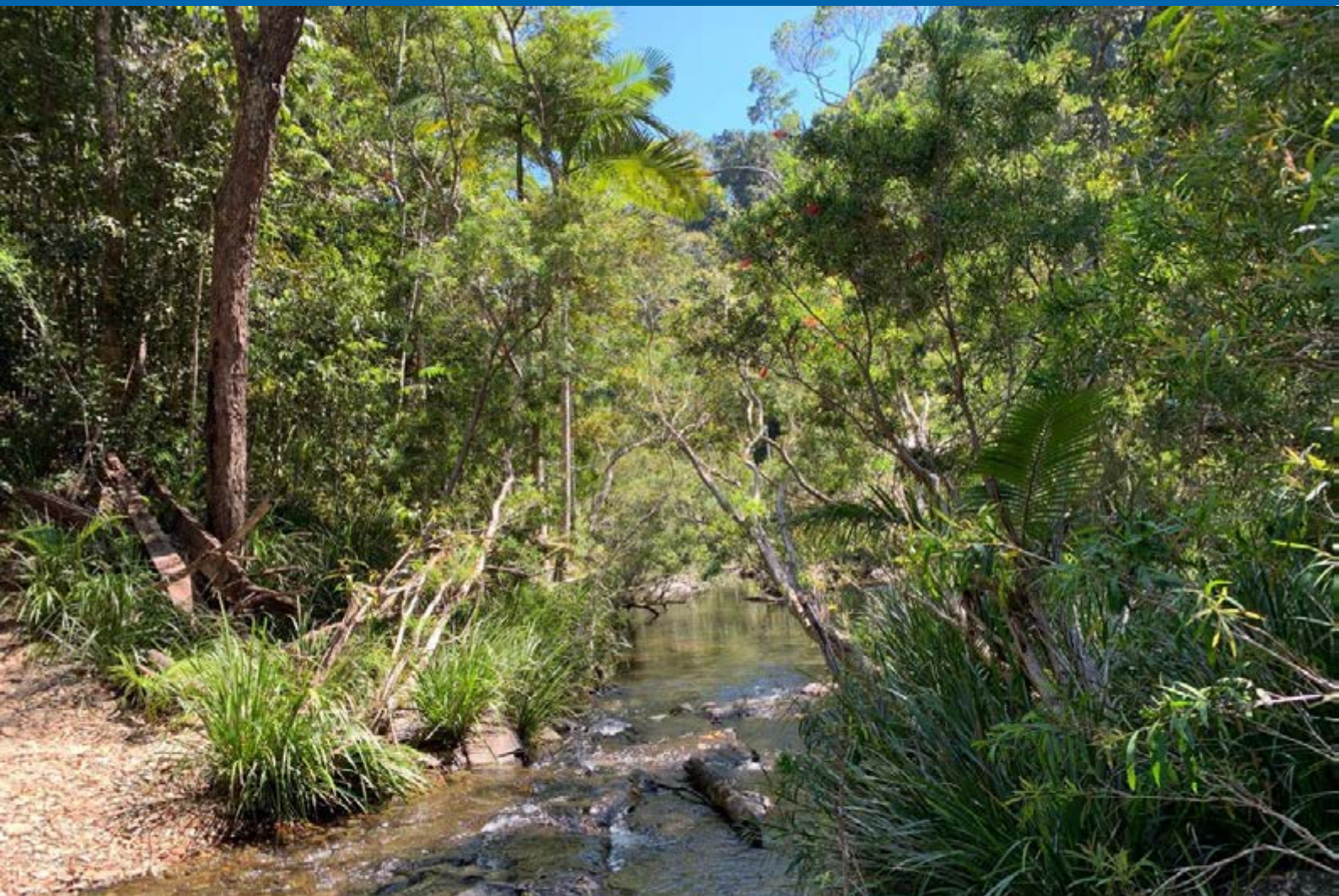


Department of State Development, Tourism, and Innovation

Wangetti Trail South Section (Wangetti to Palm Cove)

Preliminary Traffic Management Plan

December 2020



Abbreviation and acronyms

Abbreviation/acronym	Definition
AS	Australian Standards
DES	Department of Environment and Science
DoR	Department of Resources
DSDTI	Department of State Development, Tourism and Innovation
DTMR	Department of Transport and Main Roads
FNQ	Far North Queensland
km	Kilometre
MNES	Matters of National Environmental Significance
MTBA TDRS	Mountain Bike Trail Guidelines Trail Difficulty Rating System
MUTCD	Manual of Uniform Traffic Control Devices
PPE	Personal Protective Equipment
Project	Wangetti Trail – Wangetti South
TARS	Traffic Analysis and Reporting System
TDPD	Tourism Development Projects Division
TMP / Report	Traffic Management Plan
WTMA	Wet Tropics Management Authority
WTWHA	Wet Tropics World Heritage Area

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1. Introduction

1.1 Project background

The Department of State Development, Tourism and Innovation (DSDTI) – Tourism Development Projects Division (TDPD) is proposing to establish the Wangetti Trail – Wangetti South ('Project') Section, a 29.7 kilometre (km) shared use trail to accommodate both mountain bike users and hikers from the southern boundary Lot 2 SP309094 in the township of Wangetti, to Palm Cove.

Development of a preliminary Traffic Management Plan ('TMP' or 'Report') is required to support environmental approval applications for proposed works associated with the Project and to demonstrate to the regulatory authorities how traffic and the movement of vehicles will be managed to avoid and minimise impacts on matters of national environmental significance (MNES): during the construction and operational phase of the project. This report also discusses the mitigation measures to be implemented during the construction and operational phases.

This TMP has been developed with consideration of the:

- Manual of Uniform Traffic Control Devices (MUTCD), Austroads Guide to Traffic Management
- The Department of Transport and Main Roads Specifications MRTS02 Provision for Traffic and the scope of services described below in Section 1.2.
- Queensland Parks and Wildlife Service Technical Manual - Infrastructure and Equipment QPWS road works signage (for works on very low-volume roads in rural areas) (QPWS Technical Manual QPWS road works signage)
- Operational Policy: Mountain Biking in QPWS Managed Areas dated 2011
- Wangetti Trail Construction Methodology Manual April 2020
- Wangetti Trail prepared by World Trail July 2017
- Work Health and Safety legislation
- Tourism Australia – Great Walks -Guidelines for trail planning, design and management
- Advice from Department of Environment and Science (DES) and Wet Tropics Management Authority (WTMA).

1.2 Purpose

This TMP provides preliminary guidance to help establish appropriate traffic control and traffic management procedures to manage potential hazards associated with the traffic environment during the Project and to reduce potential adverse impacts to people and wildlife during the construction and operational phases of the Project. It also helps establish appropriate controls for users of the shared use trail and management procedures to manage potential hazards such as interactions with hikers and cyclist and interactions with wildlife.

It is expected that prior to any construction activity and operational activity for the Project, a detailed work specific TMP will be developed by the Contractor as part of the Environmental Management Plan (EMP). The Contractor should review the preliminary guidance provided in this Report and provide greater detail based on construction methodology, operational activities, and timing of works. The TMP will also need to be in general accordance with the MUTCD,

1.3 Scope and limitations

This report: has been prepared by GHD for Department of State Development, Tourism and Innovation and may only be used and relied on by Department of State Development, Tourism and Innovation for the purpose agreed between GHD and the Department of State Development, Tourism and Innovation as set out in section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Department of State Development, Tourism and Innovation arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

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1.4 Objective and strategies

As part of the scope of services for this Report, GHD is to provide preliminary traffic management strategies in accordance with the standards outlined in the MUTCD, Transport and Main Roads Specifications MRTS02 Provision for Traffic, Queensland Parks and Wildlife Service Technical Manual - Infrastructure and Equipment QPWS road works signage (for works on very low-volume roads in rural areas) and advice provided by Department of Environment and Science (DES) and TDPD. The following outcomes will be delivered in this Report:

- Identification of disturbed areas throughout the project site, where applicable
- Identification of the type of controls likely required for each disturbed area and indicative locations
- Preliminary guidance on traffic control measures

The objectives of the TMP are to ensure:

- The safety of the workers
- All road users, including vulnerable road users, are safely guided around, through or past any work site
- Reduce impacts to wildlife
- The performance of the road network is not unduly impacted and the disruption and inconvenience to all road users are minimised for the duration of the works

- Impacts on users of the road reserve and adjacent properties and facilities are minimised.

In an effort to meet these objectives the Traffic Management Plan will incorporate the following strategies:

- Ensuring traffic delays are minimised
- Ensuring all road users are managed including motorists, pedestrians, cyclists, people with disabilities and people using public transport (as applicable and necessary)
- Ensuring work activities are carried out sequentially to minimise adverse impacts to the environment, wildlife and road users
- Provision will be made for works personnel to enter the work area in a safe manner in accordance with safety procedures
- All entry and exit movements to and from traffic streams shall be in accordance with the requirements of safe working practices.

2. Project overview

2.1 Location

Wangetti South Section is located between Wangetti Township and Palm Cove in Far North Queensland (FNQ). The land parcels that Wangetti South Section intersects are outlined in Table 2-1.

Table 2-1 Wangetti South Project subject properties

Affected property	Address / Coordinates	Owner Details	Tenure	Locality	Proposed works
Reserves					
31SP129117	Captain Cook Highway, Ellis Beach, South Reserve	State of QLD (Department of Resources (DoR))	Reserve	Ellis Beach	Trail
6SP309107	Captain Cook Highway Wangetti	State of QLD (DoR)	Reserve	Wangetti	Service track Trail
National Park					
174NPW930	Macalister Range National Park	State of QLD (DoR)	National Park	Macalister Range	Trail Service track Dark Jungle
Road Reserves					
Road Reserve	Captain Cook Highway	Department of Transport and Main Roads (DTMR)	Road Reserve	Palm Cove – Port Douglas	Trail
Leasehold					
13NR5512	Captain Cook Highway Ellis Beach	Lessee Bellbird Park Developments Pty Ltd	State Leasehold Land Non-competitive lease 9/2568 – Tourism purposes namely tourist accommodation and ancillary facilities	Ellis Beach	Service track

The Wangetti South Section is located within Douglas Shire Council local government area and Cairns Regional Council local government area. The shared use trail within Wangetti South Section extends over 29.7 km and is constrained by the Coral Sea to the east and the Macalister Ranges to the west and is almost entirely located within the Macalister Range National Parks and the Wet Tropics World Heritage Area (WTWHA) (refer to Figure 2-1 for a locality plan of the trail).

2.2 Proposed works during construction and operational phases

The Wangetti South Section will comprise of the following components:

- 29.7 km shared use trail to accommodate both mountain bike users and hikers, consisting of natural ground and surface treatments, which will be a maximum of 1.5 m wide. The 1.5m wide trail will be located within a 40 m survey corridor, referred to as the construction allowance corridor, to allow flexibility for the placement of infrastructure during the construction phase. The trail has been designed to be a 'Mountain Biking – intermediate (blue square with blue outline) as defined in the Australian Mountain Bike Trail Guidelines Trail Difficulty Rating System (MTBA TDRS) and grade 3 for hikers, as defined in the Australian Walking Track Grading System (AWTGS), which also equates to Class 3 in the Australian Standard for Walking Tracks, Part 1: Classification and Signage (AS 2156.1-2001). The trail will have an average gradient of <10% and a maximum gradient no greater than 15% (for short distances only). Built structures proposed as part of the trail include gully crossings, bridges, staircases, platforms, rock armouring and signage, where appropriate and required
- A number of waterway crossings along the shared use trail that will comprise of the following: rock armouring, boulder crossings and low-level bridge (minor water crossing)
- Dark Jungle (public camping node and amenities block)
- The formalisation of existing access tracks into service tracks to provide restricted access to the shared use trail and Dark Jungle for construction purposes, operational purposes, maintenance purpose and for emergency purposes.

Details of the general construction methodology for the trail and Dark Jungle are outlined in World Trail Pty Ltd (2020) Wangetti Trail Construction – Final Version. During the construction phase the works will be staged and the Contractor will be responsible for determining appropriate construction staging.

All high-risk activities associated with bulk earthworks, pavement works and revegetation / stabilisation must be completed within the proposed construction works period.

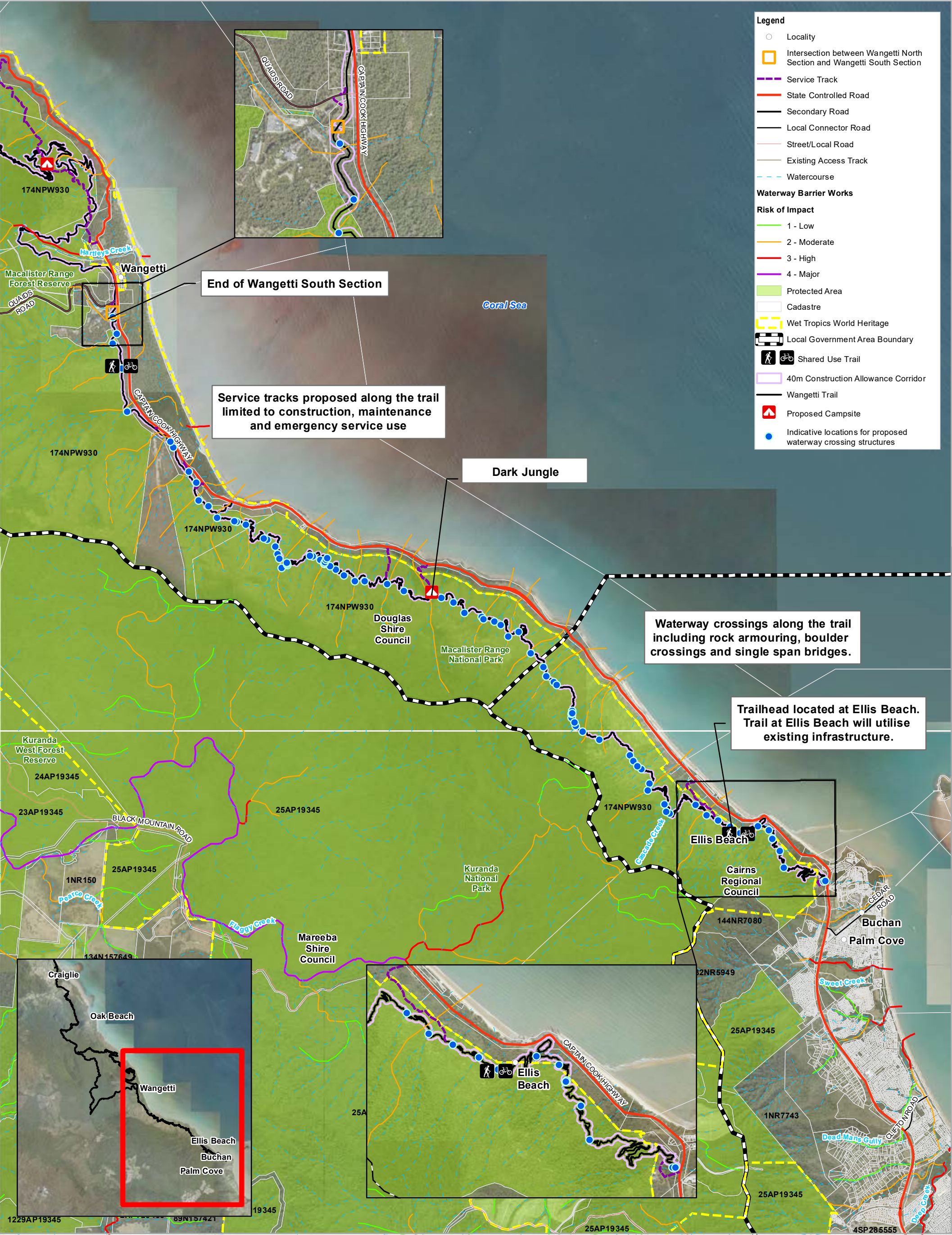
During the operational phase of the project the shared use trail will only be used by mountain bike users and hikers. Maintenance vehicles will be able to access Wangetti South Section via the nominated service tracks.

The Wangetti South Section is being proposed over four properties located within the Douglas Shire Council and Cairns Regional Council local government areas. The project area intersects both the Macalister Range National Park and the Wet Tropics World Heritage Area (WTWHA).

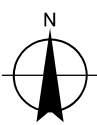
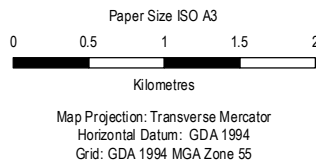
Central to the location of the Wangetti Trail, from a traffic perspective, is the Captain Cook Highway linking Palm Cove to Port Douglas. No treatments are proposed along the Captain Cook Highway road reserve as part of the project.

2.3 Site assessment and site constraint/impacts to existing traffic and road environment

The proposed Wangetti Trail will comprise a 1.5m wide shared use trail (mountain bikers and hikers). Additional facilities will include a trail head to be located at Ellis Beach, a campsite (raised platforms for tents with ablutions at Dark Jungle) and the trail end at Wangetti.



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DITID
Environment Assessment Stage 2 Wangetti Trail

Wangetti Trail Project Locality Plan
Wangetti South Section

Project No. 41-32458
Revision No. 0
Date 16/12/2020

FIGURE 2-1

It is proposed that existing access tracks that feed off the Captain Cook Highway will be utilised to provide access during construction and maintenance (they are referred to as service tracks). An existing access track will be utilised to service the campsite and ablutions at Dark Jungle. A description of the service tracks are outlined in Appendix A.

The following is noteworthy:

- No new access roads are to be constructed to provide access to the trail and amenities from the Captain Cook Highway
- The existing access roads will be closed to the public and general users of the trail
- No modifications or works are anticipated to be constructed along the Captain Cook Highway
- A marginal increase in vehicle traffic (approx. a maximum of 10 vehicles per day) is expected along the Captain Cook Highway associated with the construction phase of the project. No major construction plant is required as no major earthworks are anticipated
- Once the trail is operational, a marginal increase in vehicle traffic is expected by users of the facility (return trips by car from Ellis Beach, Wangetti or Port Douglas) (estimated <20 cars per day).

2.3.1 Captain Cook Highway

The Captain Cook Highway is a state-controlled road administered by the DTMR. Captain Cook Highway provides direct linkage between the Cairns City, Northern Beaches of Cairns and destinations further north to Port Douglas, Mossman and Daintree.

Between Palm Cove and Wangetti, speed limits range from 60 to 100 kph. The road is typically winding with restricted site distances and limited passing opportunities. Current users of the road are vehicle traffic moving between Cairns and Port Douglas, tourists and occasional cyclists. There is no dedicated cycle lane along this section of the Captain Cook Highway. There is not much pedestrian activity along the road apart from at Ellis Beach where pedestrians cross the Captain Cook Highway from the pub and car park to access the beach.

Other hazards to road users include wildlife such as wallabies, feral pigs and the occasional cassowaries which frequent the area.

According to the Traffic Analysis and Reporting System (TARS) Average Annual Daily Traffic measured at Craiglie (just south of Port Douglas) the following traffic volumes were recorded for 2019 (Queensland Government, 2020):

- AADT Average Week Day traffic – 6,257
- AADT Average Weekend Day Traffic – 6,069
- Traffic growth in last 10 years – 1.47%
- Traffic growth last year - -3.71%
- Light vehicles – 90.99%
- Heavy vehicles – 9.00%.

2.3.2 Trail head for the shared use trail

During the operational phase of the project, the trail head will start at Ellis Beach where the trail connects to the Captain Cook Highway road reserve at Ellis Beach to be situated on Lot 31 SP129117 (refer to Figure 2-1 and 2-2). Access to the trail head is via an unnamed informal access track off the Captain Cook Highway.

At the trail head, there are existing carparks at Ellis Beach that will be used by trail users. Approval from Cairns Regional Council will be required to establish the trail head, as part of the development application process under the Planning Act 2016. No treatments to Captain Cook Highway road reserve are proposed. TDPD proposes to install shade structures and signage at the trail head to guide users to the trail entrance. There is an existing pedestrian crossing over Captain Cook Highway at Ellis Beach that allows trail users to cross the road to access the trail.



Figure 2-2 Trail head at Ellis Beach

2.3.3 End of the shared used trail at Wangetti

The shared use trail will end at Wangetti at the intersection of Quaid's Road and the Captain Cook Highway road reserve as shown in Figure 2-1 and 2-3 below. No treatments are proposed with Captain Cook Highway road reserve other than signs and marking as agreed by DTMR. Users of the shared use trail would be responsible for making their own transport arrangements once they complete the trail. For guided tours a shuttle service would be organised as arranged by the operator.



Figure 2-3 End of the Shared Use Trail

3. Traffic hazard risk assessment

Traffic related risks that have been identified within the Project and could arise during the construction and operational phases of the Project are discussed below.

3.1 Construction phase

The construction phase will involve the construction of a new shared use trail, associated infrastructure, and Dark Jungle within the project area. Potential impacts arising from the construction phase to MNES include:

- Disruption to traffic along Captain Cook Highway associated with construction vehicles accessing the trail and Dark Jungle campsite. High risk areas are where the existing access roads and tracks meet the Captain Cook Highway
- Interference with wildlife by construction vehicles along access roads causing potential injury, mortalities and disturbance.
- Collision with mobile plant and people.
- Damage to protected flora species.
- Damage to sensitive environmental/cultural areas by vehicles/plant.

3.2 Operation phase

The operational phase will involve the shared use trail and Dark Jungle being used by hikers and cyclists. Maintenance and emergency vehicles will be able to access the trail and Dark Jungle via service tracks. Potential impacts arising from the operational phase to MNES and MSES include:

- Congestion by vehicles from trail users and general public at parking areas (Ellis Beach and trail end points such as Palm Cove and Wangetti)
- Increased traffic volumes on the Captain Cook Highway
- Increased pedestrian and cyclist activity on the Captain Cook Highway as a result of trail users returning from the trail back to Palm Cove or Wangetti
- Accidental damage to protected flora species.
- Interference with wildlife by maintenance vehicles along access roads and trail users causing potential mortalities and disturbance.

3.3 Methodology

The purpose of this section is to qualitatively determine the risk of potential traffic impacts that could occur as a result of the Wangetti Trail.

The risk assessment methodology in the DTMR's Technical Manual Environmental Processes Manual has been adopted for this document. An initial risk has been assigned to potential impacts occurring during the construction and operational phase in the absence of controls (refer to Table 3-3).

Recommendations to mitigate and manage these impacts are made within Section 4). The significance of the residual impact of the project, taking into consideration the full

implementation of these recommendations, is also determined and is discussed in Section 4
Table 3-2 provides the criteria used to assess significance.

Table 3-1 Impact significant criteria

Significance	Criteria	
	Initial Impact	Residual Impact
Negligible	Works are not likely to result in identifiable impacts to the environmental factor.	Implementation of recommended mitigation measures likely to result in no identifiable impacts to the environmental factor.
Low	In the absence of project-specific mitigation measures, works are likely to result in only minor, short-term impacts to a factor of limited significance	Implementation of recommended mitigation measures may still result in impacts occurring but are likely to be minor and / or short-term in nature.
Medium	In the absence of project-specific mitigation measures, major but recoverable impacts to a factor of significance are likely.	Implementation of recommended mitigation measures may reduce the severity of impacts but are still likely to result in major impacts of short / medium duration.
High	In the absence of project-specific mitigation measures, large-scale, long-term and / or irreversible impacts to a factor of high significance are likely.	Implementation of recommended mitigation measures is unlikely to significantly reduce impacts such that large-scale, long-term and / or irreversible impacts to a factor of high significance are likely.

Table 3-2 Rating criteria

Rating	Definition of rating for each criterion
Extent	The area over which the impact will be experienced
Local	Confined to project or study area or part thereof i.e. site
Regional	The region, which may be defined in various ways i.e. cadastral, catchment, topographic
(Inter) National	Nationally or beyond

Table 3-3 Risk assessment for construction and operation phases in the absence of mitigation measures

Impact	Extent	Phase	Initial Risk	Comment
Disruption to traffic along Captain Cook Highway	Local	Construction	Low	In the absence of project-specific mitigation measures, works are likely to result in only minor, short-term impacts to a factor of limited significance to matter of national environmental significance (MNES) and matter of state environmental significance (MSES). This risk is considered to result in short term impacts.
Interference with wildlife by construction vehicles	Local	Construction	Low	In the absence of project-specific mitigation measures, works are likely to result in only minor, short-term impacts to a factor of limited significance. This risk is considered to result in short term impacts.
Impacts to sensitive environmental areas by construction vehicles	Local	Construction	Low	In the absence of project-specific mitigation measures, works are likely to result in only minor, short-term impacts to a factor of limited significance.to MNES and MSES. This risk is considered to result in short term impacts.
Congestion of vehicles at existing parking areas	Local	Operational	Negligible	Works are not likely to result in identifiable impacts to the environmental factor
Increased traffic volumes on the Captain Cook Highway	Regional	Operational	Low	In the absence of project-specific mitigation measures, works are likely to result in only minor, short-term impacts to a factor of limited significance to MNES and MSES. This risk is considered to result in short term impacts.
Increased pedestrian and cyclist activity on the Captain Cook Highway	Regional	Operational	Low	In the absence of project-specific mitigation measures, works are likely to result in only minor, short-term impacts to a factor of limited significance to MNES and MSES.

Impact	Extent	Phase	Initial Risk	Comment
				This risk is considered to result in short term impacts.
Interference with wildlife by maintenance vehicles	Local	Operational	Low	<p>In the absence of project-specific mitigation measures, works are likely to result in only minor, short-term impacts to a factor of limited significance.to MNES.</p> <p>This risk is considered to result in short term impacts.</p>
Impacts to sensitive environmental areas by maintenance vehicles	Local	Operational	Low	<p>In the absence of project-specific mitigation measures, works are likely to result in only minor, short-term impacts to a factor of limited significance.to MNES.</p> <p>This risk is considered to result in short term impacts.</p>
Collision of maintenance vehicles with cyclists/hikers	Local	Operational	Medium	<p>In the absence of project-specific mitigation measures, major but recoverable impacts to a factor of significance are likely.</p> <p>This risk is considered to result in short term impacts.</p>
Collision of cyclists with hikers	Local	Operational	Medium	<p>In the absence of project-specific mitigation measures, major but recoverable impacts to a factor of significance are likely.</p> <p>This risk is considered to result in short term impacts.</p>

4. General specifications

4.1 Mitigation measures

This section discusses the mitigation measures that have been developed to minimise the impacts to existing road network, pedestrians and Matters of national environmental significance (MNES) within the Project area and surrounding area associated by the movement of vehicles within the Wangetti South Section, as identified in Section 3.4. Table 4-1 outlines the mitigation measures to be implemented during the construction and operational phases of the project.

Table 4-1 Mitigation measures to be implemented for the construction phase

Factor – traffic
Construction activities resulting in adverse impacts to the project area
<ul style="list-style-type: none"> • Disruption to traffic along Captain Cook Highway • Interference with wildlife by construction vehicles • Increased traffic as a result of construction activities • Construction activities within the road reserve • Damage to protected flora species
MNES and MSES applicable (known, likely or may occur in the Wangetti South Section)
Wet Tropics World Heritage Area and National Heritage Site
MNES and MSES bird species
<ul style="list-style-type: none"> • Southern Cassowary • Migratory birds (e.g. Eastern Curlew, great sand plover) • Non-migratory species (e.g. masked owl)
MNES and MSES flora species
<ul style="list-style-type: none"> • <i>Archontophoenix myolensis</i> (Myola palm) • <i>Anoectochilus yatesiae</i> (Marbled jewel orchid) • <i>Canarium acutifolium</i> • <i>Dendrobium fellowsii</i> • <i>Dendrobium mirbelianum</i> (Dark-stemmed antler orchid) – • <i>Diplazium cordifolium</i> • <i>Diplazium pallidum</i> • <i>Myrmecodia beccarii</i> (Ant plant) • <i>Phaius pictus</i> • <i>Phalaenopsis amabilis</i> subsp. <i>rosenstromii</i> (Native moth orchid) • <i>Polyscias bellendenkerensis</i> • <i>Randia audasii</i> • <i>Rhomboda polygonoides</i>

Factor – traffic

- *Toechima pterocarpum* (Orange tamarind)
- *Vappodes lithocola* (Dwarf butterfly orchid) (Also known as *Dendrobium lithocola*, and the Queensland Flora Census 2019 groups this species into *Dendrobium biggibum*)
- *Zeuxine polygonoides* (Velvet jewel orchid) (Also known as *Rhomboda polygonoides*)

MNES and MSES amphibian species

- *Litoria dayi* (Australian lace lid)
- *Litoria nannotis* (Waterfall frog)
- *Litoria nyakalensis* (Mountain mistfrog)
- *Litoria rheocola* (Common mistfrog)
- *Litoria serrata* (Tapping green eyed frog)

MNES and MSES mammal species

- *Dasyurus maculatus gracilis* (Spotted-tailed quoll)
- *Dasyurus hallucatus* ((Northern quoll)
- *Dendrolagus lumholtzi* (Lumholtz's tree-kangaroo)
- *Hipposideros semoni* (Semon's leaf-nosed bat)
- *Phascolarctos cinereus* (Koala)
- *Pteropus conspicillatus* (Spectacled flying-fox)
- *Rhinolophus robertsi* (Large-eared horseshoe bat)
- *Saccolaimus saccolaimus nudicluniatus* (Bare-rumped sheath-tailed bat)
- *Xeromys myoides* (Water mouse)

MNES and MSES aquatic species

- *Stiphodon semoni* (Opal cling goby)
- *Stiphodon rutilarueus* (Orange cling goby)
- *Stiphodon pelewensis* (Emerald cling goby)
- *Stiphodon surrufus* (Birdsong cling goby)

Initial risk with no control

In the absence of project-specific mitigation measures, works are likely to result in only minor, short-term impacts to a factor of limited significance.

Mitigation measure	Timing	Party responsible
Contractor to implement JSEA safe work method statement. Contractor to implement access management plan for access to site of works. Construction crew operating vehicles and mobile plant to have the appropriate certification and completed the required training The contractor is required to prepare the following documents by a suitably qualified	Prior to construction and during construction	Contractor Project Manager Site supervisor

Factor – traffic

person:

- Site access/vehicle movement plan to show where all site access points within the project area.
- Prepare a TMP and Traffic Guidance Scheme (TGS) by a suitable qualified person. The TGS shows all traffic control devices and their layouts on a plan and shall be consistent with the approved TMP. Where any change to existing traffic arrangements is proposed or where construction conflicts with normal traffic movements, the Contractor shall prepare a TGS which clearly details the revised traffic arrangements at all locations affected by the change or conflict. A separate TGS is required for each stage of the works where changes are made to the traffic control devices.
- Traffic shall be controlled at all times, during construction, in accordance with the provisions of the MUTCD Part 3 and the TMP.

Signage erected along tracks and roads where the trail connects to inform construction crew of access points to the project area

Prior to construction

Contractor Project Manager
Site supervisor

Signage around awareness of fauna species and sensitive areas.

Prior to construction

Contractor Project Manager
Site supervisor

Site inductions at the start of the construction phase with construction crews regarding:
undertaking works and the movement of vehicles within road reserves, existing access tracks.

Prior to construction

Contractor Project Manager

Wildlife present within the project area that could pose a hazard to vehicles and mobile plant

Incident response procedures will be developed to detail actions to be taken in the event of wildlife injury or mortality during clearing

Gates with locks to be installed at service tracks where they connect to the existing road network to restrict the illegal use of the tracks by members of the public.

At all times

Contractor Project Manager
Site supervisor

Appropriate scheduling of deliveries of

At all times

Contractor Project

Factor – traffic		
<p>construction material to reduce frequency and a nominated set out area to be agreed upon with DES and the construction contractor away from MNES and areas of high ecological significance.</p> <p>Visitors including visiting drivers to be made aware of the work area layout, given a copy of the site access plan prior to visiting the site. Provide drivers with safe access to amenities away from loading areas or other vehicular traffic.</p>		<p>Manager Site supervisor</p>
<p>Construction traffic to use nominated roads and nominated service tracks when accessing and exiting the project area.</p> <p>Designated vehicle routes within the project area to have a firm and even surface, be wide and high enough for the largest vehicle using them and be well maintained and free from obstructions.</p> <p>Service tracks to be clearly sign-posted to indicate speed limits and traffic calming measures (if required)</p> <p>Reducing speed is very important where administrative control measures are the only reasonably practicable approach. Speed limits to be implemented and enforced.</p> <p>Speed limits for to be adopted for the construction phase to be developed in consultation with the construction contractor, TDPD, DES, WTMA and DTMR.</p>	At all times	<p>Contractor Project Manager Site supervisor</p>
<p>Traffic control devices on service tracks to be installed and operated with consideration of the (QPWS Technical Manual QPWS road works signage) this includes the following:</p> <p>Arriving at the works site:</p> <ul style="list-style-type: none"> • Pre-work preparation and work site assessment - On arrival at the work site a series of actions is required before any work can commence including undertaking a risk assessment of the proposed work site to identify all potential hazards to workers required to work on the work site. • Select the most appropriate traffic guidance scheme - The most appropriate standardised Traffic Guidance Scheme shall be selected according to road and 	At all times	<p>Contractor Project Manager Site supervisor</p>

Factor – traffic

traffic conditions at the site and the work requirements of the officer.

- Installation of traffic control devices
- Traffic control devices approved for use by the QPWS technical manual for QPWS road works signage should only be installed according to the approved standardised Traffic Guidance Schemes provided in this document. Any work site requiring a traffic guidance scheme beyond the scope of this document shall require the engagement of an appropriately qualified Traffic Controller or Police Officer.

Operation of the work site:

- The person in control of the work site on or near roads shall:
 - a. ensure traffic control devices remain in good condition while deployed;
 - b. ensure traffic control devices remain in place according to the Traffic Guidance Scheme in use;
 - c. make a record of the time of any inspection or reinspection of the traffic control devices and the Traffic Guidance Scheme being used. Photographs be taken of any changes to the work site; and
 - d. make a record of any incidents that occur on or in relation to the work site that might have ongoing consequences.
- Maintenance of traffic guidance scheme – Personnel should ensure that the traffic control devices remain in place according to the standardised Traffic Guidance Scheme being used.
- Maintenance of devices - Ineffective signs and devices shall be replaced by similar items in good condition, if they cannot be made effective by cleaning or repair. Signs and devices that are no longer in good condition should be returned and replaced. Non-repairable signs should be destroyed so that they are not inadvertently reused.

Factor – traffic		
Regular inspection of service tracks during the construction phase of the project to determine if additional surface treatment is required	At all times	Contractor Project Manager Site supervisor
The contractor will be required to protect pedestrians and wildlife and to make sure people, wildlife and vehicles cannot interact. Spotters to be nominated on the ground to guide plant and ensure no collisions with other workers in the project area.	At all times	Contractor Project Manager Site supervisor
<p>The contractor will be required to make sure clear road markings like reflective paint and signs should be used to alert pedestrians and vehicle operators to traffic hazards in the work area where working within existing road reserves.</p> <p>Signs should be provided to indicate exclusion and safety zones, parking areas, speed limits, movement of wildlife, vehicle crossings and hazards like blind corners and steep gradients. Signs and road markings should be regularly checked and maintained so they can be easily seen.</p>	At all times	Contractor Project Manager Site supervisor
<p>If reasonably practicable the construction personnel should eliminate the need for reversing by using drive-through loading and unloading systems, multi-directional mobile plant. Where this is not possible consider:</p> <p>using devices like reversing sensors, reversing cameras, mirrors, rotating lights or audible reversing alarms</p> <p>using a person to direct the reversing vehicle if they cannot see clearly behind—this person should be in visible contact with the driver at all times and wear high-visibility clothing</p> <p>providing designated clearly marked, signposted and well-lit reversing areas, and excluding non-essential workers from the area.</p>	At all times	Contractor Project Manager Site supervisor
Construction activities will only occur during daytime hours.	At all time	Contractor Project Manager Site supervisor
Vehicles will be required to service the construction of the facilities. Motorised vehicles may range from quad bikes (or similar) to 4WD vehicles and light trucks. All drivers are to be aware of speed limits for the varying sections of	Prior to construction	Contractor Project Manager Site supervisor

Factor – traffic		
road/track.		
Residual risk with control in place		
Implementation of recommended mitigation measures likely to result in no identifiable impacts to the environmental factor.		
Performance indicator		
<ul style="list-style-type: none"> • No vehicle or mobile plant collision with fauna species within the project area. • No vehicle or mobile plant adversely impacting environmental sensitive area and/or cultural heritage areas. • Record register of the traffic management training completed by the construction crew. • No vehicle or mobile plant collision with other road users/construction crew. 		
Corrective actions		
<p>Handling of any traffic complaints will be managed by the process developed by Construction Contractor and TPDP and will be recorded in a complaints register.</p> <p>Investigations will be undertaken in the case of any traffic incident and in consultation with TPDP.</p>		
Monitoring		
<p>The following parameters will be included in a monitoring program to be developed by the construction contractor:</p> <ul style="list-style-type: none"> • The speed limits throughout the project area (regular basis) • Vehicle routes within project area and on existing road network (regular basis) • Driver behaviour within project area (Ongoing on a case by case basis) • Traffic flow to manage congestion (as required) • Interactions with wildlife (Ongoing on a case by case basis) • Interactions with other road users (Ongoing on a case by case basis) • Traffic Management Inspection to be undertaken for the project. • Regular performance/compliance audits of the Contractor's traffic control measures to be undertake and feedback provided. 		

Table 4-2 Mitigation measures to be implemented for the operational phase

Factor – traffic
Construction activities resulting in adverse impacts to the project area
<ul style="list-style-type: none"> • Congestion of vehicles at existing parking areas • Increased traffic volumes on the Captain Cook Highway • Increased pedestrian and cyclist activity on the Captain Cook Highway • Interference with wildlife by maintenance vehicles • Accidental damage to protected flora species
MNES and MSES applicable (known, likely or may occur in the Wangetti South Section)
<p>Wet Tropics World Heritage Area and National Heritage Site</p> <p>MNES and MSES bird species</p> <ul style="list-style-type: none"> • Southern Cassowary • Migratory birds (e.g. Eastern Curlew, great sand plover) • Non-migratory species (e.g. masked owl) <p>MNES and MSES flora species</p> <ul style="list-style-type: none"> • <i>Archontophoenix myolensis</i> (Myola palm) • <i>Anoectochilus yatesiae</i> (Marbled jewel orchid) • <i>Canarium acutifolium</i> • <i>Dendrobium fellowsii</i> • <i>Dendrobium mirbelianum</i> (Dark-stemmed antler orchid) – • <i>Diplazium cordifolium</i> • <i>Diplazium pallidum</i> • <i>Myrmecodia beccarii</i> (Ant plant) • <i>Phaius pictus</i> • <i>Phalaenopsis amabilis subsp. rosenstromii</i> (Native moth orchid) • <i>Polyscias bellendenkerensis</i> • <i>Randia audasii</i> • <i>Rhomboda polygonoides</i> • <i>Toechima pterocarpum</i> (Orange tamarind) • <i>Vappodes lithocola</i> (Dwarf butterfly orchid) (Also known as <i>Dendrobium lithocola</i>, and the Queensland Flora Census 2019 groups this species into <i>Dendrobium biggibum</i>) • <i>Zeuxine polygonoides</i> (Velvet jewel orchid) (Also known as <i>Rhomboda polygonoides</i>) <p>MNES and MSES amphibian species</p> <ul style="list-style-type: none"> • <i>Litoria dayi</i> (Australian lace lid) • <i>Litoria nannotis</i> (Waterfall frog) • <i>Litoria nyakalensis</i> (Mountain mistfrog)

Factor – traffic

- *Litoria rheocola* (Common mistfrog)
- *Litoria serrata* (Tapping green eyed frog)

MNES and MSES mammal species

- *Dasyurus maculatus gracilis* (Spotted-tailed quoll)
- *Dasyurus hallucatus* (Northern quoll)
- *Dendrolagus lumholtzi* (Lumholtz's tree-kangaroo)
- *Hipposideros semoni* (Semon's leaf-nosed bat)
- *Phascolarctos cinereus* (Koala)
- *Pteropus conspicillatus* (Spectacled flying-fox)
- *Rhinolophus robertsi* (Large-eared horseshoe bat)
- *Saccolaimus saccolaimus nudicluniatus* (Bare-rumped sheath-tailed bat)
- *Xeromys myoides* (Water mouse)

MNES and MSES aquatic species

- *Stiphodon semoni* (Opal cling goby)
- *Stiphodon rutilarueus* (Orange cling goby)
- *Stiphodon pelewensis* (Emerald cling goby)
- *Stiphodon surrufus* (Birdsong cling goby)

Initial risk with no control

In the absence of project-specific mitigation measures, medium but recoverable impacts to a factor of significance are likely.

Mitigation measure	Timing	Party responsible
Operator to implement JSEA safe work method statement. Operator to implement access management plan. Maintenance staff crew operating vehicles to have the appropriate certification and completed the required training	At all times	Operator
Signage erected along tracks to inform: Users of fauna species and sensitive areas Maintenance staff of access points to the project area.	Prior to operation	Operator
Site inductions during operational phase with maintenance staff regarding: undertaking works and the movement of vehicles within road reserves, existing access tracks. Wildlife present within the project area that could pose a hazard to vehicles and mobile plant	Prior to operation	Operator/DES/QPWS

Factor – traffic		
<p>Incident response procedures will be developed to detail actions to be taken in the event of wildlife injury or mortality during clearing a</p> <p>Incident response procedures will be developed to detail actions to be taken in the event of injury or mortality to hikers or cyclist.</p>		
Gates with locks to be installed at service tracks where it connects to the existing road network to restrict the illegal use of the tracks by members of the public.	At all times	Operator
<p>Appropriate scheduling of deliveries to reduce frequency and a nominated set out area to be agreed upon with DES and the operator away from MNES and areas of high ecological significance.</p> <p>Visitors including visiting drivers are made aware of the work area layout, the route they should take and safe working procedures for the work area.</p>	At all times	Operator
<p>Operational and maintenance traffic to use nominated roads and nominated service tracks when accessing the exiting the project area.</p> <p>Designated vehicle routes within the project area to have a firm and even surface, be wide and high enough for the largest vehicle using them and be well maintained and free from obstructions.</p> <p>Service tracks to be clearly sign-posted to indicate speed limits and traffic calming measures (if required)</p> <p>Reducing speed is very important where administrative control measures are the only reasonably practicable approach. Speed limits to be implemented and enforced and traffic calming devices like speed humps considered</p> <p>Speed limits for to be adopted for the operational phase to be developed in consultation with TDPD, DES, WTMA and DTMR.</p> <p>Signs and road markings should be regularly checked and maintained so they can be easily seen.</p>	At all times	Operator
Regular inspection of service tracks to determine if additional surface treatment is	At all times	Operator

Factor – traffic		
required		
Where powered mobile plant is used the operator is required to ensure it does not collide with pedestrians and/or wildlife or other powered mobile plant.	At all times	Operator
Signs should be provided to indicate exclusion and safety zones, parking areas, speed limits, movement of wildlife, vehicle crossings and hazards like blind corners and steep gradients. Signs and road markings should be regularly checked and maintained so they can be easily seen.	At all times	Operator
The use the of shared use trail will be available to be used during daytime hours. Camp areas that will remain operational overnight, but with movement restricted to the immediate camp surrounds.	At all times	Operator
Motorised vehicles may range from quad bikes (or similar) to 4WD vehicles and light trucks. All drivers are to be aware of speed limits for the varying sections of road/track.	At all times	Operator
Cyclists must not use any trail before first light and after last light each day, times dependent on the season. Times to be set by camp/trail operators with consideration of seasonal visibility early morning/late afternoon to minimise impacts to fauna (the southern cassowary in particular).	At all times	Operator
Cyclists and hikers to be educated on: the environmental values associated the project area, procedures to following if an accident occurs on the trail, accessing and exiting the trail and the appropriate use of the trail. This information can be presented on the Wangetti Trail website, at the trail head and presented by the operational staff.	At all times	Operator
Residual risk with control in place		
Implementation of recommended mitigation measures likely to result in no identifiable impacts to the environmental factor.		
Performance indicator		
<ul style="list-style-type: none"> No vehicle or mobile plant collision with fauna species within the project area. No damage to environmental sensitive areas/cultural heritage areas by 		

Factor – traffic

vehicles/cyclists/mobile plant.

- Record register of the traffic management training completed by the operational and maintenance crew.
- No vehicle or mobile plant collision with other road users, hikers and/or cyclists.

Corrective actions

Traffic to be managed strictly in accordance with the approved TGS and TMP and any non-conformances that occur the Contractor to raise a non-conformance report.

Handling of any traffic complaints will be managed by the process developed by Operator and TPDP and will be recorded in a complaints register.

Investigations will be undertaken in the case of any traffic incident and in consultation with TPDP.

Monitoring

The following parameters will be included in a monitoring program to be developed by the operator:

- The speed limits throughout the project area (regular basis)
- Vehicle routes within project area and on existing road network (regular basis)
- Driver behaviour within project area (Ongoing on a case by case basis)
- Traffic flow to manage congestion (as required)
- Interactions with wildlife (Ongoing on a case by case basis)
- Interactions with other road users (Ongoing on a case by case basis)
- Traffic Management Inspection to be undertaken for the project.
- Regular performance/compliance audits of the Contractor's traffic control measures to be undertake and feedback provided.

4.2 Responsibilities of contractors

All contractors involved in the construction and operation of the Wangetti South Section should:

- Be mindful of their responsibility to provide, as far as practicable, safe and convenient travelling conditions for road users and a safe workplace for personnel and plant under their control
- Be educated on the wildlife and areas of environmental significance within the project area
- Ensure the workplace is safe and without risk of injury or illness to anyone coming to the workplace to work and to abide by the provisions in the Work Health and Safety Act and Work Health and Safety Regulation.
- Ensure the workplace is safe and without risk of illness or injury from any plant or substance used properly in the course of work
- Remember that they, and personnel under their control, should at all times be courteous to road users. Personnel should not allow themselves to be provoked by members of the public. By exercising restraint they will strengthen their position both then and in the event of any subsequent inquiry into an incident or during any subsequent proceedings
- Ensure that personnel assigned to signing the works are adequately trained to perform the task and that traffic controllers are appropriately trained and informed of their duties
- Be familiar with, and act as far as is practicable, in accordance with the provisions of this procedure and Part 3 of the Manual of Uniform Traffic Control Devices (Queensland Department of Main Roads 2003).
- Provide a safe workplace environment that minimises, as far as practicable, the likelihood of injury to workers by traffic within or adjacent to the work area.
- Steps should be taken to warn the public of prevailing conditions and to guard, delineate and, where necessary, illuminate work that may pose a hazard to road users. Care should be taken to avoid, wherever possible, long delays or detours that may cause unnecessary inconvenience to road users.

4.3 General procedures

The construction contractor and operational contractor to ensure that as a minimum the following practices will be adopted:

- Signage to be erected on public roads around the site to warn road users of the project
- Signage erected on service tracks and gates secured to avoid the public access them
- All speed limits are to be obeyed, and construction workers are to give way to public road users at all times
- No new access roads or tracks are to be created.

4.4 Signage and road marking

During the construction phase signage and road marking within the project area will be required and the following signage and road markings are proposed:

- Clear road markings like reflective paint and signs should be used to alert pedestrians, cyclists and vehicle operators to potential traffic hazards particularly at the trail head at Ellis Beach and at the end of the trail at Wangetti.

- Signs should be provided to indicate exclusion and safety zones, parking areas, speed limits, vehicle crossings and hazards like blind corners and steep gradients
- Signs and road markings should be regularly checked and maintained so they can be easily seen.
- Appropriate temporary road signage and appropriate marking to be agreed with DTMR and installed at the intersections of the service tracks and Captain Cook Highway road reserve.

During the operational phase signage and road marking within the project area will be required. A suite of different signs is recommended for use on the shared use trail and the service tracks and includes:

- Trailhead Signs - A 'trailhead' is a designated entry point to a trail and it is the place where most people would park their car and embark on a ride or walk. Trail head signs will be used at the trail head at Ellis Beach. It will also include information about trail etiquette and encouraging courtesy and harmony between users.
- Decision Point Signs - A Decision Point Sign should be used at the start of each section, link trail and alternate trail to enable trail users to make an informed decision about whether to proceed or not. These signs will be installed at various locations along the use trail.
- Directional Signs/ Waymarkers - A Waymarker is a simple bollard or post (generally about 100mm wide x 100mm thick x 1500- 2000mm tall [with approximately 600mm embedded in the ground]) with symbols on it to guide trail users in the correct direction at any point of uncertainty. This will be used along various sections of the trail to guide the uses.
- Signs should be provided to indicate exclusion and safety zones, parking areas, speed limits, vehicle crossings and hazards like blind corners and steep gradients. Signs and road markings should be regularly checked and maintained so they can be easily seen.
- Signs will used where the trail intersects service tracks to inform the users that service tracks are restricted to emergency and maintenance vehicles.
- Clear road markings like reflective paint and signs should be used to alert pedestrians, cyclists and vehicle operators to potential traffic hazards particularly at the trail head at Ellis Beach and at the end of the trail at Wangetti.
- All signage and collateral must reinforce the trails' shared use status and must include the message that the trail was designed and constructed for both user groups and a 'code of conduct' for trail users.
- Appropriate road signage and appropriate marking to be agreed with DTMR and installed at the intersections of the service tracks and Captain Cook Highway road reserve.

4.5 Service tracks

All contractors undertaking works on the service tracks within the WTWHA or Macalister Range National Park are to implement the Technical Manual: Infrastructure and Equipment QPWS road works signage (for works on very low-volume roads in rural areas) as accessed at: https://parks.des.qld.gov.au/data/assets/pdf_file/0022/161833/tm-pk-ie-qpws-road-work-signage.pdf

4.6 Works within a road corridor

All ancillary works and encroachments within the road corridor along the Captain Cook Highway require a permit from DTMR according to the *Transport Infrastructure Act 1994*. Anticipated structures and activities proposed within the Captain Cook Highway road reserve for the project include (but not limited to):

- Signs/devices
- Fences
- Gates
- Formalisation of existing access tracks
- Property name signs
- Earthworks including vegetation clearing.

4.7 Intersections of the trail at Captain Cook Highway road reserve

Within the project area, there are a number of locations of where the Captain Cook Highway (state-controlled) road reserve is impacted by the proposed works and they are outlined below:

- Existing dirt track from Captain Cook Highway at Palm Cove (refer to service track 1 in Appendix A). At this location the track will be used by construction vehicles during the construction phase and by both hikers, cyclists and maintenance vehicles during the operational phase. Visibility at the crossing point should be free and clear of obstacles (overhanging vegetation etc.) Both pedestrians and vehicles should have good visibility. Procedures indicating who has right of way at crossings should also be established. Appropriate road marking and signage installed as discussed in Section 4.4.
- Trail head at Ellis Beach. At this location the track will be used by both hikers and cyclists during the operational phase. Visibility at the crossing point should be free and clear of obstacles (overhanging vegetation etc.) Cyclists and hikers should have good visibility. Procedures indicating who has right of way at crossings should also be established. Appropriate road marking and signage installed as discussed in Section 4.4.
- Existing dirt track from Captain Cook Highway at Ellis Beach (refer to service track 2 in Appendix A). At this location the track will be used by construction vehicles during the construction phase and used by emergency and maintenance vehicles during the operational phase. Visibility at the crossing point should be free and clear of obstacles (overhanging vegetation etc.) Procedures indicating who has right of way at crossings should also be established. Appropriate road marking and signage installed as discussed in Section 4.4.
- Service track from Ellis Beach intersecting the alignment in the Ellis Beach South Reserve (refer to service track 3 in Appendix A). At this location the track will be used by construction vehicles during the construction phase and used by emergency and maintenance vehicles during the operational phase. Visibility at the crossing point should be free and clear of obstacles (overhanging vegetation etc.) Procedures indicating who has right of way at crossings should also be established. Appropriate road marking and signage installed as discussed in Section 4.4.
- Service track begins at Redcliff Point area at Captain Cook Highway, the road extends to the Wangetti Trail and continues to the end point. Access road needs to be cut off where it transects the trail (refer to service track 4 in Appendix A). At this location the track will be

used by construction vehicles during the construction phase and used by emergency and maintenance vehicles during the operational phase. Visibility at the crossing point should be free and clear of obstacles (overhanging vegetation etc.) Procedures indicating who has right of way at crossings should also be established. Appropriate road marking and signage installed as discussed in Section 4.4.

- Sealed road providing access to the trail via 2 points, from the Captain Cook Highway (refer to Appendix A). At this location the track will be used by construction vehicles during the construction phase and used by emergency and maintenance vehicles during the operational phase. Visibility at the crossing point should be free and clear of obstacles (overhanging vegetation etc.) Procedures indicating who has right of way at crossings should also be established. Appropriate road marking and signage installed as discussed in Section 4.4.
- Service track near Rifle Range Road (refer to Appendix A). At this location the track will be used by construction vehicles during the construction phase and used by emergency and maintenance vehicles during the operational phase. Visibility at the crossing point should be free and clear of obstacles (overhanging vegetation etc.) Procedures indicating who has right of way at crossings should also be established. Appropriate road marking and signage installed as discussed in Section 4.4.

4.8 Training

Personnel working during the construction and operational phases of the Wangetti South Project will be required to undergo site specific induction which includes traffic management requirements on site and the environmental values associated with the project area including MNES fauna species. Appropriate training suiting the different roles and responsibilities is to be undertaken in accordance with appropriate standards as advised by DES, QPWS, Wet Tropics Management Authority (WTMA) and TDPD. Regular toolbox meetings are also conducted.

The construction contractor personnel will be required to ensure the operators of the mobile plant have received the appropriate training and inductions necessary to protect them and others from the risks associated with traffic in the project area.

Workers including contractors who are required to perform duties associated with traffic management within the project area will undergo appropriate training and inductions and will be required to hold the relevant certification.

4.9 Reporting

Records collected as part of traffic management activities will be retained by the Contractor and the TDPD for the legally required period of time. Environmental records include but may not be limited to:

- Site inspection checklists
- Environmental audit reports
- Training records
- Monitoring data
- Complaints and associated records of communication
- Meeting minutes.

During construction phase the contractor will make these records available to the TDPD or any relevant authorities and their representatives on request. During the operational phase, the

Proponent will make these records available to any relevant authorities and their representatives on request and where justified and in accordance with legislation.

4.10 Monitoring

Monitoring is an essential component of any TMP as it assists in determining how well control methods are working. Personnel will be nominated during the construction phase and the operational phases of the project to undertake monitoring of traffic management controls in accordance with an established schedule for the project.

4.11 Emergency, incidents and complaints

Construction personnel and operational personnel are required to report any hazardous items encountered or abnormal occurrences to their Supervisor/Team Leader or Workplace Health and Safety Representative (WHSR).

TDPD will be verbally notified of an incident on the day it occurs and as soon as practicable of the responsible person becoming aware of the incident, and in writing within 24 hours.

All notifications to authorities will be undertaken by TDPD.

The Contractor will be required to provide an Emergency Response Plan and for this plan to be thoroughly communicated to all staff members in the Construction Induction. The Emergency Response Plan should identify evacuation routes, mustering points, communication protocols and provide key contact details for local authorities and services. It should be compatible with the internal emergency response protocols of the various land managers.

When reporting traffic incidents to TDPD, the following information is to be provided:

- The name and contact details of the reporting person
- The date and time the environmental incident occurred
- The activity that was being undertaken when the incident occurred
- How the incident occurred
- Any containment measures put in place to reduce or contain environmental harm
- An assessment of the amount of environmental harm that occurred
- If any other stakeholders are aware of the incident.

The contractor during the construction phase to develop an emergencies, incidents and complaints protocols and reporting documentation to be agreed by TDPD.

The contractor during the operational phase to develop an emergencies, incidents and complaints protocols and reporting documentation to be agreed by TDPD.

4.12 Corrective Actions

The Project Manager is responsible for ensuring that on receipt of a complaint relating to traffic management, an investigation should be undertaken promptly, and appropriate actions undertaken. All corrective actions should be implemented to meet the required outcomes of the Administering Authorities.

5. References

Department of Environment and Science. 2011. *Operational Policy: Mountain Biking in QPWS Managed Areas dated 2011*.

Department of Transport and Main Roads 2020. Technical Specification Transport and Main Roads Specifications MRTS02 Provision for Traffic July 2020. Available from: <https://www.tmr.qld.gov.au/business-industry/Technical-standards-publications/Specifications/Specifications-Index>

Department of Transport and Main Roads 2013. Technical Manual Environmental Processes Manual August 2013. Available from: <https://www.tmr.qld.gov.au/business-industry/Technical-standards-publications/Environmental-processes-manual.aspx> GHD Pty Ltd 2020. *Department of State Development, Tourism and Innovation - Wangetti Trail South Section (Wangetti to Palm Cove) Matters of National Environmental Significance Baseline Ecology and Impact Assessment Report*, Final Version, July 2020



Queensland Government 2020. Traffic Analysis and Reporting System. AADT Segment Report Area 403 - Far North District Road Section 20A - Captain Cook Highway (Cairns - Mossman)

World Trail Pty Ltd (2020), *Wangetti Trail Construction Methodology Manual April 2020*

World Trail Pty Ltd (2017), *Wangetti Trail 2017*.

Appendices

Appendix A - Proposed Service Tracks

Service Tracks	
Proposal appreciation	The project will include ancillary service tracks to allow for restricted vehicle access along the alignment during the construction phase, operational phase, and maintenance phase and for emergency access. These will connect to the existing road network and will predominantly be used by side by side vehicles during maintenance and larger construction vehicles. The service tracks will be gated to members of the public, discouraging access and use. Passive surveillance from users of the trail and monitoring of the trail by QPWS and the trail operator will assist in making sure that the unlawful activities e.g. motorbike riding does not occur with the project area
Key Structures	Grading/improvements of some of the existing access tracks may be undertaken to allow them to cater for the vehicles to be used for the project.
Utility connections	No utility connections are required.
Vegetation	Limited vegetation is required to remove vegetation that has grown over the existing access tracks. Only overhanging vegetation over the existing access tracks will be cut back. Ongoing vegetation management will be required.
Service Track 1: Unnamed	
<p>Description: Existing dirt track from Captain Cook Highway at Palm Cove.</p> <p>Location:</p> <p>-16.739, 145.664 -16.739, 145.663</p> <p>Real property descriptions: 13NR5512, 174NPW930, Captain Cook Highway Road reserve</p>	 

Service Tracks

Service Track 2: Unnamed

Description: Existing dirt track from Captain Cook Highway at Ellis Beach.

Location:

-16.72560, 145.64559

-16.73084, 145.64819

Real property descriptions:
13NR5512, 174NPW930, Captain Cook Highway Road reserve



Service track 3: Unnamed (Ellis Beach area)

Description: Service track from Ellis Beach intersecting the alignment in the Ellis Beach South Reserve.

Location:

-16.69678, 145.60883

-16.70038, 145.60947

Real property description:
Captain Cook Highway Road reserve, 39SP309107, 174NPW930



Service Tracks

Service Track 4: Unnamed (Red Cliff Point Area – south east)

Description: Service track begins at Redcliff Point area at Captain Cook Highway within Section 2. The road extends to the Wangetti Trail and continues to the end point. Access road needs to be cut off where it transects the trail.

Location:

-16.69439, 145.60331

-16.6982.19, 145.60313

Real property descriptions:
39SP309107, 174NPW930,
Captain Cook Highway Road reserve



Service Track 5: Unamed (Red Cliff Point Area – west)

Description: Service track extends from the Captain Cook Highway and intersects with the Wangetti Trail in Section 2.

Location:

-16.682.189, 145.57818

-16.68646, 145.57689

Real property descriptions:
6SP309107, 174NPW930, Captain
Cook Highway Road reserve



Service Tracks

Service Track 6: Rifle Range Road

Description: Sealed road providing access to the trail via 2 points, from the Captain Cook Highway.

Location:

-16.68023, 145.57397

-16.68392, 145.57544

Real property descriptions:
6SP309107 and 11AP17379



Service Track 7: Rifle Range Road

Description: Service track near Rifle Range Road

Location:

-16.67833, 145.57188

-16.67846, 145.57145

-16.68023, 145.57396

-16.68037, 145.57377

Real property descriptions:
Captain Cook Highway Road reserve, 6SP309107



Construction

Materials and equipment
Methodology

Limited works will occur to the existing access tracks other than removal of vegetation where it obstructs the movement of vehicles and some minor surface treatments to provide safe passage for vehicles.

Service Tracks

Operation and maintenance

Operation and maintenance phase

The service tracks will be managed in accordance with QPWS trail maintenance procedures manuals.

The service tracks will be used by the operators and managers of Wangetti Trail and will be used for the following purposes:

- Deliver equipment and supplies to the camp sites
- Be used by emergency vehicles for emergencies
- Be used to access the trail and camp sites for maintenance purposes
- The service tracks will be gated to restrict access to the general public.

The trail and service tracks will be maintained in accordance with QPWS trail maintenance/ procedures/manuals for those parts of the service tracks that are within the protected area estate.

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
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Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	B Steytler	C Hooper	On file	G Squires		23/12/20

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Appendix E – Preliminary Construction Environmental Management Plan

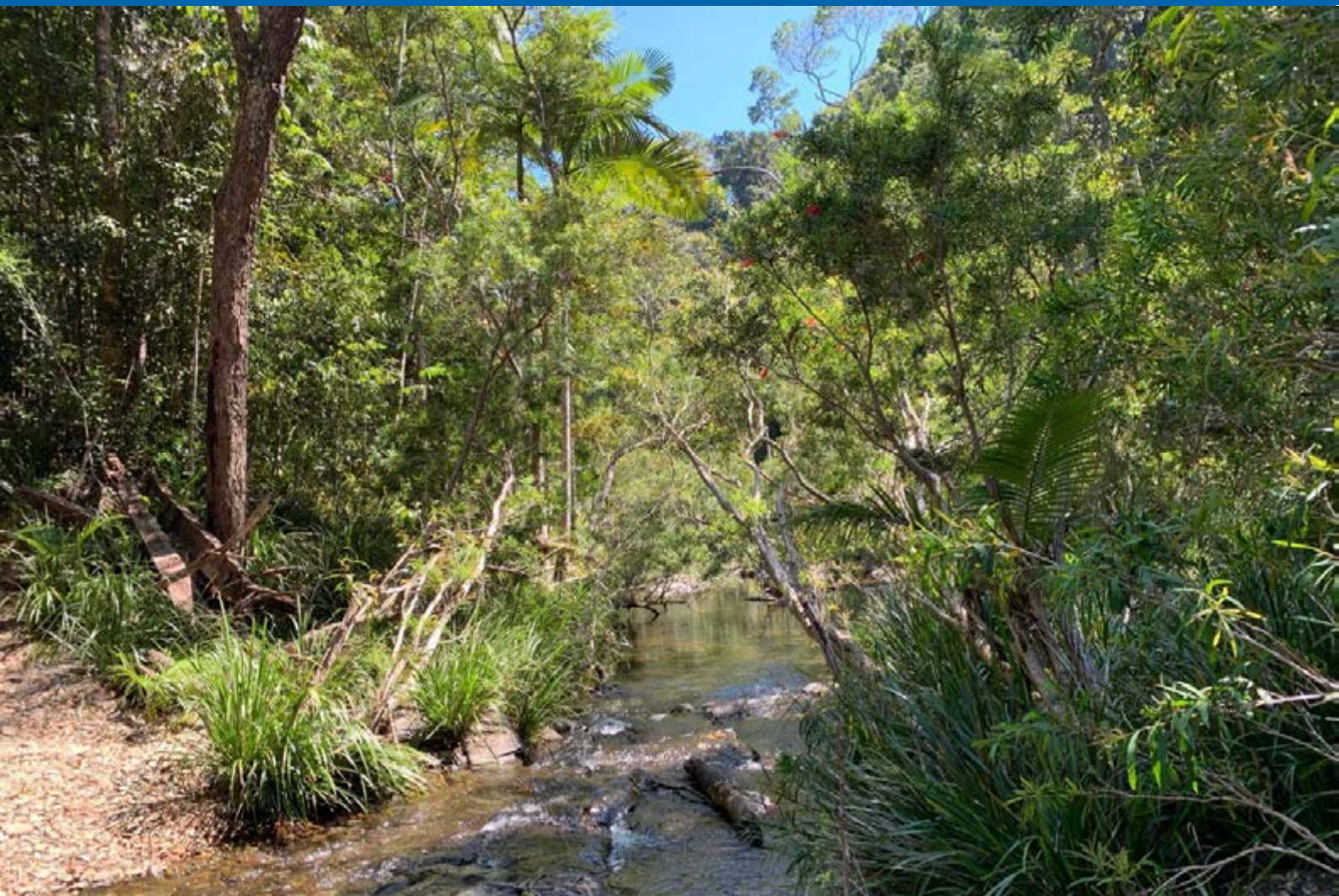


Department of State Development, Tourism, and Innovation

Wangetti Trail South Section (Wangetti to Palm Cove)

Preliminary Construction Environmental Management Plan

January 2021



Abbreviation and acronyms

Abbreviation/acronym	Definition
ACH Act	<i>Aboriginal Cultural Heritage Act 2003</i>
AHD	Australian height datum
CEMP	Preliminary Construction Environmental Management Plan
CESCP	Concept Erosion and Sediment Control Plan
CHMA	Cultural Heritage Management Agreement
CMP	Cassowary Management Plan
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DATSIP	The Department of Aboriginal and Torres Strait Islander Partnerships'
DAWE	Department of Agriculture, Water and the Environment
DES	Department of Environment and Science
DR	Department of Resources (previously referred to as Department of Natural Resources Energy and Mines)
DSDILGP	Department of State Development, Infrastructure, Local Government and Planning (previously referred to as Department of State Development, Infrastructure and Planning)
DSDTI	Department of State Development, Tourism and Innovation
DTMR	Department of Transport and Main Roads
EMP	Environmental Management Plan
EPBC Act	<i>Commonwealth Environment Protection and Biodiversity Conservation Act 1999</i>
EP Act	<i>Environmental Protection Act 1994</i>
ESCP	Erosion and Sediment Control Plan
FNQ	Far North Queensland
GED	General Environmental Duty
GHD	GHD Pty Ltd
IECA	International Erosion Control Association
ILUA	Indigenous Land Use Agreement
km	Kilometre
MNES	Matters of national environmental significance
MSSES	Matters of state environmental significance
NC Act	<i>Nature Conservation Act 1992</i>
PPE	Personal Protective Equipment
QPWS	Queensland Parks and Wildlife Service
RE	Regional ecosystem
RPP	Riverine protection permit
SMP	Species Management Plan
TDPD	Tourism Development Projects Division (TDPD)
TI Act	<i>Transport Infrastructure Act 1994</i>

TMP	Preliminary Traffic Management Plan
VM Act	<i>Vegetation Management Act 1999</i>
WPDMP	Preliminary Weed, Pest and Disease Management Plan
WTWHA	Wet Tropics World Heritage Area

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Figure 1-1 Wangetti South locality2

Appendices

Appendix A – Waterways within Wangetti South Section

Appendix B - Potential and marginal habitat for the opal cling goby (*Stiphodon semoni*) in the vicinity of the Wangetti South Section and proposed location of single span bridges

Appendix C – Wangetti South Section Ecological Field Survey Assessment Sites

Appendix D - Wangetti South Section Potential Habitat Types

1. Introduction

1.1 Project background

The Department of State Development, Tourism and Innovation (DSDTI) – Tourism Development Projects Division (TDPD) is proposing to establish the Wangetti Trail – Wangetti South (Project) Section, a 29.7 kilometre (km) shared use trail to accommodate both mountain bike users and hikers from the southern boundary Lot 2 SP309094 in the township of Wangetti, to Palm Cove (refer to Figure 1-1).

The Wangetti South Section will comprise of the following components:

- 29.7 km shared use trail to accommodate both mountain bike users and hikers, consisting of natural ground and surface treatments, which will be a maximum of 1.5 m wide. The 1.5 m wide trail will be located within a 40 m survey corridor, referred to as the construction allowance corridor, to allow flexibility for the most suitable placement of infrastructure during the construction phase to minimise impacts to the greatest extent possible. The trail has been designed to be a 'Mountain Biking – intermediate (blue square with blue outline) as defined in the Australian Mountain Bike Trail Guidelines Trail Difficulty Rating System (MBTA TDRS) and grade 3 for hikers, as defined in the Australian Walking Track Grading System (AWTGS), which also equates to Class 3 in the Australian Standard for Walking Tracks, Part 1: Classification and Signage (AS 2156.1-2001). The trail will have an average gradient of <10% and a maximum gradient no greater than 15% (for short distances only). Built structures proposed as part of the trail include gully crossings, bridges, staircases, platforms, rock armouring and signage, where appropriate and required.
- A number of waterway crossings along the shared use trail that will comprise of the following: rock armouring, boulder crossings and low-level bridge (minor water crossing) (refer to Appendix A showing the locations of the waterways within the project area).
- Dark Jungle (public camping node and amenities block).
- The formalisation of existing access tracks into service tracks to provide restricted access to the shared use trail and Dark Jungle for construction purposes, operational purposes, maintenance purpose and for emergency purposes.

Further details of the construction methodology associated with Wangetti South Section is captured in the World Trail Pty Ltd (2020), Wangetti Trail Construction Methodology Manual April 2020.

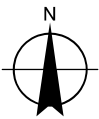
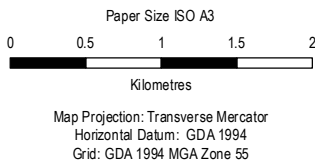
The Wangetti South Section is being proposed over four properties located within the Douglas Shire Council and Cairns Regional Council local government areas. The project area intersects both the Macalister Range National Park and the Wet Tropics World Heritage Area (WTWHA).

The project is being delivered by TDPD as part of an adventure-based ecotourism development in north Queensland. The shared use trail will provide walkers and mountain bike riders with a unique experience to traverse through natural areas of north Queensland covering bushland and coastal areas, including the Wet Tropics of Queensland (Wet Tropics), and national parks.

Development of a Preliminary Construction Environmental Management plan (CEMP) is required to demonstrate the management of environmental values within the project area during the construction phase of the Wangetti South Section. It forms part of a sub-plan in the Preliminary Environmental Management Plan (EMP) for the Wangetti South Section.



Based on or contains data provided by the State of QLD (DNRME) 2021. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for marketing or be used in breach of the privacy laws.



DITD
Environment Assessment Stage 2 Wangetti Trail

**Wangetti South Section
Project Locality Plan**

Project No. 41-32458
Revision No. 0
Date 21/12/2021

FIGURE 1-1

1.2 Purpose

GHD Pty Ltd (GHD) has been commissioned to develop a Preliminary Construction Environmental Management plan (CEMP) for the Wangetti South Section to guide construction activities associated with the Wangetti Section project to prevent or minimise the environmental impacts and disturbance on site and to the surrounding environment during the construction phase. An overview of all legislative requirements with respect to Commonwealth, State (Queensland) and local legislation and a summary of the statutory approvals associated with the project has been included in this document. This CEMP has also been prepared to satisfy the environmental obligations during the construction phase and complements the overarching Wangetti South Section Environmental Management Plan.

1.3 Structure of the CEMP

The structure of the CEMP has been developed to align with requirements in the Department of the Environment – Environmental Management Plan (DEMP) Guidelines 2014. Table 1-1 below demonstrates that this CEMP has considered the sections of the DEMP Guidelines.

Table 1-1 Structure of the CEMP

Section	Consistent with the DEMP Guidelines
1.0 Introduction	Compiles with Section 3.4, 3.5 and 3.6 in Department of Environment Environmental Management Plan Guidelines 2014
2.0 Potential environmental impacts and risks	Compiles with Section 3.8, 3.10, 3.12 and 4.0 in Department of Environment Environmental Management Plan Guidelines 2014.
3.0 CEMP Provisions	Compiles with Section 3.12 and 3.13 in Department of Environment Environmental Management Plan Guidelines 2014
4.0 Rehabilitation of works areas	Compiles with Section 3.13 in Department of Environment Environmental Management Plan Guidelines 2014
5.0 Monitoring	Compiles with Section 3.9 and 3.14 in Department of Environment Environmental Management Plan Guidelines 2014
6.0 Audit	Compiles with Section 3.14 in Department of Environment Environmental Management Plan Guidelines 2014
7.0 Review	Compiles with Section 3.14 in Department of Environment Environmental Management Plan Guidelines 2014
8.0 Emergency incident planning and response	Compiles with Section 3.11 in Department of Environment Environmental Management Plan Guidelines 2014

1.4 Assumptions and limitations

This report has been prepared by GHD for Department of State Development, Tourism and Innovation and may only be used and relied on by Department of State Development, Tourism and Innovation for the purpose agreed between GHD and the Department of State Development, Tourism and Innovation as set out in this report.

GHD otherwise disclaims responsibility to any person other than Department of State Development, Tourism and Innovation arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Department of State Development, Tourism and Innovation and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

2. Legislative requirements

Wangetti South Section is to comply with all legislative requirements with respect to Commonwealth, State (Queensland) and local legislation and a summary of the statutory approvals associated with the project is outlined in Table 2-1 below.

Table 2-1 Statutory approvals associated with Wangetti South

Legislation and Approval Type	Relevance to the project area
<i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act) DAWE Referral	Wangetti South is considered to involve undertaking an action which has, will have, or is likely to have, an impact on a Matters of National Environmental Significance (MNES). Therefore, project has been referred and is a controlled action that requires approval (reference EPBC 2020/8722).
Wet Tropics Management Plan 1998 <i>Wet Tropics Permit</i> Wet Tropics Management Authority (WTMA)	Wangetti South Section is located within the Wet Tropics World Heritage Area. The project has been approved (Wet Tropics Permit No: WTMA20001a) and a permit issued under Part 4, Division 1, Section 45 of the Wet Tropics Management Plan 1998 (<i>Wet Tropics World Heritage Protection Management Act 1993</i>) to allow for the proposed works to occur within the Wet Tropics Management Zone.
<i>Nature Conservation Act 1992</i> (NC Act) Authority required to construct trail and public camping areas under s34 of the NCA.	Subject to s34 of the NC Act, a lease, agreement, license, permit or other authority over, or in relation to land in a protected area may be granted if the activity is consistent with the management principles for the areal and, if a management plan has been approved for the area, the management plan. The grant of an authority will be considered by the Chief Executive of the Department of Environment and Science (DES) for the construction of Wangetti Trail and public camping areas in the protected area estate.
<i>Nature Conservation Act 1992</i> (NC Act) Protected plant clearing permit	Where the alignment intersects a flora survey trigger area, a protected plant clearing permit or exemption notice will be required.
Species management program (SMP) under the <i>Nature Conservation Act 1992</i> (NC Act)	Given a number of protected fauna species that are located within the project area are high-risk, a SMP may be required to allow for tampering with an animal breeding place for endangered, vulnerable and near threatened and special least concern fauna species listed under the <i>Nature Conservation (Wildlife) Regulation 2006</i> ..
<i>Native Title Act 1993</i> Indigenous Land Use Agreement (ILUA) or notification procedures	TDPD has been conducting meaningful engagement with Traditional Owners who have a native title claim or assert a native title interest in relation to trail area as outlined in Section 1.7 to address native title requirements for the project. Indigenous Land Use Arrangements (ILUA) will be negotiated between native title parties and the State accordingly.

Legislation and Approval Type	Relevance to the project area
Under the <i>Aboriginal Cultural Heritage Act 2003</i> (ACH Act) a Cultural Heritage Management Plan (CHMP) or similar may need to be established with the relevant Aboriginal parties	<p>TDPD has been conducting meaningful engagement with Traditional Owners who have interests in relation to trail area to address cultural heritage requirements under the ACH Act for the project.</p> <p>Archaeological reporting, including a Cultural Heritage Management Plan between the proponent and the Traditional Owners outlining how the project will be managed to avoid or minimise harm to Aboriginal cultural heritage (to the extent that harm cannot reasonably be avoided) will be negotiated before works commence</p> <p>The Department of Aboriginal and Torres Strait Islander Partnerships' (DATSIP) Duty of Care Guidelines are required to be followed to assist in conducting due diligence.</p>
Under the <i>Planning Act 2016</i> and Planning Regulation 2017 a Material Change of Use development permit assessable under the Douglas Shire Council planning scheme and a Material Change of Use development permit assessable under the Cairns Regional Council Planning Scheme	<p>A material change of use development permit application will be required for Wangetti South to establish the use within the project area.</p> <p>Pre-lodgement meetings have been undertaken with the former Department of State Development, Infrastructure and Planning (referred to now as Department of State Development, Infrastructure, Local Government and Planning (DSDILGP), Douglas Shire Council, Cairns Regional Council, Department of Environment and Science (DES), former Department of Natural Resources Energy and Mines (referred now as Department of Resources (DR)), Department of Agriculture and Fisheries (DAF) and Department of Transport and Main Roads (DTMR).</p>
Under the Planning Regulation 2017 and <i>Vegetation Management Act 1999</i> (VM Act) an Operational works development approval for clearing of native vegetation	<p>Wangetti South does not trigger operational work involving clearing native vegetation under Schedule 10, Part 3, Division 4, Table 1, Item 1 under the Planning Regulation 2017, as the proposed works is considered to meet the definition of government supported transport infrastructure and is therefore exempt from the clearing of remnant Category B, Category C and Category R vegetation.</p>
Under the Planning Regulation 2017 and <i>Fisheries Act 1994</i> Development Permit for operational works for constructing/raising waterway barrier works Compliance with Accepted development requirements for operational work that is constructing or raising waterway barrier works and	<p>Boulder rock crossing will trigger a development permit for operational works waterway barrier works where the work does not comply with DAF's accepted development requirements.</p> <p>Bed level crossings associated with the project are considered to meet the accepted development requirements for operational work that is constructing or raising waterway barrier works' and riverine protection permit exemption requirements WSS/2013/726.</p>

Legislation and Approval Type	Relevance to the project area
<i>Water Act 2000</i> Riverine Protection Permit Exemption Requirements.	
Under the Planning Regulation and <i>Coastal Protection and Management Act 1995</i> . Development permit for operational works for interfering with quarry material on state coastal land above the high-water mark within a Coastal Management District (CMD)	Parts of the project area are proposed within mapped coastal management district and therefore the proposed works would trigger a development permit for operational works for interfering with quarry material on state coastal land above the high-water mark within the coastal management district under Schedule 10 of the <i>Planning Regulation 2017</i> .
Under the <i>Land Act 1994</i> land owners consent for works on State Land	Land owner's consent is required from DR for work on state land to support material change of use development application.
Riverine protection permit (RPP) under the <i>Water Act 2000</i>	<p>There are a number of DR mapped watercourses along the proposed alignment. Bed level crossings are considered to meet the Riverine Protection Permit (RPP) exemption requirements WSS/2013/726.</p> <p>TDPD is an entity under schedule 2 of the RPP Exemption Requirements and therefore can follow the RPP exemption requirements WSS/2013/726 for any works proposed in a watercourse.</p> <p>Proposed works will be required to work within the vegetation clearing limit and excavation and placement of fill limit requirements.</p> <p>Where works result in the clearing of less than 0.5 ha of least concern regional ecosystem in a category B, C, R or X or carried out under an accepted development vegetation clearing code (other than if the vegetation is in a category A area), then the exemption requirements apply.</p> <p>Where works result in the excavation of 500 cubic metres or less, then the exemption requirements apply.</p> <p>Where works result in the placement of less than 150 cubic metres of fill, then the exemption requirements apply.</p>
Road corridor permit under the <i>Transport Infrastructure Act 1994</i> (TI Act)	Part of the project area is located within State controlled road reserve namely Captain Cook Highway which is managed by DTMR. Works within a state-controlled road reserve triggers a road corridor permit from DTMR.
Under the <i>Land Act 1994</i> Permanent closure or short-	Permanent road closures or short-term occupation and construction within road reserves (excluding state-controlled

Legislation and Approval Type	Relevance to the project area
term occupation within road reserves	roads) will be required during the construction phase of the project.
General Biosecurity Obligation (GBO) under the <i>Biosecurity Act 2014</i>	During the construction and operation phase of the project, activities are to be undertaken in accordance with the General Biosecurity Obligations whereby all reasonable and practical measures are to be undertaken to prevent or minimise biosecurity risks. The Act identifies seven categories of restricted matters. Where activities are proposed contrary to the restriction for each category under the Act, a Restricted Matter Permit is required.
General Environmental Duty under the <i>Environmental Protection Act 1994</i>	Under the provisions of the EP Act, all persons, whether undertaking an activity authorised under the EP Act, are required to comply with the General Environmental Duty. The duty requires that: 'A person must not carry out any activity that causes, or is likely to cause, environmental harm unless the person takes all reasonable and practicable measures to prevent or minimise the harm.' This is applicable to all phases of the project.
Environmental offset requirements under the <i>Environmental Offsets Act 2014</i> <i>Commonwealth Environment Protection and Biodiversity Conservation Act 1999 - Environmental Offsets Policy October 2012</i>	DES has advised that state environmental offsets will be triggered for the project which will be administered under s34 and s35 of the NC Act. EPBC Act offsets are proposed in relation to impacts on the southern cassowary.

2.1 Wet Tropics Management Plan 1998 (superseded 3rd July 2017)

The project has been approved (Wet Tropics Permit No: WTMA20001a) and a permit issued under Part 4, Division 1, Section 45 of the Wet Tropics Management Plan 1998 (superseded 3rd July 2017) (*Wet Tropics World Heritage Protection Management Act 1993*) to allow for the proposed works to occur within the Wet Tropics Management Zone. While the project was assessed in accordance with the Wet Tropics Management Plan 1998 plan, the project is considered to comply with the intent of the Wet Tropics Management Plan 2020.

An assessment has been undertaken against the provisions of the Wet Tropics Management Plan 1998 (superseded 3rd July 2017) and is presented in Table 2-2.

Table 2-2 Assessment against the provisions of the Wet Tropics Management Plan 1998 (3 July 2017 version)

Wet Tropics Management Plan 1998 (3 rd July 2017 version)	Response
Zone B – Zone B is comprised of land that is mostly of high	

Wet Tropics Management Plan 1998 (3 rd July 2017 version)	Response
<p>integrity but not necessarily remote from disturbance.</p> <p>It is intended that, in Zone B, land be undergoing recovery or rehabilitation towards its natural state or becoming remote from disturbance by activities associated with modern technological society; and a visitor may expect opportunities for solitude in a natural area requiring a degree of self-reliance; and management presence be limited mainly to activities required for the recovery or rehabilitation of the area.</p>	<p>The majority of the project is located within Zone B under the Wet Tropics Management Plan 1998.</p> <p>The proposed trail is considered to meet the intent of Zone B by providing opportunities to connect with nature and to be surrounded by nature along the trail. The trail will allow for winding around natural obstacles and integrating within the natural environment. Vegetation disruption, including canopy cover, is minimised.</p>
<p>The management purpose of Zone B is, to the greatest possible extent—</p> <ol style="list-style-type: none"> a. To protect and enhance the integrity of land in the zone b. If the land is disturbed— <ol style="list-style-type: none"> (i) To restore land in the zone to its natural state, as opportunities arise (ii) To include the land in zone A once it is sufficiently recovered or rehabilitated. 	<p>The Wangetti South Section has been designed to minimise built structures like bridges, boardwalks and viewing platforms. These built structures pose a number of challenges:</p> <ul style="list-style-type: none"> • They are normally constructed from imported materials and can be intrusive in the natural environment • They can burn during bushfires or prescribed burns • They can be difficult to construct in remote areas, due to the challenges of importing the materials • They increase the maintenance burden. <p>Where built structures are required, the design and finish will prioritise the use of local timbers and other materials that will age gracefully with time. Above all, the materials must be durable enough to withstand the harsh tropical climate and natural environment. Any built structures must be designed and engineered to be fit-for-purpose, to have minimal impact to the surrounding environment, to have minimal maintenance requirements and will need to take a minimalistic approach to materials given the remote nature of the trail, resulting in a minimal impact on the scenic beauty of the Wet tropics.</p>
<p>Zone C – Zone C is comprised of land on which, or adjacent to which, there is disturbance associated with community services infrastructure.</p> <p>It is intended that, in Zone C—</p> <ol style="list-style-type: none"> c. Land be mostly natural, but with some disturbance associated with community services infrastructure (community services infrastructure means infrastructure for community services such as, for example, transport services, electricity supply, water supply and telecommunications) 	<p>Where the trail is located within Zone C land, it is considered to meet the intent of Zone C areas, being, land be mostly natural, but with some disturbance associated with community services infrastructure.</p> <p>The Wangetti South Section has been designed to minimise built structures like bridges, boardwalks and viewing platforms. These built structures pose a number of challenges:</p> <ul style="list-style-type: none"> • They are normally constructed from imported materials and can be intrusive in the natural environment • They can burn during bushfires or prescribed burns • They can be difficult to construct in remote areas, due to the challenges of importing the materials • They increase the maintenance burden. <p>Where built structures are required, the design and finish will prioritise the use of local timbers and other materials that will</p>

Wet Tropics Management Plan 1998 (3 rd July 2017 version)	Response
<p>services), other community facilities and visitor facilities</p> <p>d. A visitor may expect various low-key opportunities for nature appreciation and social interaction in a natural setting, but with some disturbance by activities associated with modern technological society</p> <p>e. Management presence may be obvious.</p>	<p>age gracefully with time. Above all, the materials must be durable enough to withstand the harsh tropical climate and natural environment. Any built structures must be designed and engineered to be fit-for-purpose, to have minimal impact to the surrounding environment, to have minimal maintenance requirements and will need to take a minimalistic approach to materials given the remote nature of the trail, resulting in a minimal impact on the scenic beauty of the Wet tropics.</p>
<p>The management purpose of Zone C is—</p> <p>f. To accommodate community services infrastructure, other community facilities and visitor facilities; but (b) to the greatest possible extent—</p> <p>(i) To ensure any adverse impact of activities carried out in the zone on the area's integrity is minimal and acceptable under this plan</p> <p>(ii) To otherwise protect and enhance the integrity of land in the zone.</p>	

2.2 Wet Tropics Management Plan 1998 (11 September 2020)

Under the latest Wet Tropics Management Plan 1998 (11 September 2020), Wangetti South Section project area is located within Zone A, B and C.

2.2.1 Zone A

The intent of Zone A is:

- The main management purpose of zone A is to protect and conserve the world heritage values and integrity of land in the zone.
- Other management purposes of zone A are—
 - a. if land in the zone is disturbed—to restore and enhance the world heritage values and integrity of the land if, and
 - b. to the extent, it is reasonably practicable; and

- c. to enable visitors to access parts of the land in the zone to appreciate and enjoy the area.

Part of the shared use trail and Dark Jungle are located within Zone A and are defined as limited visitor infrastructure under the Plan. Limited visitor infrastructure includes walking or cycling track, information board, small-scale viewing platform, small-scale toilet facility, visitors' shelter and camping platforms.

2.2.2 Zone B

The intent of Zone B is:

- The main management purpose of zone B is to protect and conserve the world heritage values and integrity of land in the zone.
- Other management purposes of zone B are—
 - a. if land in the zone is disturbed—to restore and enhance the world heritage values and integrity of the land if, and to the extent, it is reasonably practicable; and
 - b. to enable visitors to access parts of the land in the zone to appreciate and enjoy the area; and
 - c. to be a buffer between zone A and community services infrastructure.

The shared use trail is partly located within Zone B and the proposed use is defined as limited visitor infrastructure and is considered to be consistent with the intent of Zone B.

2.2.3 Zone C

The intent of Zone C is:

- The main management purposes of zone C are—
 - a. to protect and enhance the world heritage values and integrity of the land in the zone, subject to paragraphs (b) and (c); and
 - b. subject to paragraph (c), to accommodate—
 - i. community services infrastructure and visitor infrastructure; and
 - ii. particular existing uses of parts of the zone shown on the zoning map; and
 - c. to minimise any adverse impact of any activities allowed to be carried out in the zone on the world heritage values and integrity of the land in the zone.

Another management purpose of zone C is to ensure, so far as is reasonably practicable, that any visitor infrastructure on land in the zone is built and maintained in a way that—

- a. is ecologically sustainable; and
- b. is sensitively integrated into the surrounding landscape; and
- c. enhances visitors' understanding and appreciation of the natural and cultural heritage of the area.

Part of the service tracks are located within Zone C and the project is anticipated to meet the intent of Zone C.

2.3 Wet Tropics Strategic Plan 2020 – 2030

The Wet Tropics Strategic Plan 2020 - 2030 provides a 10-year policy framework to guide decision-making under the *Wet Tropics World Heritage Protection and Management Act 1993*. The primary purpose of the Wet Tropics Strategic Plan 2020 - 2030 is to enable the identification, protection, and conservation of the Wet Tropics for future generations. It states the desired outcomes that will be delivered and outlines the actions that will achieve this. An assessment has been undertaken

against the provisions of the Wet Tropics Strategic Plan 2020–2030 with respect to Wangetti South Section and is outlined in Table 2-3.

Table 2-3 Assessment against the provisions of the Wet Tropics Strategic Plan 2020 – 2030

Wet Tropics Strategic Plan 2020 – 2030	Response
<p>1. Climate change and other threats</p> <p>Respond to the impacts of climate change and priority cross-tenure threats to the area</p>	<p>With respect to the production of greenhouse gases as a result of machinery use, selection of machinery is to be fit-for-purpose and low emission, wherever possible.</p> <p>Construction mitigation measures will be required to be incorporated into the contractor's CEMP. The contractor is also required to comply with the general environmental duty under the <i>Environmental Protection Act 1994</i> (EP Act) and Environmental Protection (Air) Policy 2008, as well as appropriate provisions under the contract documentation.</p>
<p>2. Support Rainforest Aboriginal Peoples</p> <p>Promote and incorporate the rights, interests and aspirations of Rainforest Aboriginal Peoples in the management of the area.</p>	<p>During the development of the project, cultural heritage representatives were engaged to provide advice regarding the significant Aboriginal areas, significant Aboriginal objects and or evidence, of archaeological or historic significance along the trail.</p> <p>As part of the Project, TDPD has been engaging with Traditional Owners regarding the proposed works and to avoid impacts on cultural heritage values.</p>
<p>3. Involve the community</p> <p>Optimise community participation and connection with the area through innovative interpretation, with a focus on education, volunteering and social inclusion.</p>	<p>The Wangetti South Section experience will be uniquely Australian, emphasising the culture, history and way of life of the Traditional Owners, the Yirrganydji people. It will encourage a sense of exploration and a spirit of adventure. It will foster an appreciation of the natural environment and the diversity of flora and fauna within it.</p> <p>The Project will provide economic, cultural and educational benefits to the community, as summarised below.</p> <p><i>Economic</i></p> <p>Wangetti South Section has the potential to diversify the tourism product offering in North Queensland, involve Traditional Owners and increase jobs by utilising Queensland's natural assets. The construction phase of the Project will provide an opportunity for the creation of local jobs and employment through the sourcing of material and equipment or through manual labour, while the operational phase of the Project will increase visitors to the area, supporting the local economies of Cairns, Wangetti and Port Douglas.</p>
<p>4. World-class tourism and recreation</p> <p>Enhance the World Heritage presentation and support opportunities for natural and cultural tourism and recreation</p>	<p>The Wangetti South Section will provide access to a World Heritage listed assets –the WTWHA, which will create value for money experiences for tourists and provide opportunities for tourism operators to extend their offerings and capture markets that are seeking access to unique nature-based experiences (PWC, 2018).</p> <p><i>Cultural and spiritual</i></p> <p>The Wangetti South Section supports a healthy wellbeing and lifestyle by encouraging the physical, mental, and spiritual activity of</p>

Wet Tropics Strategic Plan 2020 – 2030	Response
	<p>participants. Contact with nature can enhance spiritual health, which underpins all other aspects of health (PWC, 2018).</p> <p><i>Educational</i></p> <p>The Wangetti South Section will create several educational opportunities, including the community, schools and universities to increase their knowledge and understanding around wildlife and conservation in WTWHA, with the opportunity to develop education programs to help teach and upskill students (PWC, 2018).</p>
<p>5. Minimise impacts</p> <p>Manage activities that may have been an impact on the area appropriately through permit and zoning system.</p>	<p>Wangetti South Section has received a WTMA permit and therefore will be undertaken in accordance with Strategy 5 of the Wet Tropics Strategic Plan 2020 - 2030.</p>

3. Potential environmental impacts and risks

3.1 Key environmental factors

Eight preliminary key environment factors have been identified in the referral for Wangetti South Section and they include:

- Biodiversity – Flora
- Biodiversity – Fauna
- Waterways
- Soils and topography
- Public amenity
- Waste management
- Biosecurity
- Cultural heritage

Table 3-1 presents the eight preliminary key environmental factors relevant to construction, the proposal activities that would affect the factors and the site-specific environmental values, uses and sensitive components that will be affected. Table 3-1 also identifies potential Matter of National Environmental Significance (MNES) and Matters of State Environmental Significance (MSES) that could be potentially impacted by construction activities.

Table 3-1 Key environmental factors relevant to construction

Key environmental factor	Activities that would affect the factor	Applicable MNES and MSES
Biodiversity – Flora	<ul style="list-style-type: none"> Vegetation clearing - permanent and temporary loss of vegetation and habitat (direct impact). Construction vehicle movements. Construction plant operation. Soil erosion and sediment generated from earthworks. Illegal collection of flora species by construction crew and members of the public Introduction and spread of invasive species from material brought into the project area. Damage to flora species by construction crew not using designated routes. Notophyll vine forest – these forest areas are environmentally significant and need to be protected from potential visitor impacts. This includes protecting some of the large native orchids (dendrobium sp.) that may be at risk from being removed and exploited. 	<p>MNES and MSES flora species that are known, likely or may occur in the Wangetti South Section:</p> <ul style="list-style-type: none"> <i>Archontophoenix myolensis</i> (Myola palm) <i>Anoetochilus yatesiae</i> (Marbled jewel orchid) <i>Canarium acutifolium</i> <i>Dendrobium fellowsii</i> <i>Dendrobium mirbelianum</i> (Dark-stemmed antler orchid) <i>Diplazium cordifolium</i> <i>Diplazium pallidum</i> <i>Myrmecodia beccarii</i> (Ant plant) <i>Phaius pictus</i> <i>Phalaenopsis amabilis</i> subsp. <i>rosenstromii</i> (Native moth orchid) <i>Polyscias bellendenkerensis</i> <i>Randia audasii</i> <i>Rhomboda polygonoides</i> <i>Toechima pterocarpum</i> (Orange tamarind) <i>Vappodes lithocola</i> (Dwarf butterfly orchid) (also known as <i>Dendrobium lithocola</i>, and the Queensland Flora Census 2019 groups this species into <i>Dendrobium biggibum</i>) <i>Vappodes phalaenopsis</i> (Cooktown orchid) (Also known as <i>Dendrobium phalaenopsis</i> and the Queensland Flora Census 2019 groups this species into <i>Dendrobium biggibum</i>) <i>Zeuxine polygonoides</i> (Velvet jewel orchid) (also known as <i>Rhomboda polygonoides</i>)
Biodiversity – Fauna	<ul style="list-style-type: none"> Vegetation clearance resulting in injury and mortality to the local fauna. Vegetation clearance has the potential to impact on breeding areas for local fauna. Construction vehicle movements. Construction plant operation. Soil erosion and sediment generated from earthworks. Storage and management of waste from construction crew 	<p>MNES and MSES bird species that are known likely or may occur:</p> <ul style="list-style-type: none"> <i>Casuaris casuaris</i> (Southern cassowary) Migratory birds (e.g. eastern curlew, great sand plover) Non-migratory species (e.g. masked owl) <p>MNES and MSES amphibian species that are known, likely or may occur in the Wangetti South Section</p>

Key environmental factor	Activities that would affect the factor	Applicable MNES and MSES
	<ul style="list-style-type: none"> • Injury and mortality of wildlife resulting from direct collision with vehicles and mountain bike riders • Illegal collection of wildlife by construction crew and members of the public • Disturbance of wildlife behaviour by increased noise from hikers and mountain bike riders • Introduction and spread of invasive species by the movement of hikers, cyclists and maintenance vehicles • Interference of local wildlife by domestic animals • Barrier effects and reduced movement to wildlife 	<ul style="list-style-type: none"> • <i>Litoria dayi</i> (Australian lace lid) • <i>Litoria nannotis</i> (Waterfall frog) • <i>Litoria nyakalensis</i> (Mountain mistfrog) • <i>Litoria rheocola</i> (Common mistfrog) • <i>Litoria serrata</i> (Tapping green eyed frog) <p>MNES and MSES mammal species that are known, likely or may occur in the Wangetti South Section</p> <ul style="list-style-type: none"> • <i>Dasyurus maculatus gracilis</i> (Spotted-tailed quoll) • <i>Dasyurus hallucatus</i> (Northern quoll) • <i>Dendrolagus lumholtzi</i> (Lumholtz's tree-kangaroo) • <i>Hipposideros semoni</i> (Semon's leaf-nosed bat) • <i>Phascolarctos cinereus</i> (Koala) • <i>Pteropus conspicillatus</i> (Spectacled flying-fox) • <i>Rhinolophus robertsi</i> (Large-eared horseshoe bat) • <i>Saccolaimus saccolaimus nudicluniatus</i> (Bare-rumped sheath-tailed bat) • <i>Xeromys myoides</i> (Water mouse) <p>MNES and MSES aquatic species that are known, likely or may occur in the Wangetti South Section</p> <ul style="list-style-type: none"> • <i>Stiphodon semoni</i> (Opal cling goby) • <i>Stiphodon rutilarueus</i> (Orange cling goby) • <i>Stiphodon pelewensis</i> (Emerald cling goby) • <i>Stiphodon surrufus</i> (Birdsong cling goby)
Biosecurity	<ul style="list-style-type: none"> • Introduction or spread of weeds/pests/pathogens from construction/operation activities or materials • Interference of local wildlife by domestic animals 	<p>MNES and MSES species as outlined in the Biodiversity – Fauna and Flora rows above.</p> <p>Wet Tropics World and National Heritage Area.</p> <p>Protected Areas - estates protected under the NC Act.</p>
Waterways	<ul style="list-style-type: none"> • Earthworks - Soil erosion and sediment. • Installation of waterway crossings. 	<p>MNES and MSES amphibian and aquatic species as outlined in Biodiversity – Fauna row above.</p>

Key environmental factor	Activities that would affect the factor	Applicable MNES and MSES
	<ul style="list-style-type: none"> Earthworks and other construction activities have the potential to cause indirect degradation of aquatic habitats, particularly to opal cling goby habitat as shown in Appendix B. Use of construction machinery in and around aquatic habitat. The shared use trail has potential to contribute to sedimentation to the environment. The movement of hikers and mountain bike riders have the potential to cause localised habitat degradation through exposure to run-off and sedimentation, and trail widening to avoid muddy or puddled areas. 	<p>Wet Tropics World Heritage Area</p> <p>Waterways protected under the <i>Fisheries Act 1994</i> and <i>Water Act 2000</i></p> <p>Coastal management districts protected under the <i>Coastal Protection and Management Act 1995</i>.</p>
Soil and land management	<ul style="list-style-type: none"> Earthworks - Soil erosion and sediment. Soil compaction as a result of construction equipment moving in the area. Construction equipment causing displacement of soils and/or rocks. Chemicals and fuel used on-site during construction impacting on the natural environment. 	<p>Wet Tropics World Heritage Area</p> <p>MNES and MSES amphibian and aquatic species as outlined in Biodiversity – Fauna row above.</p> <p>Protected Areas - estates protected under the NC Act.</p> <p>Waterways protected under the <i>Fisheries Act 1994</i> and <i>Water Act 2000</i></p> <p>Coastal management districts protected under the <i>Coastal Protection and Management Act 1995</i>.</p>
Public amenity and health	<ul style="list-style-type: none"> Vegetation clearance Construction vehicle movements. Construction plant operation Soil erosion and earthworks. Storage and management of waste from construction crew. Construction activities may be visible to varying degrees by people living, working, and travelling through the surrounding areas. Noise and vibration generated by construction plant, vehicles and equipment impacting on sensitive receptors including wildlife. 	<p>MNES and MSES species as outlined in the Biodiversity – Fauna row above</p> <p>Wet Tropics World and National Heritage Area</p> <p>Waterways protected under the <i>Fisheries Act 1994</i> and <i>Water Act 2000</i></p> <p>Coastal management districts protected under the <i>Coastal Protection and Management Act 1995</i>.</p>

Key environmental factor	Activities that would affect the factor	Applicable MNES and MSES
	<ul style="list-style-type: none"> Noise generated by members of the public using vehicles illegally within the project area. Potential air and dust impacts to sensitive receptors as a result of construction activities, attributable to exhaust emissions and fugitive dust. During construction, construction activities have the potential to increase bushfire hazard. The use of construction machinery within the project area have the potential to ignite fires and include, but not limited to mini excavators; chainsaws, compactors, general construction tools and equipment such as drills, saws, sanders, etc. Bushfires occurring within the project area impacting threatened flora and fauna species. Steep terrain, remote location, the presence of dangerous animals and plants and potential of extreme weather events are associated with Wangetti South Section and could adversely impact on construction personnel in the following ways: <ul style="list-style-type: none"> Bites from snakes, spiders, and insects. Allergic reactions to plant species along the trail. Heat/cold exposure, falls and sprains, etc. Another hazard is the operation of a helicopter to transport construction material to the project area. Potential hostile intersection with fauna species Extreme weather events requiring evacuation Disruption to traffic along Captain Cook Highway from construction vehicles Interference with wildlife by construction vehicles 	Protected Areas - estates protected under the NC Act.

Key environmental factor	Activities that would affect the factor	Applicable MNES and MSES
	<ul style="list-style-type: none"> Impacts to sensitive environmental areas as a result of vehicles not using designated service tracks and/or members of the public using vehicles illegally within the project area. Congestion of vehicles at existing parking areas. 	
Waste management	<ul style="list-style-type: none"> Clearing of vegetation and cut and fill activities will be required to allow for the construction of the trail, camp sites and access tracks resulting in vegetation waste and excess spoil. Construction camps will produce general waste. Inappropriate waste management by construction personnel. 	<p>MNES and MSES species as outlined in the Biodiversity – Fauna and Flora rows above.</p> <p>Wet Tropics World and National Heritage Area.</p> <p>Protected Areas - estates protected under the NC Act.</p> <p>Waterways protected under the <i>Fisheries Act 1994</i> and <i>Water Act 2000</i></p>
Cultural heritage	<ul style="list-style-type: none"> Potential to find unrecorded cultural heritage and to disturb identified cultural heritage Additional access to sensitive and restricts sites that may impact on Traditional Owner cultural values. Damage to sensitive environmental areas within Wet Tropics World Heritage Area because of vehicles not using designated service tracks and/or members of the public using vehicles illegally within the project area. 	<p>MNES and MSES species as outlined in the Biodiversity – Fauna and Flora rows above.</p> <p>Wet Tropics World and National Heritage Area.</p> <p>Protected Areas - estates protected under the NC Act.</p>

3.2 Risk assessment

The purpose of this section is to qualitatively determine the risk of potential impacts to environmental factors that could occur as a result of undertaking construction activities for Wangetti South Section without having environmental controls in place. The risk assessment methodology has been based off the risk assessment methodology in the Department of Agriculture, Water and the Environment (DAWE) Environmental Management Plan Guidelines 2014.

3.2.1 Ranking impact criteria

Each potential impact was ranked according to specific criteria namely likelihood and consequence, using the criteria in Table 3-2 and Table 3-3, respectively, where

- Likelihood is based on how likely it is that the event/issue will occur after control strategies have been put in place
- Consequence is what the consequence/result will be if the issue does occur.

These ratings are then combined using the risk assessment (refer Table 3-4) to generate a risk rating of low, medium, high or severe and have been derived from the AS/NZS ISO 31000:2009 Risk management – Principles and guidelines (Standards Australia 2009).

Table 3-2 Qualitative measure of likelihood (Australian Government Department of the Environment, 2014)

Likelihood	Qualitative measure
Highly likely	Is expected to occur in most circumstances
Likely	Will probably occur during the life of the project
Possible	Might occur during the life of the project
Unlikely	Could occur but considered unlikely or doubtful
Rare	May occur in exceptional circumstances

Table 3-3 Qualitative measure of consequences (Australian Government Department of the Environment, 2014)

Consequence	Qualitative measure
Minor	Minor incident of environmental damage that can be reversed
Moderate	Isolated but substantial instances of environmental damage that could be reversed with intensive efforts
High	Substantial instances of environmental damage that could be reversed with intensive efforts
Major	Major loss of environmental amenity and real danger of continuing
Critical	Severe widespread loss of environmental amenity and irrecoverable environmental damage

Table 3-4 Risk assessment (Australian Government Department of the Environment, 2014)

	Consequence				
	Minor	Moderate	High	Major	Critical
Highly likely	Medium	High	High	Severe	Severe
Likely	Low	Medium	High	High	Severe
Possibly	Low	Medium	Medium	High	Severe
Unlikely	Low	Low	Medium	High	High
Rare	Low	Low	Low	Medium	High

Table 3-5 summarises the predicted initial impacts the proposed construction activities can have on environmental factors within the project area without environmental controls in place.

The subsequent residual impacts for each environmental factor based upon implementation of recommended management measures are outlined in Section 4.

Table 3-5 Risk assessment of construction activities on environmental factors for Wangetti South Section without environmental controls in place

Environmental value	Impact	Probability	Consequence	Risk
Biodiversity - flora and fauna	Construction activities resulting in the removal of vegetation, including MNES and MSES outside of the designated works area.	Possible	Moderate	Medium
	Construction activities may impact flora and fauna biodiversity in the area by reducing acceptable habitat and breeding areas for fauna and flora species.	Possible	Moderate	Medium
	Fauna strikes with vehicles are an increased risk during construction phase.	Possible	Moderate	Medium
	Development within Ecologically Significant Areas	Unlikely	Moderate	Low
	Injury or loss of native flora and fauna from the use of construction vehicles and/or equipment. Injury or loss of native flora and fauna from drivers not using designed service tracks to access the work area.	Possible	Moderate	Medium

	Additional disturbance to aquatic environments associated with construction and increased foot traffic and potential deviation from designated trail areas	Possible	Moderate	Medium
	Additional disturbance and disruption of flora and fauna due to increased access of area	Possible	Minor	Low
	Additional noise and vibration associated with construction/ may negatively impact flora and fauna*	Possible	Minor	Low
	Light sources generated from the construction activities adversely impacting on wildlife.	Possible	Minor	Low
	Illegal collection of flora and/or fauna species by construction crew and/or members of the public	Possible	Moderate	Medium
Biosecurity (weeds, pests and pathogens)	Introduction or spread of weeds/ pests/pathogens from construction activities or materials	Possible	Moderate	Medium
	As the trail is mostly situated within a national park, domestic animals will be prohibited. Interference of local wildlife by domestic animals is related to unintended introduction of domestic animals on the trail.	Possible	Minor	Low
Water resources	Potential for flooding to occur upstream or downstream as a result of the sizing and treatment of waterway crossings	Possible	Unlikely	Low
	Reduction in water quality through ineffective treatment of pollutant (nitrogen, phosphorous, total suspended solids and gross pollutants) load in stormwater runoff	Possible	Moderate	Medium
	Major storms and resulting flooding may cause undue erosion and impact the trail impact. Trail impact due to erosion may potentially impacts surrounding MNES habitat.	Possible	Moderate	Medium
	Potential for contamination and/or pollutant load in local drainage lines	Unlikely	Moderate	Low
	Use of construction machinery in and around waterways resulting in the degradation of aquatic habitats, bed and banks of waterways and adverse impacts to the opal cling goby habitat.	Possible	Moderate	Medium

Soil and land management	Movement of soils can adversely impact on dispersive soils which have a high erosion risk and tunnel and gully erosion can occur.	Possible	Moderate	Medium
	Erosion of soils may occur during construction. Trafficability could also prove difficult within upper layers (such as sand or clay) in wet conditions	Possible	Moderate	Medium
	Soil compaction as a result of construction and operation equipment and vehicles moving in the area and could prove difficult within the upper loose sandy layers and the silty clay layers if exposed and trafficked under wet conditions. The upper sandy layer often overlies the less permeable silty clay layer. This ground profile can often result in wet or saturated upper layers for some time following periods of high rainfall as the sand layer is typically limited to horizontal drainage.	Possible	Moderate	Medium
Soil and land management	Chemicals and fuels used on-site during construction phase not appropriately managed resulting in contaminating the natural environment.	Possible	Moderate	Medium
Public amenity and health	Production of greenhouse gases as a result of machinery use*	Possible	Minor	Low
	Decline of air quality related to construction machinery and dust particles* Production of greenhouse gases as a result of vehicles using the access tracks to service the trail and nodes.	Unlikely	Minor	Low
	Noise and vibration generated by construction plant, vehicles and equipment impacting on sensitive receptors including wildlife.	Possible	Moderate	Medium
	Noise generated by members of the public using vehicles illegally within the project area.	Possible	Minor	Low
	During construction, construction activities have the potential to increase bushfire hazard. The use of construction machinery within the project area have the potential to ignite fires and include, but not limited to mini excavators; chainsaws, compactors, general	Possible	High	Medium

	construction tools and equipment such as drills, saws, sanders, etc			
	Interference with wildlife by construction vehicles	Possible	Moderate	Medium
	Impacts to sensitive environmental areas because of vehicles not using designated service tracks and/or members of the public using vehicles illegally within the project area.	Possible	Moderate	Medium
	Increased traffic because of construction activities and potential adverse impacts to existing communities surrounding the project area	Possible	Minor	Low
	Construction activities within the road reserve and potential adverse impacts to existing road users	Likely	Minor	Low
Public amenity and health	<p>Steep terrain, remote location, the presence of dangerous animals and plants and potential of extreme weather events are associated with Wangetti South Section and could adversely impact on construction personnel in the following ways:</p> <ul style="list-style-type: none"> • Bites from snakes, spiders, and insects. • Allergic reactions to plant species along the trail. • Heat/cold exposure, falls and sprains, etc. • Another hazard is the operation of a helicopter to transport construction material to the project area. • Potential hostile intersection with fauna species 	Possible	Minor	Low
	Natural hazard events (including bushfire, landslides and storm events) occurring within the project area threatening people and structures and requiring evacuation	Possible	High	Medium
Waste Management	Waste generation/ pollution of local area during construction because of inappropriate waste management by construction personnel.	Possible	Minor	Low
Cultural heritage	Potential to find unrecorded cultural heritage*and to disturb identified cultural heritage	Possible	Moderate	Medium

	Additional access to sensitive and restricts sites that may impact on Traditional Owner cultural values	Possible	Moderate	Medium
	Damage to sensitive environmental areas within Wet Tropics World Heritage Area because of vehicles not using designated service tracks and/or members of the public using vehicles illegally within the project area.	Possible	Moderate	Medium

3.3 Rationale and approach

This CEMP has been prepared with consideration of the following site-specific environmental investigations:

- Wangetti South Section Baseline Ecology and Impact Assessment Report 2020 prepared by GHD
- Four ecological field survey events were undertaken on the following dates:
 - 11 March to 15 March 2019 and this field survey focused on areas between south of Mowbray River to Campsite 5, area near Campsite 3, near Hartleys Creek and along Ellis Beach
 - 8 April to 12 April 2019: this field survey focused on areas between Hartleys Creek and Buchan Point
 - 26 August to 30 August 2019 by a team of four ecologists. This survey focused on the coastal, mountainous sections from Hartley's Creek to Turtle Cove. It also covered Simpson Point and Ellis Beach
 - 2 September to 6 September 2019: this field trip focused on the western part of the alignment (from Tresize Road to Turtle Cove) and any remaining areas surveyed from Slip Cliff Point to Redcliff Point.
- According to the 2018 Wangetti Trail Cultural Heritage Survey Report, cultural heritage ground-truthing was conducted in the following areas and dates:
 - Ellis Beach and Mount Buchan - Tuesday 24th July 2018;
 - Hartleys Creek - Wednesday 25th July 2018;
 - Ellis Beach overtaking lane to Red Cliff Point - Tuesday 31st July to Thursday 2nd August 2018.

The location fauna and flora surveys undertaken in Wangetti South Section are shown in the maps in Appendix C.

The key findings are summarised in Table 3-1.

3.3.1 Key assumptions

Key assumptions associated with the development of this CEMP include the following:

- The construction period to be undertaken from April 2021 to April 2022
- A soil investigation has not been undertaken for the project and will need to be undertaken to confirm soil conditions (refer to ESCP)
- Construction teams are to be accommodated off site where practical

- Working areas will be clearly defined and demarcated and construction operations must not occur outside of the marked area
- During construction phase the Contractor is to consider having a trailer mounted portable toilet or something similar to be able to service the construction crew. The setup of temporary amenities to be located in disturbed areas and outside of areas of high ecological significance
- Designated eating areas and smoko areas are to be provided. The setup of the area to be located in disturbed areas and outside of areas of high ecological significance
- Material laydown areas are to be allocated and demarcated prior to storage of materials
- All fuels, chemicals, paints, wastes and other potentially environmentally hazardous substances must be stored in a weatherproof container with adequate bunding
- Construction crew will be required to carry their waste off site.

3.3.2 Management approach

This CEMP adopts a risk-based approach to identify and prioritise actions, which addresses the key environmental values, uses and sensitive components summarised in Table 3-5.

This CEMP adopts provisions based on industry standard practices for minimisation and rehabilitation of environmental impacts during construction. The provisions reflect the potential for indirect and direct impacts posed by construction activities, such as unauthorised clearing, dust emissions during high winds and collisions with wildlife.

3.3.3 Roles and responsibilities

This section outlines parties associated with the Wangetti South Section and the responsibilities during the construction phase. All personnel are responsible for ensuring they comply with the EMP, their General Environmental Duty (GED) and Duty to Notify in accordance with the EP Act, as detailed in Table 3-6.

Table 3-6 Environmental roles and responsibilities

Responsible parties	Responsibilities
TDPD (as proponent)	<p>The Project Manager shall support all project personnel in the implementation of the CEMP. The Project Manager may delegate responsibilities to appropriately qualified personnel where appropriate.</p> <ul style="list-style-type: none"> • The Project Manager's responsibilities are to: • Ensure that all personnel are familiar with the CEMP and are aware of their environmental responsibilities. • Ensure that all personnel operate in accordance with the CEMP, statutory approvals and legislative requirements. • Ensure necessary guidance and advice is provided to all personnel with regard to environmental management requirements. • Ensure that all relevant licenses/permits/approvals are in place prior to any works being undertaken (if required). • An audit program be developed by the contractor in consultation with TDPD and DES and following the review of the environment approval conditions and it be undertaken at the end of the construction phase. • Where necessary, coordinate and/or assist in the response to environmental incidents through implementation of corrective actions.

Responsible parties	Responsibilities
	<ul style="list-style-type: none"> Report environmental incidents to relevant Administering Authority.
Contractor's Project Manager	Implementation of the provisions relating to construction phase of this CEMP during the construction phase including: <ul style="list-style-type: none"> Complying with the EMP, statutory approvals, legislative requirements, Australian Standards and any relevant Code of Practice and/or Industry Standard. Provide the resources and training systems and appropriate SME trainers to develop, schedule and deliver induction to all staff and contractors including site induction and any relevant site-specific training. Record training events and maintain personnel records. Provide portable toilets onsite if required and ensure that maintenance and disposal of waste is conducted by a licensed contractor as required. Ensure all vehicles arriving onsite utilise the designated entry/exit points and parking area. Ensure that all equipment is fuelled, maintained and 'fit for purpose' for the required task prior to arriving at the site. Notify the Project Manager of environmental incidents and corrective actions taken (if any). Record and maintain a database detailing environmental incidents and non-conformances including corrective actions taken.
Contractor's Trail Designer/Builder	

3.4 Training, awareness and competence

All personnel involved in the construction process shall be required to attend a compulsory induction before commencing any work on site. The environmental component of the induction shall include (but not be limited to) the following items:

- Guidance on the significance and sensitivity of environmental features along the Wangetti Trail
- Individual's and organisation's environmental obligations under relevant environmental legislation
- The potential environmental impacts of construction (where relevant)
- Controls and procedures to prevent impacts
- All staff shall be made aware of their General Environmental Duty (GED) and Duty to Notify responsibilities as per the EP Act and the implications of failing to fulfil these duties
- All staff shall be made aware of their environmental responsibilities under the CEMP in relation to implementing mitigation measures, reporting environmental incidents and complaints and implementing corrective actions
- All staff shall be made aware of their environmental responsibilities under the CEMP in relation to contaminated land, including identification of potentially contaminated land and procedures for working with potentially contaminated land
- All staff shall be given instructions on environmental emergency response procedures (i.e. fire fighting, snake bite, spill kit locations and usage).

The environmental induction training should be developed prior to construction commencing.

Site inductions and toolbox talks

All Contractor personnel including sub-contractors will either be briefed on environmental requirements for specific construction activities or on a site-specific basis, concentrating on reinforcing practical measures. It is typical for these briefings to become a part of the Toolbox agenda. Typical topics for toolbox talks include:

- Permit conditions
- Vegetation clearing demarcations
- Refuelling plant and machinery
- Precautions to prevent sediment-laden run-off entering watercourses
- Waste management (including re-use, recycling, segregation, storage and disposal)
- Noise management measures
- Precautions for protected flora and fauna
- Wildlife care.

3.4.1 Training register

A register of all environmental training delivered during the course of the construction of the Project, (including inductions and toolbox talks), will be maintained for the duration specified by any environmental approvals. The register will be maintained to record training attendance and currency of training for each staff, contractor and visitor.

4. CEMP provisions

This section of the CEMP presents the environmental factors potentially impacted by the construction activities, the proposed environmental controls in response to the impact, when the control will be implemented and who is responsible for implementing the control. It discusses the residual impact once controls measures are implemented, nominates performance indicators used for measuring the controls, a list of corrective actions and how the controls will be monitored.

The CEMP provisions represent the TDPD commitments for environmental management and demonstrate that construction activities will be appropriately managed to reduce impacts to MNES, MSES and other significant environmental values associated with the project area.

4.1 Biodiversity

Wangetti South Section supports an array of unique and threatened flora and fauna species and ecosystems, given that the majority of works are located within a sensitive environmental area being Macalister Range National Park and the Wet Tropics World Heritage Area. Minimising impacts to threatened species and ecosystems during the construction phase will be a key aspect of environmental management for Wangetti South.

This section outlines proposed environmental controls in response to protecting threatened flora and fauna species during the construction phase. Refer to Section 4.1.1 and 4.1.2. It also outlines proposed environmental controls in response to managing weeds, pests and pathogens during the construction phase. Refer to Section 4.1.3 below.

4.1.1 Fauna

The construction phase has the potential to impact on the threatened fauna species. Habitat for MNES and MSES fauna species that are known, likely or may occur in the Wangetti South Section could be potentially affected by proposed works are outlined in Table 4-1,

Appendix D describes and shows the potential fauna habitat types have been recorded within the Wangetti South survey area, Potential habitat for the southern cassowary is captured in the Cassowary Management Plan. Appendix B shows potential modelled habitat for opal cling goby (*Stiphodon semoni*) in vicinity of Wangetti Trail - South Section.

The biodiversity (flora) environmental factors potentially impacted by the construction activities, the proposed environmental controls in response to the impact, when the control will be implemented and who is responsible for implementing the control are detailed in Table 4-1.

Table 4-1 Biodiversity (fauna) environmental factors

Factor – Biodiversity (fauna)
Construction activities resulting in adverse impacts to the project area
Construction activities resulting in the removal of vegetation, including MNES and MSES
Construction activities may impact flora and fauna biodiversity in the area
Illegal collection of wildlife
Development within Ecologically Significant Areas
Injury or loss of native flora and fauna

Factor – Biodiversity (fauna)

Additional disturbance to aquatic environments associated with increased foot traffic and potential deviation from designated trail areas

Additional disturbance and disruption of flora and fauna due to increased access of area

Additional noise and vibration associated with construction/ may negatively impact flora and fauna

Light sources generated from the construction adversely impacting on wildlife.

Initial Risk with no control

Medium to low risk

Mitigation measures/controls	Timing	Applicable MNES & MSES	Responsibility
<ul style="list-style-type: none"> Signs will be erected along the project area to remind people that the collection of wildlife within National parks is prohibited. 	During pre-start At all times	MNES and MSES bird species that are known, likely or may occur: <ul style="list-style-type: none"> <i>Casuarus casuarus</i> (Southern cassowary) 	Contractor's Project Manager Site Supervisor
Site inductions and toolbox talks with the construction crew will occur prior construction to educate them about fauna species in the project area.	During pre-start	<ul style="list-style-type: none"> Migratory birds (e.g. eastern curlew, great sand plover) Non-migratory species (e.g. masked owl) 	Contractor's Project Manager Site Supervisor
Clearing of trees that provide habitat to fauna species is carried out in a way that ensures animals in the area being cleared (the clearing site) have enough time to move out of the clearing site without human intervention; The clearing must be carried out in stages.	At all times	MNES and MSES amphibian species that are known, likely or may occur in the Wangetti South Section <ul style="list-style-type: none"> <i>Litoria dayi</i> (Australian lace lid) <i>Litoria nannotis</i> (Waterfall frog) <i>Litoria nyakalensis</i> (Mountain mistfrog) 	Contractor's Project Manager Site Supervisor
Suitability qualified fauna spotter/ecologist to be available during the construction phase to provide advice. An experienced fauna spotter-catcher is to conduct an inspection of the trail alignment and public campsites ahead of vegetation disturbance and track construction clearing. The spotter must be present through all stages of clearing. Standard fauna spotter-catcher vegetation clearing protocols are to be followed, including inspection of potential habitat features prior to disturbance	During pre-start At all times	<ul style="list-style-type: none"> <i>Litoria rheocola</i> (Common mistfrog) <i>Litoria serrata</i> (Tapping green eyed frog) MNES and MSES mammal species that are known, likely or may occur in the Wangetti South Section <ul style="list-style-type: none"> <i>Dasyurus maculatus gracilis</i> (Spotted-tailed quoll) <i>Dasyurus hallucatus</i> (Northern quoll) <i>Dendrolagus lumholtzi</i> (Lumholtz's tree-kangaroo) 	Contractor's Project Manager Site Supervisor

Factor – Biodiversity (fauna)			
Speed limits are to be restricted on access roads to avoid the incidence of vehicle strike with fauna to be nominated in the Traffic Management Plan.	At all times	<ul style="list-style-type: none"> • <i>Hipposideros semoni</i> (Semon's leaf-nosed bat) • <i>Phascolarctos cinereus</i> (Koala) • <i>Pteropus conspicillatus</i> (Spectacled flying-fox) 	All personnel
A response procedure to be developed and implemented with regards to wildlife injury or mortality during construction	At all times	<ul style="list-style-type: none"> • <i>Rhinolophus robertsi</i> (Large-eared horseshoe bat) • <i>Saccolaimus saccolaimus nudicluniatus</i> (Bare-rumped sheath-tailed bat) 	Contractor's Project Manager Site Supervisor
No fires are to be permitted within the project area.	At all times	<ul style="list-style-type: none"> • <i>Xeromys myoides</i> (Water mouse) 	All personnel
Works impacting fauna to comply with the conditions in the environmental permits issued for Wangetti South Section.	At all times	<p>MNES and MSES aquatic species that are known, likely or may occur in the Wangetti South Section</p> <ul style="list-style-type: none"> • <i>Stiphodon semoni</i> (Opal cling goby) • <i>Stiphodon rutilarueus</i> (Orange cling goby) 	All personnel
Records of pest animals observed on site to be recorded and addressed in accordance with the provision in the weed, pest and disease management plan.	At all times	<ul style="list-style-type: none"> • <i>Stiphodon pelewensis</i> (Emerald cling goby) • <i>Stiphodon surrufus</i> (Birdsong cling goby) 	All personnel
Sequential clearing of vegetation to allow resident fauna the opportunity to disperse away from the immediate construction area	During vegetation clearing		
Opal cling goby to be managed during the construction phase in accordance with the following: <ul style="list-style-type: none"> • Provisions are made to minimise the risk of fish kills arising from the works e.g. through entrapment of fish upstream or between works. In the event that fish that have been trapped by the works, fish salvage activities in accordance with the Fisheries Queensland Guidelines for Fish Salvage (available at www.daf.qld.gov.au) are implemented immediately • All clearing is to comply with requirements of relevant permits and approval conditions, with specific reference to erosion and 	At all times	<i>Stiphodon semoni</i> (Opal cling goby)	All personnel

Factor – Biodiversity (fauna)			
<p>sediment control plans that clearly identify mechanisms to avoid the discharge of sediment during construction off site into local habitat.</p> <ul style="list-style-type: none"> • Transit to construction sites will be via approved and designated services tracks only and speed limits of maximum 40 km/hr on formed roads. Construction vehicles will be of the smallest practical size to access the required areas. • Signs will be erected along the project area to remind people that the collection of wildlife within National parks is prohibited. • Within opal cling goby habitat, bridges will be designed to completely span suitable habitat and limit public access to waterways. No in-stream crossings will be included. • Adherence to daytime construction times only and all machinery to be silenced to manufacturers specifications. No blasting of rock is permitted. • Limiting construction equipment operating adjacent to waterways and undertaking hand construction where possible. • Undertake a pre-clearing weed survey and pre-clearing pest survey and treatment and management and report areas of existing weed infestation. • During construction phase, all machinery and vehicle hygiene protocols to be followed at all times to prevent the introduction of weeds and pathogens. Vehicles, plant and equipment to be used for 			

Factor – Biodiversity (fauna)			
<p>the project would be required to be clean with Weed and Seed Hygiene Declaration certificates. Vehicles, plant and equipment to be inspected prior to being used to ensure they are clean.</p> <ul style="list-style-type: none"> • Weed identification to be included in the site induction training. • Trail construction will minimise disruption of forest canopy wherever possible to avoid additional sunlight that can promote weed growth on forest floor. • Techniques for installing the bridges has been outlined in the Wangetti Trail Construction Methodology Manual and include spanning the full width of the waterway so that no works occurs within the waterway and existing nature features are left in place within the waterway. • Construction of waterway crossings only to occur in the approved areas as documented on a map in a register. • Pre-works and post works reporting to be undertaken in accordance with the Accepted development requirements for operational work that is constructing or raising waterway barrier works, Department of Agriculture and Fisheries, 2018 and information reported in the contractors environment system. • For any part of the waterway bed or banks adjacent to the works that has been altered by construction activities, the site is restored and/or 			

Factor – Biodiversity (fauna)			
<p>rehabilitated so that as a minimum:</p> <ul style="list-style-type: none"> • Stability and profiles of the bed and banks are re-instated to natural stream profiles and stability within five (5) business days of the completion of the works • The waterway bed is retained with natural substrate or reconstructed with substrate comparable to the natural substrate size and consistency • Site conditions allow the rapid re-establishment of native vegetation and cover or native species are replanted to re-establish the natural plant community • All vegetation that is removed is cut into small pieces and dispersed throughout the surrounding area (where possible) with no large windrows or stockpiles being present within the project area. The temporary (construction) footprint will be left in such a manner that natural regeneration of the local vegetation community will be encouraged, including soil, and weed management as appropriate to the disturbance and existing environment. • Storage of fuels, chemicals, wastes and other potentially environmentally hazardous substances will be banded or otherwise contained areas away from waterways. • No refuelling activities should take place within 50 m of a watercourse. • Degradation will be mitigated through minimising the size of 			

Factor – Biodiversity (fauna)			
the disturbance area, implementing an Erosion Sediment and Control Plan (ESCP), constructing bridges that span the width of the waterway, constructing during dry conditions, and minimising disturbance by noise, vibration and/or artificial lighting.			
<p>Southern cassowaries to be managed during the construction phase in accordance with the provisions in the Southern Cassowary Management Plan in the EMP.</p> <p>The induction program for all construction personnel will include a component on cassowary management measures and will include methodologies for de-escalating confrontational interactions. On any construction work site, should a cassowary approach the works area then works in that particular location will cease until the cassowary has left of its own accord. All construction work should have a plan for alternate work sites and tasks in this contingency.</p> <p>Adherence to daytime construction times only and all machinery to be silenced to manufacturers specifications. No blasting of rock is permitted.</p> <p>All machinery used in construction and operation should be silenced to manufacturers specifications and maintained to that condition. Lighting and electrical supply to the eco-accommodation and emergency lighting should be reliant on alternatives to fuel generators.</p> <p>Works adjacent permanent or significant ephemeral watercourses (e.g. bridge works) will have full erosion and sediment control measures implemented</p>	At all times	<p>MNES and MSES bird species that are known likely or may occur:</p> <ul style="list-style-type: none"> Southern cassowary 	<p>Contractor's Project Manager</p> <p>Site Supervisor</p>

Factor – Biodiversity (fauna)			
<p>and maintained for the duration of the works as per the ESCP to be developed for the project</p> <p>Helicopters cannot be used for transport/construction in any moderate, high and highest priority areas. The only exception for helicopter access to these areas will be for emergency situations.</p> <p>Permanent barrier fencing, of any sort, is not be employed in any situation. Any secured areas e.g. around waste disposal locations, should use wooden palisade fencing. Temporary fencing for construction purposes (e.g. around open pits, newly laid concrete areas) will not be made of wire, nor obstruct movement across the general site area.</p> <p>Undertake a pre-clearing weed survey treatment and management and report areas of existing weed infestation. Pre-clearance on-ground weed, and pest surveys will be undertaken by an appropriately skilled person to confirm biosecurity matters within the project area and this will assist with determining the appropriate treatments to be used to treat weeds and pests.</p> <p>All machinery and vehicle hygiene protocols to be followed at all times to prevent the introduction of weeds and pathogens. Vehicles, plant and equipment to be used for the project would be required to be clean. Vehicles, plant and equipment to be inspected prior to being used to ensure they are clean.</p> <p>Disinfecting vehicles and machinery. This will be undertaken during the construction phase of the project and maintained throughout. Plant/machinery to be washed down at a commercial washdown facility or washdown</p>			

Factor – Biodiversity (fauna)			
<p>facility at QPWS works depot prior to construction and if they used again for the different areas of the project area.</p> <p>Any weed infestation shall be treated at earliest stage while small and manageable. Treatment methods to be approved by WTMA, DES, TDPD and QPW, as applicable.</p> <p>Weed material that is cleared within the project area must be disposed of appropriately. Any weed removal as part of the construction phase will be cleared and disposed of at an approved waste disposal facility. Any infestations that subsequently establish during the construction period will be treated, and post-construction weed management of rehabilitated areas will be undertaken.</p> <p>The contractor will be required to complete a pre-clearing pest survey and report documenting areas of existing electric ant infestation and identifying treatment and management requirements. Pre-clearance on-ground pest surveys will be undertaken by an appropriately skilled person. Before starting construction, discussions with WTMA, Douglas Shire Council and Cairns Regional Council to be undertaken during the pre-start trail review to discuss and agree on specific treatments regarding pest species including but not limited to yellow crazy ants, electric ants, pigs and dogs</p> <p>Feeding of cassowaries is banned in all parts of the project area and is to be a prominent message at trailhead hub locations, at camp areas. Signage will be placed in all these locations and be part of any information package given to</p>			

Factor – Biodiversity (fauna)			
hikers, campers, mountain bike riders. Food scraps to be disposed of into bins with closed/secured lids and removed from site daily to minimise vermin infestations.			
Residual risk within control in place			
Low risk Implementation of recommended mitigation measures will minimise impacts to fauna within the project area.			
Performance indicator			
No injury or death to native fauna species.			
Corrective actions			
Incident	Corrective action		
Pre-clearing inspection find	If during clearing an active breeding place is identified, works should cease immediately, and a fauna spotter/catcher be contacted.		
Fauna within clearing area	Relocation of fauna captured during clearing works to an appropriate nearby habitat area to be undertaken by a fauna spotter/catcher.		
Injured animals	To be taken immediately to a licensed wildlife carer.		
Monitoring			
Weekly inspections to assess the implementation of the above mitigation measures with records kept in a weekly environmental checklist.			
Any non-conformances are to be documented and reported to TDPD and rectified immediately			

4.1.2 Flora

The biodiversity (flora) environmental factors potentially impacted by the construction activities, the proposed environmental controls in response to the impact, when the control will be implemented and who is responsible for implementing the control are detailed in Table 4-2.

In addition, to the environmental controls outlined in Table 4-2 below, the Wangetti Trail South Section (Wangetti to Palm Cove) Matters of national environmental significance flora pre-clearance survey methodology has been prepared for Wangetti South Section. The purpose of the Matters of national environmental significance flora pre-clearance survey methodology was to outline the pre-clearance survey methodology to be adopted before starting construction works to demonstrate how protected flora species will be identified and managed as part of the project. Protected flora considered by the document are those that are listed as MNES under the EPBC Act. The document outlines the timing of the MNES flora pre-clearance survey, the personnel required to undertake the MNES flora pre-clearance survey and the methods to be adopted. Refer to Appendix F in the EMP for a copy of the document.

Table 4-2 Biodiversity (flora) environmental factors

Factor – Biodiversity (flora)			
Construction activities resulting in adverse impacts to the project area			
<p>Clearing of vegetation will be required to allow for the construction of the trail, camp sites and service tracks.</p> <p>Construction activities may impact flora biodiversity in the area</p> <p>Development within Ecologically Significant Areas</p> <p>Additional disturbance to aquatic environments associated with increased foot traffic and potential deviation from designated trail areas</p> <p>Additional disturbance and disruption of flora due to increased access of area</p> <p>Additional noise and vibration associated with construction/ may negatively impact flora and fauna</p>			
Initial risk with no control			
Low risk.			
Mitigation measures/controls	Timing	Applicable MNES and MSES	Responsibility
During vegetation clearing preference is given to trimming vegetation rather than clearing to retain overhead canopy.	During vegetation clearing	<p>MNES and MSES flora species that are known, likely or may occur in the Wangetti South Section:</p> <ul style="list-style-type: none"> • <i>Archontophoenix myolensis</i> (Myola palm) • <i>Anoectochilus yatesiae</i> (Marbled jewel orchid) • <i>Canarium acutifolium</i> • <i>Dendrobium fellowsii</i> • <i>Dendrobium mirbelianum</i> (Dark-stemmed antler orchid) • <i>Diplazium cordifolium</i> • <i>Diplazium pallidum</i> • <i>Myrmecodia beccarii</i> (Ant plant) • <i>Phaius pictus</i> • <i>Phalaenopsis amabilis subsp. rosenstromii</i> (Native moth orchid) • <i>Polyscias bellendenkerensis</i> • <i>Randia audasii</i> • <i>Rhomboda polygonoides</i> 	All personnel
<p>During the MNES flora pre-clearance survey, the botanist/ecologist will comprehensively traverse the project footprint on foot in search of MNES plants.</p> <p>Where an MNES plant species is detected, the botanist/ecologist will notify the trail builders, and an exclusion zone will be clearly demarcated using coloured flagging tape or bunting. The precise location of all observed MNES flora species will be recorded with a hand-held global positioning system (GPS) for future reference and for notification to relevant parties (e.g. Queensland Herbarium) and inclusion on site plans.</p> <p>The re-positioning of the footprint will be to an appropriate distance from the MNES plant within the</p>	During vegetation clearing		Contractor's Project Manager Site Supervisor

Factor – Biodiversity (flora)			
<p>construction allowance corridor to allow for a buffer from the impact.</p> <p>Upon completion of works in the vicinity of an exclusion zone, all marking will be removed.</p> <p>Vegetation clearing must only take place in those areas where pre-clearance surveys have been completed. During the PSTR, the scope of the environmental issue is visually identified and marked as an exclusion zone (using different coloured flagging tape or bunting). The exact alignment of the trail is flagged, ensuring an adequate buffer from the exclusion zone.</p> <p>Detailed documentation is gathered, including photographs showing the pre-existing conditions on site before any works are undertaken. This allows for post-construction photos to be taken, which will enable before/after comparison.</p>		<ul style="list-style-type: none"> • <i>Toeckia pterocarpum</i> (Orange tamarind) • <i>Vappodes lithocola</i> (Dwarf butterfly orchid) (also known as <i>Dendrobium lithocola</i>, and the Queensland Flora Census 2019 groups this species into <i>Dendrobium biggibum</i>) • <i>Vappodes phalaenopsis</i> (Cooktown orchid) (Also known as <i>Dendrobium phalaenopsis</i> and the Queensland Flora Census 2019 groups this species into <i>Dendrobium biggibum</i>) • <i>Zeuxine polygonoides</i> (Velvet jewel orchid) (also known as <i>Rhomboda polygonoides</i>) 	
Toolbox talks with the construction crew will occur prior construction to educate them about flora species in the project area.	During pre-start		Contractor's Project Manager Site Supervisor
Plant operators are to exercise due care when operating to ensure any parts of trees are not damaged from blades or booms.	At all times		All personnel
Clearing for trail, public campsite and associated structure construction is to avoid, where practical, trees greater than 10 cm diameter at breast height (dbh).	At all times		All personnel
Suitability qualified botanist/ecologist to be onsite during the construction phase to provide advice.	During vegetation clearing		Contractor's Project Manager Site Supervisor

Factor – Biodiversity (flora)			
Where unavoidable, restrict vegetation clearing to the smallest practical work area with retention of vegetation associated with riparian areas.	During vegetation clearing		Contractor's Project Manager Site Supervisor
Clearing for public campsite facilities and associated structures is to be restricted to the footprint of individual features such as camping platforms, amenities blocks, rainwater tanks and tracks or raised walkways. Clearing is only to occur where it is unavoidable.	At all times		All personnel
Manual construction methods are encouraged in preference to mechanical methods	During vegetation clearing		All personnel
No unapproved clearing to occur beyond the required limits for construction	During vegetation clearing		All personnel
Identified sensitive areas are demarcated and managed appropriately with minimal impacts	During pre-start During vegetation clearing		All personnel
No burning of vegetation is to occur on site	At all times		All personnel
No collection of firewood is to take place	At all times		All personnel
All vegetation that is cleared should not be stockpiled and should be dispersed of within the 40 m corridor to resemble the natural surrounds and to allow natural decomposition processes to take place.	At all times		Contractor's Project Manager Site Supervisor
Residual risk within control in place			
Low risk			
Implementation of recommended mitigation measures will minimise impacts to vegetation to the approved footprint.			
Performance indicator			
No vegetation clearing outside of the approved clearing footprint.			

Factor – Biodiversity (flora)	
Corrective actions	
Incident	Corrective action
Clearing extends outside of the approved area	<p>Immediately stop works and report to TDPD and Project Manager.</p> <p>Let areas naturally regenerate and implement weed control to manage any outbreaks. Areas to be monitored to check health and condition of regenerating areas.</p>
Damage to high visibility flagging and exclusion fencing	Replacement of flagging and fencing as soon as possible to reduce the potential of accidental clearing.
Monitoring	
Weekly inspections to assess the implementation of the above mitigation measures with records kept in a weekly environmental checklist.	
Any non-conformances are to be documented and reported to TDPD and rectified immediately	

4.1.3 Biosecurity

A Preliminary Weed, Pests and Disease Management Plan (WPDMP) have been developed for the construction and operational phases of Wangetti South Section. The WPDMP provides an overview of the strategy, methods and controls implemented as part of the Wangetti South Section to manage the issue of weeds, pests and diseases. Specifically, this WPDMP identifies weeds, pests and potential diseases within the Wangetti South Section and describes management strategy, to identify, avoid and, prevent/minimise and control the introduction of and spread of weeds, pests and diseases within the Wangetti South Section and to neighbouring areas.

The objectives of the WPDMP is to:

- Protect the biodiversity of the surrounding landscape of the adverse impacts from weeds
- Reduce weed infestations by integrating control methods and cost-effective management
- Manage weeds in disturbed areas and to protect rehabilitated areas
- Manage the weed species that are currently present on the site as well as off-site work areas
- Prevent introduction of new weed infestations to the Project area and adjoining areas
- Increase on-site awareness about the major weed species and manage pest species through strategic management, where possible.
- Avoid and effectively manage impacts associated with weeds, pests and diseases.

Weed and pest species and pathogens identified onsite are to be managed in accordance with the WPDMP which can be found in Appendix C of the Wangetti South EMP.

4.1 Soil and land management

Soil and land management measures will be a key aspect of environmental management for Wangetti South given the terrain, climate and that the majority of works are located within a

sensitive environmental area being Macalister Range National Park and the Wet Tropics World Heritage Area.

This section outlines proposed environmental controls in response to managing soils and erosion during the construction phase. It also outlines proposed environmental controls in response to managing chemicals and fuels related to plant, vehicle and equipment used to complete works during the construction phase. Refer to Section 4.1.1 and Section 4.1.2 below.

4.1.1 Erosion and sediment control

The Department of State Development, Tourism and Innovation - Tourism Development Project Division - Wangetti Trail South Section (Wangetti to Palm Cove) Concept Erosion and Sediment Control Plan (CESCP) has been prepared for Wangetti South Section and outlines the control measures to be adopted and considered the Contractor. Refer to Appendix A in the EMP for a copy of the CESCP.

4.1.2 Chemical and fuel management

Chemicals and fuel used on site will largely be related to the equipment used to complete works and the chemicals used in the construction.

Equipment used for on-site works during the construction phase include:

- Mini Excavators
- Bobcats
- Power carriers
- Chainsaws
- Compactors
- Generators
- General construction tools and equipment (drills, saws, sanders, etc.).

Some of this equipment will require petrol to be stored on site. Equipment will be refuelled using petrol storage containers on site.

All chemicals will be stored in a designated bunded chemical storage compound located at the project site office. Chemicals will be stored according to the storage and handling requirements listed in the relevant safety data sheet and comply with AS 1940 and AS 3833, including minor storages in accordance with Section 2 of the Standards, with incompatible chemicals not stored together.

Spill kits and chemical containment measures will be maintained at the project site compound, as well as in the site vehicles when required.

The chemical and fuel management environmental factors potentially impacted by the construction activities, the proposed environmental controls in response to the impact, when the control will be implemented and who is responsible for implementing the control are detailed in Table 4-3 and Table 4-5.

Table 4-3 Chemical and fuel management environmental factors

Factor – Chemical and fuel management
Construction activities resulting in adverse impacts to the project area

Factor – Chemical and fuel management

Chemicals and fuel used on-site for project works will largely be related to the equipment used to complete works and the chemicals used in the construction.

Equipment used for on-site works during the construction phase include:

- Mini Excavators
- Bobcats
- Power carriers
- Chainsaws
- Compactors
- Generators
- General construction tools and equipment (drills, saws, sanders, etc.).

Initial risk with no control

Medium

Mitigation measures/controls	Timing	Applicable MNES and MSES	Responsibility
All chemicals will be stored in a designated bunded chemical storage compound located at the project site office.	At all times	MNES and MSES amphibian species that are known, likely or may occur in the Wangetti South Section	All personnel
Chemicals will be stored according to the storage and handling requirements listed in the relevant safety data sheet and comply with AS 1940 and AS 3833, including minor storages in accordance with Section 2 of the Standards, with incompatible chemicals not stored together.	At all times	<ul style="list-style-type: none"> • <i>Litoria dayi</i> (Australian lace lid) • <i>Litoria nannotis</i> (Waterfall frog) • <i>Litoria nyakalensis</i> (Mountain mistfrog) • <i>Litoria rheocola</i> (Common mistfrog) • <i>Litoria serrata</i> (Tapping green eyed frog) 	All personnel
Refuelling and transfer operations must be done in areas with adequate containment systems, away from watercourses. Safe handling techniques will be employed during refuelling, such as using pumps to prevent spillage.	At all times	MNES and MSES aquatic species that are known, likely or may occur in the Wangetti South Section	All personnel
All plant and equipment must be maintained and operated in their proper and effective condition and no routine maintenance and servicing to be undertaken on site.	At all times	<ul style="list-style-type: none"> • <i>Stiphodon semoni</i> (Opal cling goby) • <i>Stiphodon rutilarueus</i> (Orange cling goby) 	All personnel
Contaminants must not be directly or indirectly released to any waters or land.	At all times	<ul style="list-style-type: none"> • <i>Stiphodon pelewensis</i> (Emerald cling goby) 	All personnel
Spill kits and chemical containment measures will be maintained at the project site compound, as well as in the site vehicles when required.	At all times	<ul style="list-style-type: none"> • <i>Stiphodon surrufus</i> (Birdsong cling goby) 	All personnel

Factor – Chemical and fuel management			
Spills are to be isolated, stopped and contained and will be cleaned up utilising onsite spill kits. Waste to be placed in a sealed container, suitable to hold such materials and waste to be consigned to a contractor licensed to receive such wastes for disposal.	At all times	Wet Tropics World Heritage Area National Heritage Site Waterways protected under the <i>Fisheries Act 1994</i> and <i>Water Act 2000</i>	All personnel
In an instance of a spill, irrespective of the quantity, a report detailing the incident, investigations, corrective actions and monitoring requirements will be prepared.	At all times	Protected Areas - estates protected under the NC Act Coastal Management District	Contractor's Project Manager Site Supervisor
Residual risk within control in place			
Low risk			
Implementation of recommended mitigation measures will minimise the potential for accidental spills, with any spills appropriately captured and managed.			
Performance indicator			
No contamination of water quality, soil, and vegetation as a result of the storage and handling of chemicals and fuels			
Appropriate storage of fuels and chemicals			
Adequately maintained spill response kits and procedures			
Corrective actions			
Incident	Corrective action		
If a spill is identified	Undertake corrective actions outlined in the spill containment procedure.		
Containers damaged or bunded areas in poor condition	Fix bunded areas to be in working order.		
Appropriate equipment in spill kits	If spill kits are lacking equipment, equipment is to be replaced as soon as possible.		
Monitoring			
Weekly inspections to assess the implementation of the above mitigation measures with records kept in a weekly environmental checklist.			
Any non-conformances are to be documented and reported to TDPD and rectified immediately			

Table 4-4 Hazardous materials environmental factors

Factor – Hazardous materials			
Construction activities resulting in adverse impacts to the project area			
Hazardous materials used on-site for project works will largely be related to the equipment and materials used to complete works.			
Initial risk with no control			
Medium risk			
Mitigation measures/controls	Timing	Applicable MNES and MSES	Responsibility
Material Safety Data Sheets (MSDS) are to be available to all personnel for all chemicals that are stored on site.	At all times	MNES and MSES amphibian species that are known, likely or may occur in the Wangetti South Section	Contractor's Project Manager Site Supervisor
Hazardous waste (i.e. paint, thinners, cleaning materials, petrochemicals and other toxic chemicals) must be stored at a dedicated hazardous waste container/containment area. The hazardous waste must be disposed of as a registered waste handling facility for toxic/hazardous materials/chemicals	At all times	<ul style="list-style-type: none"> • <i>Litoria dayi</i> (Australian lace lid) • <i>Litoria nannotis</i> (Waterfall frog) • <i>Litoria nyakalensis</i> (Mountain mistfrog) • <i>Litoria rheocola</i> (Common mistfrog) • <i>Litoria serrata</i> (Tapping green eyed frog) 	Contractor's Project Manager Site Supervisor
Hazardous materials should be stored in a contained, stable and safe environment with relevant labels placed on storage containers and lids firmly applied to prevent spillage	At all times	MNES and MSES aquatic species that are known, likely or may occur in the Wangetti South Section	All personnel
Special care must be taken to avoid the spillage of hazardous materials/chemicals onto the ground or into water resources	At all times	<ul style="list-style-type: none"> • <i>Stiphodon semoni</i> (Opal cling goby) • <i>Stiphodon rutilarueus</i> (Orange cling goby) • <i>Stiphodon pelewensis</i> (Emerald cling goby) • <i>Stiphodon surrufus</i> (Birdsong cling goby) 	All personnel
A mixing of concrete to take place on an impermeable surface	At all times		All personnel
No wastewater from concrete mixing is to be discharged to the receiving environment.	At all times	Wet Tropics World Heritage Area National Heritage Site Waterways protected under the <i>Fisheries Act</i>	All personnel

Factor – Hazardous materials			
		1994 and Water Act 2000 Protected Areas - estates protected under the NC Act Coastal Management District	
Residual risk within control in place			
Low risk Implementation of recommended mitigation measures will minimise the potential for accidental spills, with any spills appropriately captured and managed.			
Performance indicator			
No contamination of water quality, soil, and vegetation, as a result of the storage and handling of hazardous materials.			
Appropriate storage of hazardous materials.			
Adequately maintained spill response kits and procedures			
Corrective actions			
Incident	Corrective action		
If a spill is identified	Undertake corrective actions outlined in the spill containment procedure.		
Containers damaged or banded areas in poor condition	Fix banded areas to be in working order.		
Appropriate equipment in spill kits	If spill kits are lacking equipment, equipment is to be replaced as soon as possible.		
Monitoring			
Weekly inspections to assess the implementation of the above mitigation measures with records kept in a weekly environmental checklist.			
Any non-conformances are to be documented and reported to TDPD and rectified immediately			

The fuels and oils environmental factors potentially impacted by the construction activities, the proposed environmental controls in response to the impact, when the control will be implemented and who is responsible for implementing the control are detailed in Table 4-5.

Table 4-5 Fuels and oils environmental factors

Factor – Fuels and oils
Construction activities resulting in adverse impacts to the project area
Fuels and oils used on-site for project works will largely be related to the equipment and materials used to complete works.

Factor – Fuels and oils			
Initial risk with no control			
Medium risk			
Mitigation measures/controls	Timing	Applicable MNES and MSES	Responsibility
Fuel shall be stored in appropriate storage containers or bunded areas away from waterways.	At all times	MNES and MSES amphibian species that are known, likely or may occur in the Wangetti South Section <ul style="list-style-type: none"> <i>Litoria dayi</i> (Australian lace lid) <i>Litoria nannotis</i> (Waterfall frog) <i>Litoria nyakalensis</i> (Mountain mistfrog) <i>Litoria rheocola</i> (Common mistfrog) <i>Litoria serrata</i> (Tapping green eyed frog) 	All personnel
Refuelling of machinery shall conform with the following: <ul style="list-style-type: none"> i. Occur away from waterways unless for tracked machinery and contingency plan management measures are available in the immediate area; ii. Fuelling activity to be supervised at all times; and iii. Hoses to be fitted with a stop valve at the nozzle end. For smaller equipment that may require more regular re-fuelling (e.g. chainsaws, a limit of 5 litres of extra fuel in an appropriate container can be kept along the trail). Spill kits will also be available on site for all personnel to use. All personnel will be trained in spill response procedures and in the use of spill kits.	At all times		All personnel
No refuelling activities to occur within 50 m of a watercourse.	At all times	MNES and MSES aquatic species that are known, likely or may occur in the Wangetti South Section <ul style="list-style-type: none"> <i>Stiphodon semoni</i> (Opal cling goby) <i>Stiphodon rutilarueus</i> (Orange cling goby) <i>Stiphodon pelewensis</i> (Emerald cling goby) <i>Stiphodon surrufus</i> (Birdsong cling goby) 	All personnel
Site supervisor should be supplied with the contact number for the local fire department unit.	At all times	MNES and MSES flora species that are known, likely or may occur in the Wangetti South Section:	All personnel
All chemical storage and handling will be in accordance with material SDS, with appropriate firefighting equipment (e.g. specific fire extinguisher types) identified in the SDS to be maintained on-site.	At all times	<ul style="list-style-type: none"> <i>Archontophoenix myolensis</i> (Myola palm) <i>Anoectochilus yatesiae</i> (Marbled jewel orchid) <i>Canarium acutifolium</i> <i>Dendrobium fellowsii</i> <i>Dendrobium mirbelianum</i> (Dark-stemmed antler orchid) 	Contractor's Project Manager Site Supervisor
Adequate fire suppression equipment should be on site.	At all times		Contractor's Project Manager Site Supervisor

Factor – Fuels and oils			
Machinery will be used and serviced as per manufacturer's instructions.	At all times	<ul style="list-style-type: none"> • <i>Diplazium cordifolium</i> • <i>Diplazium pallidum</i> • <i>Myrmecodia beccarii</i> (Ant plant) 	All personnel
No burning of any substances, including wooden debris or products, will be undertaken as part of this project.	At all times	<ul style="list-style-type: none"> • <i>Phaius pictus</i> • <i>Phalaenopsis amabilis</i> subsp. <i>rosenstromii</i> (Native moth orchid) • <i>Polyscias bellendenkerensis</i> • <i>Randia audasii</i> • <i>Rhomboda polygonoides</i> • <i>Toechima pterocarpum</i> (Orange tamarind) • <i>Vappodes lithocola</i> (Dwarf butterfly orchid) (also known as <i>Dendrobium lithocola</i>, and the Queensland Flora Census 2019 groups this species into <i>Dendrobium biggibum</i>) • <i>Vappodes phalaenopsis</i> (Cooktown orchid) (Also known as <i>Dendrobium phalaenopsis</i> and the Queensland Flora Census 2019 groups this species into <i>Dendrobium biggibum</i>) • <i>Zeuxine polygonoides</i> (Velvet jewel orchid) (also known as <i>Rhomboda polygonoides</i>) <p>Wet Tropics World Heritage Area National Heritage Site</p> <p>Waterways protected under the <i>Fisheries Act 1994</i> and <i>Water Act 2000</i></p> <p>Protected Areas - estates protected under the NC Act</p> <p>Coastal Management District</p>	All personnel

Factor – Fuels and oils	
Residual risk within control in place	
Low risk	
Implementation of recommended mitigation measures will minimise the potential for accidental spills, with any spills appropriately captured and managed.	
Performance indicator	
No contamination of water quality, soil, and vegetation as a result of the storage and handling of hazardous materials.	
Appropriate storage of hazardous materials.	
Adequately maintained spill response kits and procedures	
Corrective actions	
Incident	Corrective action
If a spill is identified	Undertake corrective actions outlined in the spill containment procedure. Where spills occur compromised soil/vegetation should be treated as hazardous waste and disposed of accordingly.
Containers damaged or banded areas in poor condition	Fix banded areas to be in working order.
Appropriate equipment in spill kits	If spill kits are lacking equipment, equipment is to be replaced as soon as possible.
Monitoring	
Weekly inspections to assess the implementation of the above mitigation measures with records kept in a weekly environmental checklist.	
Any non-conformances are to be documented and reported to TDPD and rectified immediately	

4.2 Cultural heritage

Sections of the Wangetti South Section are considered to have high cultural heritage values. Environmental management for the project should adhere to the measures in the Aboriginal Cultural Heritage Act 2003 Duty of Care Guidelines. The project would constitute a Category 5 development and should not proceed without cultural heritage assessment.

The Wangetti South Section is also located within the Wet Tropics World Heritage Area, which is recognised as a national heritage place for both natural and Indigenous values.

The cultural heritage environmental factors potentially impacted by the construction activities, the proposed environmental controls in response to the impact, when the control will be implemented and who is responsible for implementing the control are detailed in Table 4-6.

Table 4-6 Cultural heritage environmental factors

Factor – Cultural heritage			
Construction activities resulting in adverse impacts to the project area			
<p>Clearing of vegetation will be required to allow for the construction of the trail, camp sites and access tracks which may impact on cultural heritage sites.</p> <p>Damage to sensitive environmental areas within Wet Tropics World Heritage Area as a result of vehicles not using designated service tracks and/or members of the public using vehicles illegally within the project area.</p>			
Initial risk with no control			
Medium risk			
Mitigation measures/controls	Timing	Applicable MNES and MSES	Responsibility
All works are to be undertaken in accordance with the <i>Queensland Heritage Act 1992</i> , ACH Act and the Duty of Care Guidelines unless otherwise agreed in a CHMP.	At all times	Wet Tropics World Heritage Area National Heritage Site Waterways protected under the <i>Fisheries Act 1994</i> and <i>Water Act 2000</i>	All personnel
All site personnel shall attend environmental training as part of the site induction process prior to entering the work site. As part of this training, a cultural heritage induction should be delivered by the nominated cultural heritage officer to all site personnel before entering the site, with the notification procedure in the event of an unexpected find to be clearly indicated during the induction	At all times	Protected Areas - estates protected under the NC Act Coastal Management District	All personnel
<p>In the event of a find the following actions are to be undertaken:</p> <ol style="list-style-type: none"> 1. FIND: A potential Cultural Heritage item or object is found. 2. STOP: STOP WORK IMMEDIATELY and install an exclusion zone around the area. 3. NOTIFY: Notify a responsible person (e.g. Site Supervisor, Project Manager). 4. MANAGE: Report the discovery to the project manager for advice on management. 	At all times		All personnel

Factor – Cultural heritage			
<p>Cease operations and follow cultural heritage reporting procedure. Report to TDPD and Project Manager.</p> <p>Protocols to follow as outlined in the Cultural Heritage Agreement.</p> <p>Let areas naturally regenerate and implement weed control to manage any outbreaks. Areas to be monitored to check health and condition of regenerating areas.</p> <p>Construction Manager should be notified immediately who will then notify the Archaeologist appointed to the project</p> <p>Archaeologist is to provide management recommendations to the Construction Manager and will liaise (if necessary) with the Department of Environment and Science to ensure compliance with the Queensland Heritage Act 1992 and the ACH Act.</p>			
<p>Within the WTWHA minimise clearing to designed and demarcated areas; weed and pest management to avoid disturbance and degradation of flora and fauna environmental values.</p>	Prior to construction		<p>Contractor's Project Manager</p> <p>Site Supervisor</p>
<p>Prior to conducting construction works within the WTWHA the contractor conducting the works has been informed of the requirements of the Wet Tropics Permit No: WTMA20001a</p> <p>The works supervisor has obtained a briefing describing the natural values of the subject site from the relevant QPWS Ranger or a Wet Tropics Management Authority officer.</p> <p>The works supervisor must also be given direction by the relevant QPWS Ranger or a Wet Tropics Management Authority officer as to the nature and extent of the clearing or earthworks to be undertaken.</p>	Prior to construction		<p>Contractor's Project Manager</p> <p>Site Supervisor</p>
Residual risk within control in place			
Low risk			

Factor – Cultural heritage	
Implementation of recommended mitigation measures will minimise the potential for accidental spills, with any spills appropriately captured and managed.	
Performance indicator	
No damage to known or unknown to cultural heritage sites.	
Corrective actions	
Incident	Corrective action
Construction works extend outside of approved disturbance footprint and uncover of cultural heritage artefact.	<p>Cease operations and follow cultural heritage reporting procedure. Report to TDPD and Project Manager.</p> <p>Protocols to follow as outlined in the Cultural Heritage Agreement.</p> <p>Let areas naturally regenerate and implement weed control to manage any outbreaks. Areas to be monitored to check health and condition of regenerating areas.</p>
Monitoring	
Weekly inspections to assess the implementation of the above mitigation measures with records kept in a weekly environmental checklist.	
Any non-conformances are to be documented and reported to TDPD and rectified immediately	

4.3 Water management

Wangetti South Section traverses several watercourses protected under the *Water Act 2000* and *Fisheries Act 1994*. The shared use trail will require a number of waterway crossings to be installed over waterways to allow hikers and mountain bikers to safely cross the waterways.

The exact and type of structure proposed as the waterway crossings will be determined by the trail builder and will comprise of the following options: rock armouring, boulder crossings and low-level bridge (minor water crossing).

Habitat for the following MNES and MSES fauna species that are known, likely or may occur in the Wangetti South Section could be potentially affected by proposed works within and adjoining waterways and they include:

- *Casuarius casuarius* (Southern cassowary)
- *Litoria dayi* (Australian lace lid)
- *Litoria nannotis* (Waterfall frog)
- *Litoria nyakalensis* (Mountain mistfrog)
- *Litoria rheocola* (Common mistfrog)
- *Litoria serrata* (Tapping green eyed frog)
- *Xeromys myoides* (Water mouse)
- *Stiphodon semoni* (Opal cling goby)

- *Stiphodon rutilarueus* (Orange cling goby)
- *Stiphodon pelewensis* (Emerald cling goby)
- *Stiphodon surrufus* (Birdsong cling goby).

Appendix D describes and shows the potential fauna habitat types have been recorded within the Wangetti South survey area, including potential breeding and calling habitat for amphibians, potential feeding and breeding habitat for aquatic species and foraging and breeding habitat for fish species.

Potential habitat for the southern cassowary is captured in the Cassowary Management Plan.

Appendix B shows potential modelled habitat for opal cling goby (*Stiphodon semoni*) in vicinity of Wangetti Trail - South Section.

The water resources potentially impacted by the construction activities, the proposed environmental controls in response to the impact, when the control will be implemented and who is responsible for implementing the control are detailed in Table 4-7.

Table 4-7 Water management environmental factors

Factor – Water management			
Construction activities resulting in adverse impacts to the project area			
A number of low-level bridges and crossings and gully crossing style bridges for minor waterway crossings will be used to minimise the loss of aquatic habitats. Instream crossings, including boulder rock crossings will be designed during the detailed design to maintain natural characteristics of the waterway and not impact flows or fish passage			
Initial risk with no control			
Medium risk			
Mitigation measures/controls	Timing	Applicable MNES and MSES	Responsibility
All construction phase related aspects of the ESCP (refer to the EMP) are to be implemented	At all times	MNES and MSES species that are known, likely or may occur in the Wangetti South Section and could be potentially affected by proposed works within and adjoining waterways and they include: <ul style="list-style-type: none"> • <i>Casuarus casuarus</i> (Southern cassowary) • <i>Litoria dayi</i> (Australian lace lid) • <i>Litoria nannotis</i> (Waterfall frog) • <i>Litoria nyakalensis</i> (Mountain mistfrog) • <i>Litoria rheocola</i> (Common mistfrog) 	All personnel
Construction of waterway crossings only to occur in the approved areas as documented on a map in a register.	At all times		All personnel
No refuelling activities should take place within 50 m of a watercourse.	At all times		All personnel
Degradation will be mitigated through minimising the size of the disturbance area, implementing an Erosion Sediment and Control Plan (ESCP), constructing bridges that span the width of the waterway, constructing during dry	At all times		All personnel

Factor – Water management			
conditions, and minimising disturbance by noise, vibration and/or artificial lighting.		<ul style="list-style-type: none"> • <i>Litoria serrata</i> (Tapping green eyed frog) • <i>Xeromys myoides</i> (Water mouse) • <i>Stiphodon semoni</i> (Opal cling goby) • <i>Stiphodon rutilarueus</i> (Orange cling goby) • <i>Stiphodon pelewensis</i> (Emerald cling goby) • <i>Stiphodon surrufus</i> (Birdsong cling goby). 	
Provisions are made to minimise the risk of fish kills arising from the works e.g. through entrapment of fish upstream or between works. In the event that fish that have been trapped by the works, fish salvage activities in accordance with the Fisheries Queensland Guidelines for Fish Salvage (available at www.daf.qld.gov.au) are implemented immediately	During works within waterways.	Wet Tropics World Heritage Area National Heritage Site	All personnel
Fish kills must be reported in accordance with the emergency procedure.	During works within waterways.	Waterways protected under the <i>Fisheries Act 1994</i> and <i>Water Act 2000</i>	All personnel
Limit the use of machinery within waterways. Use machinery no greater than the capacity required for the purpose.	During works within waterways.	Protected Areas - estates protected under the NC Act Coastal Management District	All personnel
Excess spoil, if generated, shall be disposed of in a suitable disposal area outside of the WTWHA, unless prior approval has been sought from WTMA.	At all times		All personnel
Pre-works and post works reporting to be undertaken in accordance with the Accepted development requirements for operational work that is constructing or raising waterway barrier works, Department of Agriculture and Fisheries, 2018 and information reported in the contractors environment system.	At all times		Contractor's Project Manager Site Supervisor
No major alterations to waterway bed/banks. For any part of the waterway bed or banks adjacent to the works that has been altered by construction activities. The site is restored and/or rehabilitated so that as a minimum:	During works within waterways.		All personnel

Factor – Water management			
<ul style="list-style-type: none"> Stability and profiles of the bed and banks are re-instated to natural stream profiles and stability within five (5) business days of the completion of the works The waterway bed is retained with natural substrate or reconstructed with substrate comparable to the natural substrate size and consistency Site conditions allow the rapid re-establishment of native vegetation and cover or native species are replanted to re-establish the natural plant community 			
Works within/adjacent to waterways to comply with the conditions in the environmental permits issued for Wangetti South Section.	At all times		All personnel
Within opal cling goby habitat, bridges will be designed to completely span suitable habitat and limit public access to waterways. No in-stream crossings will be included.	At all times	<i>Stiphodon semoni</i> (Opal cling goby)	Contractor's Project Manager Site Supervisor
Residual risk within control in place			
<p>Low risk</p> <p>Implementation of recommended mitigation measures will minimise the potential for impacts to waterways.</p>			
Performance indicator			
No residual impacts to waterways.			
Corrective actions			
Incident	Corrective action		
Impacts to waterways outside of approved areas.	Reinstate any changes to the waterway.		

Factor – Water management
Monitoring
Weekly inspections to assess the implementation of the above mitigation measures with records kept in a weekly environmental checklist.
Weather conditions to be monitored and temporary controls established during extreme weather events.
Any non-conformances are to be documented and reported to TDPD and rectified immediately.

4.4 Waste management

TDPD is committed to undertaking the project sustainability, and to minimise waste production during the project.

While the production of waste during construction is expected to be minimal, waste will be disposed of according to the waste and resource management hierarchy:

2. AVOID unnecessary resource consumption
3. REDUCE waste generation and disposal
4. RE-USE waste resources without further manufacturing
5. RECYCLE waste resources to make the same or different products
6. RECOVER waste resources, including the recovery of energy
7. TREAT waste before disposal, including reducing the hazardous nature of waste
8. DISPOSE of waste only if there is no viable alternative.

An indication of the types and an estimate of the volume of waste produced during the project is provided below:

- Waste soil material – no soil to be removed from site unless contaminated
- Miscellaneous waste – worker's personal waste, to be removed and disposed daily.

The following waste management controls detailed in Table 4-8 are proposed to meet the requirements of the *Waste Reduction and Recycling Act 2011* (Qld) and associated regulations.

Table 4-8 Waste management environmental factors

Factor – Waste management
Construction activities resulting in adverse impacts to the project area
Clearing of vegetation and cut and fill activities will be required to allow for the construction of the trail, camp sites and access tracks resulting in vegetation waste and excess spoil.
Construction camps will produce general waste.
Inappropriate waste management by construction personnel.
Initial risk with no control
Low risk

Factor – Waste management			
Mitigation measures/controls	Timing	Applicable MNES and MSES	Responsibility
All project personnel will be instructed in applicable waste management practices as a part of the environmental induction process.	At all times	MNES and MSES bird species that are known, likely or may occur: <ul style="list-style-type: none"> <i>Casuarus casuarus</i> (Southern cassowary) 	Contractor's Project Manager Site Supervisor
All vegetation waste to be cut into practical sizes and placed at edge of clearings to naturally decompose.	At all times	<ul style="list-style-type: none"> Migratory birds (e.g. eastern curlew, great sand plover) Non-migratory species (e.g. masked owl) 	Contractor's Project Manager Site Supervisor
Material from any restricted invasive plant species will be cleared and disposed of at an approved waste disposal facility.		MNES and MSES amphibian species that are known, likely or may occur in the Wangetti South Section	
All general refuse and food wastes to be collected and transported to a local government approved disposal site and suitable bins will be provided for waste streams (general and recyclable) to reduce proclivity of waste to attract fauna and pest species.	At all times	<ul style="list-style-type: none"> <i>Litoria dayi</i> (Australian lace lid) <i>Litoria nannotis</i> (Waterfall frog) <i>Litoria nyakalensis</i> (Mountain mistfrog) <i>Litoria rheocola</i> (Common mistfrog) <i>Litoria serrata</i> (Tapping green eyed frog) 	All personnel
Adopt the waste management hierarchy (i.e. avoid, re-use, recycle, energy recover and disposal), before materials are considered waste for disposal in landfill, determine if they can first be recycled, reused or recovered.	At all times	MNES and MSES mammal species that are known, likely or may occur in the Wangetti South Section <ul style="list-style-type: none"> <i>Dasyurus maculatus gracilis</i> (Spotted-tailed quoll) 	Contractor's Project Manager Site Supervisor
General housekeeping shall be undertaken on an ongoing basis to keep the site clean, and housekeeping duties monitored to ensure that waste is contained appropriately and site is clean at all times	At all times	<ul style="list-style-type: none"> <i>Dasyurus hallucatus</i> (Northern quoll) <i>Dendrolagus lumholtzi</i> (Lumholtz's tree-kangaroo) <i>Hipposideros semoni</i> (Semon's leaf-nosed bat) 	All personnel
No on-site burial or burning of waste material.	At all times	<ul style="list-style-type: none"> <i>Phascolarctos cinereus</i> (Koala) 	All personnel
Excavated soils will be reused on site where possible.	At all times	<ul style="list-style-type: none"> <i>Pteropus conspicillatus</i> (Spectacled flying-fox) <i>Rhinolophus robertsi</i> (Large-eared horseshoe bat) 	All personnel
Any wastewater shall be collected and appropriately disposed of offsite. Disposal of water onsite is	At all times	<ul style="list-style-type: none"> <i>Saccolaimus saccolaimus</i> 	All personnel

Factor – Waste management			
only to be undertaken if analysis has proven the water suitable.		<i>nudicluniatus</i> (Bare-rumped sheath-tailed bat)	
<p>Provide portable toilets onsite if required during the construction phase and ensure that maintenance and disposal of waste is conducted by a licensed contractor as required. The setup of temporary amenities to be located in disturbed areas and outside of areas of high ecological significance.</p> <p>Where trail builders are required to camp overnight along the trail due to the remoteness of the area they will be required to carry all rubbish out; bury human waste at least 100 m from streams and at least 15 cm deep, or carry it out.</p>	At all times	<ul style="list-style-type: none"> • <i>Xeromys myoides</i> (Water mouse) <p>MNES and MSES aquatic species that are known, likely or may occur in the Wangetti South Section</p> <ul style="list-style-type: none"> • <i>Stiphodon semoni</i> (Opal cling goby) • <i>Stiphodon rutilarueus</i> (Orange cling goby) • <i>Stiphodon pelewensis</i> (Emerald cling goby) • <i>Stiphodon surrufus</i> (Birdsong cling goby) <p>MNES and MSES flora species that are known, likely or may occur in the Wangetti South Section:</p> <ul style="list-style-type: none"> • <i>Archontophoenix myolensis</i> (Myola palm) • <i>Anoectochilus yatesiae</i> (Marbled jewel orchid) • <i>Canarium acutifolium</i> • <i>Dendrobium fellowsii</i> • <i>Dendrobium mirbelianum</i> (Dark-stemmed antler orchid) • <i>Diplazium cordifolium</i> • <i>Diplazium pallidum</i> • <i>Myrmecodia beccarii</i> (Ant plant) • <i>Phaius pictus</i> • <i>Phalaenopsis amabilis</i> subsp. <i>rosenstromii</i> (Native moth orchid) • <i>Polyscias bellendenkerensis</i> • <i>Randia audasii</i> • <i>Rhomboda polygonoides</i> • <i>Toechima pterocarpum</i> (Orange tamarind) • <i>Vappodes lithocola</i> (Dwarf butterfly orchid) (also known as <i>Dendrobium lithocola</i>, and the Queensland Flora 	Contractor's Project Manager Site Supervisor

Factor – Waste management			
		<p>Census 2019 groups this species into <i>Dendrobium biggibum</i>)</p> <ul style="list-style-type: none"> • <i>Vappodes phalaenopsis</i> (Cooktown orchid) (Also known as <i>Dendrobium phalaenopsis</i> and the Queensland Flora Census 2019 groups this species into <i>Dendrobium bigibbum</i>) • <i>Zeuxine polygonoides</i> (Velvet jewel orchid) (also known as <i>Rhomboda polygonoides</i>)) <p>Protected Areas - estates protected under the NC Act</p> <p>Wet Tropics World Heritage Area National Heritage Site</p> <p>Waterways protected under the <i>Fisheries Act 1994</i> and <i>Water Act 2000</i></p>	
Residual risk within control in place			
Low risk			
Implementation of recommended mitigation measures will minimise the potential for incorrect waste management.			
Performance indicator			
No land or water contamination as a result of inappropriate waste management.			
Wastes minimised and opportunities for reuse and recycling identified and implemented			
All waste disposal to be removed from site.			
Corrective actions			
Incident	Corrective action		
Improper waste management	<p>Inspect waste storage areas.</p> <p>If area is untidy or unkempt, undertake measures to rectify.</p>		

Factor – Waste management
Monitoring
Weekly inspections to assess the implementation of the above mitigation measures with records kept in a weekly environmental checklist.
Any non-conformances are to be documented and reported to TDPD and rectified immediately

4.5 Public amenity and health

Sensitive receptors (e.g. existing residences, places of work, schools, agricultural or ecologically significant areas/species that could be impacted) within and surrounding the Project that may be potentially affected by the proposed construction works associated with Wangetti South Section include:

- Wet Tropics World Heritage Area and National Heritage area including wildlife
- National Parks
- Residential communities within Palm Cove and Wangetti.

Wangetti South Section is predominantly within an area which has been subjected to very limited disturbance and is set back from urbanised areas. Construction related activities have the potential to adversely impact on the amenity of the area.

Wangetti South Section is also characterised by steep terrain, is home to dangerous animals and plants and there is the potential for extreme weather events to occur in the area. All of these matters could have adverse impacts on construction personnel working within Wangetti South Section during the construction phase.

This section outlines proposed environmental controls in response to protecting the amenity of the area, managing bushfire and extreme weather events, managing dangerous animals and plants and managing traffic during the construction phase. Refer to Table 4-9, Section 4.5.1 to Section 4.5.5.

Table 4-9 Public amenity environmental factors

Factor – Public amenity			
Construction activities resulting in adverse impacts to the project area			
Construction activities may be visible to varying degrees by people living, working, and travelling through the surrounding areas.			
Initial risk with no control			
Low risk			
Mitigation measures/controls	Timing	Applicable MNES and MSES	Responsibility
Construction equipment, stockpiles and other visible elements to be located away from views to or from sensitive visual receptors.	At all times	Wet Tropics World and National Heritage Area Waterways protected under the <i>Fisheries Act</i>	All personnel

Factor – Public amenity			
Construction work area to be marked out and fenced to restrict construction crew to the works area.	At all times	1994 and <i>Water Act 2000</i> Coastal management districts protected under the <i>Coastal Protection and Management Act 1995</i> . Protected Areas - estates protected under the NC Act	All personnel
Should equipment or stockpiles be located in visually prominent locations for any reasonable period of time, incorporate screening measures and practices to keep areas tidy.	At all times		All personnel
Provide notification to surrounding properties of upcoming works.	At all times		All personnel
Residual risk within control in place			
Low risk			
Implementation of recommended mitigation measures will minimise the potential for incorrect waste management.			
Performance indicator			
No complaints from the public.			
Corrective actions			
Incident	Corrective action		
Visual amenity complaint	Inspect the area for where the complaint was made to ensure all equipment and stockpiling is adequately stored. If area is untidy or unkempt, undertake measures to rectify.		
Monitoring			
Weekly inspections to assess the implementation of the above mitigation measures with records kept in a weekly environmental checklist.			
Any non-conformances are to be documented and reported to TDPD and rectified immediately			

4.5.1 Bushfire

Bushfires pose a significant risk to human safety, for both the construction personnel working on the trails but also other local residents and workers. Bushfires also pose a significant threat to threatened flora and fauna. The main hazards related to bushfire are the risk of works on-site being an ignition source for a bushfire and the risk of a bushfire in the region impacting on site works.

With this in mind, the following practices detailed in Table 4-10 have been identified to reduce the likelihood of site works contributing to a bushfire, as well as measures to control a fire should site works result in a fire being ignited.

Table 4-10 Bushfire environmental factors

Factor – Bushfire			
Construction activities resulting in adverse impacts to the project area			
<p>The site is located within the very high potential intensity and bushfire hazard buffer of the bushfire hazard overlay. During construction, construction activities have the potential to increase bushfire hazard. The use of construction machinery within the project area have the potential to ignite fires and include, but not limited to mini excavators; chainsaws, compactors, general construction tools and equipment such as drills, saws, sanders, etc.</p> <p>Bushfires occurring within the project area impacting threatened flora and fauna species</p>			
Initial risk with no control			
Medium risk			
Mitigation measures/controls	Timing	Applicable MNES and MSES	Responsibility
Fire extinguishers to be kept in all vehicles, as well as the project site office and/or work areas.	At all times	<p>MNES and MSES flora species that are known, likely or may occur in the Wangetti South Section:</p> <ul style="list-style-type: none"> <i>Archontophoenix myolensis</i> (Myola palm) <i>Anoectochilus yatesiae</i> (Marbled jewel orchid) <i>Canarium acutifolium</i> <i>Dendrobium fellowsii</i> <i>Dendrobium mirbelianum</i> (Dark-stemmed antler orchid) <i>Diplazium cordifolium</i> <i>Diplazium pallidum</i> <i>Myrmecodia beccarii</i> (Ant plant) <i>Phaius pictus</i> <i>Phalaenopsis amabilis</i> subsp. <i>rosenstromii</i> (Native moth orchid) <i>Polyscias bellendenkerensis</i> <i>Randia audasii</i> <i>Rhomboda polygonoides</i> <i>Toechima pterocarpum</i> 	All personnel
Fuel shall be stored in appropriate storage containers.	At all times		All personnel
Fire management plan is to be developed for the construction phase of the project, in conjunction with WTMA. The nominated construction contractor of the trail and public campsites will be required to develop a bushfire management plan as part of their contract.	Prior to construction		Contractor's Project Manager Site Supervisor
All chemical storage and handling will be in accordance with material SDS, with appropriate firefighting equipment (e.g. specific fire extinguisher types) identified in the SDS to be maintained on-site.	At all times		Contractor's Project Manager Site Supervisor
Adequate fire suppression equipment should be on site.	At all times		All personnel
No burning of any substances, including wooden debris or products, will be undertaken as part of this project.	At all times		All personnel
Toolbox talks with the construction crew will occur prior to construction to educate them about bushfire management,	At all times		Contractor's Project Manager Site Supervisor

Factor – Bushfire			
bushfire hazards and evacuation routes.		(Orange tamarind)	
Working during the fire season, ensure that each team has at least one team member who has been trained in basic bushfire awareness	During pre-start	<ul style="list-style-type: none"> • <i>Vappodes lithocola</i> (Dwarf butterfly orchid) (also known as <i>Dendrobium lithocola</i>, and the Queensland Flora Census 2019 groups this species into <i>Dendrobium biggibum</i>) 	Contractor's Project Manager Site Supervisor
During the fire season, each team must always have the following equipment on hand: <ul style="list-style-type: none"> • Viable, functioning, two-way communications – e.g. mobile phone, UHF radio or satellite phone. Each team needs to be able to contact each other team and external contacts and each team needs to be contactable; • One filled and operational knapsack pump or charged airwater extinguisher (not less than 9L capacity); • Two rake hoes; • Weather instruments capable of measuring temperature, wind speed and humidity; • Fire Weather Log Book. 	At all times	<ul style="list-style-type: none"> • <i>Vappodes phalaenopsis</i> (Cooktown orchid) (Also known as <i>Dendrobium phalaenopsis</i> and the Queensland Flora Census 2019 groups this species into <i>Dendrobium biggibum</i>) • <i>Zeuxine polygonoides</i> (Velvet jewel orchid) (also known as <i>Rhomboda polygonoides</i>)) 	All personnel
During the fire season, chainsaw work to be scheduled to take place early in the morning, when fire danger risk is lowest.	At all times	MNES and MSES bird species that are known, likely or may occur: <ul style="list-style-type: none"> • <i>Casuarus casuarus</i> (Southern cassowary) 	All personnel
During the fire season, prior to starting chainsaw work: <ul style="list-style-type: none"> • Ensure that the immediate area has been manually cleared of twigs, leaves, scrub and other flammable material; • Have another staff member act as spotter. Spotter to standby at all times while chainsaw is being used; • Ensure that the knapsack is on hand, filled and ready for use. 	At all times	<ul style="list-style-type: none"> • Migratory birds (e.g. eastern curlew, great sand plover) • Non-migratory species (e.g. masked owl) <p>MNES and MSES amphibian species that are known, likely or may occur in the Wangetti South Section</p> <ul style="list-style-type: none"> • <i>Litoria dayi</i> (Australian lace lid) 	All personnel
Working on Total Fire Ban Days – If TDPD approves work to go	At all times		All personnel

Factor – Bushfire			
<p>ahead, then the following rules must be applied:</p> <ul style="list-style-type: none"> • Only work in areas with good communication including mobile phone reception • Only work in areas with quick/easy access where vehicles can be parked close by • No operating excavators, chainsaws, brush cutters, or any other machinery/equipment that could conceivably emit sparks during operation • Generally, all work should be conducted with hand tools only • Ensure all workers have adequate sun protection • Ensure all workers work to the conditions and drink plenty of water 		<ul style="list-style-type: none"> • <i>Litoria nannotis</i> (Waterfall frog) • <i>Litoria nyakalensis</i> (Mountain mistfrog) • <i>Litoria rheocola</i> (Common mistfrog) • <i>Litoria serrata</i> (Tapping green eyed frog) <p>MNES and MSES mammal species that are known, likely or may occur in the Wangetti South Section</p> <ul style="list-style-type: none"> • <i>Dasyurus maculatus gracilis</i> (Spotted-tailed quoll) • <i>Dasyurus hallucatus</i> (Northern quoll) • <i>Dendrolagus lumholtzi</i> (Lumholtz's tree-kangaroo) • <i>Hipposideros semoni</i> (Semon's leaf-nosed bat) • <i>Phascolarctos cinereus</i> (Koala) • <i>Pteropus conspicillatus</i> (Spectacled flying-fox) • <i>Rhinolophus robertsi</i> (Large-eared horseshoe bat) • <i>Saccolaimus saccolaimus nudicluniatus</i> (Bare-rumped sheath-tailed bat) • <i>Xeromys myoides</i> (Water mouse) <p>MNES and MSES aquatic species that are known, likely or may occur in the Wangetti South Section</p> <ul style="list-style-type: none"> • <i>Stiphodon semoni</i> (Opal cling goby) 	
<p>On TFB days, the following weather monitoring protocols apply:</p> <ul style="list-style-type: none"> • At arrival to site in the morning, check weather observations and record in Fire weather logbook • Before returning to work, check weather observations and record in Fire weather logbook • Before returning to work after lunch, check weather observations and record in Fire weather logbook • Before returning to work after afternoon smoko, check weather observations and record in Fire weather logbook • If there is a fire danger, consider suspending operations and leaving site. 	At all times		All personnel

Factor – Bushfire			
		<ul style="list-style-type: none">• <i>Stiphodon rutilarueus</i> (Orange cling goby)• <i>Stiphodon pelewensis</i> (Emerald cling goby)• <i>Stiphodon surrufus</i> (Birdsong cling goby) <p>Wet Tropics World Heritage Area National Heritage Site</p> <p>Waterways protected under the <i>Fisheries Act 1994</i> and <i>Water Act 2000</i></p> <p>Protected Areas - estates protected under the NC Act</p> <p>Coastal Management District</p>	
Residual risk within control in place			
Low risk			
Implementation of recommended mitigation measures will minimise impacts to fauna within the project area.			
Performance indicator			
No injury or death to humans or native fauna species, loss of vegetation and/or damage to property or buildings.			
Corrective actions			
Incident	Corrective action		
Fire starts during the construction phase	Staff re- trained in the use of firefighting equipment.		
Replacement of firefighting equipment.	Staff re- trained to minimise exposure to hazardous materials.		
Monitoring			
Weekly inspections to assess the implementation of the above mitigation measures with records kept in a weekly environmental checklist.			
At the start of each working week (or some other agreed schedule) provide reports to TDPD (depending on work locations) stating the trails being worked on, their location and the number of			

Factor – Bushfire
personnel working on each. Report to provide contact details for key personnel in construction crew.
At the start of each working week, check the weather forecast and note any potential high-risk days (i.e. high-risk days are those with high temperatures and high winds. They generally only occur during the hot summer months or during periods of drought)
On the day before any anticipated high-risk days, check to see if a Total Fire Ban (TFB) has been called for the area. Local fire bans will be checked to see if they are in place, with any project works that pose a high fire risk not performed during this time. If a TFB day has been called, contact DES via the Shadow Ranger immediately to discuss whether it is safe/appropriate to work.
During the fire season, the following weather monitoring protocols apply: <ul style="list-style-type: none"> • At arrival to site in the morning, check weather observations and record in Fire Weather Log Book • Before returning to work after lunch, check weather observations and record in Fire Weather Log Book
Any non-conformances are to be documented and reported to TDPD and rectified immediately

4.5.2 Hazards, health and safety

Wangetti South Section traverses an area which is susceptible to a number of hazards, health and safety matters. This section provides a summary of the existing hazard, health and safety matters within the project area and immediate surrounds. It also assesses the potential impacts as a result the construction activities.

The majority of Wangetti South Section will be located within national park offering a remote trail experience to hikers and mountain bikers and as a result carries an inherent risk for the users detailed in Table 4-11.

Another hazard is the operation of a helicopter to transport construction material to the project area.

The hazards, health and safety environmental factors potentially impacted by the construction activities, the proposed environmental controls in response to the impact, when the control will be implemented and who is responsible for implementing the control are detailed in Table 4-11.

Table 4-11 Hazards, health and safety environmental factors

Factor – Hazards, health, and safety
Construction activities resulting in adverse impacts to the project area
<p>Steep terrain, remote location, the presence of dangerous animals and plants and potential of extreme weather events are associated with Wangetti South Section and could adversely impact on construction personnel in the following ways:</p> <ul style="list-style-type: none"> • Bites from snakes, spiders, and insects. • Allergic reactions to plant species along the trail. • Heat/cold exposure, falls and sprains, etc. • Another hazard is the operation of a helicopter to transport construction material to the project area.

Factor – Hazards, health, and safety			
<ul style="list-style-type: none"> Potential hostile intersection with fauna species Extreme weather events requiring evacuation 			
Initial risk with no control			
Low risk			
Mitigation measures/controls	Timing	Applicable MNES and MSES	Responsibility
All health and safety related aspects of the Traffic Management Plan (in the EMP)) as it relates to the construction phase are to be adhered to.	At all times	MNES and MSES bird species that are known likely or may occur: <ul style="list-style-type: none"> Southern cassowary Protected Areas - estates protected under the NC Act Wet Tropics World Heritage Area National Heritage Site	All personnel
Appropriate Personal Protective Equipment (PPE) must be worn by all personnel on site (i.e. steel-cap boots, high-vis shirt/vest as appropriate, etc.)	At all times		All personnel
Helicopter operations to be carefully controlled, and clustered into half or full day blocks. Helicopter operations to be scheduled to occur on a recurring fortnightly/monthly basis (as required), with operations organised in advance. The Contractor to liaise with TDPD Project Manager to coordinate the use of helicopters and ensure all permits and approvals are obtained prior to operations commencing. Contractor to map out helicopter staging area locations for the project. All aircraft used for construction material delivery or waste removal shall be flown not less than 1000ft above ground level when operating over the World Heritage Area unless: a) Taking off or landing; or b) Flying at a level that is reasonably necessary for safety purposes; or c) Flying over infrastructure footprints.	At all times		Contractor's Project Manager Site Supervisor

Factor – Hazards, health, and safety			
Workplace health and safety plans need to be developed and implemented by the contractor on site	At all times		All personnel
All signage installed with the project area must have a unique ‘location identification number’ on it, to be quoted in case of emergency. Emergency responders would be provided with GPS coordinates corresponding to each ‘location identification number’ and instructions about the most direct and reliable routes of access to that point.	At all times		All personnel
Identify any locations where mobile phone coverage is poor or unavailable.	At all times		All personnel
Toolbox talk with construction crew about working within difficult terrain and procedure to follow.	At all times		All personnel
First aid kits to be available on site.	At all times		All personnel
Residual risk within control in place			
Low risk			
Implementation of recommended mitigation measures will minimise the potential for incorrect waste management.			
Performance indicator			
No injuries to construction personnel.			
Corrective actions			
Incident	Corrective action		
Injury as a result of improper use of construction material or from flora and fauna.	Identify action and prepare corrective action to manage any future impacts. Administer first aid treatment (as required).		
Monitoring			
Weekly inspections to assess the implementation of the above mitigation measures with records kept in a weekly environmental checklist.			
Any non-conformances are to be documented and reported to TDPD and rectified immediately			

4.5.3 Noise and vibration

Due to the proximity of the trails to population centres, the number of noise-sensitive receptors that may be impacted by site works is limited as identified by the following:

- Residents in close proximity to site works (at the trail head/entry and exit points)
- Wildlife inhabiting the park.

Site works that may contribute to noise that impacts on these receptors include:

- The use of chainsaws
- The use of excavation equipment
- The use of compacting equipment
- The use of power carriers
- Helicopters
- Vehicular use (4WD, ATV).

Vehicle use will involve the carting of materials and equipment to and from the works sites. The nature of the site and the location of works in bushland means that the main noise-sensitive receptors that will be impacted by site works are park visitors and wildlife inhabiting the park. As such, management actions have been designed to reduce the impact of noise on these receptors.

Hazards related to vibration works will be associated with track compaction works. However, the risk from vibration work should be minimal and localised.

The main noise-sensitive receptors that will likely be impacted by site works are users of the national park and the local fauna. As such, management actions have been designed to reduce the impact of noise on these receptors.

The noise and vibration environmental factors potentially impacted by the construction activities, the proposed environmental controls in response to the impact, when the control will be implemented and who is responsible for implementing the control are detailed in Table 4-12.

Table 4-12 Noise and vibration environmental factors

Factor – Noise and vibration
Construction activities resulting in adverse impacts to the project area
<p>Due to the proximity of the trails to population centres, the number of noise-sensitive receptors that may be impacted by site works is limited as identified by the following:</p> <ul style="list-style-type: none">• Residents in close proximity to site works (noting this is limited);• Wildlife inhabiting the park. <p>Site works that may contribute to noise that impacts on these receptors include:</p> <ul style="list-style-type: none">• The use of chainsaws• The use of excavation equipment• The use of compacting equipment• The use of power carriers• Helicopters• Vehicular use (4WD, ATV). <p>Noise generated by members of the public using vehicles illegally within the project area.</p>

Factor – Noise and vibration			
Initial risk with no control			
Low risk			
Mitigation measures/controls	Timing	Applicable MNES and MSES	Responsibility
Notifying adjoining residences of the timing of construction works prior to undertaking construction works and providing them with a contact in case they have questions.	Prior to construction commencing	MNES and MSES bird species that are known, likely or may occur: <ul style="list-style-type: none"> <i>Casuarus casuarus</i> (Southern cassowary) Migratory birds (e.g. eastern curlew, great sand plover) Non-migratory species (e.g. masked owl) 	TDPD
All construction vehicles to comply with maintenance schedules and has up to date service records and operational restrictions designed to limit noise impacts during construction.	At all times	MNES and MSES amphibian species that are known, likely or may occur in the Wangetti South Section	Contractor's Project Manager Site Supervisor
Vehicles and machinery to be switched off when not in use.	At all times	<ul style="list-style-type: none"> <i>Litoria dayi</i> (Australian lace lid) <i>Litoria nannotis</i> (Waterfall frog) 	All personnel
Equipment is to be fitted with noise control devices.	At all times	<ul style="list-style-type: none"> <i>Litoria nyakalensis</i> (Mountain mistfrog) 	All personnel
Helicopter operations to be carefully controlled, and clustered into half or full day blocks. Helicopter operations to be scheduled to occur on a recurring fortnightly/monthly basis (as required), with operations organised in advance. The Contractor to liaise with TDPD Project Manager to coordinate the use of helicopters and ensure all permits and approvals are obtained prior to operations commencing. All aircraft used for construction material delivery or waste removal	At all times	<ul style="list-style-type: none"> <i>Litoria rheocola</i> (Common mistfrog) <i>Litoria serrata</i> (Tapping green eyed frog) MNES and MSES mammal species that are known, likely or may occur in the Wangetti South Section <ul style="list-style-type: none"> <i>Dasyurus maculatus gracilis</i> (Spotted-tailed quoll) <i>Dasyurus hallucatus</i> (Northern quoll) <i>Dendrolagus lumholtzi</i> (Lumholtz's tree-kangaroo) <i>Hipposideros semoni</i> (Semon's leaf-nosed bat) <i>Phascolarctos cinereus</i> (Koala) 	Contractor's Project Manager Site Supervisor

Factor – Noise and vibration			
<p>shall be flown not less than 1000ft above ground level when operating over the World Heritage Area unless:</p> <p>a) Taking off or landing; or</p> <p>b) Flying at a level that is reasonably necessary for safety purposes; or</p> <p>c) Flying over infrastructure footprints.</p>		<ul style="list-style-type: none"> • <i>Pteropus conspicillatus</i> (Spectacled flying-fox) • <i>Rhinolophus robertsi</i> (Large-eared horseshoe bat) • <i>Saccolaimus saccolaimus nudiclunatus</i> (Bare-rumped sheath-tailed bat) • <i>Xeromys myoides</i> (Water mouse) <p>MNES and MSES aquatic species that are known, likely or may occur in the Wangetti South Section</p> <ul style="list-style-type: none"> • <i>Stiphodon semoni</i> (Opal cling goby) • <i>Stiphodon rutilarueus</i> (Orange cling goby) • <i>Stiphodon pelewensis</i> (Emerald cling goby) • <i>Stiphodon surrufus</i> (Birdsong cling goby) <p>Protected Areas - estates protected under the NC Act</p> <p>Wet Tropics World Heritage Area National Heritage Site</p>	
Residual risk within control in place			
<p>Low risk</p> <p>Implementation of recommended mitigation measures will minimise the potential for noise and vibration impacts to listed threatened species, residents, and other wildlife within the Wet Tropics.</p>			
Performance indicator			
<p>Negligible noise and vibration impacts to sensitive receptors.</p> <p>No noise complaints</p>			

Factor – Noise and vibration	
Corrective actions	
Incident	Corrective action
Construction equipment requiring a service resulting in additional noise produced.	Vehicles and equipment to be serviced as soon as possible
Receiving complaints about excess noise and vibration impacting sensitive receivers	Reporting incidents relating to noise and/or vibration are the responsibility of all personnel onsite at all times and are to be recorded and managed in a complaints register with the corrective actions undertaken. The contractor in the construction phase will be required to develop a complaints management system and register and seek approval from TDPD, DES and QPWS.
Monitoring	
Weekly inspections to assess the implementation of the above mitigation measures with records kept in a weekly environmental checklist.	
Any non-conformances are to be documented and reported to TDPD and rectified immediately	

4.5.4 Air quality

The Project is predominantly within an area which is previously undisturbed. As such, air quality is largely influenced by the coastal location and surrounding related to the natural environment including bird calls and vegetation movements from wind. There are also a number of sensitive receivers located along Wangetti South Section including national parks and residential areas in the southern extent.

It is anticipated that limited air quality nuisances will be generated as a result of the Project, with the construction phase representing the highest potential for air quality changes. During construction, the use of machinery will have the most significant impact on air quality. However, these impacts are anticipated to be minor and short term and intermittent as works progress along the trail alignment.

The air quality environmental factors potentially impacted by the construction activities, the proposed environmental controls in response to the impact, when the control will be implemented and who is responsible for implementing the control are detailed in Table 4-13.

Table 4-13 Air quality environmental factors

Factor – Air quality
Construction activities resulting in adverse impacts to the project area
Potential air and dust impacts to sensitive receptors as a result of construction activities, attributable to exhaust emissions and fugitive dust.
Initial risk with no control
Low risk

Factor – Air quality			
Mitigation measures/controls	Timing	Applicable MNES and MSES	Responsibility
Consider weather conditions and prevailing winds when conducting construction activities that may result in air emissions. Reduce clearing during periods of high wind.	At all times	MNES and MSES flora species that are known, likely or may occur in the Wangetti South Section: <ul style="list-style-type: none"> <i>Archontophoenix myolensis</i> (Myola palm) <i>Anoectochilus yatesiae</i> (Marbled jewel orchid) <i>Canarium acutifolium</i> <i>Dendrobium fellowsii</i> <i>Dendrobium mirbelianum</i> (Dark-stemmed antler orchid) <i>Diplazium cordifolium</i> <i>Diplazium pallidum</i> <i>Myrmecodia beccarii</i> (Ant plant) <i>Phaius pictus</i> <i>Phalaenopsis amabilis</i> subsp. <i>rosenstromii</i> (Native moth orchid) <i>Polyscias bellendenkerensis</i> <i>Randia audasii</i> <i>Rhomboda polygonoides</i> <i>Toechima pterocarpum</i> (Orange tamarind) <i>Vappodes lithocola</i> (Dwarf butterfly orchid) (also known as <i>Dendrobium lithocola</i>, and the Queensland Flora Census 2019 groups this species into <i>Dendrobium biggibum</i>) <i>Vappodes phalaenopsis</i> (Cooktown orchid) (Also known as <i>Dendrobium phalaenopsis</i> and the Queensland 	All personnel
Wetting the road/work area during dry periods to reduce dust being generated.	At all times		All personnel
Construction vehicles to be cleaned of soils before driving on sealed roads to reduce dust being generated.	At all times		All personnel
A maximum speed limit of 40 km/hr shall apply to access roads and tracks to minimise the potential for dust generation.	At all times		All personnel
All temporary soil stockpiles will be covered, stabilised and/or moistened as required to prevent generation of dust particles.	At all times		All personnel
Soil stockpiles will be kept minimal to prevent any wind erosion.	At all times		All personnel
Stockpiles that are anticipated to be present in the medium (1-3 months) and long term (>3 months) are to be covered to minimise dust emissions.	At all times		All personnel
All vehicles carrying loads with the potential to create dust shall cover their loads.	At all times		All personnel
Minimal ground disturbance during construction to reduce dust emissions.	At all times		All personnel
At the commencement of the construction, the entire trail will be broken into Construction Segments. The Construction	Prior to construction		Contractor's Project Manager Site Supervisor

Factor – Air quality			
Segments assist in reducing the amount of area to be exposed during the construction phase, which in turns reduces impacts to the natural environment and reduces the impact to the movement of wildlife in the area.		<p><i>Flora Census 2019 groups this species into Dendrobium bigibbum)</i></p> <ul style="list-style-type: none"> • <i>Zeuxine polygonoides</i> (Velvet jewel orchid) (also known as <i>Rhomboda polygonoides</i>)) 	
Vehicles, plant and equipment will be regularly serviced and comply with Australian Design Standards.	At all times	<p>MNES and MSES bird species that are known, likely or may occur:</p> <ul style="list-style-type: none"> • <i>Casuarus casuarus</i> (Southern cassowary) • Migratory birds (e.g. eastern curlew, great sand plover) • Non-migratory species (e.g. masked owl) 	All personnel
All machinery and equipment are to have proprietary emission control equipment fitted and in working order.	At all times		All personnel
When not in use, vehicles and machinery shall be turned off.	At all times	<p>MNES and MSES amphibian species that are known, likely or may occur in the Wangetti South Section</p> <ul style="list-style-type: none"> • <i>Litoria dayi</i> (Australian lace lid) • <i>Litoria nannotis</i> (Waterfall frog) • <i>Litoria nyakalensis</i> (Mountain mistfrog) • <i>Litoria rheocola</i> (Common mistfrog) • <i>Litoria serrata</i> (Tapping green eyed frog) <p>MNES and MSES mammal species that are known, likely or may occur in the Wangetti South Section</p> <ul style="list-style-type: none"> • <i>Dasyurus maculatus gracilis</i> (Spotted-tailed quoll) • <i>Dasyurus hallucatus</i> (Northern quoll) • <i>Dendrolagus lumholtzi</i> (Lumholtz's tree-kangaroo) 	All personnel

Factor – Air quality			
		<ul style="list-style-type: none"> • <i>Hipposideros semoni</i> (Semon's leaf-nosed bat) • <i>Phascolarctos cinereus</i> (Koala) • <i>Pteropus conspicillatus</i> (Spectacled flying-fox) • <i>Rhinolophus robertsi</i> (Large-eared horseshoe bat) • <i>Saccolaimus saccolaimus nudicluniatus</i> (Bare-rumped sheath-tailed bat) • <i>Xeromys myoides</i> (Water mouse) <p>MNES and MSES aquatic species that are known, likely or may occur in the Wangetti South Section</p> <ul style="list-style-type: none"> • <i>Stiphodon semoni</i> (Opal cling goby) • <i>Stiphodon rutilarueus</i> (Orange cling goby) • <i>Stiphodon pelewensis</i> (Emerald cling goby) • <i>Stiphodon surrufus</i> (Birdsong cling goby) <p>Wet Tropics World Heritage Area National Heritage Site</p> <p>Protected Areas - estates protected under the NC Act</p>	
Residual risk within control in place			
Low risk			
Implementation of recommended mitigation measures will minimise the potential for impacts to air quality.			
Performance indicator			
Negligible air and dust impacts to sensitive receptors.			

Factor – Air quality	
Corrective actions	
Incident	Corrective action
Vehicles and equipment servicing not up to date	Vehicles and equipment to be serviced as soon as possible.
Monitoring	
Weekly inspections to assess the implementation of the above mitigation measures with records kept in a weekly environmental checklist.	
Any non-conformances are to be documented and reported to TDPD and rectified immediately	

4.5.5 Roads and traffic

A Preliminary Traffic Management Plan (TMP) have been developed for the construction and operational phases of Wangetti South Section. The TMP provides preliminary guidance to help establish appropriate traffic control and traffic management procedures manage potential hazards associated with the traffic environment during the Project and to reduce potential adverse impacts to people and wildlife during the construction and operational phases of the Project.

It is expected that prior to any construction activity and operational activity for the Project, a detailed work specific TMP will be developed by the contractor as part of the EMP. The contractor should review the preliminary guidance provided in this TMP and provide greater detail based on construction methodology, operational activities, and timing of works. The TMP will also need to be in general accordance with the MUTCD, Austroads Guide to Traffic Management and Transport and Main Roads Specifications MRTS02 Provision for Traffic.

Refer to Appendix D in the EMP for a copy of the TMP.

5. Work completion

At the completion of each construction trail segment and the Dark Jungle campground, the Contractor will undertake rehabilitation of all temporary disturbed areas that are not associated with long standing fixtures of the Wangetti trail and Dark Jungle. This will involve:

- Remove all flagging tape that may still be visible;
- Removal any rubbish or construction debris;
- Remove all construction equipment and machinery;
- Leave in place any sediment control measures for a duration as agreed and determined by the DES Shadow Ranger. As a minimum, sediment control measures should be retained until the Trail Curing Period has finished dependent on weather conditions and the trail or Construction Segment is deemed ready to be opened to the public;
- Trim any tree branches that may protrude into the riding or walking corridor;
- Trim or remove any sharp tree stumps within the fall zone adjacent to the trail;
- Check that any imported surfacing materials or raised embankments have been compacted to a suitable level;
- Check that all rock work is stable and secure;
- Check that the trail is draining as intended – i.e. no puddling of water anywhere on the trail, all grade reversals have a clear outlet and are draining effectively with no blockages, that any outsloped sections of trail have the appropriate gradients and there are no blockages along the lower edge;
- If excavators and other plant/machinery are being relocated to another project or a different area, they are to be washed down at a commercial washdown facility or washdown facility at QPWS works depot.
- Scattering cut vegetation (excluding weeds) into the surrounding environment, without smothering existing vegetation

Should at any time, any aspect of the activity be closed or decommissioned, all construction equipment and material must be removed off site and the disturbed site must be rehabilitated to a condition with a suitable vegetation cover that is the same or better than the surrounding environment

On completion of the construction works, the Contractor shall decommission their facilities and related works and ensure that the site is clean and left in a state which is safe, stable and non-polluting. Further details are in the rehabilitation plan has been developed for Wangetti South Section and is in the EMP.

6. Monitoring and environmental inspections

The contractor will be required to develop an environment monitoring plan and schedule to be approved by TDPD for the construction phase of Wangetti South Section and to include the following requirements in Table 6-1.

Table 6-1 Construction phase monitoring requirements

Environmental Aspect	Monitoring requirements
Biodiversity (fauna)	Weekly inspections to assess the implementation of the mitigation measures identified within the environmental management sub plans with records kept in a weekly environmental checklist.
	Any non-conformances are to be documented and reported to TDPD and rectified immediately.
Biodiversity (flora)	Weekly inspections to assess the implementation of the mitigation measures identified within the environmental management sub plans with records kept in a weekly environmental checklist.
	Any non-conformances are to be documented and reported to TDPD and rectified immediately.
Bushfire, heavy rainfall and other extreme weather events.	Weekly inspections to assess the implementation of the mitigation measures identified within the environmental management sub plans with records kept in a weekly environmental checklist.
	At the start of each working week (or some other agreed schedule) provide reports to TDPD depending on work locations) stating the trails being worked on, their location and the number of personnel working on each. Report to provide contact details for key personnel in construction crew.
	At the start of each working week, check the weather forecast and note any potential high-risk days (i.e. high-risk days are those with high temperatures and high winds. They generally only occur during the hot summer months or during periods of drought).
	On the day before any anticipated high-risk days, check to see if a Total Fire Ban (TFB) has been called for the area. Local fire bans will be checked to see if they are in place, with any project works that pose a high fire risk not performed during this time. If a TFB day has been called, contact DES via the Shadow Ranger immediately to discuss whether it is safe/appropriate to work.
	During the fire season, the following weather monitoring protocols apply: At arrival to site in the morning, check weather observations and record in Fire Weather Log Book.
	Before returning to work after lunch, check weather observations and record in Fire Weather Log Book.
	Weekly inspections to assess the implementation of the mitigation measures identified within the environmental management sub plans with records kept in a weekly environmental checklist.

Environmental Aspect	Monitoring requirements
	At the start of each working week (or some other agreed schedule) provide reports to TDPD depending on work locations) stating the trails being worked on, their location and the number of personnel working on each. Report to provide contact details for key personnel in construction crew.
	At the start of each working week, check the weather forecast and note any potential high-risk days (i.e. high-risk days are those with high rainfall and high winds). They generally only occur during the hot summer months.
	Check with local area news for any heavy rainfall events or forecast cyclones for the region.
Chemical and fuel management	Weekly inspections to assess the implementation of the mitigation measures identified within the environmental management sub plans with records kept in a weekly environmental checklist.
	Any non-conformances are to be documented and reported to TDPD and rectified immediately.
Cultural heritage	Monitoring in accordance with the project's Cultural Heritage Management Plan (CHMP).
Erosion and sediment control	A formal monitoring and maintenance program prior to site establishment. The monitoring and maintenance program shall make allowance for required site inspections.
Water management	Weekly inspections to assess the implementation of the mitigation measures identified within the environmental management sub plans with records kept in a weekly environmental checklist.
	Weather conditions to be monitored and temporary controls established during extreme weather events.
	Any non-conformances are to be documented and reported to TDPD and rectified immediately.
Noise and vibration	Weekly inspections to assess the implementation of the mitigation measures identified within the environmental management sub plans with records kept in a weekly environmental checklist.
	Any non-conformances are to be documented and reported to TDPD and rectified immediately.
Waste management	Weekly inspections to assess the implementation of the mitigation measures identified within the environmental management sub plans with records kept in a weekly environmental checklist.
	Any non-conformances are to be documented and reported to TDPD and rectified immediately.
Hazards, health, safety	Weekly inspections to assess the implementation of the mitigation measures identified within the environmental management sub plans with records kept in a weekly environmental checklist.
	Any non-conformances are to be documented and reported to TDPD and rectified immediately.
Air quality	Weekly inspections to assess the implementation of the mitigation measures identified within the environmental management sub plans with records kept in a weekly environmental checklist.

Environmental Aspect	Monitoring requirements
	Any non-conformances are to be documented and reported to TDPD and rectified immediately.
Roads and traffic	<p>The following parameters will be included in a monitoring program to be developed by the construction contractor:</p> <ul style="list-style-type: none"> • The speed limits throughout the project area (regular basis). • Vehicle routes within project area and on existing road network (regular basis). • Drive behaviour within project area (Ongoing on a case by case basis). • Traffic flow to manage congestion (as required) • Interactions with wildlife (Ongoing on a case by case basis) • Interactions with other road users (Ongoing on a case by case basis). <p>Traffic Management Inspection to be undertaken for the project.</p> <p>Regular performance/compliance audits of the Contractor's traffic control measures to be undertake and feedback provided.</p> <p>The following parameters will be included in a monitoring program to be developed by the operator:</p> <ul style="list-style-type: none"> • The speed limits throughout the project area (regular basis) • Vehicle routes within project area and on existing road network (regular basis) • Traffic flow to manage congestion (as required) • Interactions with wildlife (Ongoing on a case by case basis) • Interactions with other road users (Ongoing on a case by case basis) <p>Traffic Management Inspection to be undertaken for the project.</p> <p>Regular performance/compliance audits of the Contractor's traffic control measures to be undertake and feedback provided.</p>
Public amenity	<p>Weekly inspections to assess the implementation of the mitigation measures identified within the environmental management sub plans with records kept in a weekly environmental checklist.</p> <p>Any non-conformances are to be documented and reported to TDPD and rectified immediately.</p>

7. Audit

During construction activities, compliance audits will be conducted in accordance with the requirements of CEMP as well as construction procedures, relevant legislation, licence and permit conditions and industry standards.

An audit program be developed by the contractor in consultation with TDPD and DES and following the review of the environment approval conditions and it be undertaken at the end of the construction phase.

All inspection and audit reports of environmental performance will be stored in an electronic database that is used to enable corrective actions identified during the inspection/auditing process to be recorded, tracked and closed out. The information will be made available to the relevant regulatory authorities as required.

8. Review

During the construction phase TDPD will regularly review and (if necessary) update the CEMP. The review will take into account the following:

- Changes in legislative requirements (including conditions of approvals)
- Environmental performance, findings of environmental audits and inspections
- Outcomes of agency consultation
- Outcomes of consultation with communities and resolution of complaints
- Changes in external and internal policies, standards and guidelines.

The review will ensure the continuing suitability, adequacy, and effectiveness of the EMP. The review will include assessing opportunities for improvement.

9. Emergency incident planning and response

Emergency and incident responses will vary depending on the nature of the incident.

TDPD will be verbally notified of an incident on the day it occurs and as soon as practicable of the responsible person becoming aware of the incident, and in writing within 24 hours.

All notifications to authorities including but not limited to Wet Tropics Management Authority (WTMA), Department of Environment and Science (DES), Queensland Parks and Wildlife Service (QPWS)), State emergency services (police/fire/ambulance) and Department of Transport and Main Roads will be undertaken by TDPD.

The Contractor will be required to provide an Emergency Response Plan and for this plan to be thoroughly communicated to all staff members in the Construction Induction. The Emergency Response Plan should identify evacuation routes, mustering points, communication protocols and provide key contact details for local authorities and services. It should be compatible with the internal emergency response protocols of the various land managers.

When reporting environmental incidents to TDPD, the following information is to be provided:

- The name and contact details of the reporting person
- The date and time the environmental incident occurred
- The activity that was being undertaken when the incident occurred
- How the incident occurred
- Any containment measures put in place to reduce or contain environmental harm
- An assessment of the amount of environmental harm that occurred
- If any other stakeholders are aware of the incident.

Environmental incidents and emergencies have been identified within Section 4. However, proactive environmental risk management measures should be undertaken wherever possible, if events such as extreme rainfall or flooding are forecast.

Some examples of environmental risk responses are provided in Table 9-1 below.

Table 9-1 Example environmental incidents and mitigation and reporting requirements

Incident	Mitigation Measures	Report
Failure of erosion and sediment control devices following rainfall event or flooding	Re-instatement of ESC devices	Report to TDPD

Identification of cultural heritage aspects during excavation	Cease operations and follow cultural heritage reporting procedure	Report to TDPD
Injury to fauna during site works	Following notification procedure.	Report to TDPD
Damage to vegetation	Cease operations in the vicinity of impacted vegetation. Attempt to stabilise area and engage project botanist.	Report to TDPD

10. References

Australian Government Department of the Environment 2014. Environmental Management Plan Guidelines 2014. Available from:

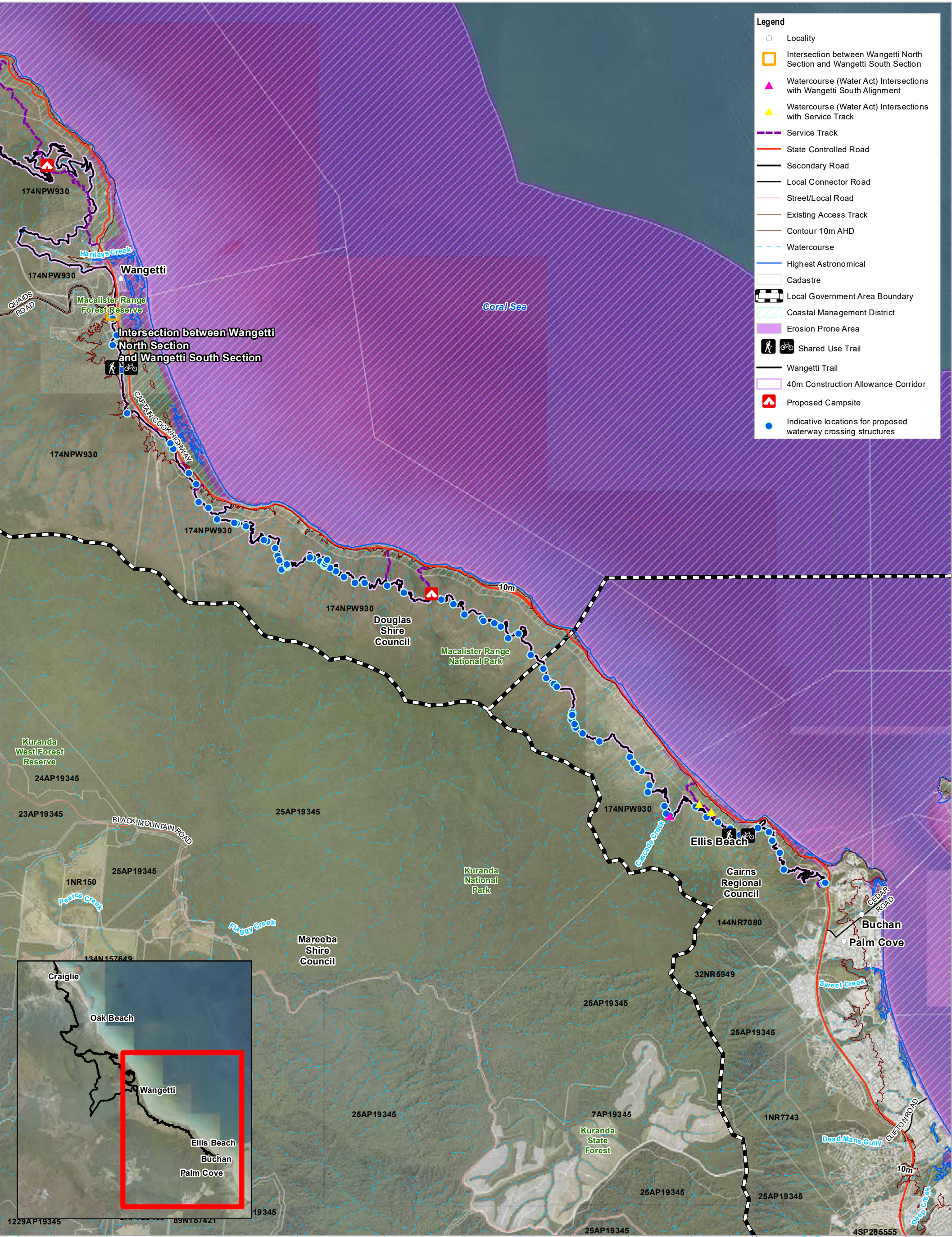
<https://www.environment.gov.au/epbc/publications/environmental-management-plan-guidelines>

GHD Pty Ltd 2020. Department of State Development, Tourism and Innovation - Wangetti Trail South Section (Wangetti to Palm Cove) Matters of National Environmental Significance Baseline Ecology and Impact Assessment Report, Final Version, July 2020

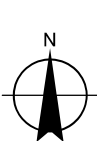
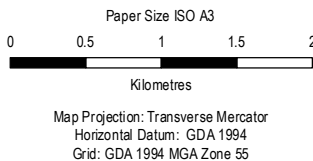
World Trail Pty Ltd 2020. *Wangetti Trail Construction Methodology Manual April 2020*.

Appendices

Appendix A – Waterways within Wangetti South Section



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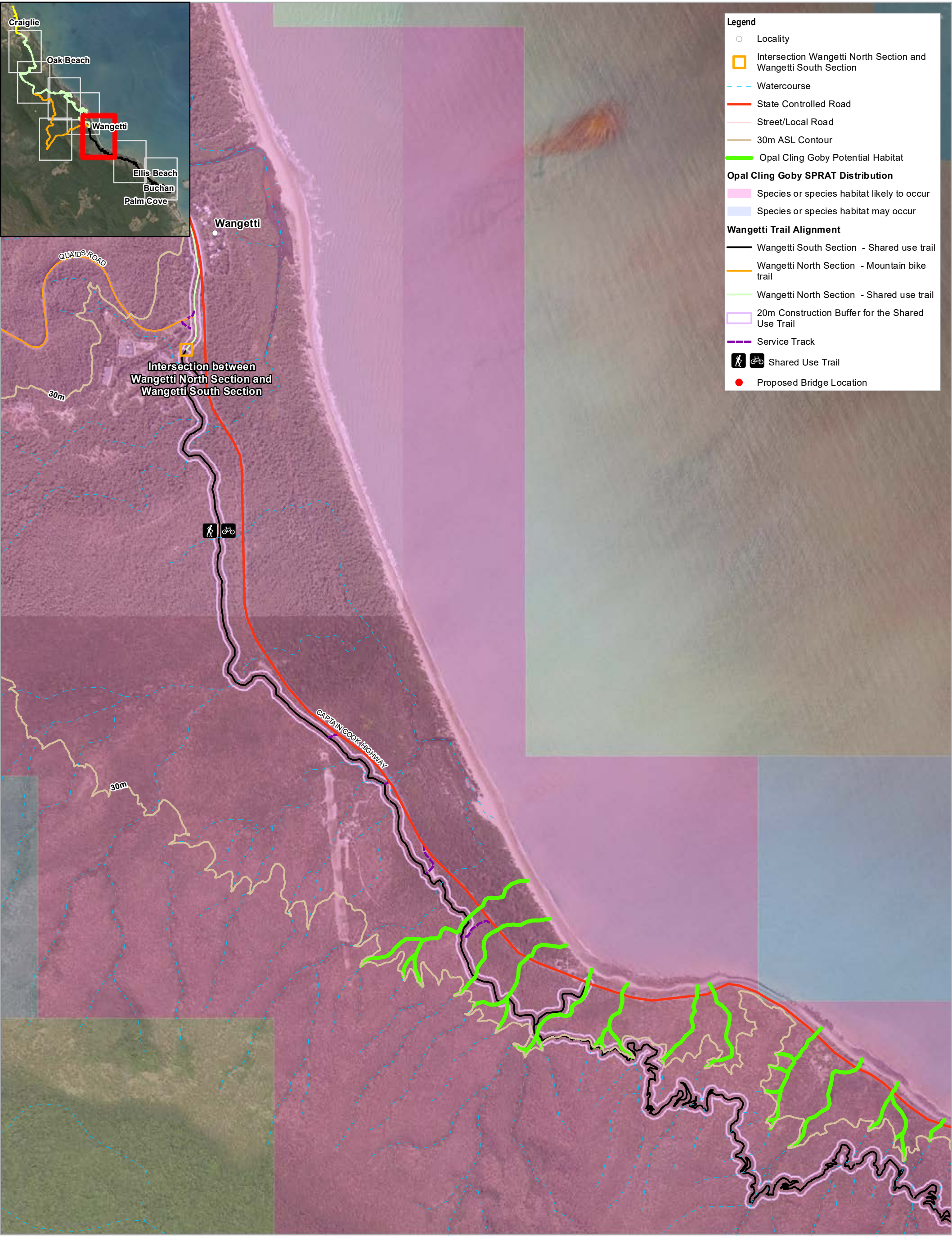
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Environment Assessment Stage 2 Wangetti Trail

**Waterways, Coastal Management
District and Erosion Prone Area
Wangetti South Section**

Project No. 41-32458
Revision No. 0
Date 16/12/2020

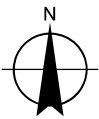
Appendix A-1

Appendix B - Potential and marginal habitat for the opal cling goby (*Stiphodon semoni*) in the vicinity of the Wangetti South Section and proposed location of single span bridges



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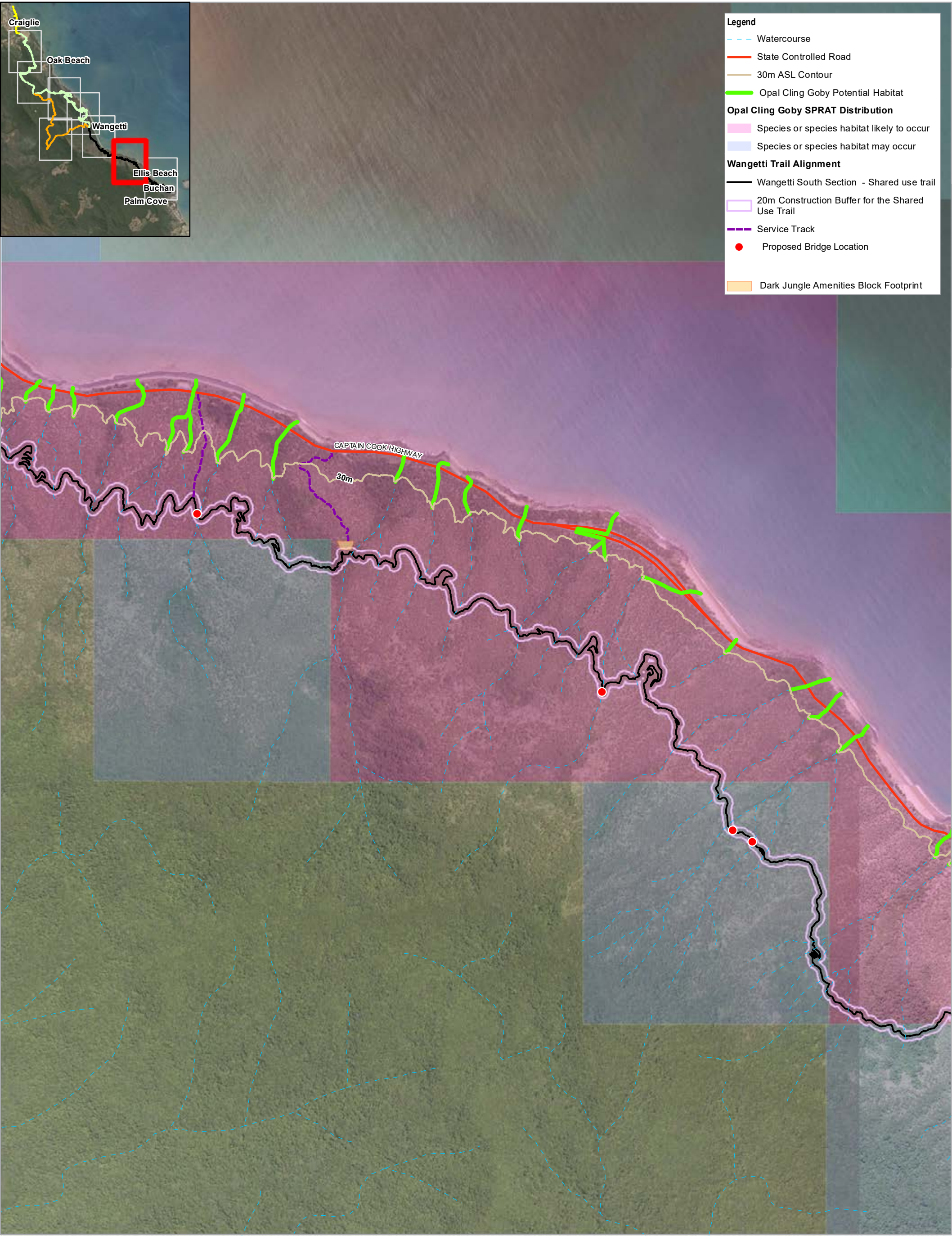


DITID
Environment Assessment Stage 2 Wangetti Trail

Potential Modelled Habitat for
opal cling goby (*Stiphodon semoni*)
in vicinity of Wangetti Trail - South Section

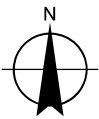
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APPENDIX B-1
(Sheet 1 of 3)



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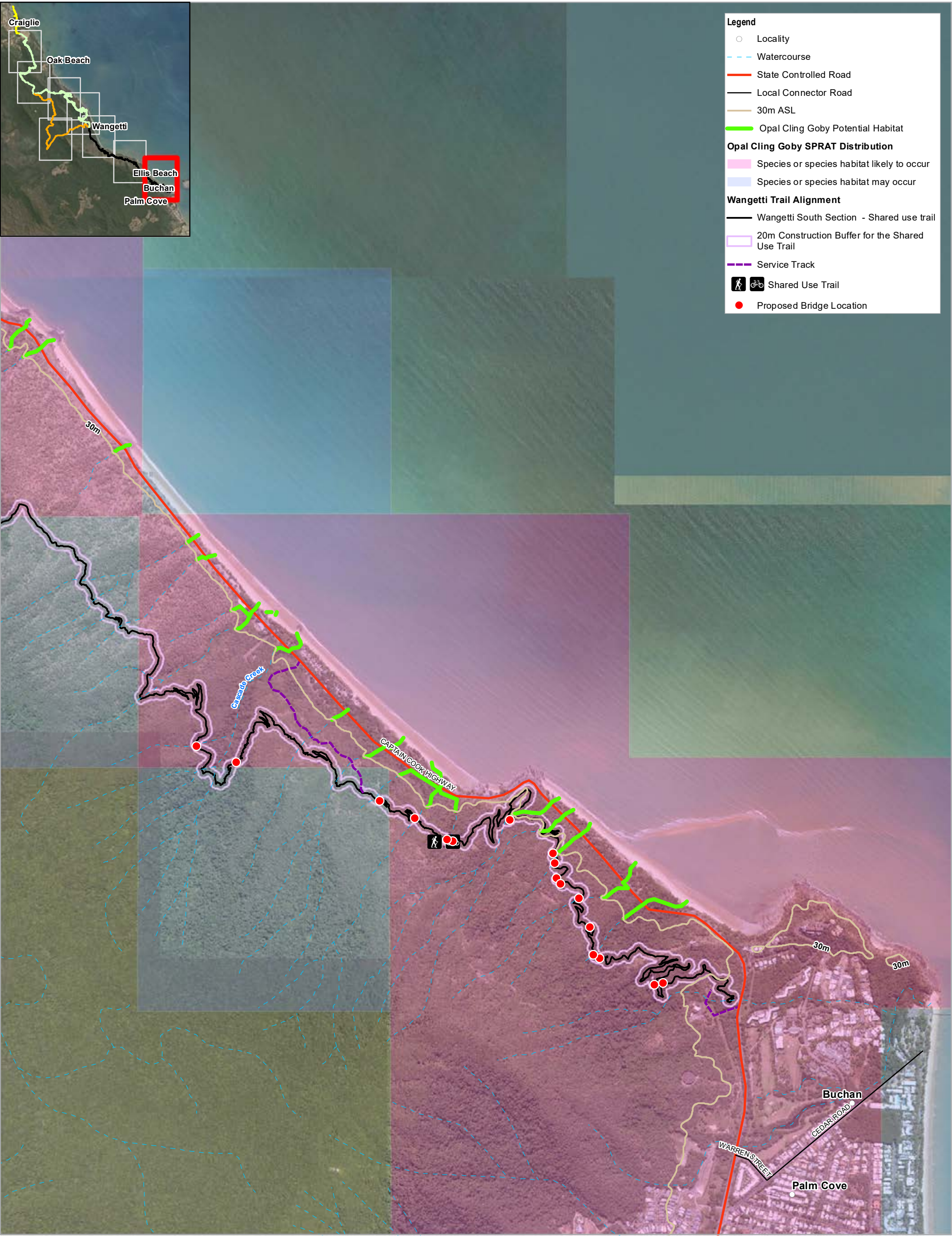


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Environment Assessment Stage 2 Wangetti Trail

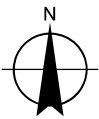
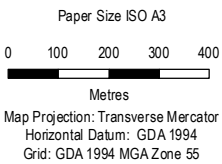
Potential Modelled Habitat for
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in vicinity of Wangetti Trail - South Section

Project No. 41-32458
Revision No. B
Date 1/12/2020

APPENDIX B-2
(Sheet 2 of 3)



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Potential Modelled Habitat for
opal cling goby (*Stiphodon semoni*)
in vicinity of Wangetti Trail - South Section

Project No. 41-32458
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APPENDIX B-3
(Sheet 3 of 3)

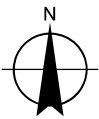
Appendix C – Wangetti South Section Ecological Field Survey Assessment Sites





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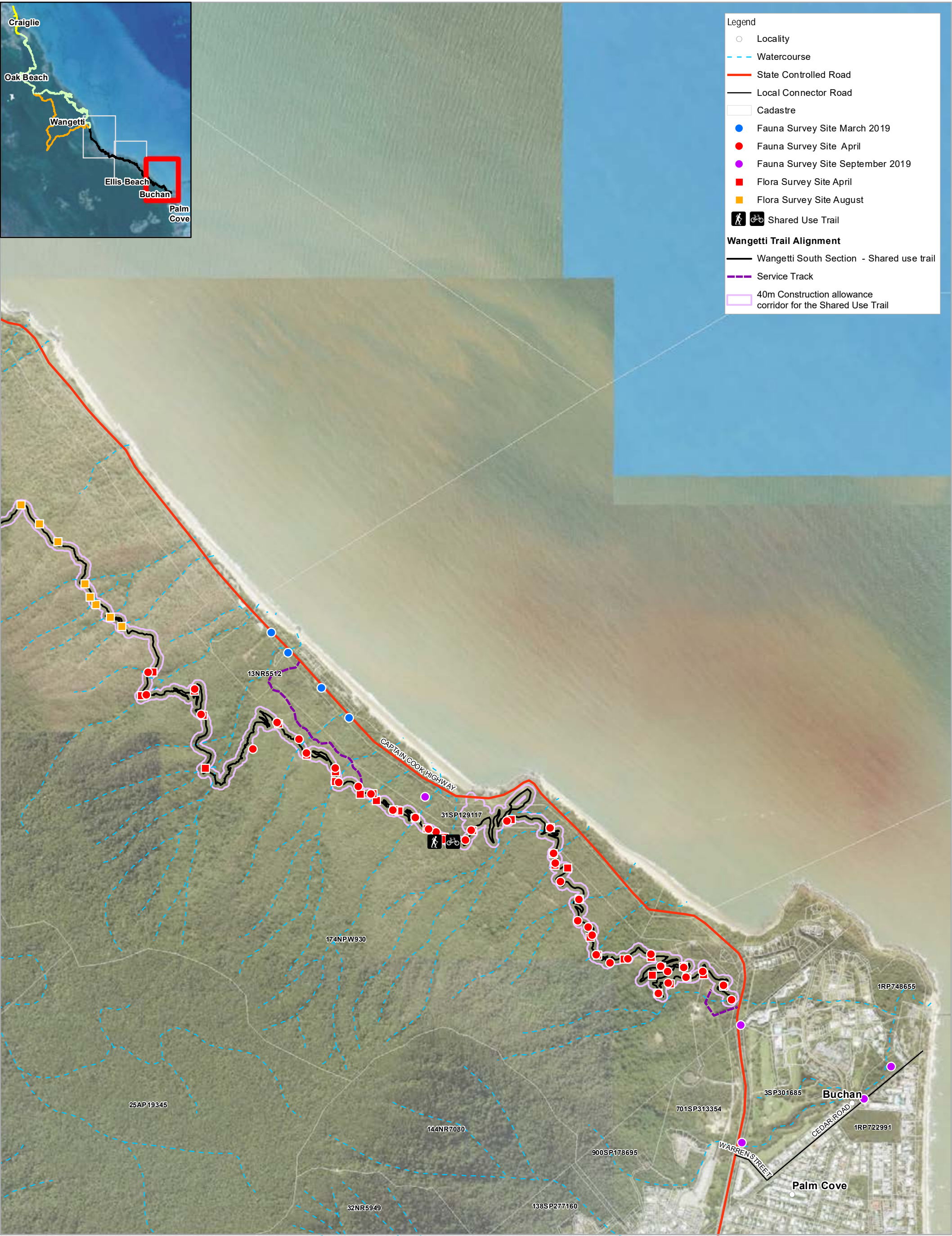


DITID
Environment Assessment Stage 2 Wangetti Trail

Wangetti South Section
Ecological Field Survey
Assessment Sites

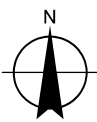
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APPENDIX C
(Sheet 2 of 3)



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DITID
Environment Assessment Stage 2 Wangetti Trail
**Wangetti South Section
Ecological Field Survey
Assessment Sites**

Project No. 41-32458
Revision No. 2
Date 30/06/2020

**APPENDIX C
(Sheet 3 of 3)**

Appendix D - Wangetti South Section Potential Habitat Types

Fauna habitat types within Wangetti South Section



Nine distinct fauna habitat types have been recorded within the Wangetti South survey area during the field surveys. These include the following:



- *Acacia* woodland
- Disturbed rainforest
- Ephemeral waterways
- Eucalypt woodland on steep rocky slopes
- *Melaleuca* swamp
- Mixed *Melaleuca viridiflora* woodlands on inundated plains
- Open woodland over grasses on undulating plains
- Permanent streams
- Vine forest
- Modified landscapes.



A representative photograph and description of each of these habitat types is provided in Table D-1, together with identification of which habitat types provide potential habitat for MNES fauna species.



The distribution of fauna habitat types within the Wangetti South Section is presented in Appendix D-1 to D-3.


Table D-1 Fauna habitat recorded during the field survey within the Wangetti South Section

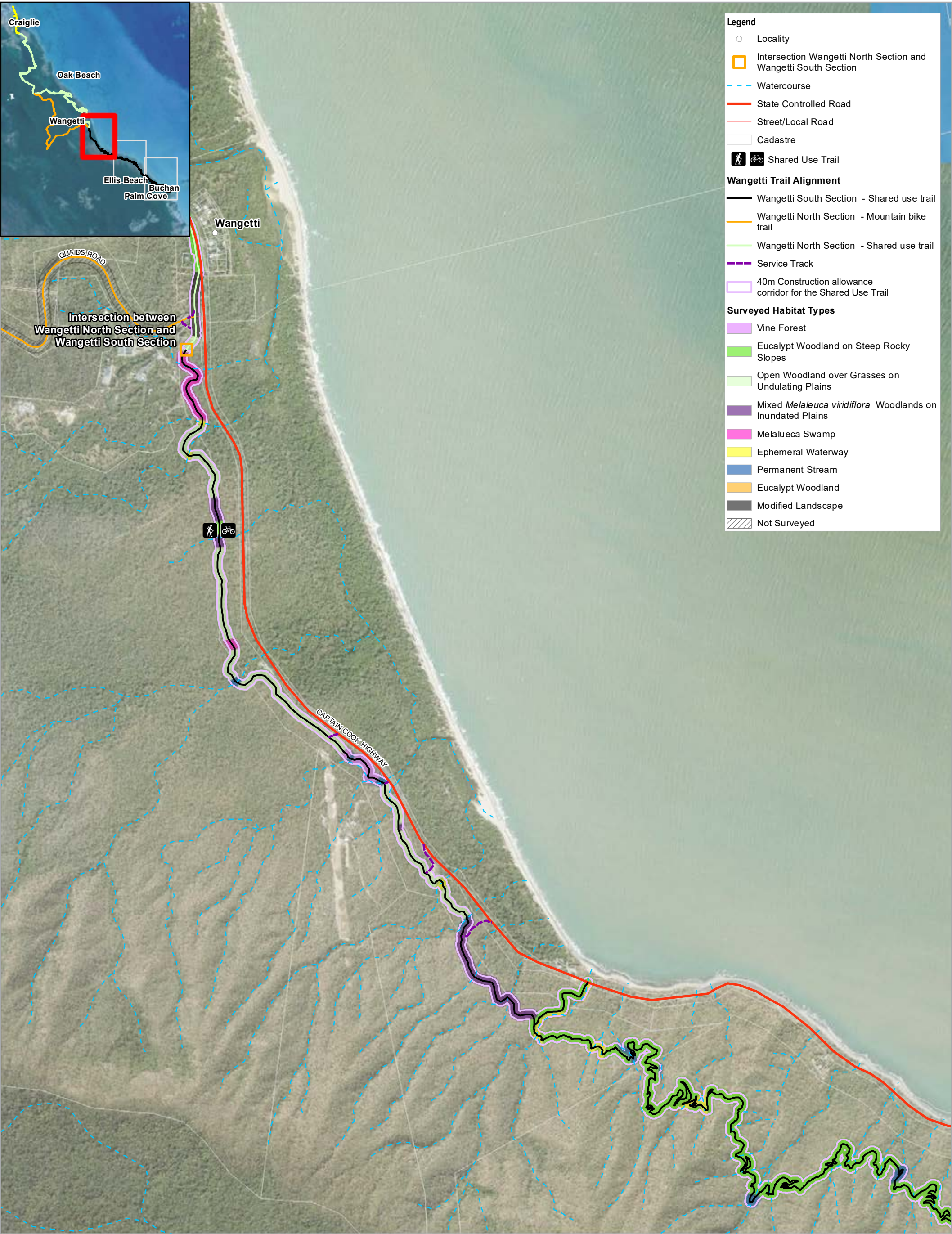
Habitat type	Characteristics	Ecological values
<p>Disturbed rainforest</p> 	<ul style="list-style-type: none"> • Canopy dominated by <i>Acacia celsa</i>, and retains a variety of mature rainforest tree species • Dense vines including <i>Calamus australis</i> (wait-a-while) and ground palms, dominate the shrub and understorey layer • Occasional large, hollow-bearing trees • Dense leaf litter, rotting woody debris logs, and scattered rocks • Soft friable soils suitable for burrowing. 	<ul style="list-style-type: none"> • Canopy vegetation provides foraging and nesting opportunities for a range of rainforest specialists, including doves, honeyeaters, monarchs, flycatchers, gerygones and figbirds, and foraging habitat for flying foxes • Abundance of fruits provide foraging habitat for frugivorous birds and ground mammals • Microhabitats for snakes, geckos and skinks • Potential conservation significant species – southern cassowary.
<p>Vine forest</p> 	<ul style="list-style-type: none"> • Closed canopy dominated by mature rainforest tree species • Dense shrub layer dominated by palms, ferns and vines • Dense vine understorey • Occasional large, hollow-bearing trees • Abundance of fruit and berries • Understorey relatively open with dense leaf litter, rotting woody debris logs, and scattered rocks • Soft friable soils suitable for burrowing. 	<ul style="list-style-type: none"> • Canopy vegetation provides foraging and nesting opportunities for a range of rainforest specialists, including doves, honeyeaters, monarchs, flycatchers, gerygones and figbirds, and foraging habitat for flying foxes • Microhabitats for snakes, geckos and skinks • Refuge for microbats • Refuge and foraging habitat for rodents and other ground-dwelling mammals • Potential conservation significant species – southern cassowary and migratory birds.

Habitat type	Characteristics	Ecological values
<p>Eucalypt woodland on steep rocky slopes</p> 	<ul style="list-style-type: none"> • Canopy dominated by <i>Eucalyptus portuensis</i> or retains a variety of mature canopy sclerophyll tree species, including <i>E. tessellaris</i>, <i>E. tereticornis</i>, <i>Lophostemon suaveolens</i>, <i>Corymbia intermedia</i> and <i>C. clarksoniana</i> • Hollow-bearing trees are moderately prevalent • Sparse shrub layer • Dense ground cover, including <i>Imperata cylindrical</i> (blady grass) and native ferns • Presence of logs, woody debris and leaf litter • Presence of rocky outcrops and boulders. 	<ul style="list-style-type: none"> • Canopy vegetation provides foraging and nesting opportunities for honeyeaters and parrots, and foraging habitat for flying foxes and arboreal mammals • Hollow-bearing trees provide den sites for arboreal mammals, such as possums, microbats, and nesting habitat for hollow-nesting birds, such as lorikeets, cockatoos and owls • Rocky outcrops and boulders provide basking and sheltering habitat for snakes, monitors and skinks • Potential conservation significant species – migratory birds.
<p>Open woodland over grasses on undulating plains</p> 	<ul style="list-style-type: none"> • Tall, sparse canopy vegetation • Hollow-bearing trees are moderately prevalent • Very sparse shrub layer present • Open understorey • Presence of logs, woody debris and leaf litter. 	<ul style="list-style-type: none"> • Canopy vegetation provides blossoms and nesting opportunities for honeyeaters and parrots, and foraging habitat for flying foxes • Refuge and foraging habitat for arboreal mammals and nocturnal birds • Microhabitats for snakes, geckos, skinks and other reptile species • Grasses provide food resources for granivorous birds and herbivorous mammals • Potential conservation significant species – none.

Habitat type	Characteristics	Ecological values
<p><i>Acacia</i> woodland</p> 	<ul style="list-style-type: none"> • Dense regrowth canopy cover of <i>Acacia melanoxylon</i> • Dense leaf litter and woody debris • Scattered rock and decorticated bark present. 	<ul style="list-style-type: none"> • Canopy vegetation provides blossoms for honeyeaters and parrots • Microhabitats for snakes, geckos, skinks and other reptile species • Potential conservation significant species – none.
<p>Mixed <i>Melaleuca viridiflora</i> woodlands on inundated plains</p> 	<ul style="list-style-type: none"> • Dense canopy cover of <i>Melaleuca viridiflora</i> • Shrub layer absent • Diverse ground layer of grasses, sedges and forbs • Presence of woody debris and leaf litter • Soft friable soils suitable for burrowing. 	<ul style="list-style-type: none"> • Canopy vegetation provides blossoms and nesting opportunities for honeyeaters and parrots, and foraging habitat for flying foxes and arboreal mammals • Grasses provide food resources for granivorous birds and herbivorous mammals • Burrowing habitat for reptiles and amphibians • Potential conservation significant species – migratory birds.

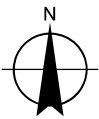
Habitat type	Characteristics	Ecological values
<p><i>Melaleuca</i> swamp</p> 	<ul style="list-style-type: none"> • Dense canopy cover of <i>Melaleuca viridiflora</i> • Dense sedges and grasses fringing swamp. 	<ul style="list-style-type: none"> • Canopy vegetation provides blossoms for honeyeaters and parrots • Drinking sites for birds and mammals • Breeding and calling habitat for amphibians • Foraging habitat for frog-eating snakes • Foraging habitat for flying foxes and microbats • Potential conservation significant species – migratory birds.
<p>Ephemeral waterways</p> 	<ul style="list-style-type: none"> • Tall closed canopy vegetation • Presence of complex riparian habitat • In stream complexity with undercut banks, roots balls, trailing vegetation, and large rocks to boulders. 	<ul style="list-style-type: none"> • Canopy vegetation provides blossoms and fruits for doves, honeyeaters, friarbirds, figbirds and parrots • Temporary feeding and breeding habitat for aquatic species, and important for facilitating movement during flow events between permanent streams • Drinking site for birds and mammals • Breeding and calling habitat for amphibians • Foraging habitat for frog-eating snakes • Foraging habitat for flying foxes and microbats • Potential conservation significant species – southern cassowary and migratory birds.

Habitat type	Characteristics	Ecological values
Permanent streams 	<ul style="list-style-type: none"> • Tall closed canopy vegetation • Slow and fast flowing permanent streams with splash zones • Large boulders and rocks • Rock crevices. 	<ul style="list-style-type: none"> • Foraging and breeding habitat for fish species and crustaceans • Foraging habitat for kingfishers and other fishing birds • Drinking site for birds and mammals • Breeding and foraging habitat for amphibians • Foraging habitat for frog-eating snakes • Foraging habitat for flying foxes and microbats • Potential conservation significant species – southern cassowary. Suitable habitat for the waterfall frog, common mistfrog and Australian lace-lid.
Modified landscapes 	<ul style="list-style-type: none"> • Canopy and shrub layer absent • Ground layer heavily altered. 	<ul style="list-style-type: none"> • Foraging habitat for raptors and birds adapted to open landscapes • Foraging habitat for macropods • Potential conservation significant species – none.



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Environment Assessment Stage 2 Wangetti Trail

Wangetti South Section
Potential Habitat Types
within the Project Area

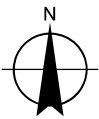
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(Sheet 1 of 3)



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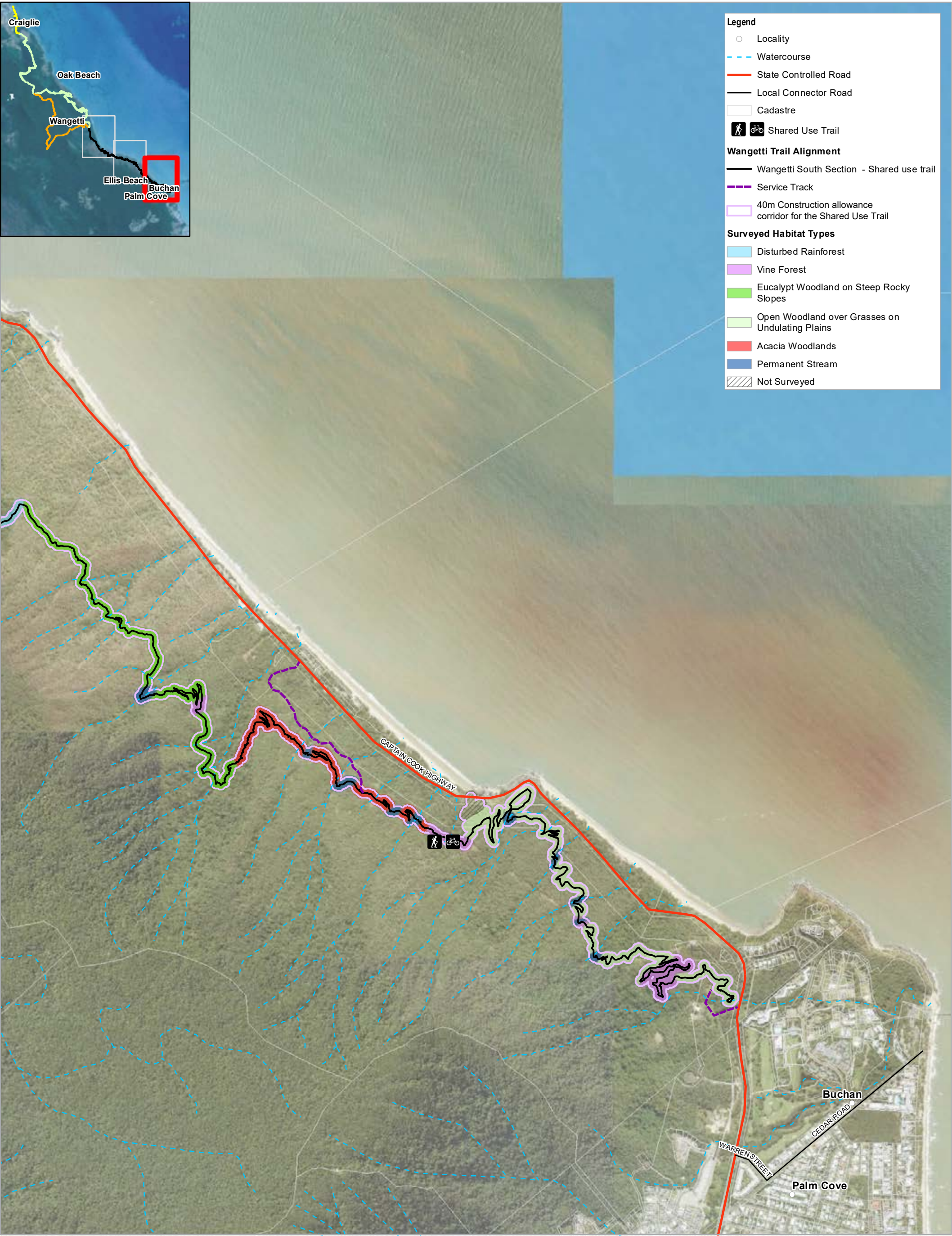


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Environment Assessment Stage 2 Wangetti Trail

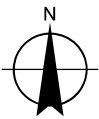
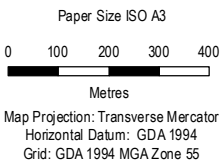
Wangetti South Section
Potential Habitat Types
within the Project Area

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APPENDIX D-2
(Sheet 2 of 3)



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DITID
Environment Assessment Stage 2 Wangetti Trail

**Wangetti South Section
Potential Habitat Types
within the Project Area**

Project No. 41-32458
Revision No. 3
Date 30/06/2020

APPENDIX D-3
(Sheet 3 of 3)

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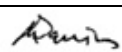
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Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	N. Schulz	B. Steytler	<i>On file</i>	G Squires		20.1.21

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Appendix F – Matters of national environmental significance flora pre-clearance survey methodology



Department of State Development, Tourism, and Innovation

Wangetti Trail South Section (Wangetti to Palm Cove)

**Matters of national environmental significance flora pre-clearance
survey methodology**

January 2021

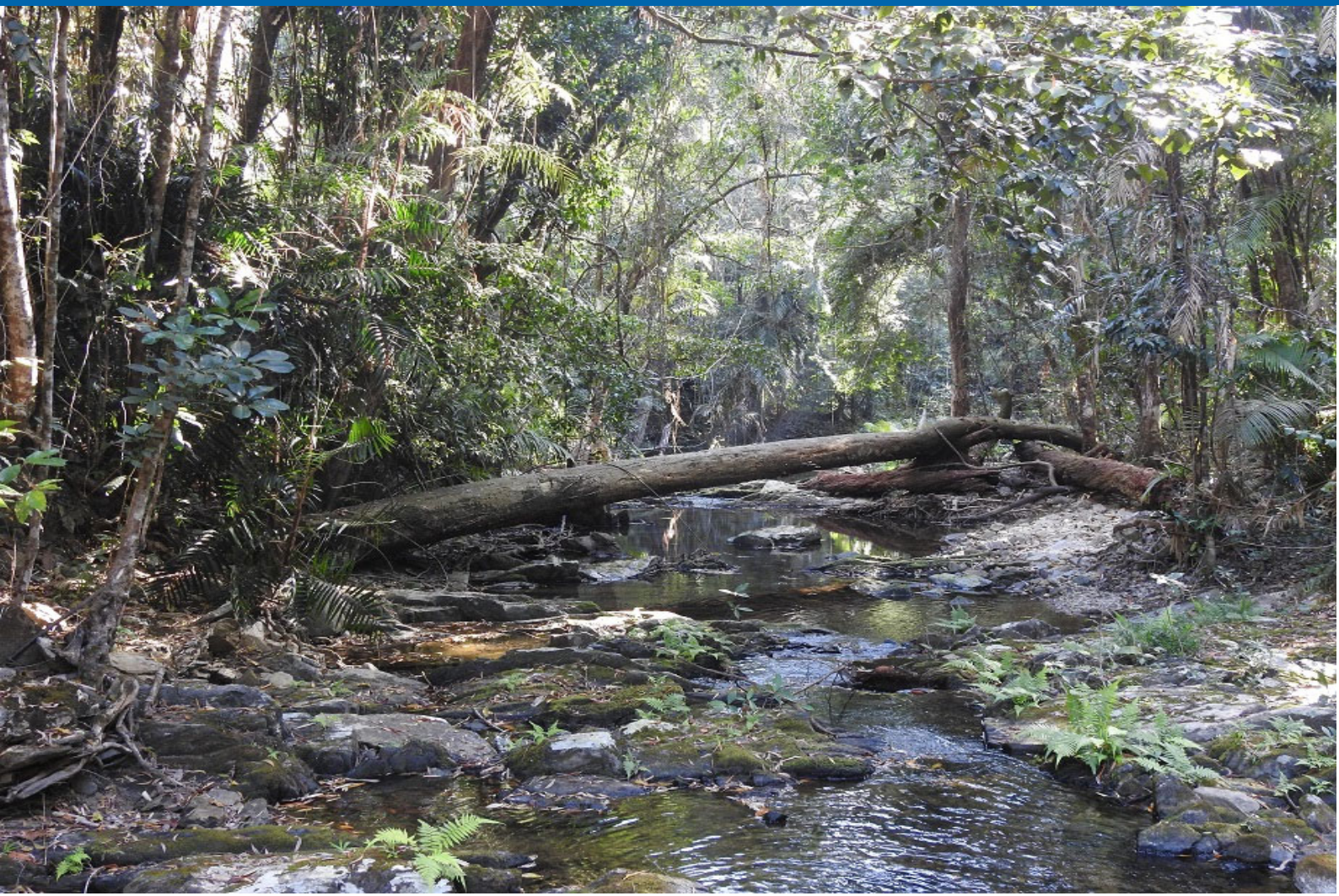


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1. Introduction

1.1 Project background

1.1.1 Overview

The Department of State Development, Tourism and Innovation (DSDTI) - Tourism Development Projects Division (TDPD) is proposing to establish the Wangetti Trail – Wangetti South Section, a 29.7 kilometre (km) shared use trail to accommodate both mountain bike users and hikers from Lot 2 SP309094 in the township of Wangetti, to Palm Cove. Figure 1 shows the location of the Wangetti South Section.

The Wangetti South Section will comprise the following components:

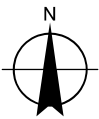
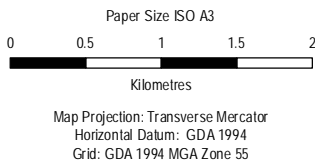
- 29.7 km shared use trail to accommodate both mountain bike users and hikers, consisting of natural ground and surface treatments, which will be a maximum of 1.5 m wide. The 1.5 m wide trail will be located within a 40 m survey corridor, referred to as the construction allowance corridor, to allow flexibility for the placement of infrastructure during the construction phase. The trail has been designed to be a 'Mountain Biking – intermediate (blue square with blue outline) as defined in the Australian Mountain Bike Trail Guidelines Trail Difficulty Rating System (MTBA TDRS) and grade 3 for hikers, as defined in the Australian Walking Track Grading System (AWTGS), which also equates to Class 3 in the Australian Standard for Walking Tracks, Part 1: Classification and Signage (AS 2156.1-2001). The trail will have an average gradient of <10% and a maximum gradient no greater than 15% (for short distances only). Built structures proposed as part of the trail include gully crossings, bridges, staircases, platforms, rock armouring and signage, where appropriate and required.
- A number of waterway crossings along the shared use trail that will comprise of the following: rock armouring, boulder crossings and low-level bridge (minor water crossing).
- Dark Jungle (public camping node and amenities block) which will have a footprint of 0.25 ha and will comprise of:
 - 10 x 4 m diameter elevated camping decks
 - 1 x 2.5 m x 2.5 m toilet block
 - 1 communal gathering area including bike rack, table and seating, cooking and bench area and shelter
 - Interconnecting pathways, boardwalks and access tracks.
- The formalisation of existing access tracks into service tracks to provide restricted access to the shared use trail and Dark Jungle for construction purposes, operational purposes, maintenance purpose and for emergency purposes.

The Wangetti South Section is being proposed over four properties located within the Douglas Shire Council and Cairns Regional Council local government areas. The project area intersects both the Macalister Range National Park and the Wet Tropics World Heritage Area (WTWHA).

The project is being delivered by TDPD as part of an adventure-based ecotourism development in north Queensland. The shared use trail will provide walkers and mountain bike riders with a unique experience to traverse through natural areas of north Queensland covering bushland and coastal areas, including the Wet Tropics of Queensland (Wet Tropics), and national parks.



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DITID
Environment Assessment Stage 2 Wangetti Trail

Wangetti South Section
Project Locality Plan

Project No. 41-32458
Revision No. 5
Date 1/12/2020

FIGURE 1

In August 2020, TDPD submitted a referral under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) for the proposed Wangetti South Section (ref: EPBC 2020/8722). As part of the referral, the Wangetti South Section (Wangetti to Palm Cove) Matters of National Environmental Significance Baseline Ecology and Impact Assessment Report was prepared by GHD (2020) noted the following regarding threatened flora species:

- No threatened flora species have been confirmed present within the project area during field surveys.
- Four threatened flora species were considered 'likely to occur' within the project area based on the presence of potentially suitable habitat and previous records, namely:
 - *Myrmecodia beccarii* (Ant plant) – Vulnerable
 - *Toechima pterocarpum* (Orange tamarind) – Endangered
 - *Vappodes lithocola*¹ (Dwarf butterfly orchid) – Endangered
 - *Zeuxine polygonoides*² (Velvet jewel orchid) – Vulnerable.
- Nine threatened flora species were rated as 'may occur' within the project area.

Following the assessment of the referral documentation by Commonwealth Department of Agriculture, Water and the Environment (DAWE), it was determined on 11 September 2020, that the Project would be a controlled action and would be assessed by preliminary documentation. DAWE requested that further information, in particular a pre-clearance survey methodology document be developed to demonstrate its predicted effectiveness to avoid listed threatened flora species during the construction stage. As a result, the Wangetti Trail – South Section (Wangetti – Palm Cove) MNES flora pre-clearance survey methodology document has been prepared.

1.2 Purpose of this report

The purpose of this document is to outline the pre-clearance survey methodology to be adopted before starting construction works for the Wangetti South Section to demonstrate how protected flora species will be identified and managed as part of the project. Protected flora considered by the document are those that are listed as Matters of National Environmental Significance (MNES) under the EPBC Act. This document outlines the timing of the MNES flora pre-clearance survey, the personnel required to undertake the MNES flora pre-clearance survey and the methods and reporting to be adopted.

This document will be incorporated in the Construction Environmental Management Plan for Wangetti South Section. This document has been developed with reference to the following documents:

- Department of State Development, Tourism and Innovation Wangetti Trail South Section (Wangetti to Palm Cove) - Matters of National Environmental Significance -Baseline Ecology and Impact Assessment Report prepared by GHD dated July 2020
- Wangetti Trail Construction Methodology Manual, prepared by World Trail dated April 2020
- Department of Environment and Science Flora Survey Guidelines (DES Flora Survey Guidelines) – Protected Plants Nature Conservation Act 1992 NCS/2016/2534 version 2.01 dated 22 August 2020.

¹ Also known as *Dendrobium lithocola*, and the Queensland Flora Census 2019 groups this species into *Dendrobium biggibum*

² Also known as *Rhomboda polygonoides*

2. MNES flora pre-clearance survey methodology

2.1 Overview of the Pre-Start Trail Review and pre-clearance surveys for Wangetti Trail South Section

At the commencement of the construction of the Wangetti Trail South Section, the entire trail will be broken into Construction Segments. The Construction Segments assist in reducing the amount of area to be exposed during the construction phase, which in turn reduces impacts to the natural environment and reduces the impact to the movement of wildlife in the area.

Before starting the construction of a Construction Segment, a Pre-Start Trail Review (PSTR) will be undertaken. The purpose of the PSTR is to review and inspect the proposed alignment of the trail with the TDPD Project Manager, prior to construction starting, to confirm the exact alignment within the groundtruthed corridor, identify any specific environmental values to be protected (including values identified to date together with any additional values identified during the PSTR) and to discuss and agree on specific construction treatments.

The following personnel will be involved in the PSTR:

- TDPD Project Manager
- Contractor's Project Manager
- Contractor's Trail Designer/Builder for that Construction Segment
- Suitably qualified botanist/ecologist
- DES Shadow Ranger.

A representative of the respective land manager(s), Queensland Parks and Wildlife Services (QPWS), Wet Tropics Management authority (WTMA), Douglas Shire Council, Cairns Regional Council, and the Traditional Owners will be invited to attend the PSTR.

Other personnel may also be required – for example, if the trail is in close proximity to areas of high environmental values, qualified environmental specialists should be present to provide assistance in micro-siting the trail to avoid impacts to these values. In areas of high cultural heritage values, qualified archaeologists and/or Traditional Owners should be present.

Prior to commencing the PSTR, known information about the Construction Segment will be gathered and assessed – length, proposed difficulty rating, likely construction treatments, known environmental issues that have been identified including protected flora species.

MNES flora pre-clearance survey will be undertaken during the PSTR and will be carried out across the entire project footprint.

The Construction Segments, PSTR and pre-clearance surveys are control measures being adopted by the Project to demonstrate how the Project can avoid, minimise and mitigate impacts on MNES:

- This process includes the delineation of the approved clearing area with flagging tape or survey pegs and this ensures that any areas of high ecological values encountered can be avoided in the first instance by the proposed works (including values identified to date together with any additional values identified during the PSTR). Where there is an environmental issue specific to the trail during the field inspection of the pre-start phase, the environmental issue would be visually identified and then marked in the field as an exclusion zone (using different coloured flagging tape or bunting). The exact alignment of

the trail is flagged, ensuring an adequate buffer from the exclusion zone. Detailed documentation is gathered, including photographs showing the pre-existing conditions on site and photo points using GPS coordinates before any works are undertaken. This allows for post-construction photos to be taken, which will enable before/after comparison. A suitably qualified botanist/ecologist will be involved during the process.

- A QPWS ranger will be invited to attend the PSTR for areas with high environmental significance in order to aid in micro-siting the trail to avoid impacts to environmental values.
- Record any MNES flora species encountered during the PSTR and pre-clearance survey. Where any MNES flora species are identified, the botanist/ecologist and trail builders will be able to collaborate and achieve a satisfactory solution to micro-site the trail and avoid potential impact to MNES flora species. Findings from the MNES flora pre-clearance survey will be discussed with TDPD Project Manager, Contractor's Project Manager and the Contractor's Trail Designer/Builder to determine if additional protection measures are required and/or if any changes need to be made to the alignment.
- Detailed documentation is gathered, including photographs showing the pre-existing conditions on site before any works are undertaken. This allows for post-construction photos to be taken and to create photo points using a GPS coordinate, which will enable before/after comparison. This information will be used to develop a monitoring plan of the MNES flora species to monitor the number and condition of MNES species within the project area.
- Hand construction may need to be undertaken in areas of high environmental values, therefore requiring minimal excavation and disturbance footprints.
- The construction segments allow for disturbed areas to be rehabilitated in a timely manner.

2.2 Target species

No MNES flora species have been confirmed present within the construction allowance corridor during field surveys. However, four MNES flora species were considered likely to occur by the MNES Baseline Report (GHD 2020), namely:

- Ant Plant (*Myrmecodia beccarii*) - Vulnerable
- Dwarf butterfly orchid (*Vappodes lithocola*³) – Endangered
- Orange Tamarind (*Toechima pterocarpum*) - Endangered
- Velvet jewel orchid (*Zeuxine polygonoides*⁴) – Vulnerable.

The Department of Agriculture, Water and the Environment (DAWE) identified a further eight MNES flora species that have the potential to occur, however no historic records of these species were identified by the baseline assessment undertaken for the project such that they were not rated as 'likely to occur' by the MNES Baseline Report (GHD 2020). These additional species are identified by DAWE as follows:

- *Canarium acutifolium* - Vulnerable
- Dark-stemmed Antler Orchid (*Dendrobium mirbelianum*) - Endangered
- *Diplazium cordifolium* - Vulnerable
- *Diplazium pallidum* - Endangered

³ Also known as *Dendrobium lithocola*, and the Queensland Flora Census 2019 groups this species into *Dendrobium biggibum*

⁴ Also known as *Rhomboda polygonoides*

- *Phaius pictus* - Vulnerable
- Native Moth Orchid (*Phalaenopsis amabilis* subsp. *rosenstromii*) - Endangered
- *Polyscias bellendenkerensis* - Vulnerable
- Cooktown Orchid (*Vappodes phalaenopsis*) – Vulnerable (also known as *Vappodes phalaenopsis* and the Queensland Flora Census 2019 recognises this species as *Dendrobium biggibum*)

2.3 Survey team

The MNES flora pre-clearance survey will be undertaken by a qualified botanist or ecologist. Given the complexity and diversity of ecosystems that characterise the construction area, the botanist/ecologist must have significant and demonstrable experience in survey of the relevant ecosystem types and identifying the specific target species.

Prior to the PSTR/pre-clearance flora survey commencing, the experience of the botanist/ecologist undertaking the requirements of the flora survey will be reviewed by TDPD Project Manager. The qualifications and experience of the botanist/ecologist will be included in the flora survey report.

During the MNES pre-clearance survey, the qualified botanist or ecologist will be accompanied by the Contractor's Trail Designer/Builder for that construction segment to facilitate clear communications and allow for development of on-the-ground practical solutions in the event than an MNES flora species is encountered.

2.4 Timing

Construction is anticipated to commence in April 2021. Accordingly, the MNES flora pre-clearance survey will be undertaken in March 2021 so as to complete this survey and reporting prior to commencement of construction activities.

This proposed timing is suitable for detection of all target species (refer Table 2-1). Specifically, the target species are all long-lived species, and the survey timing will coincide with the flowering season for many of the more cryptic species. Where any orchid species with an absence of flowers are recorded and the identity cannot be confidently determined at the time of survey, these plants will either be completely avoided (i.e. assumed to be a potential MNES species for the purpose of flora management) or works in that area will not be undertaken until identification during a suitable season can be undertaken.

Any areas that are not cleared within 18 months from the time of the MNES flora pre-clearance survey are to be re-surveyed prior to clearing.

Table 2-1 Seasonality for survey of target MNES flora species

Species	Seasonality for survey
<i>Canarium acutifolium</i>	Seasonality not critical (long-lived tree that can be identified based on vegetative features)
<i>Dendrobium mirbelianum</i>	Flowering is variable, generally August to November. However, it is a perennial species that can be detected outside of flowering season based on vegetative features (also see footnote* below).
<i>Diplazium cordifolium</i>	Seasonality not critical (long-lived fern that can be identified based on vegetative features)

Species	Seasonality for survey
<i>Diplazium pallidum</i>	Seasonality not critical (long-lived fern that can be identified based on vegetative features)
<i>Myrmecodia beccarii</i>	Seasonality not critical (long-lived plant that is highly distinctive based on vegetative features)
<i>Phaius pictus</i>	Flowers in April to June. This is a long-lived evergreen orchid and the genus is highly distinctive, such that the presence of this genus can be detected outside of the flowering season and therefore seasonality is not critical (also see footnote* below).
<i>Phalaenopsis amabilis</i> subsp. <i>rosenstromii</i>	Flowers in December to April such that the seasonality of the survey will be appropriate (also see footnote* below).
<i>Polyscias bellendenkerensis</i>	Seasonality not critical (long-lived shrub / small tree that can be identified based on vegetative features)
<i>Toeckima pterocarpum</i>	Seasonality not critical (long-lived tree that can be identified based on vegetative features)
<i>Vappodes lithocola</i>	Flowers in March to July such that the timing of the survey will be appropriate (also see footnote* below)
<i>Vappodes phalaenopsis</i>	Flowers in March to July such that the timing of the survey will be appropriate (also see footnote* below)
<i>Zeuxine polygonoides</i>	The species flowers from June to August; however vegetative features are distinctive such that seasonality is not critical.

* Where any orchid species with an absence of flowers are recorded and the identity cannot be confidently determined at the time of survey, these plants will either be completely avoided (i.e. assumed to be a potential MNES species for the purpose of flora management) or works in that area will not be undertaken until identification during a suitable season can be undertaken.

2.5 Target area

The MNES flora pre-clearance survey will be undertaken across the entire project footprint.

For the purpose of identifying where particular species may occur, a map has been developed to identify habitats that may be suitable for the target MNES flora species. This map was developed by researching the habitat requirements of each species (based primarily on the DAWE's Species Profile and Threats Database (SPRAT), and then using Regional Ecosystem mapping to identify areas supporting potentially suitable vegetation communities. Where habitats are likely to be only marginally suitable, a precautionary approach was adopted, and these were included in the habitat map. Where relevant, geological and/or altitudinal information was used to refine the mapping for species with specific requirements relating to these characteristics.

The mapping is provided as Appendix A and the attributes on which the mapping was developed are provided in Appendix B.

2.5.1 Disturbance areas

Shared Use Trail

The width of the shared use trail will be a maximum of 1.5 m and the total length of the trail (excluding mountain bike trail) is 29.7 km. Details of the vegetation clearing technique to be adopted during the construction phase of the project is outlined in the Wangetti Trail Construction Methodology Manual (World Trail 2020). Vegetation clearing will be used to clear the pathway of vines, shrubs, bushes, ground covers and small trees, to allow clear access for the mini-excavator.

Up to 1.0 m temporary disturbance (i.e. 0.5 m on either side of the 1.5 m trail) has been allowed during the construction phase in order to accommodate construction equipment including a small excavator. Up to 2.5 m height temporary disturbance has been allowed during the construction phase in order to accommodate construction equipment including a small excavator.

A construction allowance corridor (20 m on either side of the trail for a total corridor of 40 m width) has been allowed for the trail to provide flexibility to the trail builders to deviate from the alignment up to 20 m to either side, in order to respond to any unexpected issues that may arise including avoiding any identified MNES flora species. Taking into consideration the population characteristics that are typical for the target species (i.e. no extensive populations of clustered individuals are anticipated to occur), the 40 m construction allowance corridor should be sufficient in most cases to enable the trail to be moved or adjusted to avoid any MNES plants.

Proposed single span bridges along Shared Use Trail

In order to accommodate the construction of the abutments and to allow for the installation of the single span bridge a maximum area of 21 m² has been allowed on either side of the waterway (total disturbance area 42 m²) or a width of 1.5 m over the waterway.

Service tracks

Limited vegetation disturbance is required for only one service track to remove vegetation that has grown over the existing access track. In regards to the other service tracks, only overhanging vegetation over the existing access tracks will be cut back.

Dark Jungle

For Dark Jungle, an area of up to 0.25 ha will be permanently disturbed for the public camping node and amenities block camp site. The design of the public camping node will be refined during the detailed design phase by the nominated construction contractor with a maximum of 0.25 ha allowed.

2.6 Flora pre-clearance survey method

During the MNES flora pre-clearance survey, the botanist/ecologist will comprehensively traverse the project footprint on foot in search of MNES plants. This is feasible given that the total width of the footprint is 2.5 m (i.e. permanent and temporary footprints combined). Areas beyond the 2.5 m footprint will be surveyed within the 40 m wide corridor should the footprint require adjustment at any location.

Where an MNES plant species is detected, the botanist/ecologist will notify the trail builders, and an exclusion zone will be clearly demarcated using coloured flagging tape or bunting. The precise location (including accuracy of recorded location) of all observed MNES flora species will be recorded with a hand-held global positioning system (GPS) for future reference and for notification to relevant parties (e.g. Queensland Herbarium) and inclusion on site plans.

Supplementary information regarding the occurrence of the MNES flora species is to be recorded including a description of the supporting habitat, the size and maturity of individuals, the presence of reproductive output, and any observations on health and condition.

The re-positioning of the footprint will be to an appropriate distance from the MNES plant within the 40 m wide construction allowance corridor to allow for a buffer from the impact, also taking into consideration indirect impacts that could occur such as reduction of canopy cover. The buffer will be determined by the botanist/ecologist taking into consideration the size, age, type and the condition of the MNES plant.

Upon completion of works in the vicinity of an exclusion zone, all marking will be removed.

3. Reporting

3.1 Reporting results of the MNES flora pre-clearance survey

During the MNES flora pre-clearance survey during the PSTR, findings will be recorded using a handheld GPS device and reported in a flora survey report. The flora survey report must include photos and specific GPS coordinates associated with the protected plant species. A copy of the completed and signed document must be provided to the TDPD Project Manager.

Findings from the MNES flora pre-clearance survey will be discussed with TDPD Project Manager, Contractor's Project Manager and the Contractor's Trail Designer/Builder to determine if additional protection measures are required and/or if any changes need to be made to the alignment.

Where a protected plant species has been identified within the disturbance area of the shared use trail, the following protocol would apply:

- TDPD Project Manager, Contractor's Project Manager and the Contractor's Trail Designer/Builder and the relevant regulatory authority would be contacted prior to the field inspection for specific recommendations and invited to attend if required (for example, micro-siting to avoid MNES flora sites);
- During the MNES flora pre-clearance survey, the plant would be visually identified and then marked in the field as an exclusion zone (using different coloured flagging tape or bunting). The exact alignment of the trail to be constructed would be flagged in the field, ensuring an adequate buffer from the exclusion zone.
- Detailed documentation will be gathered, including photographs showing the pre-existing conditions on site before any works are undertaken. This allows for post-construction photos to be taken, which will enable before/after comparison.

4. Predicted effectiveness

4.1 Identification of MNES flora

This survey method is expected to be highly effective in identifying any MNES flora species that are present within the project footprint for the following reasons:

- Given the narrow extent of the project footprint for the shared use trail (i.e. maximum of 2.5 m in width) and Dark Jungle (0.25 ha), it will be feasible to comprehensively ground-truth the entire project footprint.
- The seasonality of the survey will be appropriate for detection of the target species.
- The requirement for the botanist/ecologist to demonstrate significant experience in the specific ecosystems and relevant species provides assurance in the outcomes of the survey.

4.2 Avoidance of impacts

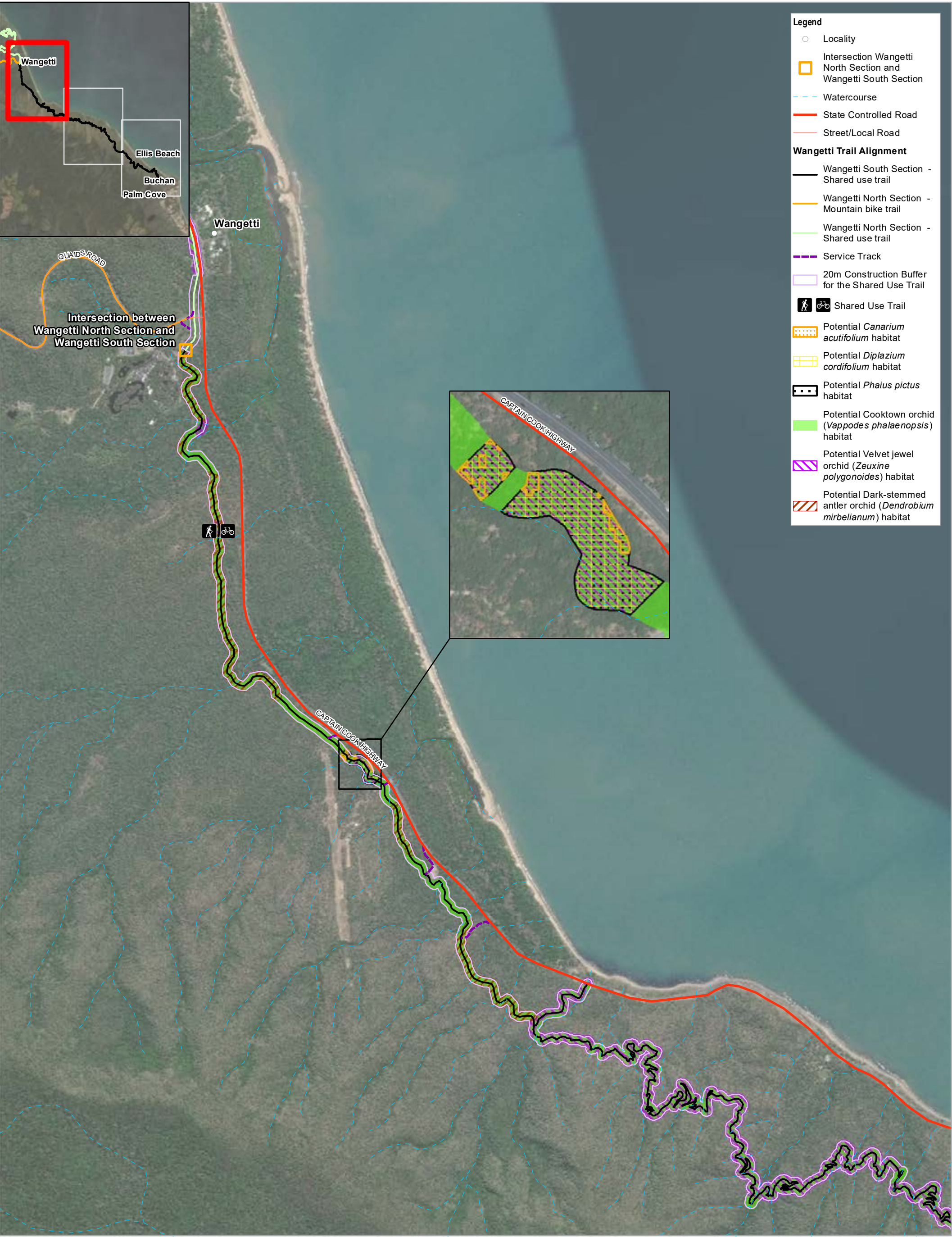
The approach is also expected to be highly effective in achieving avoidance of potential impacts to MNES flora species for the following reasons:

- Given the flexibility of the precise project footprint location within the construction allowance corridor, it will be achievable for the project footprint to be re-positioned as required so as to successfully avoid impact to any MNES flora species that are detected.
- The documented population characteristics that are typical of the target species are such that no large populations comprising numerous clustered individuals are anticipated to occur, and therefore the construction allowance corridor is expected to provide sufficient space for avoidance of impacts to an overall population, including consideration of indirect impacts such as reduced canopy cover .
- The presence of the Contractor's Trail Designer/Builder during the MNES flora pre-clearance survey will facilitate clear communication between the botanist/ecologist and the trail builder, such that there is no misinformation or misunderstanding regarding the presence of MNES flora species. Where any MNES flora species are identified, the botanist/ecologist and trail builders will be able to collaborate and achieve a satisfactory solution to micro-site the trail and avoid potential impact to MNES flora species.
- Where a MNES plant is encountered, the re-positioning of the footprint will be at an appropriate distance from the MNES plant within the construction allowance corridor to allow for a buffer from the impact.

5. References

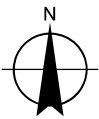
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- Department of the Environment, Water, Heritage and the Arts (DEWHA) 2008b. *Approved Conservation Advice for Diplazium cordifolium*. Canberra: Department of the Environment, Water, Heritage and the Arts.
- Department of the Environment, Water, Heritage and the Arts (DEWHA) 2008c. *Approved Conservation Advice for Diplazium pallidum*. Canberra: Department of the Environment, Water, Heritage and the Arts.
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Appendix A – Mapping of the preferred habitat for MNES flora species within Wangetti South Section



Based on or contains data provided by the State of QLD (DNRME) 2020. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for marketing or be used in breach of the privacy laws.

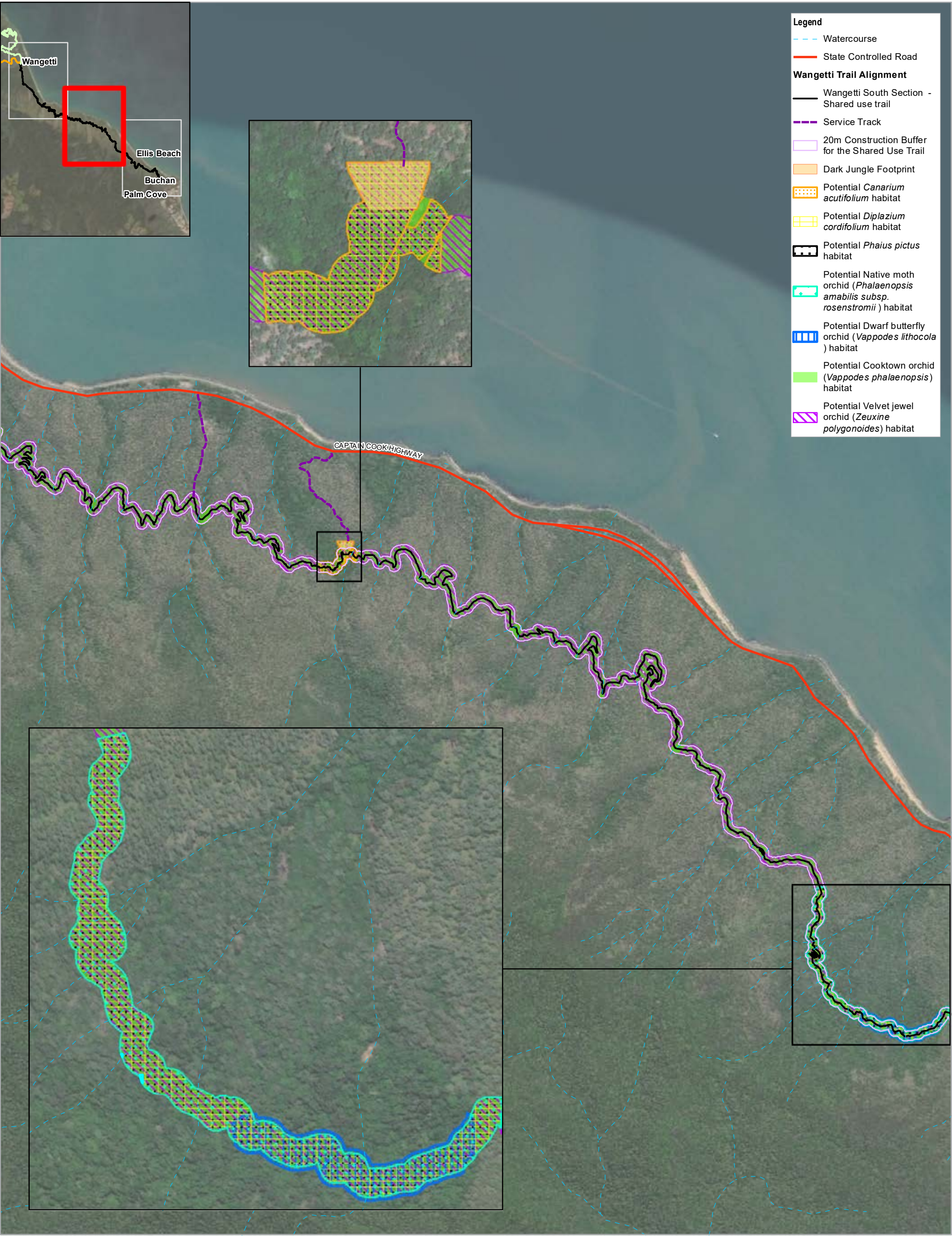
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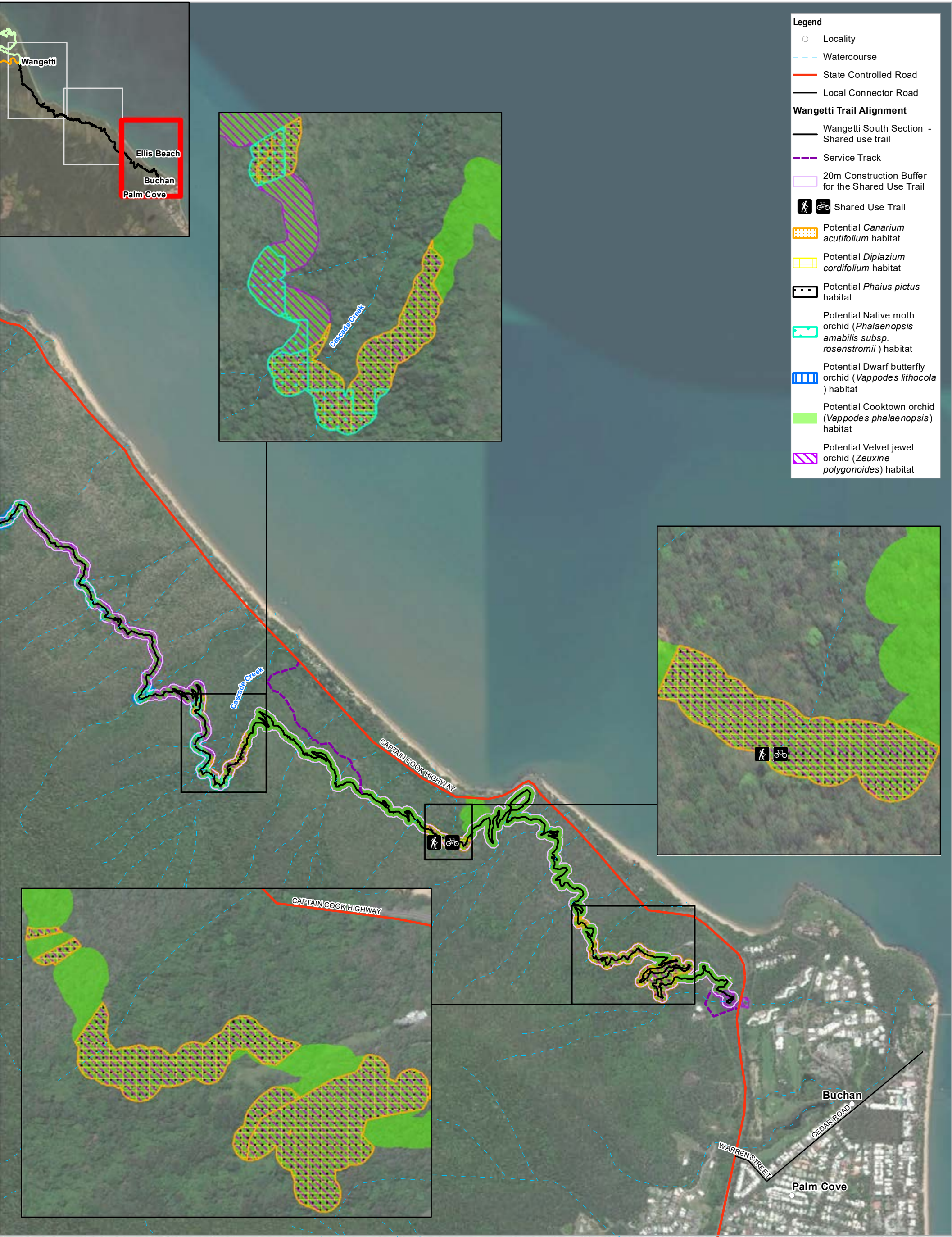
DITID
Environment Assessment Stage 2 Wangetti Trail
**Wangetti Trail South Section -
Wangetti to Palm Cove Potential habitat
for threatened flora species**

Project No. 41-32458
Revision No. A
Date 23/12/2020

FIGURE 3
(Sheet 1 of 3)

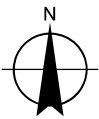


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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55



DITID
Environment Assessment Stage 2 Wangetti Trail
**Wangetti Trail South Section -
Wangetti to Palm Cove Potential habitat
for threatened flora species**

Project No. 41-32458
Revision No. A
Date 24/12/2020

FIGURE 3
(Sheet 3 of 3)

Appendix B – Determination of preferred habitat for MNES flora species within Wangetti South Section

Threatened flora species	Preferred habitat	Relevant Regional Ecosystems (REs)	Altitudinal limits
<i>Canarium acutifolium</i>	Dense, primary rainforest, also in the more open, secondary formations; especially along forest-edges, riverbanks and in clearings (DEWHA 2008a).	7.3.10 – Mesophyll to notophyll vine forest 7.11.1 – Mesophyll vine forest 7.11.1a – Mesophyll vine forest 7.11.1b – Mesophyll vine forest 7.11.7 – Notophyll vine forest 7.11.7a – Notophyll vine forest 7.11.7b – Notophyll vine forest 7.12.1a – Mesophyll to notophyll vine forest 7.12.7 – Notophyll vine forest 7.12.7a – Notophyll vine forest 7.12.12 – Notophyll vine forest 7.12.48 – Notophyll vine forest	Occurring between 5 and 200 m AHD (DEWHA 2008a).
Dark-stemmed antler orchid (<i>Dendrobium mirbelianum</i>)	Grows mainly on trees (epiphytic) in mangroves and coastal swamps in humid locations and has also been recorded growing on rocks (Jones 2006).	7.3.8b - contains coastal melaleuca swamps	Occurring between 2 and 150 m AHD (Jones 2006).
<i>Diplazium cordifolium</i>	Occurs in rainforests and along creek banks (DEWHA 2008b).	7.3.10 – Mesophyll to notophyll vine forest 7.11.1 – Mesophyll vine forest 7.11.1a – Mesophyll vine forest 7.11.1b – Mesophyll vine forest 7.11.7 – Notophyll vine forest 7.11.7a – Notophyll vine forest 7.11.7b – Notophyll vine forest 7.12.1a – Mesophyll to notophyll vine forest 7.12.7 – Notophyll vine forest 7.12.7a – Notophyll vine forest 7.12.12 – Notophyll vine forest 7.12.48 – Notophyll vine forest	-
<i>Diplazium pallidum</i>	Fern growing in lowland rainforest, particularly near streams, but has not been found growing in creeks. It occurs on basalt soils (DEWHA 2008c).	Nil (This species requires soils derived of basalt, which are not known to be present in the project area).	-
Ant plant (<i>Myrmecodia beccarii</i>)	This species is known from the coastal woodlands between Cooktown and Ingham in Queensland and occurs in open woodland dominated by Melaleuca viridiflora or mangroves (DEWHA 2008d).	7.3.8 – Melaleuca woodland	-
<i>Phaius pictus</i>	This species is highly localised and restricted to rainforests from 0 to 600 m altitude. It usually occurs in sheltered humid sites, close to streams and seepage	7.3.10 – Mesophyll to notophyll vine forest 7.11.1 – Mesophyll vine forest 7.11.1a – Mesophyll vine forest 7.11.1b – Mesophyll vine forest 7.11.7 – Notophyll vine forest 7.11.7a – Notophyll vine forest	Occurring between 0 and 600 m AHD (Jones 2006).

	among forest litter on boulders (Jones 2006).	7.11.7b – Notophyll vine forest 7.12.1a – Mesophyll to notophyll vine forest 7.12.7 – Notophyll vine forest 7.12.7a – Notophyll vine forest 7.12.12 – Notophyll vine forest 7.12.48 – Notophyll vine forest	
Native moth orchid (<i>Phalaenopsis amabilis</i> subsp. <i>rosenstromii</i>)	Species is known to grow in trees in humid airy environments, on sheltered slopes and gullies in deep gorges and close to streams in rainforests (Jones 2006).	7.3.10 – Mesophyll to notophyll vine forest 7.11.1 – Mesophyll vine forest 7.11.1a – Mesophyll vine forest 7.11.1b – Mesophyll vine forest 7.11.7 – Notophyll vine forest 7.11.7a – Notophyll vine forest 7.11.7b – Notophyll vine forest 7.12.1a – Mesophyll to notophyll vine forest 7.12.7 – Notophyll vine forest 7.12.7a – Notophyll vine forest 7.12.12 – Notophyll vine forest 7.12.48 – Notophyll vine forest	Occurring between 200 and 500 m AHD (Jones 2006).
<i>Polyscias bellendenkerensis</i>	Grows in microphyll vine/fern thickets, notophyll vine forest and stunted shrublands (Elliot and Jones 1997).	Nil (No potential habitat was identified as altitude requirements for the species are not met).	Occurring between 1100 and 1600 m AHD (Elliot and Jones 1997).
Orange tamarind (<i>Toechima pterocarpum</i>)	Occurs in lowland tropical rainforest, often along watercourses, with an altitude range from sea level to 450 m. It occurs around Julatten, Mossman and Wangetti in north Queensland (DEWHA 2008f).	7.3.10 – Mesophyll to notophyll vine forest 7.11.1 – Mesophyll vine forest 7.11.7 – Notophyll vine forest 7.12.1 – Mesophyll to notophyll vine forest	-
Dwarf butterfly orchid (<i>Vappodes lithocola</i>) (also known as <i>Dendrobium lithocola</i> and recognised as <i>Dendrobium bigibbum</i> by the Queensland Flora Census 2019)	Species occurs in coastal ranges between Daintree and Cairns, growing in rainforest on rocks, boulders and cliff faces on ridges and slopes (Jones 2006).	7.3.10 – Mesophyll to notophyll vine forest 7.11.1 – Mesophyll vine forest 7.11.1a – Mesophyll vine forest 7.11.1b – Mesophyll vine forest 7.11.7 – Notophyll vine forest 7.11.7a – Notophyll vine forest 7.11.7b – Notophyll vine forest 7.12.1a – Mesophyll to notophyll vine forest 7.12.7 – Notophyll vine forest 7.12.7a – Notophyll vine forest 7.12.12 – Notophyll vine forest 7.12.48 – Notophyll vine forest	Occurring between 250 and 800 m AHD (Dockrill 1992; Barker 1997; Jones 2006).
Cooktown orchid (<i>Vappodes phalaenopsis</i>) (also known as <i>Dendrobium phalaenopsis</i> and recognised as <i>Dendrobium bigibbum</i> by the Queensland Flora Census 2019)	Species grows on trees and rocks in coastal scrub, littoral rainforest, riverine vegetation, monsoon thickets, swamps and gullies in open forests ¹ at altitudes of up to 400 m above sea level (Jones 2006).	7.3.8b - Contains coastal melaleuca swamps 7.3.10 – Mesophyll to notophyll vine forest 7.3.44 – Open forest to woodland 7.11.1 – Mesophyll vine forest 7.11.1a – Mesophyll vine forest 7.11.1b – Mesophyll vine forest 7.11.5 – Open forest 7.11.5a – Open forest	Occurring between 0 and 400 m AHD (Jones 2006).

	<p>1Note - Mapping of this species for the purposes of this report is highly conservative as fine scale information to identify gullies was not available, such that a precautionary approach was adopted and all open forest was identified as potentially suitable.</p>	<p>7.11.5d – Open forest 7.11.7 – Notophyll vine forest 7.11.7a – Notophyll vine forest 7.11.7b – Notophyll vine forest 7.11.10 – Open to closed forest 7.11.16 – Open forest to woodland 7.11.26 – Open shrubland to closed scrub 7.11.44 – Open forest to woodland 7.11.49 – Open forest to woodland 7.11.51 – Open forest to woodland 7.11.51a – Open forest to woodland 7.11.51c – Open forest 7.12.1a – Mesophyll to notophyll vine forest 7.12.5 – Open forest or vine forest 7.12.7 – Notophyll vine forest 7.12.7a – Notophyll vine forest 7.12.9 – Open forest 7.12.12 – Notophyll vine forest 7.12.24 – Open forest to woodland 7.12.24c – Open forest to woodland 7.12.29 – Open forest to woodland 7.12.34 – Open forest to woodland 7.12.48 – Notophyll vine forest 7.12.53 – Open forest 7.12.59 – Open forest to woodland 7.12.61a – Open forest to tall open forest and woodland</p>	
<p>Velvet jewel orchid (<i>Zeuxine polygonoides</i>) (Also known as <i>Rhomboda polygonoides</i>)</p>	<p>Mesophyll vine forests and simple notophyll vine forests (DAWE 2020). This species grows in mostly moist, cloudy or wet rainfall zones on metamorphic substrates, granite or rhyolite (Jones 2006).</p>	<p>7.3.10 – Mesophyll to notophyll vine forest 7.11.1 – Mesophyll vine forest 7.11.1a – Mesophyll vine forest 7.11.1b – Mesophyll vine forest 7.11.7 – Notophyll vine forest 7.11.7a – Notophyll vine forest 7.11.7b – Notophyll vine forest 7.12.1a – Mesophyll to notophyll vine forest 7.12.7 – Notophyll vine forest 7.12.7a – Notophyll vine forest 7.12.12 – Notophyll vine forest 7.12.48 – Notophyll vine forest</p>	-

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


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Revision	Author	Reviewer		Approved for Issue		
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Appendix G – Wangetti Trail Construction Methodology Manual April 2020

WANGETTI TRAIL

CONSTRUCTION METHODOLOGY

APRIL 2020

FINAL

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1 INTRODUCTION

This Construction Methodology has been prepared to guide construction activities associated with the Wangetti Trail project to minimise impacts to the environment and ensure compliance with all permits, approvals and legislative requirements. This document is intended to provide a high-level amount of information for contractors to inform the eventual Construction Environmental Management Plan. Note that information relating to the following is not covered in this document and will be required by WTMA of the successful contractor as part of the subsequent detailed Construction Environmental Management Plan:

- Weed and disease management;
- Flora management such as for fallen trees, old growth trees and vegetation clearing;
- Fauna management such as general and species-specific prescriptions.

The Department of Innovation and Tourism Industry Development Tourism Development Projects Division is proposing to establish the Wangetti Trail. The trail is proposed to be 94km dual use, stretching from Port Douglas in the north to Palm Cove in the south.

The Wangetti Trail will be an iconic overnight hiking/mountain biking trail, unique in Australia and the world. It traverses some of the most magnificent and picturesque scenery imaginable, with endless views out over the coast and the Great Barrier Reef. It passes through a myriad of different vegetation communities and aspects, including dense vine draped rainforests, more open rainforests with minimal understory, grassy open Eucalypt forests, fern and Cycad groves, mangroves and crystal-clear rainforest streams, providing a constantly changing backdrop and personality to the trail.

2 THE WANGETTI TRAIL

2.1 WHAT IS THE WANGETTI TRAIL?

The trail is proposed to be an approximately 94km dual-use trail used by hikers and mountain bikers, between Port Douglas and Palm Cove in northern Queensland.

The trail comprises two separable portions (SPs):

- SP1 Mowbray North – The northern section of the trail, from Port Douglas to the Mowbray River (northern bank);
- SP2 Wangetti Balance – The southern section of the trail, from the Mowbray River (southern bank) to Palm Cove, which will include campsites and supporting ancillary facilities.

This Construction Methodology is intended to address requirements for SP2.

The SP2 Wangetti Balance is a dual-use trail involving accommodation nodes and supporting ancillary facilities to support an expected 28,000 annual visitors. The length of the trail for SP2 is 82.15km, to a width of up to 1.5m, encompassing an area from the south of Mowbray River to Palm Cove.

Within the Wet Tropics World Heritage Area, the following components are proposed:

- Single dual use trail to accommodate both mountain bike users and hikers, consisting of natural ground and surface treatments;
- A number of low-level bridges and crossings including Hartley Creek bridge, boulder rock crossings and gully crossing style bridge from minor waterway crossings;
- Five public campsites;
- Four private campsites;
- Utilisation of existing access tracks;
- Mountain bike trail using existing access tracks associated with Twin Bridges Road (Black Mountain Road East) and Quaid Road.
- Landscaping treatments using natural materials available in-situ, including rock armouring, rock retaining walls, etc.;
- Landscaping treatments using imported materials such as pre-cast concrete steps, adjustable rock matting etc.;
- Upgrades, improvements or extensions to access roads as required for either construction or ongoing operational access purposes.

A fifth public and private campsite is located outside of the Wet Tropics Management Zone.

2.2 TRAIL ALIGNMENT

The Wangetti Trail is located between Port Douglas and Palm Cove, approximately 30km north of Cairns, in northern Queensland.

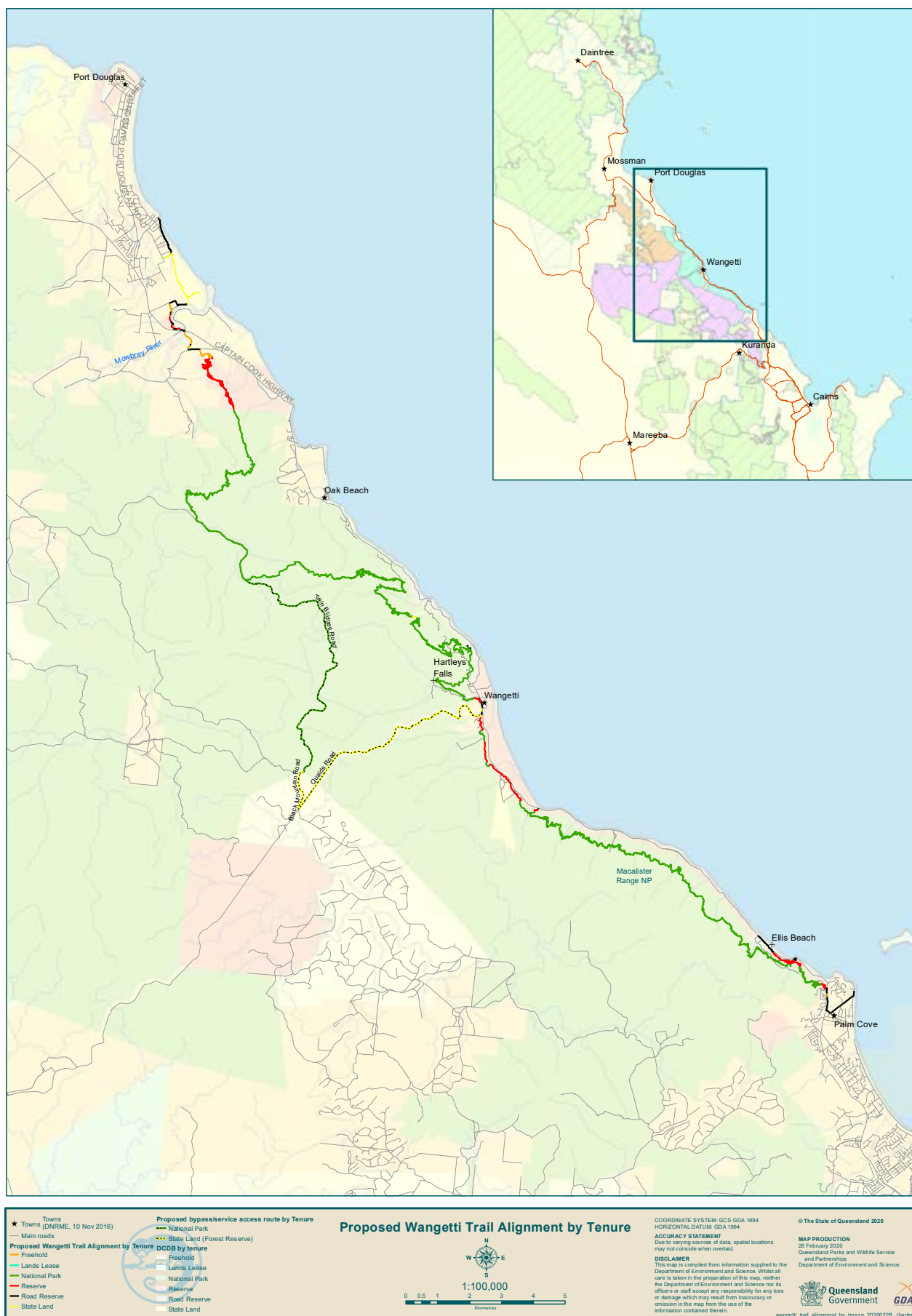
The trail alignment is constrained by the Pacific Ocean to the east and the Macalister Ranges to the west, and is mostly contained within the Mowbray and Macalister Range National Parks. The landscape is comprised of coastal floodplains, volcanic mountain ranges and estuarine mudflats, although the trail is generally aligned upon the elevated eastern slopes of the Macalister Ranges.

The proposed trail currently traverses undeveloped rural land, wet tropics conservation park, national park, unallocated state land, existing tracks, service roads and road reserve. It comprises of seven sections and one mountain bike only trail section that will traverse Twin Bridges Road (Black Mountain East Road) and Quaid Road.

Map 1 and Map 2, on the following pages show the proposed Wangetti Trail alignment.

Map 1 – Proposed Wangetti Trail Alignment



Map 2 – Proposed Wangetti Trail Alignment by Tenure

2.3 STYLE PHILOSOPHY

The Wangetti Trail experience will be uniquely Australian, emphasising the culture, history and way of life of the Traditional Owners, the Yirrganydji people. It will encourage a sense of exploration and a spirit of adventure. It will foster an appreciation of the natural environment and the diversity of flora and fauna within it.

For the Wangetti Trail to be a world-class trail, the construction must be of the highest quality, but the end result needs to look like it has been in place for thousands of years, blending into the landscape seamlessly and harmoniously.

The trail will be predominantly natural surface, constructed from the natural soil and rock found along the trail. Imported surfacing materials such as fine crushed rock may be used from time to time, but only in high traffic areas or where other requirements dictate its use. Imported materials can be visually unappealing and can introduce weeds and pathogens. Any surfacing materials that are used should be of local provenance and suitable for the intended purpose.

The Wangetti Trail has been designed to minimise built structures like bridges, boardwalks and viewing platforms. These built structures pose a number of challenges:

- They are normally constructed from imported materials and can be intrusive in the natural environment;
- They can burn during bushfires or prescribed burns;
- They can be difficult to construct in remote areas, due to the challenges of importing the materials;
- They increase the maintenance burden.

Where built structures are required, the design and finish will prioritise the use of local timbers and other materials that will age gracefully with time. Above all, the materials must be durable enough to withstand the harsh tropical climate and natural environment.

Any built structures must be designed and engineered to be fit-for-purpose, to have minimal impact to the surrounding environment, to have minimal maintenance requirements and will need to take a minimalistic approach to materials given the remote nature of the trail and difficulties getting materials into the locations where they are required.

The Wangetti Trail will utilise the natural rock and stone to maximum advantage, including rock slabs, rock outcrops and loose surface rock. Rock is the ultimate trail building material, especially when it is locally sourced. Loose surface rock provides the raw materials for rock walls, rock armouring and even the construction of trail-side furniture like bench seats.

The suite of different signs required along the Wangetti Trail must be complementary to each other, but also to the overall look and feel and aesthetic of the trail. The materials should be as natural as possible and durable within the outdoor environment; the colour palette should feature muted, earthy natural tones; styling should be elegant, timeless and understated.

The final position, character, style and finish of a trail is a combination of the design choices made by the construction team (particularly the machine operator), the terrain and environment, the intended user group and any permit conditions stipulated by the land manager and regulatory authorities. Constraints and no-go areas as marked and defined within plans and as part of the construction environmental management plan must also be considered.

2.4 TRAIL DIFFICULTY

As a dual-use trail for hikers and mountain bikers, the difficulty of the trail must match the expectations of the two main user groups.



To this end, the Wangetti Trail is proposed to have the following rating:

- Mountain Biking – Intermediate (blue square with blue outline) as defined in the Australian Mountain Bike Trail Guidelines Trail Difficulty Rating System (MTBA TDRS);
- Hiking – Grade 3 for hikers, as defined in the Australian Walking Track Grading System (AWTGS), which also equates to Class 3 in the Australian Standard for Walking Tracks, Part 1: Classification and Signage (AS 2156.1-2001).

In general, the Intermediate rating for mountain biking and Grade 3 rating for walking are fairly similar and complimentary and seem as the ‘best fit’ for the Wangetti Trail as described in this document, with the following comments/observations:

- The AWTGS specifies a distance of no more than 20km for a Grade 3 trail. As each section of the Wangetti Trail is proposed as a single stand-alone day walk, it will comply with this criterion;
- The MTBA TDRS states a width of 600mm plus or minus 300mm for an Intermediate trail, while the AWTGS simply states a width of less than 1200mm for a Grade 3 trail. Given the dual-use status and expected high usage of the Wangetti Trail, a width of 1000-1500mm is recommended, which is not deemed to contradict either of these ratings. Note that trail width in the MTBA TDRS is deemed one of the ‘Guiding Criteria’ and allows some deviation from the parameters provided;
- The AWTGS states that steps may be common. The MTBA TDRS doesn’t discuss steps per se, but they would be treated as ‘unavoidable obstacles’. An Intermediate trail can have unavoidable obstacles up to 200mm high, hence single steps of less than 200mm would be acceptable. Flights of steps however, are not acceptable on a mountain bike trail, especially one that is dual directional. The trail has been designed to minimise any steps on the main trail – any steps that have been specified are located on alternative optional ‘detour’ sections.

Table 1. Summary of Trail Difficulty Ratings

Rating System	MTBA TDRS	AWTGS
Rating	Intermediate	Grade 3
Symbol		
General Description	<p>Single trail with moderate gradients, variable surface and obstacles.</p> <p>Dual use or preferred use.</p>	<p>Short steep hills.</p> <p>Formed track, some obstacles.</p> <p>Sign posted.</p> <p>Some bushwalking experience recommended.</p>
Distance	Not specified.	Total distance of track must not exceed 20km.
Signage	Not specified.	Track head signage and route markers at intersections and where track is indistinct.
Trail Width	600mm plus or minus 300mm.	Less than 1200mm.
Trail Surface	Possible sections of rocky or loose tread.	Formed earthen track, few obstacles. Generally, a modified surface, sections may be hardened. Mostly clear of intrusions and obstacles.
Average Trail Gradient	<p>Mostly moderate gradients but may include steep sections.</p> <p>Ave. trail grade – 10% or less.</p>	Generally, no steeper than 1:10 (10%).
Maximum Trail Gradient	Max. trail grade – 20%.	May exceed 1:10 (10%) for short sections.
Level of Trail Exposure	Exposure to either side of the trail corridor includes downward slopes of up to 20%.	Not specified.
Natural Obstacles and Technical Trail Features	<p>Unavoidable obstacles to 200mm high, such as logs, roots and rocks.</p> <p>Avoidable, obstacles to 600mm may be present.</p> <p>Unavoidable bridges 600mm wide.</p> <p>Short sections may exceed these criteria.</p>	Not specified.
Experience Required	<p>Suitable for skilled mountain bikers with basic mountain bike skills.</p> <p>Suitable mountain bikes.</p>	Users need no bushwalking experience and minimum level of specialised skills. Users may encounter natural hazards such as steep slopes, unstable surfaces and minor water crossings. They are responsible for their own safety.
Steps	Not specified	Steps may be common.

3 TRAIL DESIGN AND CONSTRUCTION PROCESS

3.1 TRAIL DESIGN PROCESS

The process used to design the Wangetti Trail included two broad stages – Conceptual Design and Detailed Design (also called ground-truthing).

The Conceptual Design stage involved the trail being planned and mapped out based on a sound understanding of the on-ground conditions, knowledge of access points into the trail and the aspirations of the project with regard to user experience, difficulty, trail sustainability etc.

The Detailed Design fieldwork was undertaken in 2018. The primary purpose of the work was to identify, flag and map the exact route in the field for the proposed Wangetti Trail. At completion of this work, the entire route was known and mapped, all construction treatments were allocated and quantified, a construction cost estimate was prepared and all proposed campsite locations were identified.

Over the course of three months in mid 2018, the entire route was walked twice by World Trail personnel, using an iterative ‘two-pass process’. During the first pass, the objective was to determine the preferred alignment, mark it with coloured flagging tape and map it with GPS. In the second pass, the objective was to assess the alignment and determine appropriate construction treatments, measuring, photographing and recording them using GPS.

In relation to the flagging tape, the following protocols apply:

- The flagging tape indicates roughly the centreline of the proposed trail alignment;
- Generally, each strip of flagging tape should be visible from the next/previous one, but this can’t always be relied on as they can be removed by weather/animals. In thick vegetation, flagging tape is placed more frequently. In sparse vegetation tape is used more sparingly;
- Where the trail performs a sharp turn or switchback, three pieces of tape tied around a single trunk or branch are generally used to indicate the apex of the turn (see **Error! Reference source not found.** on next page);
- Switchbacks are often used in close succession to each other to help a trail climb up or descend a steep slope. In these situations, there can be multiple ‘legs’ of the trail running roughly parallel to each other. Anyone attempting to follow the proposed trail alignment needs to be aware of where these switchbacks might be and ensure that they look forward along the contour to locate the next piece of flagging tape;
- Where the trail is proposed to follow an existing road flagging may be sporadic.

The alignment of the Wangetti Trail changed considerably during ground-truthing. The changes can be classified as:

- Minor changes, due to environmental factors identified in the field such as impassable barriers like cliffs etc. Minor changes were made at the discretion of field staff, in response to the environmental conditions present;
- Major changes, due to more strategic factors such as the overall length and cost of the trail, the identification of areas of cultural or environmental sensitivity, concerns about the user experience, safety or longevity of the trail and so on. Many such changes were driven by new discoveries in the field or by new information from other projects partners and approved by the client. Where major alignment changes were undertaken, these were also ground-truthed using the same two-pass methodology described above.

Further refinement of the ground-truthed alignment was undertaken by GHD in response to the following:

- Additional field investigations being undertaken of the alignment;
- Additional consultation with key stakeholders including adventure-based tourism operators;
- Additional consultation being undertaken with land owners impacted by the alignment;
- Consultation with WTMA regarding the location of the proposed infrastructure within the Wet Tropics Zone and whether they are considered appropriate for the intent of the zone.

This resulted in some minor amendments to the alignment, amendments to the location of the camps and the inclusion of the separate mountain bike trail (utilising the existing roads). This also resulted in the removal of one of the proposed camps on the basis of sensitive environmental areas being deemed too significant to accommodate a camp site at the proposed location.

Figure 1. Triple taping to indicate apex of switchback corner



3.2 STANDARD CONSTRUCTION PROCESS

The main construction activity to be undertaken in this project, covered by this Construction Methodology, is the construction of a dual-use hiking and mountain biking trail, including all associated landscaping, the campsites, bridges, boardwalks, viewing platforms and signage. The scope of works for this Construction Methodology is limited to the above. It does not include the construction of trail heads, car parks, roads or other supporting infrastructure associated with the broader Wangetti Trail project.

All trail construction activities should align with modern best practice for sustainable trail construction, as outlined below:

- Sustainable trails align with users' needs, provide social and economic benefits, minimise environmental impact and require less maintenance. To achieve sustainable trails, the land manager must develop the right trail, in the right area, the right way and for the right reasons.
- Trail development must be planned, designed and constructed with the highest environmental standards. Trails should be appropriate to the landscape, sense of place, and add value to the area.
- Trails should not destabilise soils or slopes. Vegetation should not be cleared or damaged beyond the required trail footprint. Trails should be used to manage recreation on wildlife and habitats in a positive way. Trails should be designed and constructed in a way that minimises the potential spread of pathogens, diseases and weeds.
- Trail development must be consistent with the sustainable provision of resources to manage the trail and associated infrastructure. Design and construction of trails should minimise maintenance requirements and ongoing costs.

A 40m corridor has been approved for the construction of the trail. This is referred to as the Ground-truthed Corridor. The purpose of the Ground-truthed Corridor is to allow flexibility for the placement of the trail and associated infrastructure, so as to avoid, where possible, impacting on Matters of State Environmental Significance (MSES) and Matters of National Environmental Significance (MNES).

The Ground-truthed Corridor is defined by the flagging tape placed during ground-truthing works, which represents the centreline of the Ground-truthing Corridor. The Ground-truthing Corridor extends 20m outward on both sides from the centreline (measured along the ground, perpendicular to the direction of the centreline). Note that if the flagging tape is no longer in place, the GPS alignment recorded during ground-truthing should be used as the indicative centreline. The successful contractor will be provided with the complete set of GPS coordinates of the final approved trail alignment and 20m corridor either side.

Broadly speaking, the process of constructing a standard mountain biking trail is as follows:

1. Prior to commencing work, each separate trail or section of trail as defined by the land manager, is to be re-walked and assessed as part of a Pre Start Trail Review (PSTR) – refer to Section 7.2 for more information about this process. At the completion of the PSTR the exact alignment of the trail will have been re-marked. There should be no ambiguity or uncertainty about the exact alignment of the trail. Although noting that during construction if something needs to be avoided, the trail can be moved around within the 40m corridor;
2. Clear the Construction Corridor of vegetation. The Construction Corridor is defined as the horizontal corridor from the top of the upslope batter to the toe of the downslope batter and the vertical corridor to about 2.5m high (sufficient to allow passage of the excavator). Clearing of the Construction Corridor is usually undertaken manually using motorized tools such as brush cutters, chainsaws and hedge trimmers and hand tools like loppers, hand saws and secateurs. Large trees do not need to be removed, as the trail can be routed to avoid them, however, it is

likely that small boughs and limbs may need to be removed. All vegetation that is removed is cut into small pieces and dispersed throughout the surrounding area – no large windrows or stockpiles should be present. At this stage, all vegetation is removed except for ground covers, herbs and grasses (which are left in place for later removal by the excavator). For larger trails such as the Wangetti Trail, the Construction Corridor is cleared in section lengths of approximately 100-150m at a time. This process allows a visible amount of vegetation to be cleared ahead of where the machine is operating, the trail construction to be undertaken by the machine operator and trail labourers working behind to clean up before moving ahead to the next section.

3. Cut the bench using cut and fill technique. The topsoil and mineral earth removed from the inner side of the bench are used to build up the outer edge of the bench. The excavator works forwards, cutting the bench ahead of it and then moving forward onto the bench. The bench must be wide enough and stable enough for the excavator to operate safely on. Using a small rubber-tracked mini-excavator (refer Figure 2) with a minimum track width of about 900mm, the bench is generally constructed at 1-1.5m width. Note that the cut material (i.e. the spoil) may be moved locally forward or backwards along the trail to areas where fill material is required. Overall, cut and fill is always balanced, with no fill material removed off-site. On steeper slopes, the outer edge of the bench may need to be retained. This is generally done using dry stone rock walls, built from rock sourced during the construction of the bench, with the excavator creating the foundations for the base course and moving the largest rocks into place;
4. Any additional trail embellishments, such as trail surfacing, steps, rock armouring etc., are generally constructed at this stage, prior to the finishing steps below;
5. Define the preferred riding/hiking line by placing rocks, logs and other obstacles as necessary. Large obstacles work best and should be manoeuvred into place by the excavator. The ideal riding/hiking line is generally on the inner side of the bench, at the toe of the upslope batter, where the soil is firm and compacted. Obstacles are manually and deliberately placed to control rider speed and position riders/hikers towards the inside of the bench;
6. Clean up the trail tread, removing loose rocks and roots, compacting the tread, back sloping the batter and managing drainage (for example, ensuring grade reversals flow correctly or that the trail is outsloped where practical). This step is undertaken manually by trail labourers working behind the excavator.

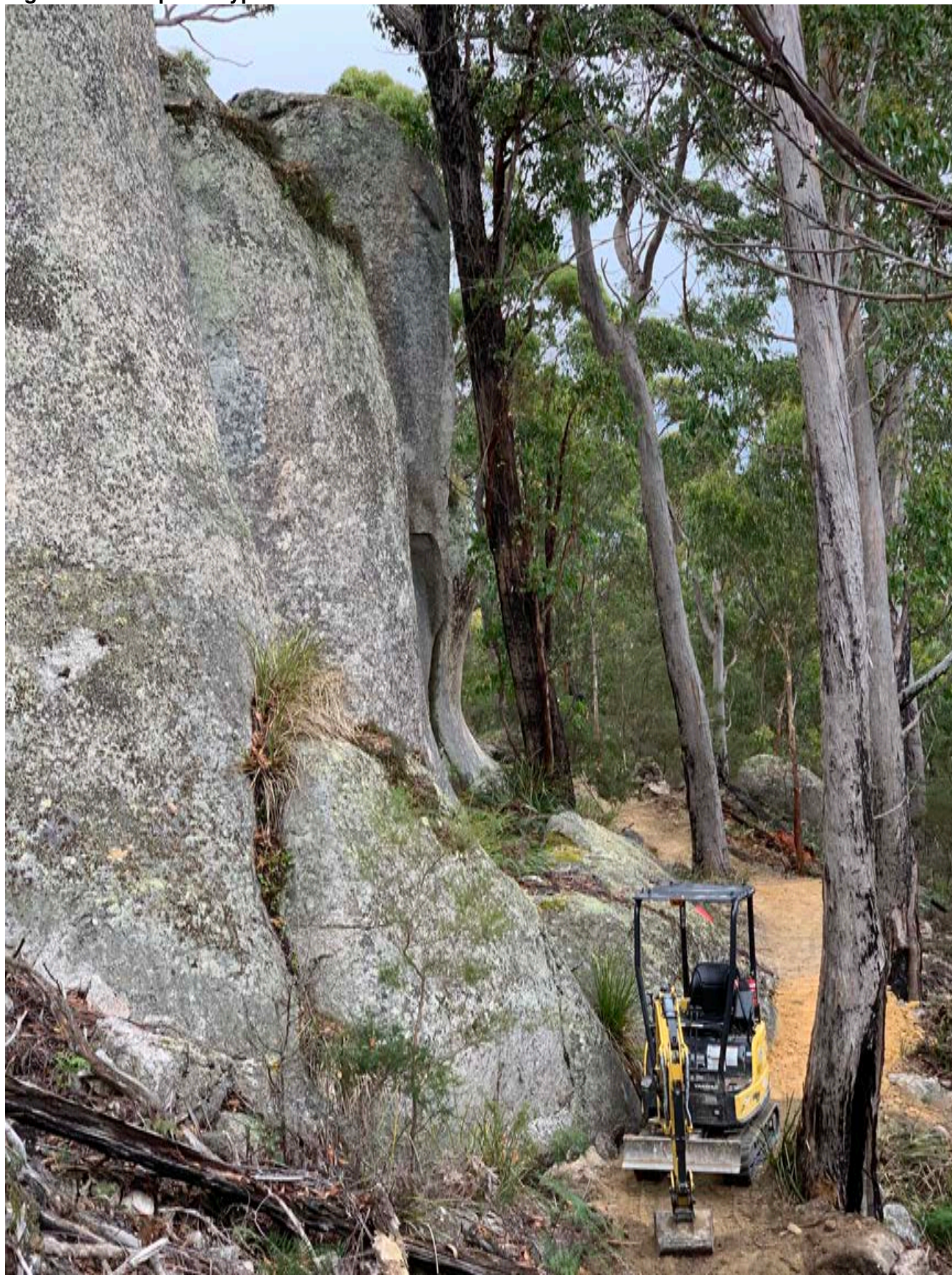
From time to time, step 3 may need to be undertaken by hand. Hand construction may be necessary in the following situations:

- It is not physically possible to get the mini-excavator to the location. For example, there is a steep-sided creek requiring the construction of a bridge, which will not be trafficable by a mini-excavator, or there are large boulders that prevent access of the machine;
- It is not safe to use a mini-excavator. For example, on extremely steep side slopes, or in locations with unstable ground, or on sloping rock slabs, it may not be deemed safe to operate a mini-excavator;
- Areas of high environmental or cultural heritage values, requiring minimal excavation;
- Close to large tree roots, especially buttress style roots running along ground surface;

The trail should be allowed to rest for a period before allowing riders/hikers to use it. This process is called 'curing' and allows the trail tread to settle and harden before being subjected to use.

This process above describes the typical methodology for 80-90% of trails.

Figure 2. Example of typical mini-excavator used for trail construction



3.3 RE-ALIGNMENT PROCESS

From time to time during trail construction, changes need to be made to the proposed trail alignment. These changes occur in response to issues that become apparent once construction commences (for example, unstable ground caused by a former industrial use), or in response to new opportunities that are identified to improve the trail experience.

If the proposed realignment is still within the approved 40m Ground-truthed Corridor, then the proposed realignment must be communicated to the TDPD Project Manager for their records.

If the proposed realignment passes outside the approved 40m Ground-truthed Corridor, then the proposed realignment must be referred to the TDPD Project Manager and will most likely require further investigations prior to approval.

4 CAMP SITE DESIGN AND CONSTRUCTION

The Wangetti Trail will include five high quality, sustainable camp sites, providing an interesting camping experience in a range of stunning tropical rainforest environments.

The Wangetti Trail will provide both public and private camp sites to cater for different user groups and experiences. The exact location and configuration of the proposed camp sites will be determined during further detailed planning to ensure the best sites are utilised to cater for a range of experiences.

Each camp site will be constructed to protect the environment by minimising the impact of people at each location. The use of elevated tent platforms and raised boardwalks has become the recognised means to provide a quality camping experience, while protecting the surrounding, sensitive environment.

All camp site locations along the Wangetti Trail must undergo thorough assessment to select an appropriate site based on the following design and construction considerations.

Table 2. Camp site Design and Construction Considerations

Consideration	Notes
Location	<p>The five camp sites proposed as part of the Wangetti Trail include:</p> <ul style="list-style-type: none"> • Camp site 1: Dark Jungle; • Camp site 2: Pinnacles; • Camp site 3: Vodaphone; • Camp site 4: Twin Bridges; • Camp site 5: Tresize (located outside of the WTWHA). <p>Camp site 1: Dark Jungle An area of up to 0.25 ha will be permanently disturbed to allow for the construction of a public camp site, which will cater for a maximum of 20 people per night and be managed by QPWS. Properties impacted include lot 174 on NPW930. Located within Zone B of the WTWHA.</p> <p>Camp site 2: Pinnacles A conservative disturbance area of up to 3.6 ha has been allowed for the siting of the campsite infrastructure, including construction footprint and buffers for the public and private campsites. The design details of the campsite will be developed further during the detailed detail phase and would result in the permeant disturbance footprint of 0.5 ha. Properties impacted include lot 174 on NPW930. Located within Zone C of the WTWHA.</p> <p>Camp site 3: Vodaphone A conservative disturbance area of up to 3.3 ha has been allowed for the siting of the campsite infrastructure, construction footprint and buffers for the public and private campsites. The design details of the campsite will be developed further during the detailed detail phase and would result in the permeant disturbance footprint of 0.5 ha. Properties impacted include lot 174 on NPW930. Located within Zone C of the WTWHA.</p> <p>Camp site 4: Twin Bridges For campsite 4 a conservative disturbance area of up to 3.6 ha has been allowed for the siting of the campsite infrastructure, including construction footprint and buffers for the public and private campsites. The design details of the campsite will be developed further during the detailed detail phase and would result in the permeant disturbance footprint of 0.5 ha. Properties impacted include lot 174 on NPW930. Located within Zone C of the WTWHA.</p>

Consideration	Notes
	<p>Camp site 5: Tresize</p> <p>For campsite 5 a conservative disturbance area of up to 2.9 ha has been allowed for the siting of the campsite infrastructure, including construction footprint and buffers for the public and private campsites. The design details of the campsite will be developed further during the detailed detail phase and would result in the permeant disturbance footprint of 0.5 ha.</p> <p>This camp site is not located within the WTWHA and therefore does not require assessment as part of this permit. Properties impacted include lot 117 on SR898.</p>
Visitor Experience	<p>Take advantage of views but be well hidden and not obviously visible from the trail.</p> <p>Not detract from the primary experience of the ride/walk or diminish the remote experience.</p>
Environmental Sustainability	<p>Fit sensitively into the landscape with minimal ecological footprint, respectful of the carrying capacity of the site and avoiding damage to environmentally significant area.</p> <p>Be demountable to allow removal / relocation in the future if required.</p> <p>Be located on existing disturbed sites where possible.</p> <p>Avoid impacting areas of cultural significance.</p>
Management and Operation	<p>Be safe for all users and undergo a risk assessment (including tree fall, bushfire, falls from height, flood, drowning);</p> <p>Be in accordance with park management plans, overlays, zoning and legislation, including regard for the WTMA requirements.</p> <p>Be located to allow servicing by vehicle or quad bike where possible.</p> <p>All camp sites will require regular cleaning and maintenance of toilets and camp infrastructure. The frequency of servicing will depend on usage and time of year. Vehicle or side by side access will be important.</p>
Scale	<p>For all camp sites, the total impact footprint for the public and private camp site infrastructure will be 0.25 ha each, within the abovementioned buffer areas. Resulting in a total impact footprint of 0.5 ha at each campsite location, with the exception of Campsite 1 which will have a footprint of only 0.25 ha (as it will be a public only camp site).</p> <p>The buffer areas have been provided at each camp site to accommodate both private and public camp sites, with the exception of campsite 1 which will be a public only campsite. The actual location of the campsites within this buffer area will be determined by the nominated construction contractor.</p> <p>A minimum 100m buffer is allowed for between the public and private camp sites to provide a buffer between public and private users.</p> <p>Camp sites will accommodate a maximum of 20 people per night on 10 tent platforms. Each platform would be large enough to pitch a tent or lay a swag. It would ideally be elevated off the ground and connected by pathways at grade and elevated boardwalks to ensure minimal damage to the surrounding environment The campsite would be a clearly delineated, controlled zone which will reduce camp site 'creep', an important element in the World Heritage Area.</p>

Consideration	Notes
Utility Connections	<p>The camps will have no reliance on reticulated services and would be self-sufficient for power, using a combination of solar and gas with a small back-up generator for emergency power. Water would be sourced from roof capture. Domestic waste would be removed from the site by maintenance staff.</p> <p>Structures will be prefabricated, and assembled on site on screw piles that enable water flows to continue unaffected.</p> <p>Each camp site could provide unobtrusive, solar powered charge points for small electrical devices such as phones, GPS devices and digital cameras. To maintain a true camping experience, charge points will not run larger electrical devices or lights.</p>
Public Camp Site Infrastructure	<p>Each public camp site location shall contain the following infrastructure:</p> <ul style="list-style-type: none"> • 10 x elevated timber camp desks/pads (4m diameter circular or 3mx3m square); • 1 x toilet block containing two toilets (note: Gough hybrid toilets are proposed to be used in accordance with the design in the QPWS Facilities Manual); • 1 x outdoor shower (optional); • 2 x rainwater storage tanks; • 1 x communal shelter facility (camping hub) for use as a gathering place and to provide protection from rain and extreme weather. This facility shall include bench seating and the allowance for 1 x bike rack facility incorporated into the camping hub (for up to 15 x bicycles); • Combination of pathways at grade and elevated boardwalks that interconnect the camp facilities (camping hub and toilet block) and camp decks (width approx. 1.2m); • Camp access tracks - from the camp site area to the main Wangetti Trail (as required). <p>Figure 3 shows an example of public camp site infrastructure.</p>
Private Camp Site Infrastructure	<ul style="list-style-type: none"> • 10 small basic huts; • 1 common building for dining, food preparation and bathrooms; • Interconnecting pathways, boardwalks and access tracks. <p>Figure 4 shows an example of private camp site infrastructure.</p>
Materials and Equipment Methodology	<p>The construction of the camp sites will ultimately be determined by the nominated construction contractor; however the following objectives will be applied to the construction phase:</p> <ul style="list-style-type: none"> • The camp sites must be sympathetic to the terrain and topography – they must blend into the landscape and create a sense of purpose and movement through the landscape; • The camp sites will connect to existing roads, vehicle tracks or walking tracks; • The camp sites will avoid areas of highest environmental significance where possible; • The camp sites will be built to modern best-practice standards for sustainable accommodation and amenities; • The structures at the camp sites will consist of modular, pre-fabricated and easy to assemble construction technologies to reduce construction related impacts; • The nominated contractor will be required to use locally sourced material that is lightweight yet durable; • Renewable, durable, non-toxic and environmentally sustainable materials to be considered during the construction phase of the camp sites; • Waste streams to be managed during construction through re-use of on-site materials that are within the development zone (e.g. soils, vegetation, fabricated materials);

Consideration	Notes
	<ul style="list-style-type: none"> Water sensitive urban design practices such as rainwater tanks, onsite recycling of water/wastewater, swales and bio-retention basins for water treatment and water efficient appliances be considered during the construction phase.
Design Principles	<ul style="list-style-type: none"> There needs to be a degree of physical and visual separation between the public and private campsites; Ideally, no trees should need to be removed for the construction of the camp sites and associated facilities. Tent pads, walkways, communal shelters etc. to be sensitively located to avoid the need for tree removal; Ideally, broad objective is to ensure the retention of as much vegetation as possible – only the area directly beneath each structure (i.e. tent pads, shelters, toilets etc.) and connecting walkways and pathways is to be cleared of vegetation. There should be no broad scale clearing of vegetation across the entire site. This requirement ensures protection of environmental values, but also helps to preserve the intended experience for the users – i.e. immersion in nature, solitude etc.; The use of in-situ materials wherever possible (eg: rock for the access track, pathways, and stormwater deviations); Minimal clearing and grubbing during construction; Liaise with qualified ecological consultants to understand the implications at each camp site, and to adjust (micro-site) the position of each element to achieve the best possible environmental outcomes; The intent of the camp sites is to enhance the trail experience; therefore, camp site arrangements need to sympathise with the environment, prioritise views where possible, allow privacy and space between campers and embrace the uniqueness that is at each location; Where duplication can be achieved, this is encouraged as it may minimise costs, create ease of construction and simplify ongoing maintenance, user booking and actual use by trail hikers / bike riders; Each camp site will be designed in a robust manner to minimise potential damage from vandalism or other anti-social behaviour.

Figure 3. Example of public camp site infrastructure. Bugiga Hiker Camp, Grampians Peaks Trail, Victoria



Figure 4. Example of private camp site infrastructure. Blue Derby Pods, Derby, Tasmania.



5 CONSTRUCTION TREATMENTS

5.1 LOCATION AND QUANTITIES OF CONSTRUCTION TREATMENTS

Section 5.2 of this document lists all of the Construction Treatments that have been specified for the construction of the Wangetti Trail. These Construction Treatments were specified by experienced trail designers working in the field during the Detailed Design stage of the project. Each specific occurrence of a Construction Treatment was measured on the ground and then recorded using high accuracy GPS enabled software. Each specific occurrence of a Construction Treatment consists of a number of pieces of information:

- The name of the Construction Treatment;
- The quantity (usually a length measurement);
- Photo/s;
- GPS coordinates;
- Other data specific to that treatment. For example, for rock armouring, the field worker is required to state whether rock is available on site or not.

Section 5.4 of this document provides specifications for the various Construction Treatments to be implemented.

The full suite of GPS data collected during ground-truthing will be provided to the Contractor, along with a series of maps that show the approximate placement of all of the Construction Treatments. However, it must be understood that the Construction Treatments and associated quantities as determined during ground-truthing and outlined in this document, should be used as a guide only. There are numerous reasons for this:

- GPS error margins – while ground-truthing was conducted using the best available technology, there remain inherent inaccuracies in the data, especially when working under heavy tree canopies. Accuracy of the field data collected is estimated to be generally under 10m;
- GPS recording process – the GPS data for the trail includes a linear trail alignment that should generally correspond to the flagged, ground-truthed alignment on the ground, and waypoints which correspond to the approximate centrepont for a particular construction treatment. For example, a 20m section of rock armouring, is represented by a single waypoint, recorded at the approximate centre point for that specific treatment;
- Reliance on flagging tape – ground-truthing was undertaken in 2018. Flagging tape may or may not still be in place – it can degrade quickly in harsh environments and can be removed by animals, people, or strong wind.

During the construction phase, the Contractor will be required to use their experience and knowledge to determine the best Construction Treatment, understanding that the treatments and quantities specified are a guide only. This requires:

- GIS/GPS capabilities – The ability to interpret and follow the spatial data and flagging tape in the field, to navigate to and identify the locations of the various Construction Treatments;
- Trail design experience – The ability to read the landscape and choose the most appropriate treatment, understanding that the treatment specified and the quantity estimated will be influenced by the final position of the trail within the 40m Ground-truthed Corridor;
- Trail construction experience – The ability to implement the various Construction Treatments outlined in this document.

5.2 BILL OF QUANTITIES

Table 3. Bill of Quantities

Construction Treatment	Unit	Quantity	Drawing Reference	Drawing Title
Trail Benching	Metre	82095	WTSTD-001-WG2	Typical Trail Benching
Trail Benching (Hand Construction)	Metre	55		
Vegetation Clearing	Metre	82150	WTSTD-033-WG2	Vegetation Clearing
Rock Walling (Up to 500mm)	Metre	1501	WTSTD-034-WG2	Rock Walling – Up To 500mm Placement and Dimensions
Retaining Wall (Up to 1000mm)	Metre	901	WTSTD-004-WG2	Rock Retaining Wall Up To 1000mm Placement and Dimensions
Ballast Surfacing	Metre	4595	WGST-045-WG2	Ballast Surfacing Placement and Dimensions
Pre-cast Concrete Steps	Step	1000	WTSTD-003-WG2 WTSTD-043-WG2 WTSTD-030-WG2	Precast Concrete Steps Placement and Dimensions Rock Pavement Treatment Trail Construction Precast Concrete Steps Trail Grading Guidelines
Natural Rock Seats	Stone Seats	20	WTSTD-005-WG2	Natural Rock Seat Placement and Dimensions
Rock Armouring	Metre	2315	WTSTD-007-WG2	Rock Armouring – Dual Use Placement and Dimensions
Boulder Water Crossings	Metre	1166	WTSTD-006-WG2	Boulder Rock Crossing Placement and Dimension
Minor Water Crossings	Metre	468	S030 & S031	Typical Gully Crossing – Sheet 1 & Sheet 2
Major Water Crossings	Metre	35	S010	Hartley's Creek Crossing

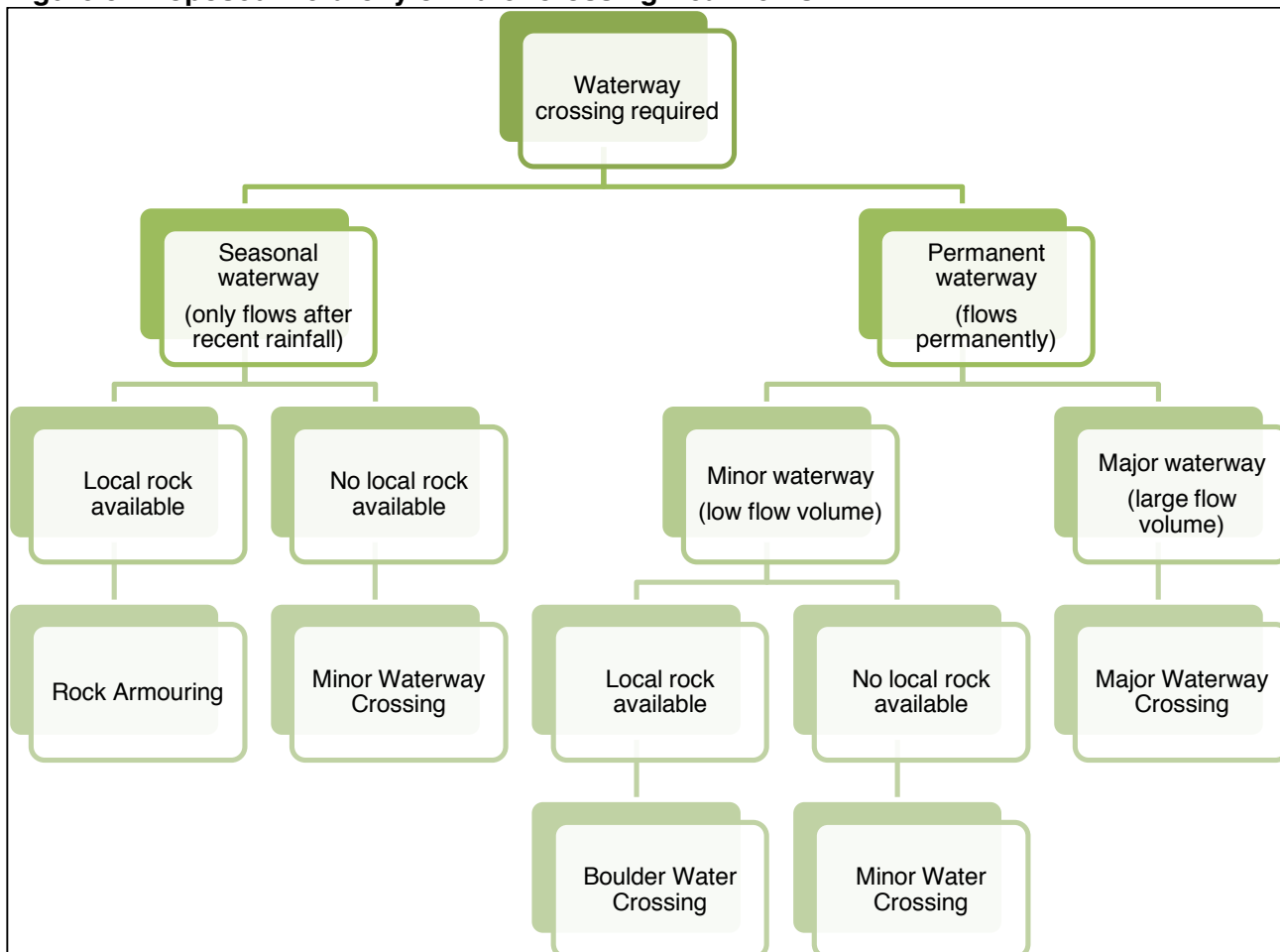
5.3 WATERWAY CROSSINGS

There are a number of different treatments proposed for the crossing of waterways:

- Rock Armouring;
- Boulder Rock Crossing;
- Minor Waterway Crossing;
- Major Waterway Crossing.




Figure 5 below shows the hierarchy for when/how the various treatments are to be applied.

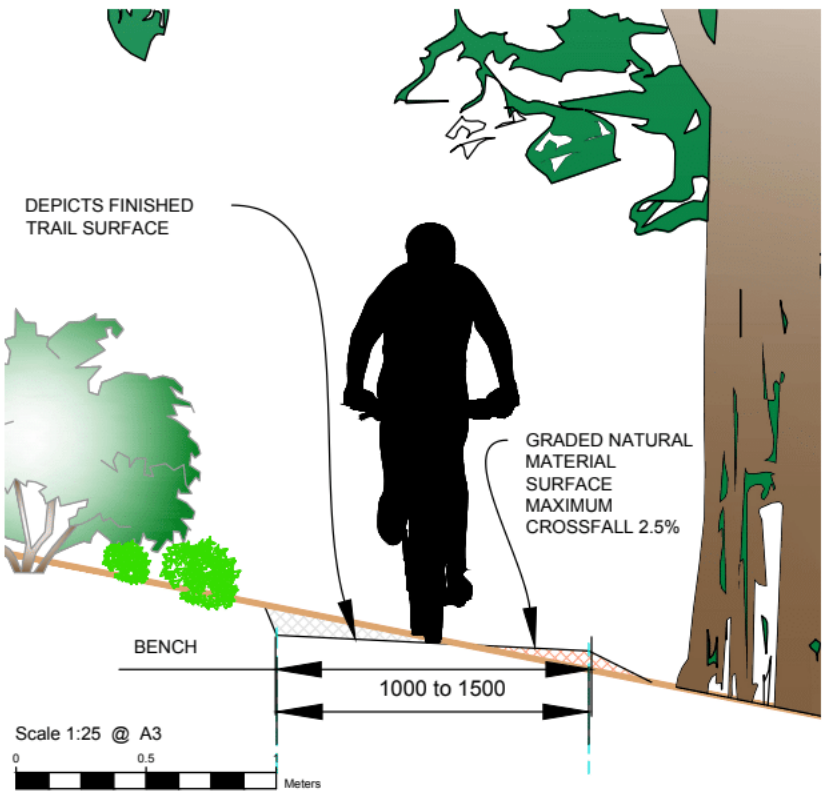
Figure 5. Proposed hierarchy of water crossing treatments



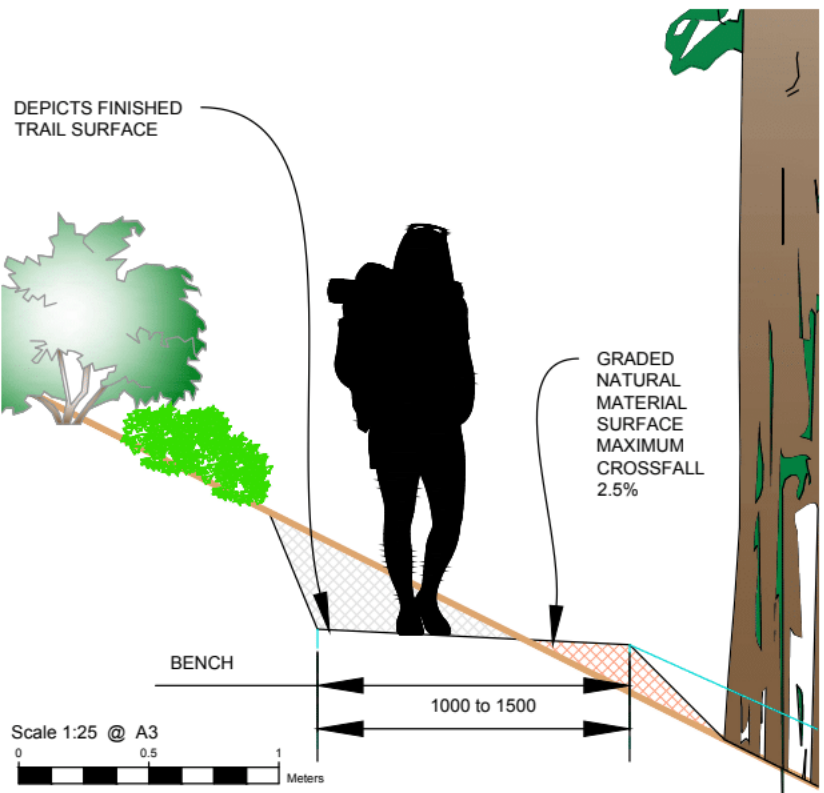
5.4 CONSTRUCTION TREATMENTS – SPECIFIED

5.4.1 Trail Benching

What is it?		<div>Examples</div> <div></div>
<p>Trail Benching is the main construction technique to be used to construct the vast majority of the trail. It is the earthworks undertaken by a mini-excavator to construct the bench which becomes the tread of the trail. It is generally a balanced cut and fill process.</p> <p>Trail Benching (Hand Construction) is a construction technique to be used to construct small sections of trail that can't be constructed with mini-excavator. It is otherwise the same as standard Trail benching, but all earthworks are undertaken by hand, using hand tools only.</p>		
When is it Used?		
<p>Trail Benching is used when creating new rolling contour trails in sideslope locations.</p>		
Why is it Used?		
<p>Trail Benching is the most appropriate, effective and least impact method of creating new rolling contour trail. Balanced cut and fill approach ensures that there is no surplus spoil to dispose of.</p> <p>Trail Benching (Hand Construction) is used when it is not possible to use a mini-excavator. This may be due to safety concerns, physical space limitations that prevent the passage of an excavator, slope instability or the desire to create a narrower tread width than is possible with a mini-excavator.</p>		
Notes		
<p>The intended finished width of the Wangetti Trail is 1.5m. This means that the largest excavator that can be used to construct the trail is one with a track width of 1.5m, which would usually be less than 2.5T in weight.</p> <p>While a larger excavator has more power, making it more efficient at moving soil and able to move larger rocks, this needs to be balanced against the larger footprint of the machine and the ability to have it airlifted by helicopter.</p>		
Materials	Machinery / Equipment	
<ul style="list-style-type: none">In situ soilNo imported materials	<ul style="list-style-type: none">Rubber tracked mini-excavator;Trail building hand tools including rakes, mattocks, rake hoes, leaf rakes, shovels etc.	
Estimated Length of Treatment	Drawing Reference	
<p>Trail Benching:</p> <ul style="list-style-type: none">82,095 metres (of entire 82.15km length of trail) <p>Trail Benching (Hand Construction):</p> <ul style="list-style-type: none">55 metres (of entire 82.15km length of trail)	<p>WTSTD-001-WG2</p> <p>Typical Trail Benching</p>	



TYPICAL SECTION - 5:1 (20%) CROSS SLOPE
FILL BATTER SLOPE - 2:1



TYPICAL SECTION - 2:1 (50%) CROSS SLOPE
FILL BATTER SLOPE - 1:1

NOTES:

GENERAL:

- The trail will provide access along a slightly modified, natural environment alignment, with little provision of interpretive signage and few facilities.
- Users can expect occasional encounters with others.
- Locate and protect any underground or overhead services prior to commencement of works.
- Trail excavation is to be cut and fill.
- Naturally occurring rock is to be used to protect the uphill cut and the downhill toe where available and appropriate.
- Dimensions in millimetres unless otherwise notated.
- Trail excavation is to be cut and fill.
- Cut batters are at 67.5°. Fill batters are as defined.
- Rocks can be used in the toe of the fill batter to provide additional stabilisation at steeper slopes.
- Rocks and/or plants can be placed (or remain) in the bench area between the Ride & Hike Line and the Fill Batter to guide riders and hikers into the appropriate alignment.
- Cut material will need to be transported along the trail from steeper trail cross slope areas.
- All site clearing is to be restricted to the trail alignment and nominal clearances for cut and fill works.
- Trail layout is to be undertaken using the "Sustainability Guidelines" as defined by the MTBA and as summarised below. More detailed information should be obtained through the MTBA.
- The trail is to be constructed to Class 3 Standard, as defined in AS 2156.1-2001.
- The trail is to be constructed in accordance with the "Blue Square" difficulty rating as defined in the IMBA - Australia, Trail Difficulty Rating System, 2014, version 2.0.

NOTES:

MTBA TRAIL SUSTAINABILITY GUIDELINES

THE HALF RULE

- A trail's grade shouldn't exceed half the grade of the hill slope or sideslope that the trail traverses.
- Grades exceeding the half rule may cause water to flow along the trail causing erosion.

THE TEN PERCENT AVERAGE GUIDELINE

- The overall grade of a trail should be 10% or less.
- Some sections may be steeper than 10% and some less steep.
- The ten percent average guideline may need to be adjusted to suit different soil types.

MAXIMUM SUSTAINABLE GRADE

- The maximum sustainable grade is typically 15% to 20% but is dependent on a wide range of factors.
- These factors include soil type, annual rainfall, vegetation and topography constraints and the level of difficulty for users.

GRADE REVERSALS - (see Standard Drawing WTSTD-046-WG2 for details)

- Grade reversals are points at which the trail gradient changes from down to up (or up to down), creating a low point where water is pushed off the trail.
- The more frequent the grade reversals, the smaller the amount of water that needs to cross at each point thereby reducing the potential erosion and the need for drainage infrastructure.

OUTSLOPE

- Outslope is the grading of the trail to a cross slope of 5% following the general slope direction of the local terrain.
- Outsloping enables stormwater to flow across the trail as a sheet rather than as concentrated flow.
- Outslopes will not be appropriate near berms or banked turns or in some loose soil types.

LEGEND:

- AREA OF CUT
- AREA OF FILL
- NATURAL GROUND SURFACE

Rev.	Date	Revision Details	Drn.	Ver.	App.
B	07/04/20	MAJOR LAYOUT & NOTES CHANGES			
A	24/03/20	ISSUED FOR INFORMATION	JR		

Client:	




Project:	

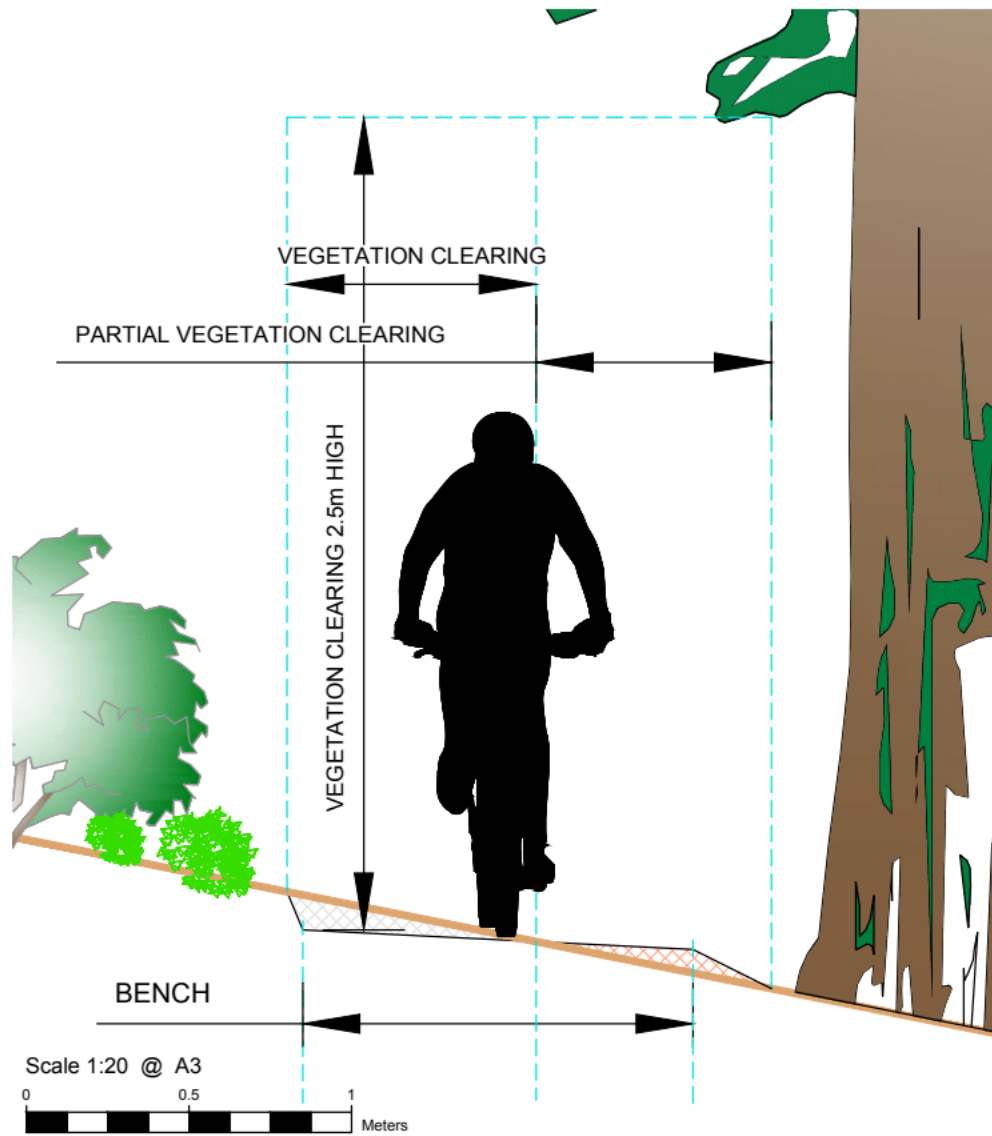
Drawn	Signed	Date
JR		07/04/20
Designed	Signed	Date
DS		07/04/20
Verified	Signed	Date
DS		07/04/20
Approved	Signed	Date

Drawing Title:	

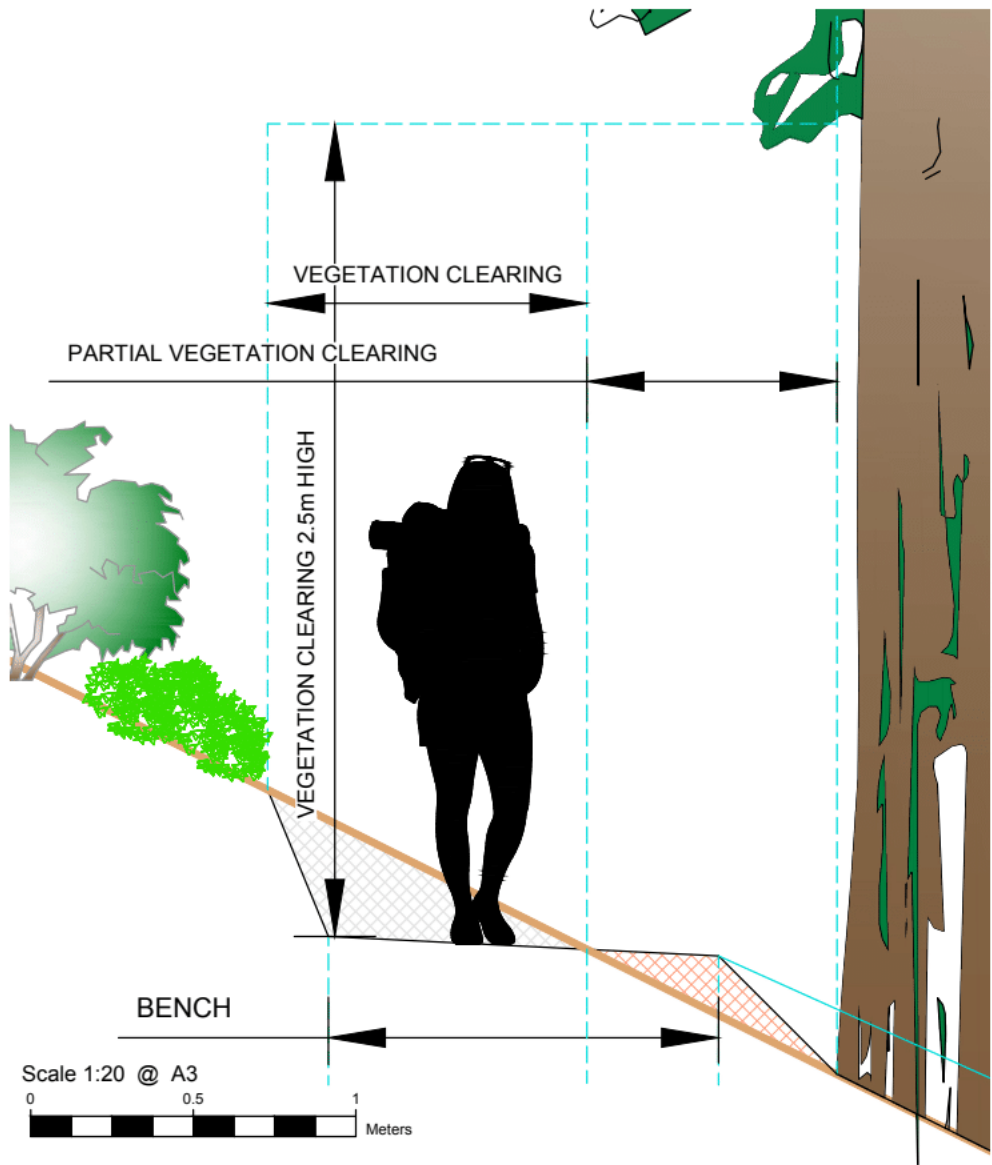
FOR INFORMATION		
Project No.	WT20-Wangetti-001	
Scale	1:25	Sheet Size
		A3
Drawing No.	WTSTD-001-WG2	Rev.
		B

5.4.2 Vegetation Clearing

What is it?		
Vegetation Clearing is the technique of clearing the intended pathway (i.e. the Trail Corridor) of vegetation ahead of the mini-excavator.		
When is it Used?		
Vegetation Clearing is used when creating new trails in vegetated locations. It generally occurs simultaneously with Trail Construction - Standard, but around 50-100m ahead of the excavator.		
Why is it Used?		
Vegetation Clearing is used to clear the pathway of vines, shrubs, bushes, ground covers and small trees, to allow clear access for the mini-excavator. It should also be cleared to sufficient height to allow for unimpeded access of trail users once complete.		
Notes		
Vegetation Clearing shouldn't proceed too far ahead of the excavator in case small realignments need to be made.		
Care will be taken to ensure no windrows or stockpiles of cut vegetation are created. Cut vegetation must be scattered into the surrounding environment, without smothering existing vegetation		
Materials	Machinery / Equipment	
<ul style="list-style-type: none">No materials required.	<ul style="list-style-type: none">Mechanised tools including chainsaws, brushcutters and hedgetrimmers;Hand tools including loppers, snippers, hand saws, secateurs, shears etc.	
Estimated Length of Treatment	Drawing Reference	
82,150 metres	WTSTD-033-WG2 Vegetation Clearing	



TYPICAL SECTION - 5:1 (20%) CROSS SLOPE
FILL BATTER SLOPE - 2:1



TYPICAL SECTION - 2:1 (50%) CROSS SLOPE
FILL BATTER SLOPE - 1:1

NOTES:

GENERAL:

- Vegetation Clearing should be kept to a minimum.
- Vegetation clearing should not be undertaken outside the Areas depicted on this plan unless approved by the Project Principle.
- Vegetation clearing should be undertaken as defined in AS 4970 - 2009 (Incorporating Amendment No. 1).
- No windrows or stockpiles should be created during vegetation clearing.
- Cut vegetation must be scattered into the surrounding environment, without smothering existing vegetation.

CONSTRUCTION ZONES VERSUS TERRAIN SIDE SLOPE				
TERRAIN CROSS SLOPE	BENCH WIDTH	VEG. CLEARING WIDTH	PARTIAL VEG. CLEARING WIDTH	TOTAL IMPACT WIDTH
5:1 (20%)	1-1.5 m	0.77 m	0.72 m	1.49 m
2:1 (50%)	1-1.5 m	0.98 m	0.77 m	1.75 m

LEGEND:

- AREA OF CUT
- AREA OF FILL
- NATURAL GROUND SURFACE

Rev.	Date	Revision Details	Drn.	Ver.	App.
B	07/04/20	CHANGES TO LAYOUT & NOTES	JR	DS	
A	25/03/20	ISSUED FOR INFORMATION	JR	DS	

Client:

Project:

WANGETTI TRAIL
DETAILED DESIGN

Drawn	Signed	Date
JR		07/04/20
Designed	Signed	Date
DS		07/04/20
Verified	Signed	Date
DS		07/04/20
Approved	Signed	Date

Drawing Title:



VEGETATION CLEARING
STANDARD DRAWING

FOR INFORMATION

Project No.	WT20-Wangetti-001
Scale	1:20
Sheet Size	A3
Drawing No.	WTSTD-033-WG2
Rev.	B

5.4.3 Grade Reversals

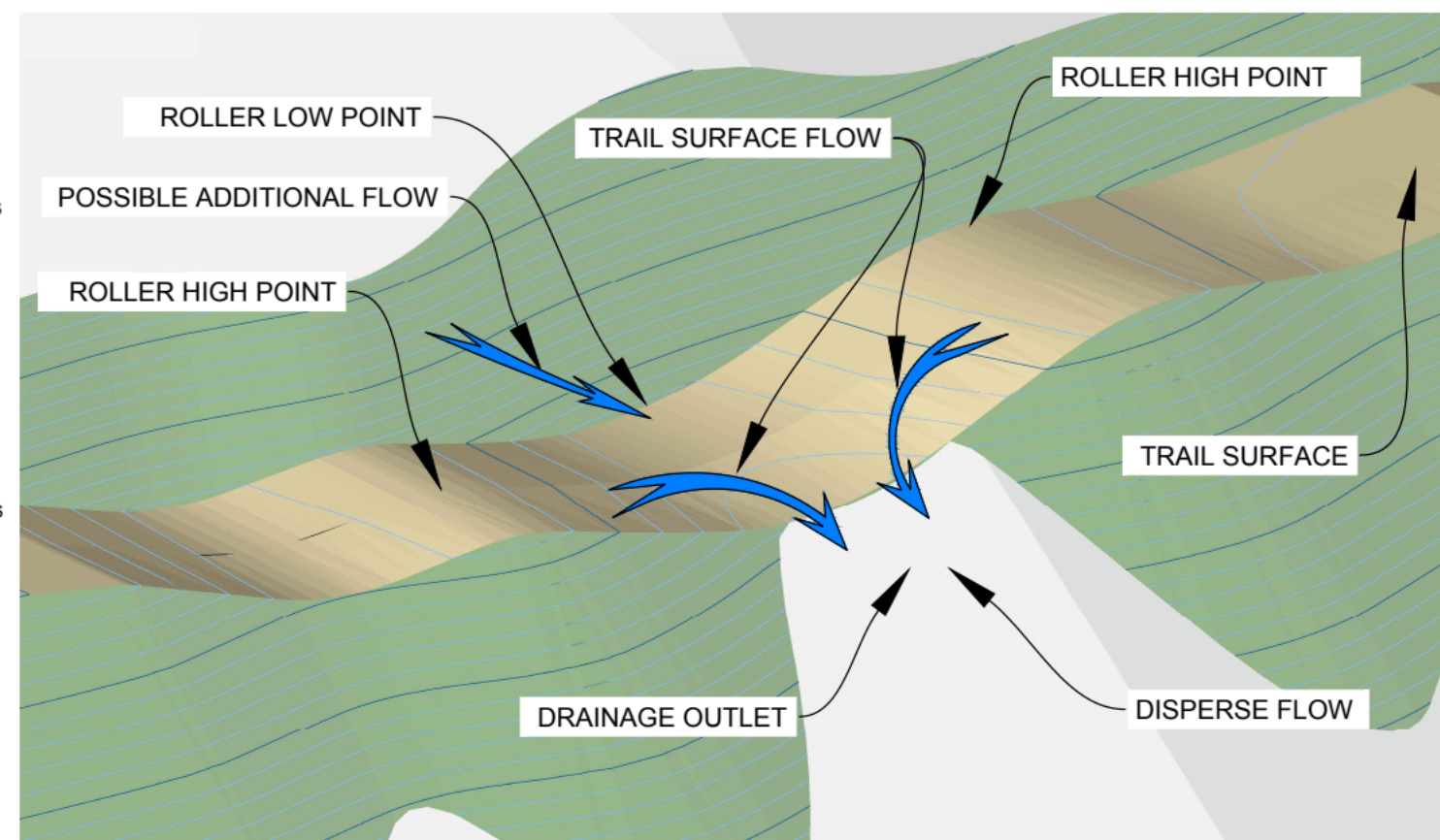
What is it?		Examples
<p>Grade Reversals are points at which trail gradient changes from up to down (or down to up) as the trail moves across a side slope.</p> <p>Grade Reversals push water off the trail at the low point of the grade reversal, preventing erosion. The undulations caused by the grade reversal give the trail a sense of playfulness.</p>		
When is it Used?		
<p>Grade Reversals should be used frequently, regardless of hand or machine construction, regardless of the intended user group and intended difficulty rating. They are a critical (and often overlooked) element of sustainable trail design.</p> <p>The size (height/amplitude) of the grade reversal is generally increased on steeper and more difficult trails.</p>		
Why is it Used?		
<p>Grade Reversals are the key element of sustainable trails. More frequent grade reversals push water off the trail incrementally, preventing it to build up volume or velocity, ensuring the long-term sustainability of the trail. With regular Grade Reversals, surface water can only be trapped on the trail for a short distance, flowing downwards along the trail until it reaches the first Grade Reversal. Grade Reversals effectively divide the trail into short, individual watersheds, so the drainage characteristics of one section of trail won't affect any other section.</p> <p>Grade Reversals also make trails more enjoyable by giving them a sense of playfulness – a constantly rising and falling nature.</p>		
Notes		
<p>Grade Reversals are constructed during Trail Benching, integrated with the standard trail construction process.</p> <p>As a general rule, the steeper the trail gradient, the more frequent the grade reversals should be, but this needs to be assessed on-site, with consideration of soils, rainfall, upslope catchment area, trail user types and speeds and so on. As a guide, the following spacing is suggested:</p> <ul style="list-style-type: none">Trail gradient of <5% - grade reversals to be spaced at approximately 20 - 40m intervals;Trail gradient of 5-10% - grade reversals to be spaced at approximately 16 - 19m intervals;Trail gradient of 10-15% - grade reversals to be spaced at approximately 12 - 15m intervals;Trail gradient of 15-20% - grade reversals to be spaced at approximately 8 - 11m intervals.		
Materials	Machinery / Equipment	
<ul style="list-style-type: none">In situ soil.No imported materials.	<ul style="list-style-type: none">Rubber tracked mini-excavator;Trail building hand tools including rakes, mattocks, rake hoes, leaf rakes, shovels etc.	
Estimated Length of Treatment	Drawing Reference	
Not specified, but required across entire length of trail – 82,150 metres	WTSTD-046-WG2 Trail Grade Reversals Placement and Dimensions	



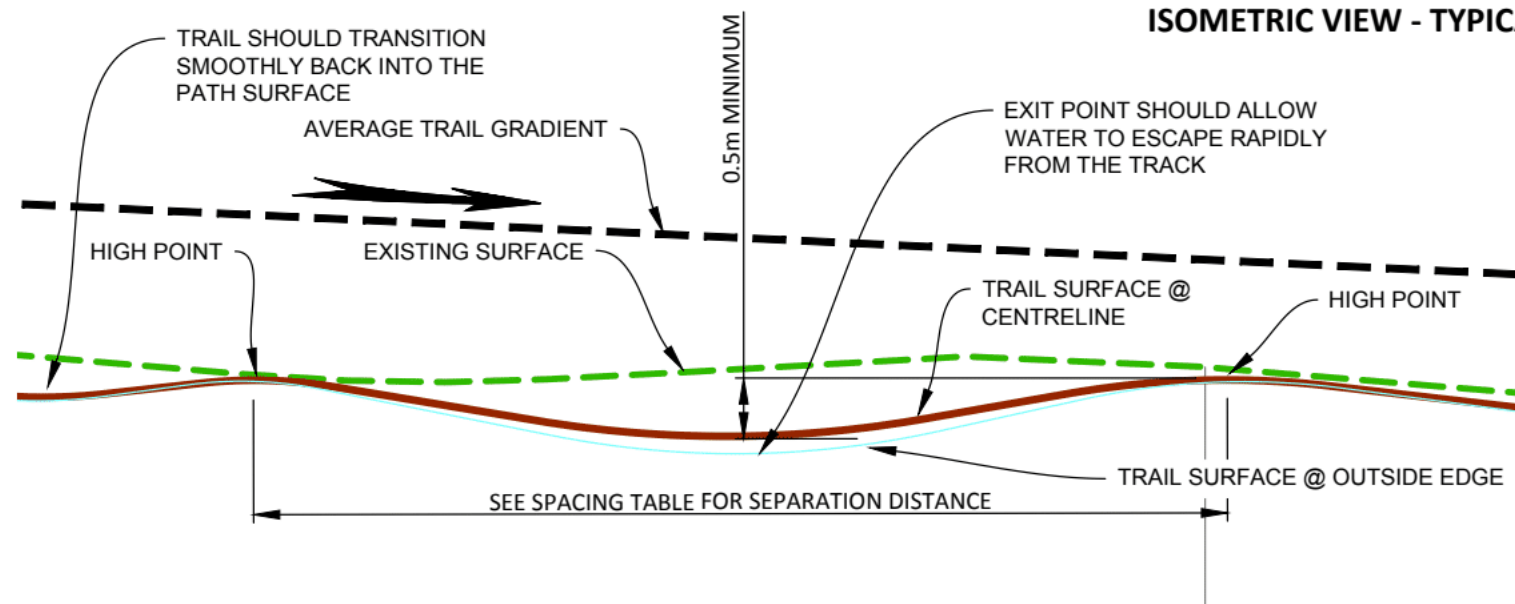


NOTES:

- Grade Reversals can be used on trails for walking, biking or dual use.
- Dimensions and setout of the swale may vary considerably from that depicted, depending on cross slopes, trail gradients and potential stormwater volumes.
- Water should exit the swale at the drainage outlet, ensuring rapid removal of flows from the trail.
- The drainage outlet should disperse water along the contour or across a broad discharge area to reduce velocities and allow for sediment dropout.
- Additional flows may occur from uphill of the grade reversal low point and should be considered in any sizing or erosion protection required.
- Erosion protection, generally using rock, may be required if the location constraints make it difficult to disperse flows.
- Grade reversals should not be confused with waterbars. A grade reversal is one of the most crucial parts in trail construction, both shedding water and also helping to shed speed.
- If a section of trail is on a low gradient with long arc to arcs then the grade reversal is longer and flatter.
- If a section of trail is on a steep gradient with shorter arc to arcs, then the grade reversal needs to be more aggressive, higher and deeper.
- Grade reversals need to be made sustainable and sized correctly to cope with factors like weather, time and riders wear.
- The recommended high point spacing table below provides guidance on these separations.
- Standard grade reversals should always be rollable by both novice and experienced riders.
- Experienced riders should be able to transfer across reverse grades if they are traveling at the necessary pace.
- Grade reversals should not be short, steep and kinky, as this can lead to abrasion, forced risk, injury and a substandard ride experience.
- The grade reversal shape should never force a less experienced rider into the air.
- Contours depicted are at 100mm intervals.

**ISOMETRIC VIEW - TYPICAL GRADE REVERSAL @ 8m SPACING**

0 1 2 Meters
Scale 1:40 @ A3

**PLAN VIEW - TYPICAL REVERSE GRADE**

0 1 2 Meters
Scale 1:50 @ A3

GENERAL
ARRANGEMENT
SCALE: 1:50

RECOMMENDED REVERSE GRADE SPACING TABLE

TRAIL GRADIENT (%)	HIGH POINT SPACING (m)
less than 5	20 - 40
5 - 10	16 - 19
10 - 15	12 - 15
15 - 20	8 - 11

FOR INFORMATION

Project No. WT20-Wangetti-001	Sheet Size A3
Scale 1:50	Rev. A
Drawing No. WTSTD-046-WG2	

Rev.	Date	Revision Details	Drn.	Ver.	App.
A	07/04/20	ISSUED FOR INFORMATION	JR	DS	DS




Client:
Project:
**WANGETTI TRAIL
DETAILED DESIGN**

Drawn JR	Signed	Date 07/04/20
Designed DS	Signed	Date 07/04/20
Verified DS	Signed	Date 07/04/20
Approved	Signed	Date

Drawing Title:
**TRAIL GRADE REVERSALS
PLACEMENT AND DIMENSIONS
STANDARD DRAWING**

5.4.4 Switchbacks

What is it?		Examples
A Switchback is a 180° turn on a hillside, engineered for drainage. The upper approach is usually insloped and the lower approach is usually outsloped. The Switchback turn reverses the direction of a trail, and is located on a relatively level, constructed landing.		
When is it Used?		
Switchbacks are used to ascend/descend steep slopes while avoiding unsustainably steep trail gradients. Ideally, the use of Switchbacks should be minimised as much as possible, and ideally, they should be staggered across a hillside rather than being stacked directly on top of each other.		
Switchbacks are used when it is not possible for the trail to continue traversing across the hillside for some reason.		
Why is it Used?		
Switchbacks are used to provide a broad, flat platform on which a sharp turn can be placed. Grade Reversals should be incorporated into the trail at the entry and exit to the switchback corner, to prevent excess water flowing into the corner.		
Notes		
Switchbacks are constructed during Trail Benching, integrated with the standard trail construction process.		
Materials	Machinery / Equipment	
<ul style="list-style-type: none">In situ soil.In situ rocks for rock walls if required.	<ul style="list-style-type: none">Rubber tracked mini-excavator;Trail building hand tools including rakes, mattocks, rake hoes, leaf rakes, shovels etc.	
Estimated Length of Treatment	Drawing Reference	
N/A	WTSTD-047-WG2 Rock Walled Switchback Placement and Dimensions	

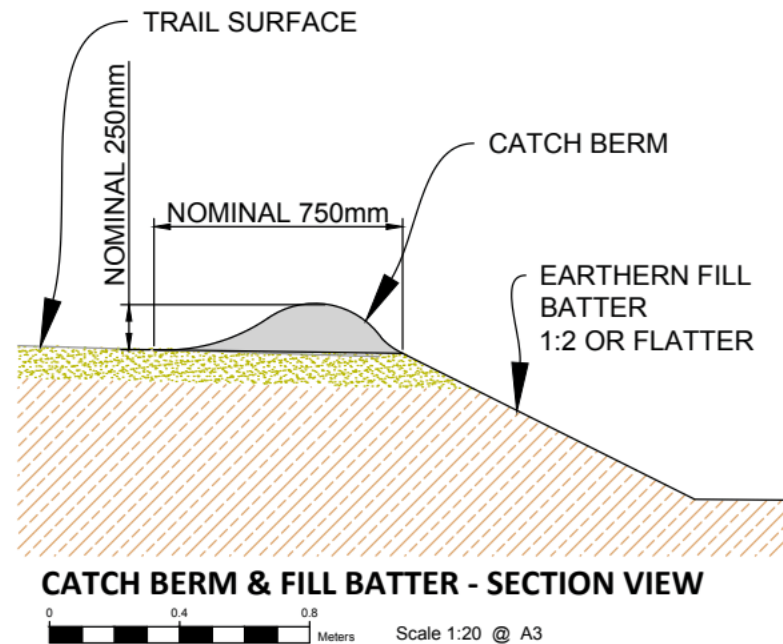


A	07/04/20	ISSUED FOR INFORMATION						JR	DS	DS
Rev	Date	Revision Details						Des	Ver	App

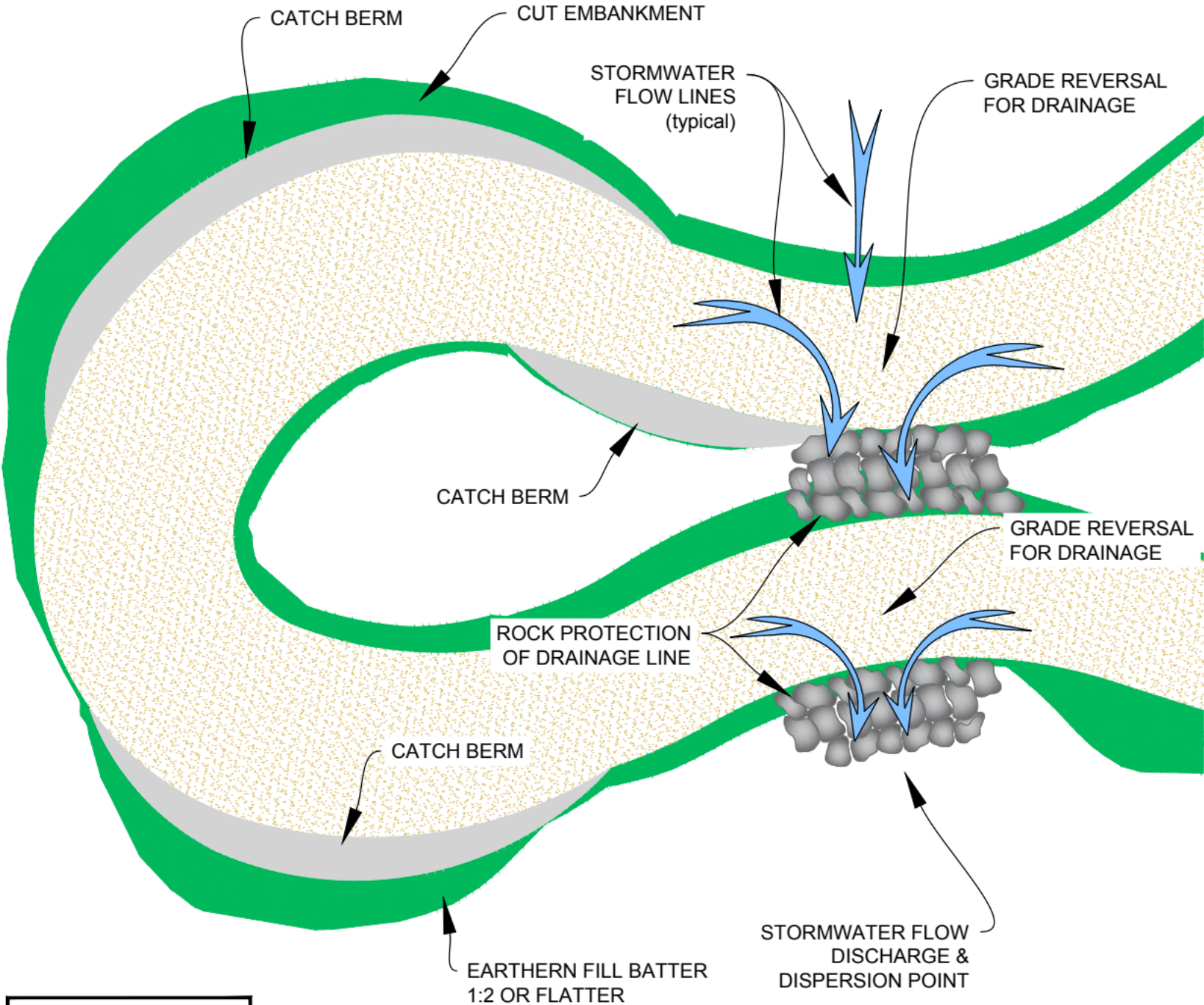
NOTES:

GENERAL:

- The standard switchback is for flatter cross slopes where earthen batters are sufficient to provide elevation to downhill trail edges.
- The switchback depicted is indicative only and large variations in shape and dimensions are expected due to the large variations in the topography and hydrology of switchback locations along a trail.
- This switchback is most suitable for cross slopes flatter than 25%.
- Embankment fill batters vary from 25% to 50%. Any fill batters steeper than 50% may require structural support and erosion protection depending on the fill material used.
- Embankment "Cut" sidewalls should not exceed 1.5m in height.
- Trail gradients through the switchback should comply with the general trail construction requirements.
- Trail widening will be required around the arc of the switchback with between 400mm & 700mm wider than the standard trail width common.
- Radii of inside trail edge in the switchback may vary from 0.8m to 4m around the asymmetric arc.
- See details below for "Catch Berms" that are located at strategic locations to provide a riding edge to direct the ride line.
- The Catch Berms are constructed of well compacted trail wear surface material.
- The drainage outlet should disperse water along the contour or across a broad discharge area to reduce velocities and allow for sediment dropout.
- Additional flows may occur from uphill of the switchback low point and should be considered in any sizing or erosion protection required.
- Erosion protection downstream of the outlet, generally using rock, may be required if the location constraints make it difficult to disperse flows.



CATCH BERM & FILL BATTER - SECTION VIEW



STANDARD SWITCHBACK - PLAN VIEW

ISSUED FOR CLIENT REVIEW	
APPROVED	<input type="checkbox"/>
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NOT APPROVED	<input type="checkbox"/>
SIGNED.....	DATE.....

GENERAL
ARRANGEMENT
AS SHOWN

0 1 2 Meters
Scale 1:50 @ A3

Rev.	Date	Revision Details	Drn.	Ver.	App.
A	07/04/20	ISSUED FOR INFORMATION	JR	DS	DS





Project:
WANGETTI TRAIL
DETAILED DESIGN

Drawn	Signed	Date
JR		07/04/20
Designed	Signed	Date
DS		07/04/20
Verified	Signed	Date
DS		07/04/20
Approved	Signed	Date

Drawing Title:
STANDARD SWITCHBACK
PLACEMENT AND DIMENSIONS
STANDARD DRAWING

FOR INFORMATION	
Project No.	WT20-Wangetti-001
Scale	AS SHOWN
Sheet Size	A3
Drawing No.	WTSTD-048-WG2
Rev.	A

5.4.5 Rock Walling (Up To 500mm)




What is it?		Examples	
Rock Walling (up to 500mm) are smaller structures designed to restrain soil to a slope that it would not naturally keep to (typically a steep, near-vertical or vertical slope).			
When is it Used?			
Rock Walling is used to retain soils of height between 0 and 500mm. They may be used to retain the upslope or downslope batter.			
Why is it Used?			
On steep side slopes, cutting the trail to the desired width of 1500mm may create overly high, unsustainable and unstable batters, either the upslope or downslope batter. The use of Rock Walling provides a strong and durable structure that will prevent either batter from slumping.			
Notes			
Materials	Machinery / Equipment		
<ul style="list-style-type: none">Rock (can be in situ or imported, subject to land manager requirements).	<ul style="list-style-type: none">Rubber tracked mini-excavator;Trail building hand tools including rakes, mattocks, rake hoes, leaf rakes, shovels etc.;Rock work hand tools such as crow bars, rock bars, rock hammers, wedges etc.;Ropes, pulleys, winches, chains, straps and rock slings to assist in manipulating rocks into place.		
Estimated Length of Treatment	Drawing Reference		
1,501 metres (of entire 82.15km length of trail)	WTSTD-034-WG2 Rock Walling – Up To 500mm Placement and Dimensions		

GENERAL:

-
- MULCH/LANDSCAPING
IF SPECIFIED
- DOWNSIDE BOULDER WALL
500mm MAXIMUM HEIGHT
- UPSIDE BOULDER WALL
500mm MAXIMUM HEIGHT
- TRAIL SURFACE
- The diagram illustrates a cross-section of a trail. A central trail surface, represented by a stippled pattern, is flanked by two boulder walls. The top boulder wall is labeled 'DOWNSIDE BOULDER WALL 500mm MAXIMUM HEIGHT'. The bottom boulder wall is labeled 'UPSIDE BOULDER WALL 500mm MAXIMUM HEIGHT'. Above the top boulder wall, an arrow points to a layer of mulch/landscaping, labeled 'MULCH/LANDSCAPING IF SPECIFIED'. A silhouette of a person is shown walking on the trail surface. An arrow points from the 'TRAIL SURFACE' label to the stippled area.

Scale 1:25 @ A3



-  TRAIL SURFACE
 SELECT FILL
 NATURAL GROUND

GENERAL
ARRANGEMENT
SCALE 1:25



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FOR INFORMATION

Project No. WT20-Wangetti-001	
Scale 1:25	Sheet Size A3
Drawing No. WTSTD-034-WG2	Rev. A

A	07/04/20	ISSUED FOR INFORMATION						JR		
Rev.	Date	Revision Details						Dwn.	Ver.	App.

5.4.6 Retaining Walls (Up To 1000mm)

What is it?		Examples	
Retaining Walls are larger structures designed to restrain soil to a slope that it would not naturally keep to (typically a steep, near-vertical or vertical slope).			
When is it Used?			
Retaining Walls are used to retain soils of height up to 1000mm. They may be used to retain the upslope batter or the downslope batter.			
Why is it Used?			
On steep side slopes, cutting the trail to the desired width of 1500mm may create overly high, unsustainable and unstable batters, either the upslope or downslope batter. The use of a Retaining Wall provides a strong and durable structure that will prevent either batter from slumping.			
Notes			
Materials	Machinery / Equipment		
<ul style="list-style-type: none">• Rock (can be in situ or imported, subject to land manager requirements);• Concrete;• Mortar;• Geofabric;• Drainage materials as per drawing.	<ul style="list-style-type: none">• Rubber tracked mini-excavator;• Concrete mixer;• Trail building hand tools including rakes, mattocks, rake hoes, leaf rakes, shovels etc.• Rock work hand tools such as crow bars, rock bars, rock hammers, wedges etc.		
Estimated Length of Treatment	Drawing Reference		
901 metres (of entire 82.15km length of trail)	WTSTD-004-WG2 Rock Retaining Wall Up To 1000mm Placement and Dimensions		

NOTES:

- The wall dimensions shown assume a minimum allowable bearing capacity of 100 KPa is available on site.
- Mortar to be 1 part cement to 3 parts sand (by volume). Face joints to be 25mm nominal width.
- Rocks to be selected spalls set in cement mortar beds in horizontal layers. Unless specified otherwise open faced stonepitching to be used where the concrete is recessed 50mm behind the stone facing. If closed face stonepitching is specified, concrete to be flush with stone facing. Select spalls to avoid sharp edges.
- The standard building regulation 1993 requires that a building application be lodged for earth retaining structures >1000mm high. A geotechnical assessment by a suitably qualified engineer is required for all walls founded in poor materials eg. bearing capacity <100 KPa.
- Install weepholes in addition to the longitudinal drain for maintenance and overflow purposes. Weepholes to be 100mm dia upvc at 1000mm max centres, positioned at approx 100mm constant height above ultimate ground level and connected to the longitudinal drain using standard manufacturers fittings.
- Longitudinal drain shall be 300mm * 50mm megaflow or 100mm dia corrugated perforated polyethylene pipe, encased with geofabric (BIDIM A29 or equivalent). The invert of the longitudinal drain and the weephole inlet shall be aligned to allow direct discharge via the weephole.
- All connection, including the joining of lengths of megaflow or corrugated perforated polyethylene pipe, shall be made using standard manufacturers fittings.
- Filter drainage layer for full height and length of wall to be Cordrain or equivalent with Geofabric (BIDIM A29 or equivalent) adhered to both sides. Alternately, a 300mm thick, free draining filter sand/gravel layer separated from insitu material by a type 2 geofabric layer.
- Backfill shall be freedraining, non plastic predominantly granular material with minimum friction angles of 38° and 27° where founding materials are sand or other materials respectively. Do not place backfill behind the wall until at least 10 days after wall construction.
- The 50mm blinding layer can be replaced with a 200 micron IR2 polyethylene sheet when the bottom off the footing excavation is in stable sound material.
- Drawings are not to scale.
- Dimensions in millimetres unless otherwise notated.

ISSUED FOR CLIENT REVIEW

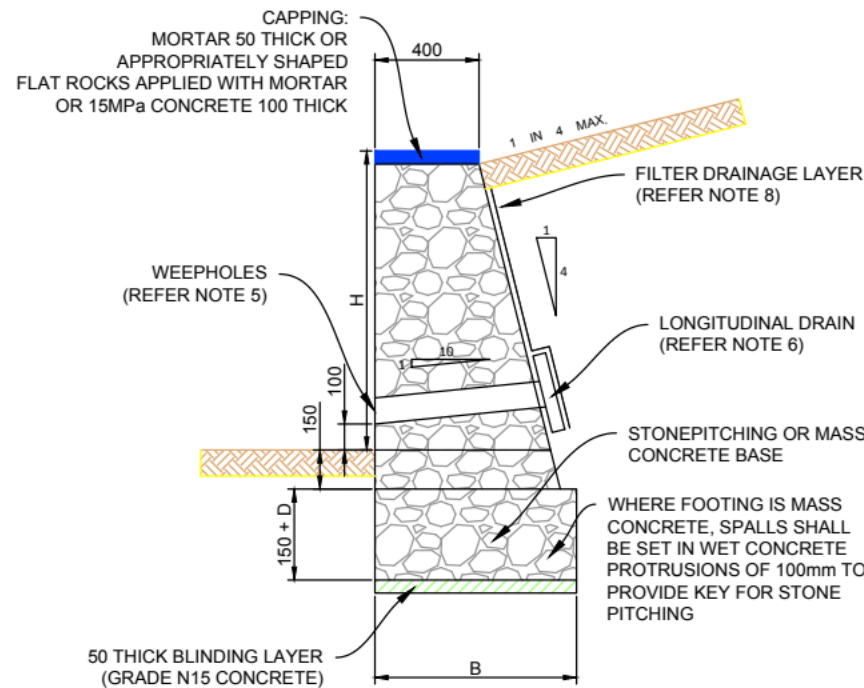
APPROVED

APPROVED AS NOTED

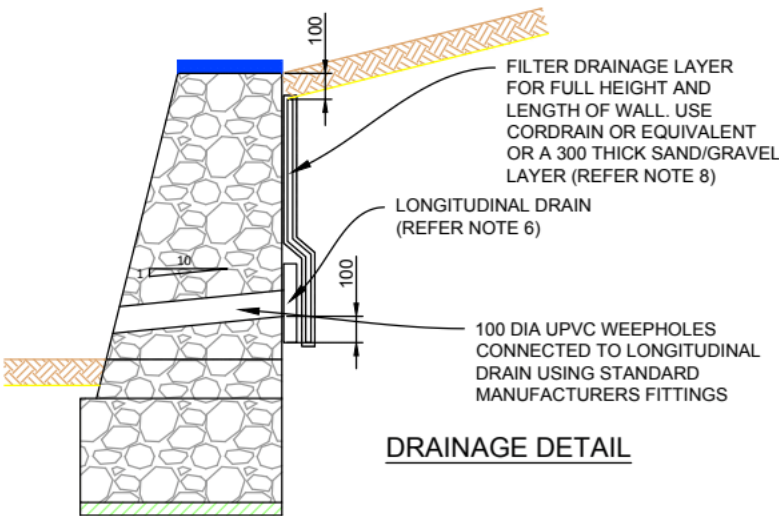
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DATE.....

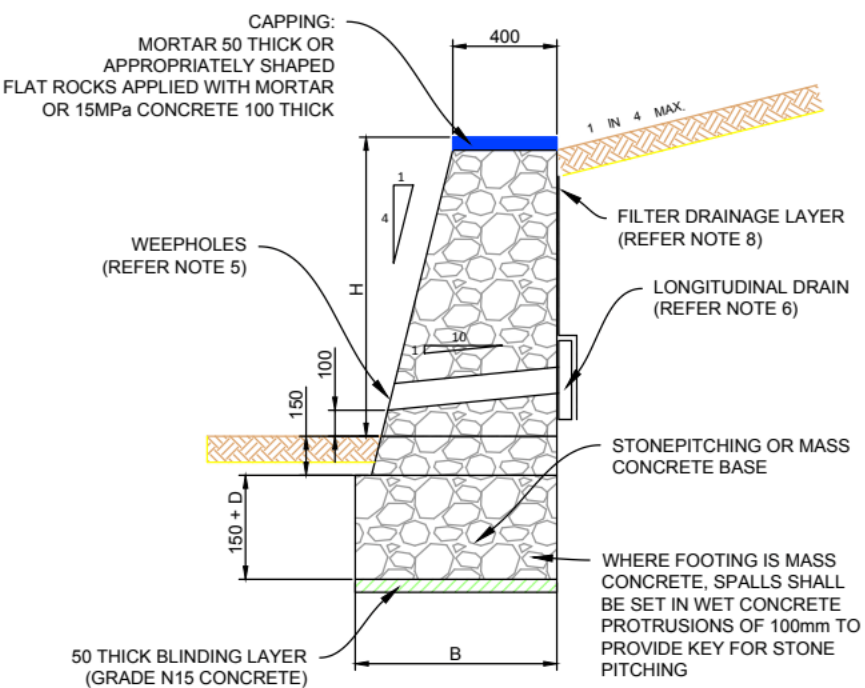


STONEPITCHED RETAINING WALL
VERTICAL FACE
UNSTABLE INSITU MATERIAL RETAINED



DRAINAGE DETAIL

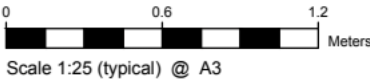
GENERAL
ARRANGEMENT
SCALE 1:25



STONEPITCHED RETAINING WALL
4 IN 1 FACE SLOPE
UNSTABLE INSITU MATERIAL RETAINED

WALL DIMENSIONS

SLOPING BACKFILL - 1 IN 4 (MAX) OR LEVEL WITH 5 kPa SURCHARGE		
H	B	D
0 - 400	600	0
401 - 750	660	0
751 - 1000	775	200



FOR INFORMATION

Project No.	WT20-Wangetti-001
Scale	1:25
Sheet Size	A3
Drawing No.	WTSTD-004-WG2
Rev.	A




Rev.	Date	Revision Details	Drn.	Ver.	App.
A	24/03/20	ISSUED FOR INFORMATION	JR	MB	DS

Client:

Project: **WANGETTI TRAIL
DETAILED DESIGN**

Drawn	Signed	Date	Drawing Title: ROCK RETAINING WALL UP TO 1000mm PLACEMENT AND DIMENSIONS STANDARD DRAWING
JR		24/03/20	
Designed	DS	24/03/20	
Verified	DS	24/03/20	
Approved	Signed	Date	

5.4.7 Ballast Surfacing

What is it?		Examples	
<p>Ballast Surfacing is a two-course surfacing treatment, used to raise and/or harden the surface of the trail.</p>			
When is it used?			
<p>Ballast Surfacing is used in high traffic areas, sunken or low-lying areas, wet or boggy areas, or areas requiring the passage of vehicles. Due to the high bulk material requirements, it is usually only used in areas where vehicle access is available nearby to import materials.</p> <p>For the Wangetti Trail, this treatment is proposed to treat sections of existing, eroded, sunken four-wheel drive tracks in the flat terrain immediately south of Wangetti. In this area, the trail comes very close to the Captain Cook Highway to skirt around a military firing range. This proximity to the highway provides good access for trucks.</p>			
Why is it used?			
<p>Ballast Surfacing can be used for a variety of purposes - to harden the surface in high traffic areas, to provide a more uniform or level surface, to improve traction or for aesthetic purposes.</p>		 	
Notes			
<p>At the outset of the construction process, works should be undertaken to identify suitable surfacing materials that are locally available and that can be certified to weed/pathogen free status for land manager approval.</p>			
Materials	Machinery / Equipment		
<ul style="list-style-type: none">• Ballast rock for base course (as per drawing)• Fine crushed rock for wearing course (as per drawing);• Geofabric (as per drawing).	<ul style="list-style-type: none">• Rubber tracked mini-excavator;• Skid-steer excavator (i.e. Bobcat) for spreading;• Trail building hand tools including rakes, mattocks, rake hoes, leaf rakes, shovels etc.;• Small dumper or mechanized wheelbarrow (i.e. power carriers) for moving the material along the trail from the stockpile location;• Roller or vibrating plate compactor.		
Estimated Length of Treatment	Drawing Reference		
<p>4,595 metres (of entire 82.15km length of trail)</p>	<p>WTSTD-045-WG2 Ballast Surfacing Placement and Dimensions</p>		

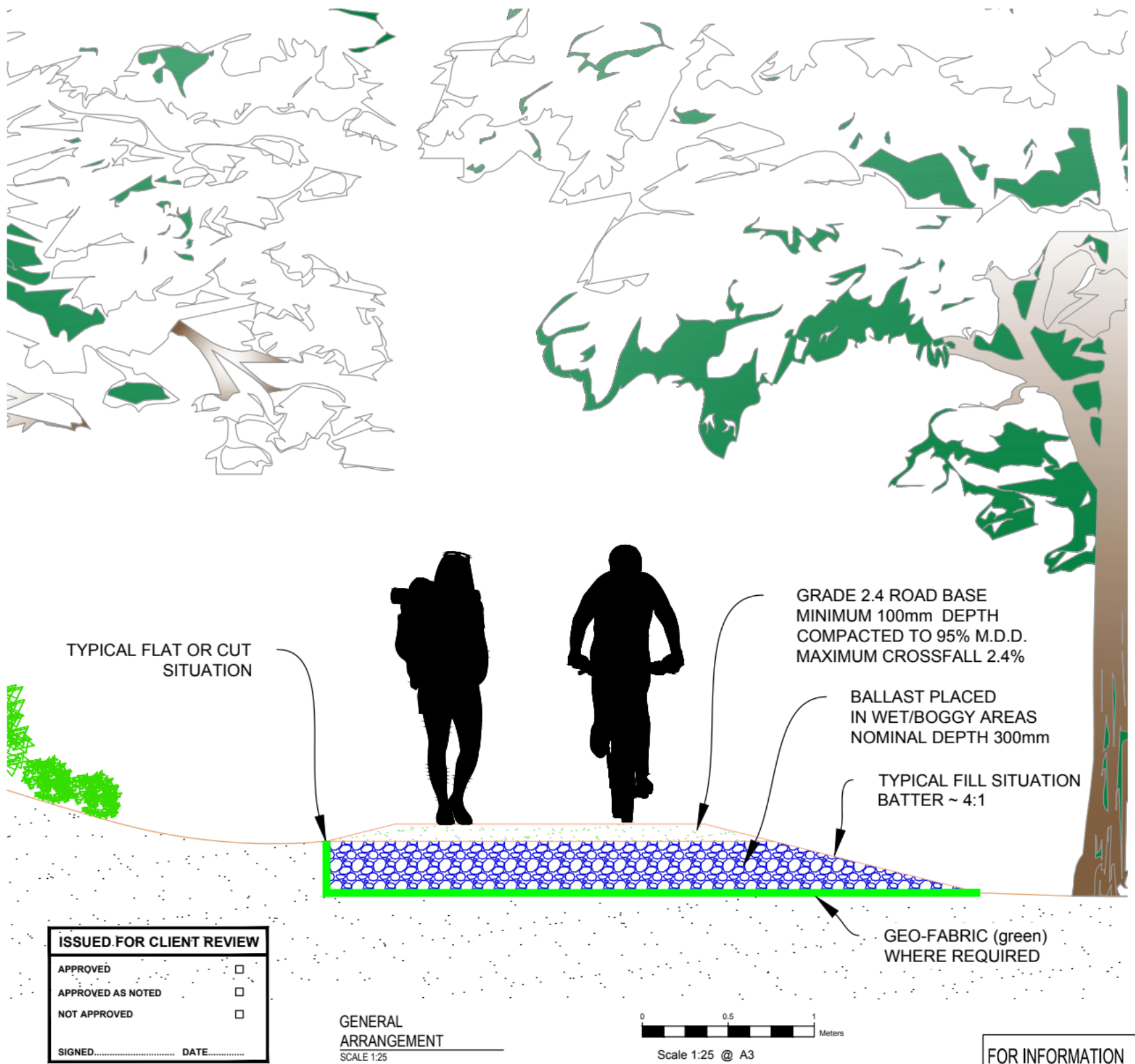
NOTES:

GENERAL:

- Dual direction (two way) trail.
- Dual use trail for walking and biking.
- The trail will provide access along a slightly modified, natural environment alignment, with little provision of interpretive signage and few facilities.
- Ballast surfacing is to be used in wet & boggy locations to provide a solid platform for the trail wearing course layer.
- Ballast is to be placed in such a way that it does not severely impede local stormwater flows.
- Locations where the placement of Ballast might impede the natural connectivity of fauna corridors should be identified and remediation infrastructure such as pipes or sections of boulder crossing implemented in a way that will mitigate the blockage.
- Dimensions in millimetres unless otherwise notated.

BALLAST PLACEMENT:

- Ballast shall be clean, durable crushed rock with a size distribution of 13mm to 63mm. The majority of particles shall be greater than 37.5mm in size.
- The Ballast rock shall be hard, non - flaky material with a Bulk Density greater than 1200 Kg/m³ and a Particle Density of greater than 2500 Kg/m³.
- The nominal depth of 300mm depicted may vary considerably, depending on the depth of unsuitable sub-grade material at each location.
- Trail width may increase from the general width in the sections with Ballast Surfacing. This is to allow additional shoulder width for trail users through these unsuitable locations.
- The width of the Ballast may extend up to 3m in particularly boggy areas to provide a stable platform for trail construction.
- Geofabric underlay of a suitable class may be required under the Ballast to minimise the intrusion of unsuitable material up into the Ballast embankment.
- Ballast should be compacted using wheel or track rolling, until the particles are firmly meshed and void spaces are minimised.
- In extreme locations and where low velocity water flows are possible, Geo-Fabric of a suitable class may also be required on top of the Ballast and under the Trail wearing course layer. In these locations the wearing course layer thickness may need to be increased to 150mm or 200mm.



A	07/04/20	ISSUED FOR INFORMATION	JR	DS	DS
Rev.	Date	Revision Details	Dwn.	Ver.	App.





Client: **Wangetti Trail**
Project: **DETAILED DESIGN**

Drawn	Signed	Date
JR		07/04/20
Designed	Signed	Date
DS		07/04/20
Verified	Signed	Date
DS		07/04/20
Approved	Signed	Date

Drawing Title:
**BALLAST SURFACING
PLACEMENT AND DIMENSIONS
STANDARD DRAWING**

5.4.8 Pre-Cast Concrete Steps

What is it?		Examples
Pre-Cast Concrete Steps are used to climb up/down steep sections of trail on hikers only sections.		
When is it Used?		
Pre-Cast Concrete Steps allow the trail to climb up/down steep slopes, while ensuring good traction and stability for hikers. They are not suitable generally for dual-use or mountain biking trails.		
Why is it Used?		
On steep slopes hikers may struggle to maintain traction, especially with a heavy pack, creating risks to safety and possible damage to the trail surface. The use of Pre-Cast Concrete Steps provides a safer and more sustainable outcome, while also hardening the surface and ensuring its long-term sustainability.		
Notes		
The Pre-Cast Concrete Steps detailed here result in a gradient of 28° along a flight of these steps (approx. 31% gradient).		
Materials	Machinery / Equipment	
<ul style="list-style-type: none">• Pre-cast concrete steps (available in different sizes);• Concrete for foundation of base step;• Road base for foundation of mid-flight steps;• Mortar;• Large rocks as corrals;• Anchors to sides of flight of steps.	<ul style="list-style-type: none">• Rubber tracked mini-excavator;• Trail building hand tools including rakes, mattocks, rake hoes, leaf rakes, shovels etc.;• Rock work hand tools such as crow bars, rock bars, rock hammers, wedges etc.;• Concrete mixer;• Vibrating plate compactor.	
Estimated Length of Treatment	Drawing Reference	
1,000 steps	WTSTD-003-WG2 Precast Concrete Steps Placement and Dimensions WTSTD-043-WG2 Rock Pavement Treatment Trail Construction WTSTD-030-WG2 Precast Concrete Steps Trail Grading Guidelines	



NOTES:**STEP TREADS:**

- Step treads are to be supplied by the Paving Group Pty Ltd trading as Stone Directions or equivalent treads as approved by the client or project principle.
- Step treads are precast from a 4:1 white Portland cement mix using screened crushed granite, high grade quartz/sandstone washed sand and fibre reinforcing.
- Steps meet around 55MPa material strength.
- Step treads are available in 4 widths: 1500mm, 1200mm, 900mm & 600mm.
- Other dimensions are as depicted on this plan and include a 50mm overlap between treads.
- In accordance with AS 2156.2 - 2001 Table 4, a Class 3 Walking Track can include up to 36 steps in a row before a landing is required.
- Landings will be a minimum of 900mm in length.
- The specifications of the precast concrete steps depicted in this drawing result in an overall slope/gradient of 28°.
- In some locations, ground conditions may not be conducive to this preset slope. Three options can be considered in these circumstances:
 - Using hand tools, excavate the insitu ground to form the required slope.
 - Import and compact suitable road base to form the ideal slope.
 - Use landings (of varying lengths) to suit the existing slope of the work area.

HANDLING:

- Step treads should be handled using techniques appropriate to the item weight. See the adjacent table for approx. tread weights.
- Treads should be handled in a manner that minimizes the risk of cracking or fracture as treads must be undamaged or weakened before track use.

SITE FOUNDATION MATERIALS:

- The foundation materials on which the stairway is to be constructed must be carefully assessed for foundation rigidity.
- If foundation material conditions are not obvious or the site includes dangerous fall conditions a geotechnical analysis of the foundation materials should be undertaken.
- The foundation materials need to be assessed as to whether they are "Unstable or Sandy" or "Stable".
- Placement methodologies vary depending on this classification.

PLACEMENT:**UNSTABLE or SANDY FOUNDATION MATERIALS:**

- The first step must be laid on a concrete slab footing of minimum 75mm depth.
- Concrete is to be minimum 15 MPa which allows the use of post mix or rapid set premix concrete.
- This slab footing must be a minimum of the length and breadth of the precast tread unit.
- The tread unit should be laid level apart from a slight fall to the

front on the footing using 10 to 15mm of 4:1 mortar mix.

- Additional tread units should be laid with a 50mm overlap over the previous tread and with either another slab footing the size of the tread or at a minimum a strip footing along the sides and back of the tread.
- The strip footing should be a minimum of 100mm wide by 75 mm deep.
- The additional tread should again be laid on a 10 to 15mm mortar bed and levelled to provide a slight fall to the front of around 10mm.
- More additional treads can be added using a similar methodology.
- All slab and strip footings should be laid in an excavation or bounded with suitable rocks or local material to ensure concrete overflow does not impede backfill against the finished stairway using soils or rock protection.

STABLE FOUNDATION MATERIALS:

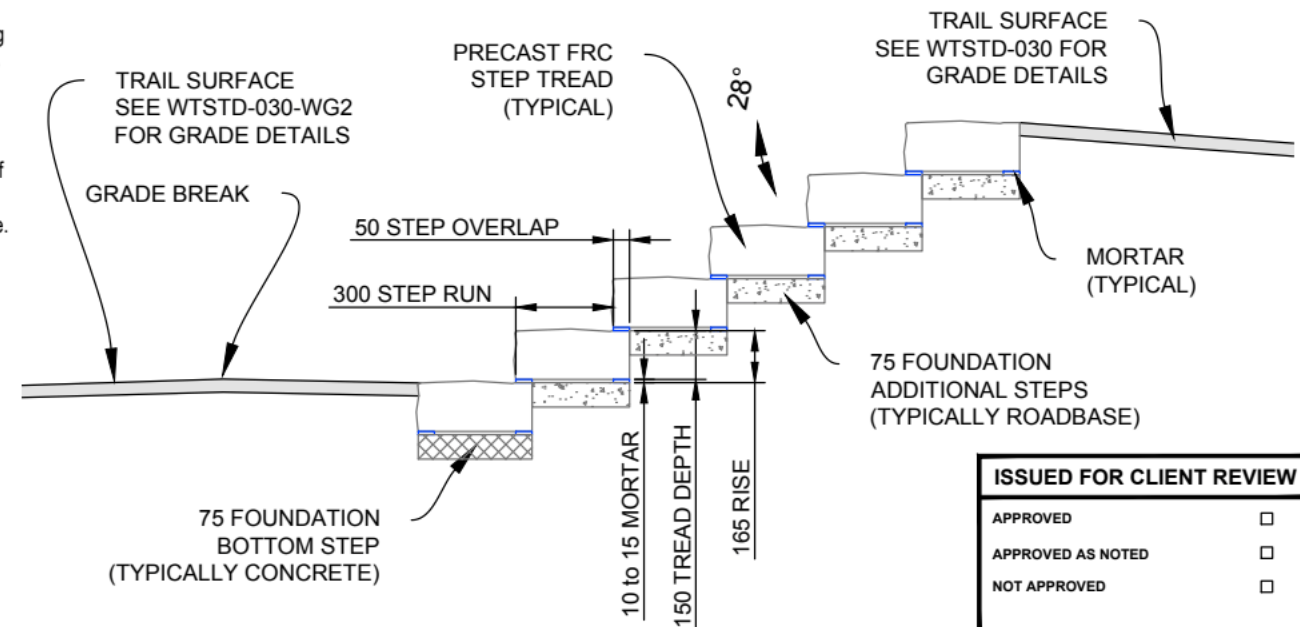
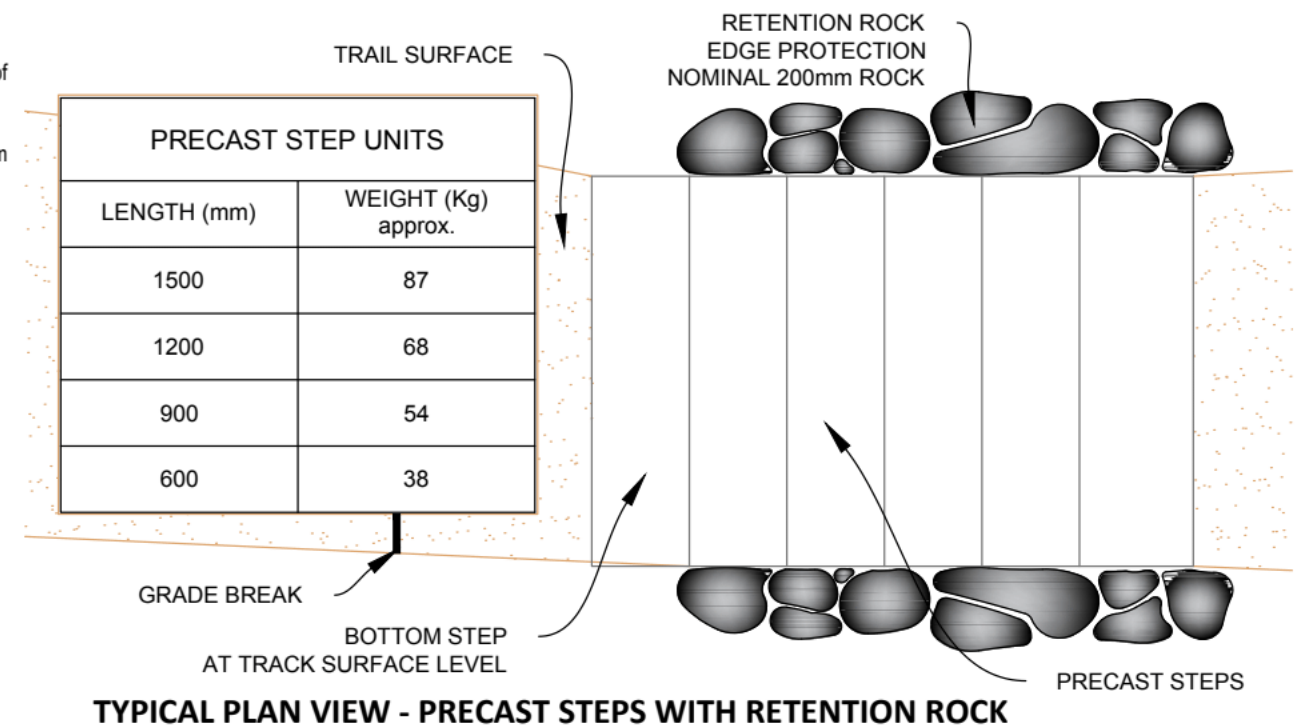
- Treads may be laid directly onto hard stable surfaces (eg shale or granite type materials) plumbed and leveled using a 4:1 mortar mix.
- Treads may be laid directly onto a well compacted 75mm layer of good quality road base again using a 4:1 mortar mix.
- The road base must be contained within an excavation or by appropriate retention rocks to facilitate compaction.
- Where this containment is not possible a concrete slab footing must be used particularly on the bottom tread.
- The contained road base or concrete footing must be at least the full size of the tread.
- Additional treads can be laid on well compacted road base using 10-15mm 4:1 mortar mix with a 50mm overlap over the previous tread.

GENERAL PLACEMENT

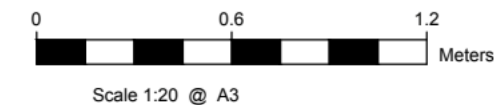
- The mortar mix should be continuous around the bottom edge of the tread unit with some mortar will overflow up and into the hollow part of the tread unit to assist in holding the tread in place.
- The mortar mix must be placed on solid material with all flaky or loose material removed to ensure good bonding.
- The treads are designed to have a 300mm run and a 165mm rise. The mortar depth is critical in achieving this run/rise ratio.
- Additional side support to ensure the treads remain in place can be provided through backfill against the sides using soils or retention rock.
- Retention rock should be used in areas where water flows are likely to occur. Retention rock can be bound in place using a 4:1 mortar mix.
- Step treads are supplied with 3 pattern styles. Ensure styles are mixed and matched to avoid any obvious symmetry and maximize a "natural look".
- Dimensions in millimetres unless otherwise notated.

TRAIL ALIGNMENT

- See WTSTD-030-WG2 for details on trail grading requirements above, below & at landings between stair sections.

**TYPICAL SECTION PRECAST STEPS - 5 STEP EXAMPLE**

GENERAL
ARRANGEMENT
SCALE 1:20



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APPROVED AS NOTED	<input type="checkbox"/>
NOT APPROVED	<input type="checkbox"/>
SIGNED..... DATE.....	

FOR INFORMATION

Project No.	WT20-Wangetti-001
Scale	1:20
Sheet Size	A3
Drawing No.	WTSTD-003-WG2
Rev.	E

Rev.	Date	Revision Details	Drn.	Ver.	App.
E	07/04/20	TRAIL GRADE & BOTTOM STEP ALTERED	JR	DS	DS
D	14/08/19	ADDITIONAL NOTES ADDED	JR	DS	DS
C	07/08/19	RETENTION ROCK PLAN VIEW ADDED	JR	DS	DS
B	17/12/18	ADDITIONAL NOTES ADDED	JR	DS	DS
A	22/11/18	ISSUED FOR INFORMATION	JR	DS	DS

Client:



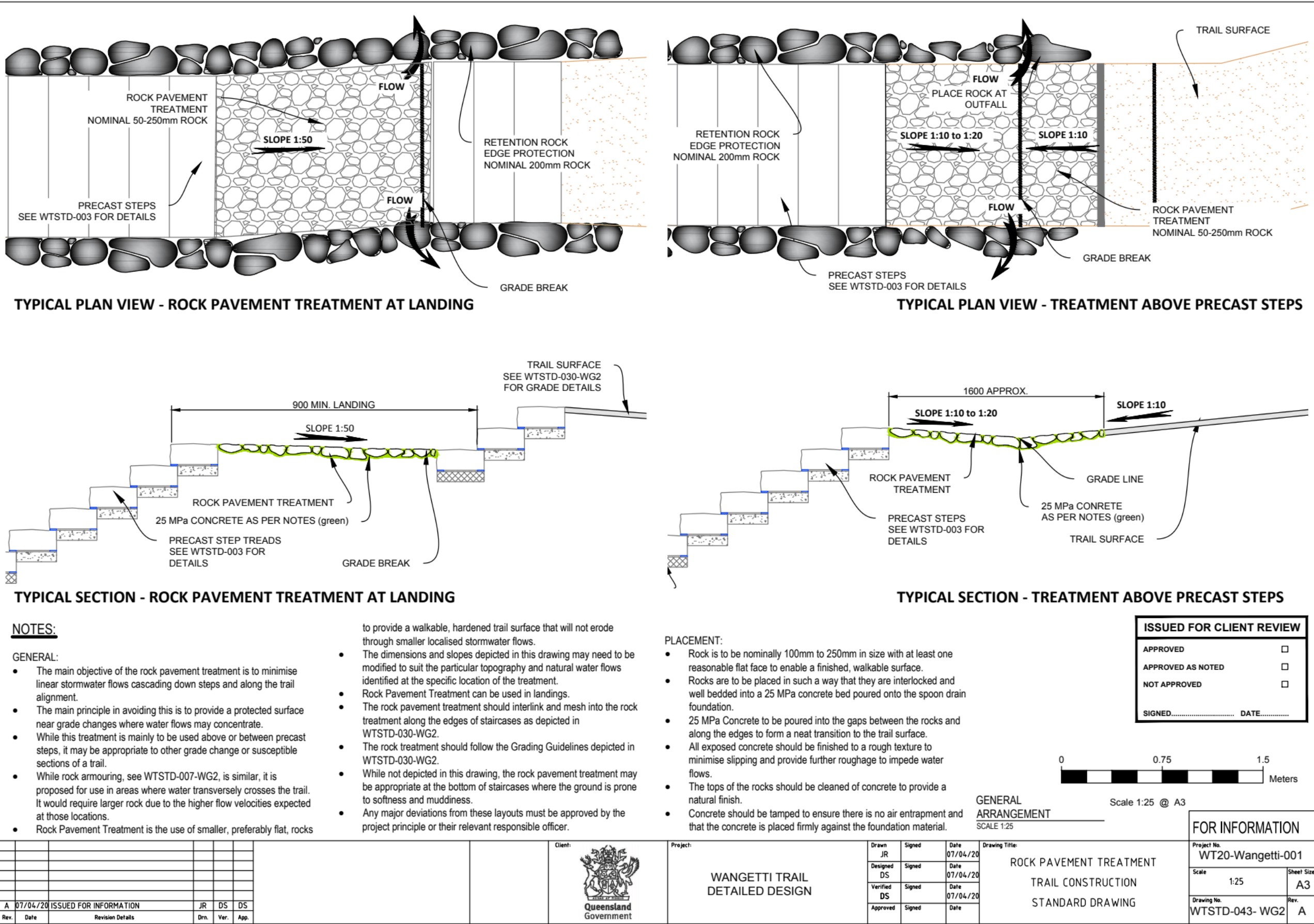
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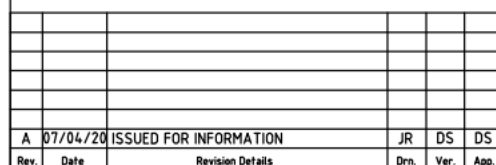
WANGETTI TRAIL
DETAILED DESIGN

Drawn	Signed	Date
JR		07/04/20
Designed	Signed	Date
DS		07/04/20
Verified	Signed	Date
DS		07/04/20
Approved	Signed	Date


Drawing Title:

PRECAST CONCRETE STEPS
PLACEMENT AND DIMENSIONS
STANDARD DRAWING








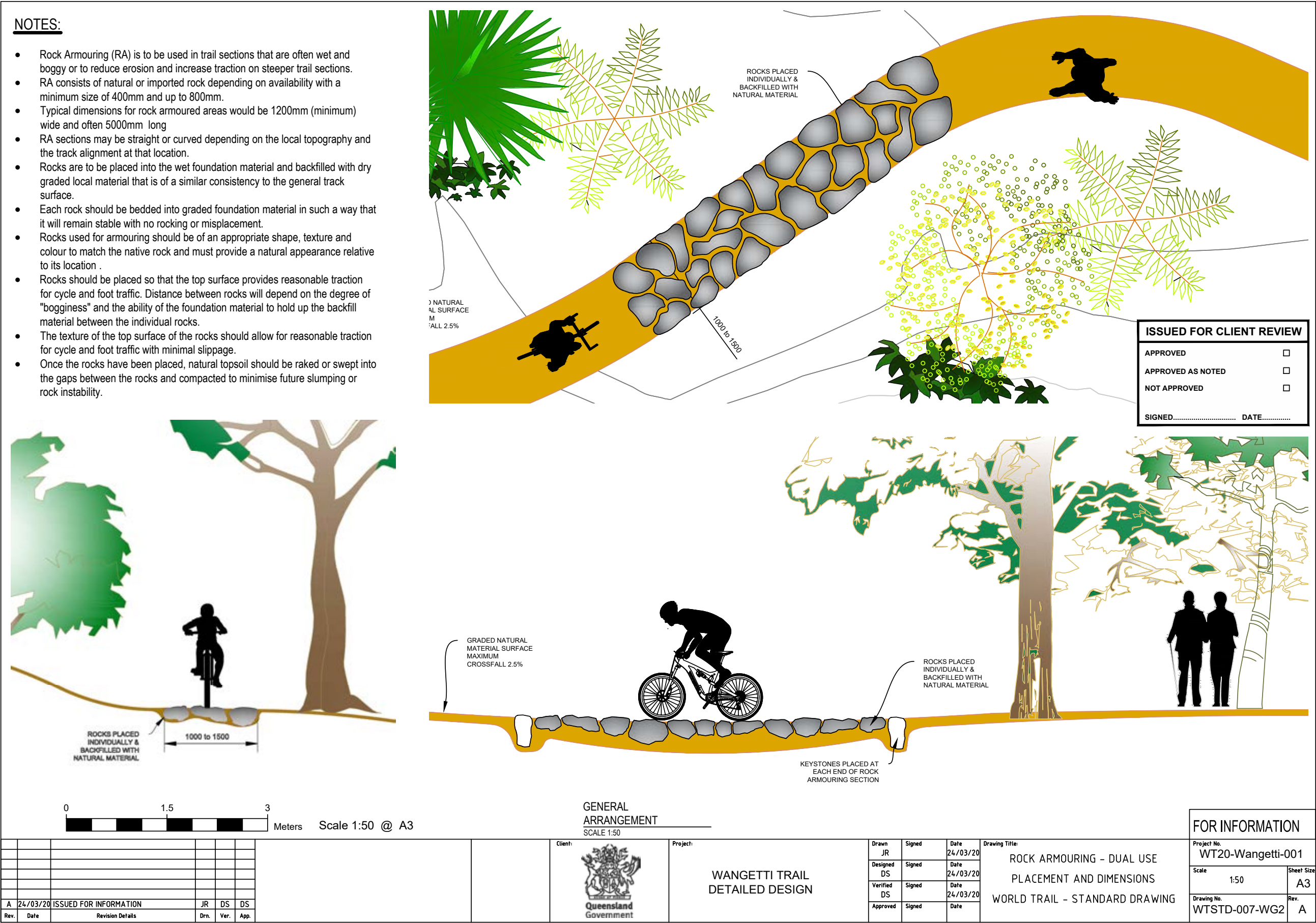
5.4.9 Natural Rock Seats

What is it?		Examples	
Natural Rock Seats are used at rest locations to provide seating.			
When is it Used?			
Natural Rock Seats are used when there is a good opportunity to provide a formalised rest spot – generally a location that has good views/ambience, or where it may be deemed necessary to create a rest (i.e. part way up a long climb).			
Generally, this treatment is best suited to locations with lots of loose, suitable sized rock available, as importing rock for this treatment would be onerous and costly.			
Why is it Used?			
Stone is the most durable material for constructing trail furniture.			
Notes			
Materials	Machinery / Equipment		
<ul style="list-style-type: none">Rock (can be in situ or imported, subject to land manager requirements);Concrete;Mortar;Geofabric;Drainage materials as per drawing.	<ul style="list-style-type: none">Rubber tracked mini-excavator;Concrete mixer;Trail building hand tools including rakes, mattocks, rake hoes, leaf rakes, shovels etc.;Rock work hand tools such as crow bars, rock bars, rock hammers, wedges etc.		
Estimated Length of Treatment	Drawing Reference		
20 stone seats	WTSTD-005-WG2 Natural Rock Seat Placement and Dimensions		



5.4.10 Rock Armouring

What is it?		<div>Examples</div> <div></div>
Rock Armouring is a technique used to harden the trail surface, using rocks of 400-800mm in size, embedded into the ground to create a hard, rock paved surface.		
When is it Used?		
Rock Armouring is used in the following situations: 1. Sections of track that are often wet and boggy, where no alternate route is available – for example, where the trail crosses a drainage line; 2. On steep gradients, to reduce the potential for erosion and to provide traction for users; 3. In high traffic areas to prevent erosion or compaction.		
Why is it Used?		
Rock Armouring is used to prevent soil erosion and compaction, to provide traction for users, or to harden the trail surface in boggy areas. It is often used to cross small seasonal watercourses or drainage gullies. Rock Armouring is sometimes the only way to ensure the sustainability of a trail.		
Notes		
Rock Armouring will resist erosion and last for many years, if constructed correctly.		
Materials	Machinery / Equipment	
<ul style="list-style-type: none">Rock (can be in situ or imported, subject to land manager requirements).	<ul style="list-style-type: none">Rubber tracked mini-excavator;Trail building hand tools including rakes, mattocks, rake hoes, leaf rakes, shovels etc.Rock work hand tools such as crow bars, rock bars, rock hammers, wedges etc.;Ropes, pulleys, winches, chains, straps and rock slings to assist in manipulating rocks into place.	
Estimated Length of Treatment	Drawing Reference	
2,315 metres (of entire 82.15km length of trail)	WTSTD-007-WG2 Rock Armouring – Dual Use Placement and Dimensions	

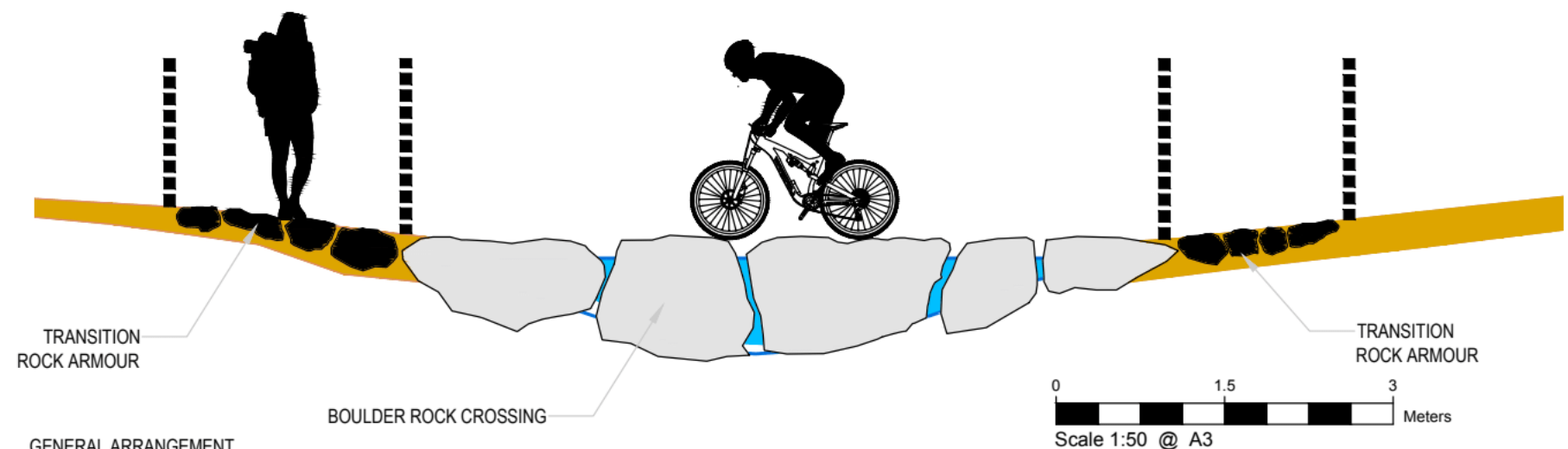




5.4.11 Boulder Water Crossings

What is it?		Examples
Boulder Water Crossings are structures made of rocks or boulders, used to allow passage of riders and hikers across a small watercourse, while minimising sedimentation.		
When is it Used?		
Boulder Water Crossings are used when the trail crosses a small permanent watercourse and there is suitable large rock or boulders available locally to construct a Boulder Water Crossing. Boulder Water Crossings should only be considered in watercourses with slow water velocities and a depth of less than 1m during high flows.		
Why is it Used?		
Boulder Water Crossings are used to facilitate safe crossing of small watercourses, keeping riders and hikers largely above the water. It is preferable to the construction of bridges or structures that require the importation of man-made materials. They are long lasting, relatively inexpensive, impervious to bushfire and maintain a natural appearance relative to their location and setting.		
Notes		
Boulder Water Crossings do not interfere with the movement of water, sediment or aquatic life when they are properly constructed.		
Materials	Machinery / Equipment	 
<ul style="list-style-type: none">In situ rock / boulders, large enough to resist movement in high flow.No imported materials.	<ul style="list-style-type: none">Rubber tracked mini-excavator;Trail building hand tools including rakes, mattocks, rake hoes, leaf rakes, shovels etc.Rock work hand tools such as crow bars, rock bars, rock hammers, wedges etc.;Ropes, pulleys, winches, chains, straps and rock slings to assist in manipulating rocks into place.	
Estimated Length of Treatment	Drawing Reference	
1,166 metres (of entire 82.15km length of trail)	WTSTD-006-WG2 Boulder Rock Crossing Placement and Dimension	

- The stone crossing design depicted is a single crossing layout that represents a whole range of possible alternate configurations.
- Crossings may be straight or curved depending on the local topography and the track alignment at that location.
- Crossings consist of rock transitions using rock armouring at each end and a large boulder crossing within the creek invert and between the transitions.
- See drawing WTSTD-007-WG2 for details on placement and design of rock armouring.
- Boulders in the creek invert should be large enough to resist being moved during high flow events. Minimum size around 1.5m.
- While gaps should be provided between the rocks to allow for water passage during normal flows, they should be narrow enough to allow for both hiking & bicycle passage.
- Boulders used for crossing construction must be of an appropriate shape, texture and colour to match the native rock and must provide a natural appearance relative to its location .
- Boulders should be placed so that the top surface provides a reasonable surface for foot placement and bicycle ride lines and the distances between stones should allow for reasonable bicycle passage and step lengths by an average person..
- The texture of the top surface of the boulders should allow for reasonable bicycle traction and hiker footage with minimal slippage.
- The transition connection of the track to the first boulders in the crossing should be well graded to allow safe access to the start of the crossing. This will provide an opportunity for riders and walkers to stop and assess the alignment required to navigate the crossing prior to proceeding.
- Smaller rocks can be used at the transitions to facilitate an even platform.



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SIGNED..... DATE.....

GENERAL ARRANGEMENT
PLAN & PROFILE VIEW
SCALE varies

A	24/03/20	ISSUED FOR INFORMATION			JR	DS DS	
Rev.	Date	Revision Details			Dwn.	Ver.	App.

Client:	
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	Project:
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WANGETTI TRAIL
DETAILED DESIGN



Drawn JR	Signed	Date 24/03/20
Designed DS	Signed	Date 24/03/20
Verified DS	Signed	Date 24/03/20
Approved	Signed	Date

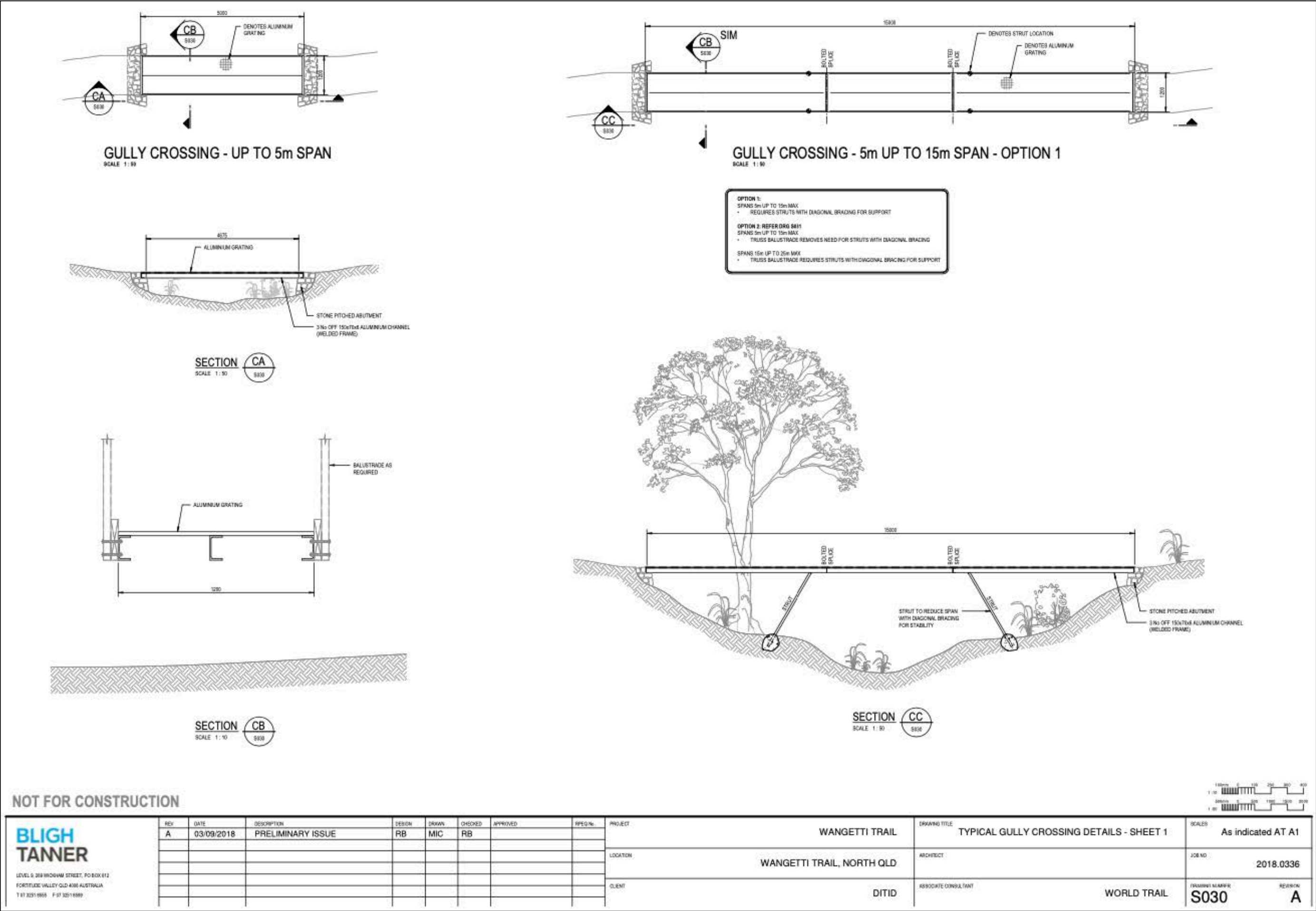
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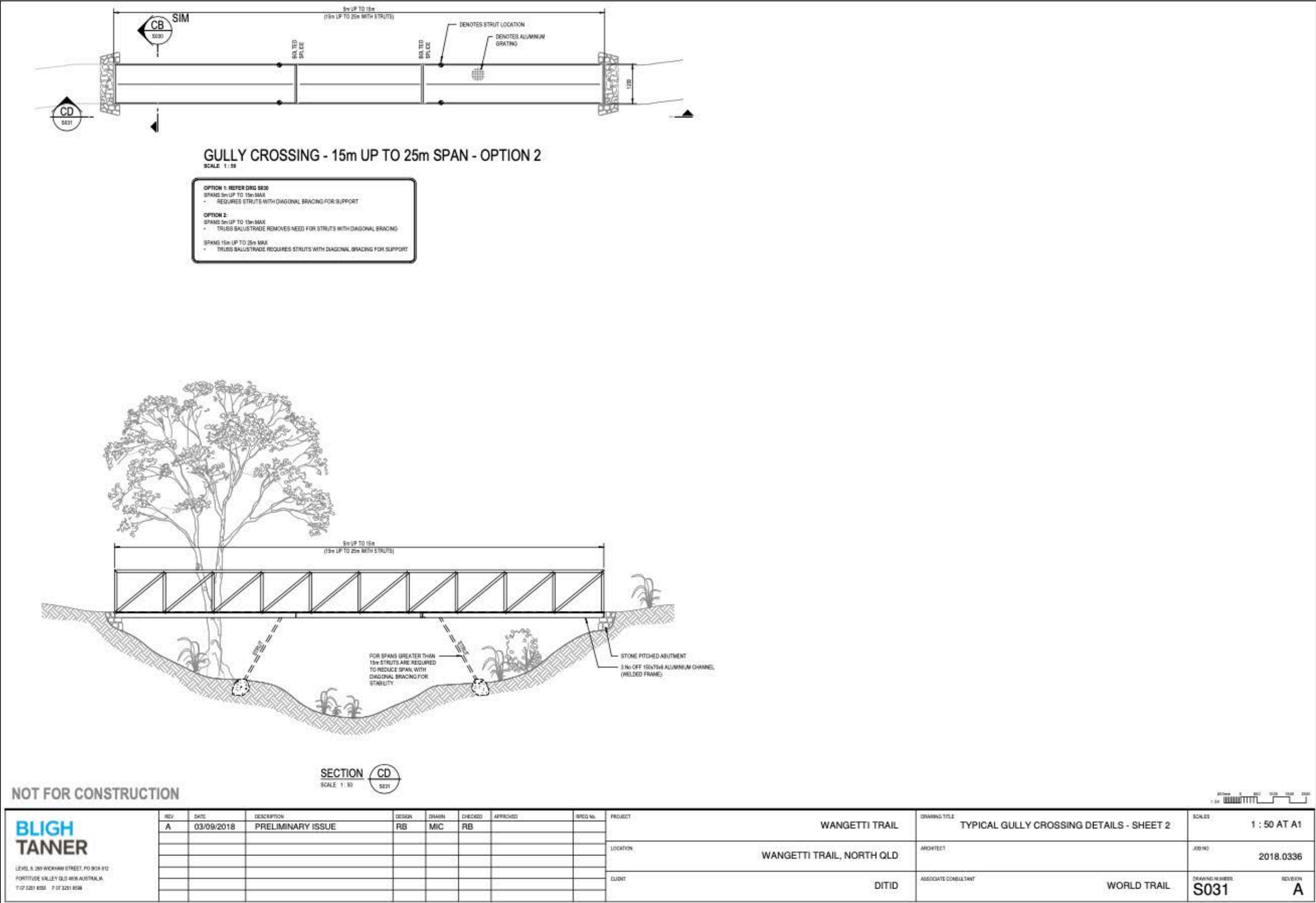
BOULDER ROCK CROSSING
PLACEMENT AND DIMENSIONS
STANDARD DRAWING

Project No. WT20-Wangetti-001	
Scale varies	Sheet Size A3
Drawing No. WTSTD-006-WG2	Rev. A

5.4.12 Minor Waterway Crossings



What is it?		Examples
Minor Waterway Crossings are small bridges, spanning from 5m to 25m.		
When is it Used?		
<p>Minor Water Crossings are used when the trail crosses a small permanent watercourse and suitable large rock or boulders are not available locally to construct a Rock Water Crossing.</p> <p>Where required to cross multiple braids of the same waterway, separate Minor Water Crossings can be joined end to end (provided that span lengths are maintained as shown) to create a longer, boardwalk type structure or separated by earthen or rock landings.</p>		
Why is it Used?		
<p>Minor Water Crossings are used to facilitate safe crossing of small watercourses, keeping riders and hikers above the water, protecting water quality and minimising the potential for sedimentation of the waterway. It will also be used to span waterways that support the opal cling goby (<i>Stiphodon semoni</i>) habitat.</p>		
Notes		
<p>Typically, Minor Waterway Crossings should be less than 1m above the ground (measured from the top of the decking surface down to the ground) to avoid the requirement for handrails. Handrails can be a crush hazard to mountain bike riders' fingers. Sometimes the need for a handrail can be avoided by slightly adjusting the location of a bridge and thus reducing the height of the drop off.</p> <p>Minor Waterway Crossings should be designed and placed so as to be as short, straight and level as possible. The trail entry and exit should ideally be straight and in-line with the bridge. The trail design should naturally slow riders on their approach to the bridge, ensuring that they don't enter at high speeds. Rock Armouring for 2-5m at the entry and exit of the bridge is generally recommended – it helps manage any abrasion that may result from heavy braking and can also help to shed mud/dirt off tyres before crossing the bridge.</p> <p>A variety of different decking materials can be used. The most commonly used materials are timber, Fibre Reinforced Plastic (FRP) mesh or steel mesh. The use of mesh decking allows light and water to penetrate through the bridge, thus minimising the impact on the vegetation below.</p>		 
Materials		Machinery / Equipment
<ul style="list-style-type: none">• Subject to final design, but likely to include:<ul style="list-style-type: none">◦ Decking materials – timber, steel mesh, FRP etc.;◦ Framing materials – timber, steel, FRP etc.;◦ Concrete for footings;◦ Fixings.	<ul style="list-style-type: none">• Rubber tracked mini-excavator;• Concrete mixer;• Trail building hand tools including rakes, mattocks, rake hoes, leaf rakes, shovels etc.;• Rock work hand tools such as crow bars, rock bars, rock hammers, wedges etc.;• Carpentry and general construction equipment.	
Estimated Length of Treatment		Drawing Reference
468 metres (of entire 82.15km length of trail)	S030 – A S031 – A	

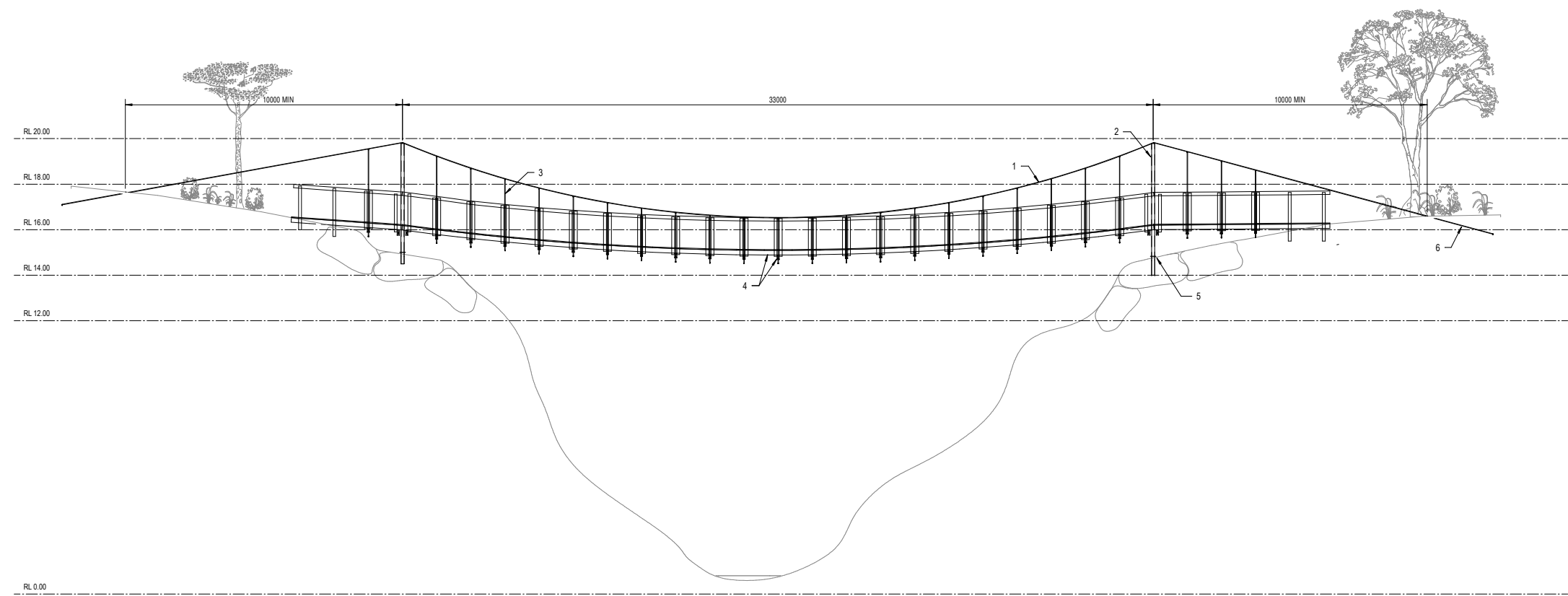




5.4.13 Major Waterway Crossing

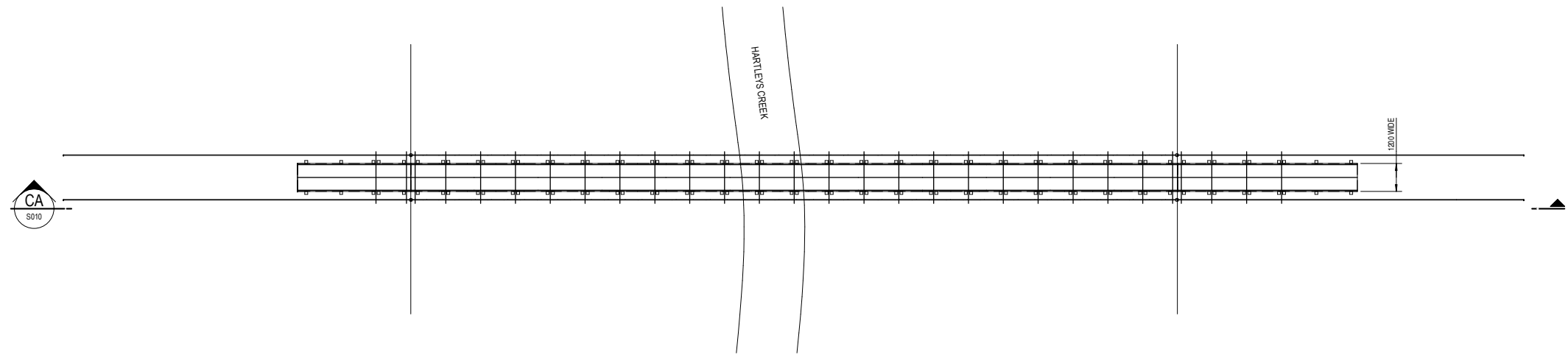
What is it?		Examples
The Major Waterway Crossing is a cable suspension bridge proposed to be used to cross over Hartley’s Creek near Wangetti township.		
When is it Used?		
It is proposed to be used on only one occasion – Hartley’s Creek near Wangetti. It allows the trail to cross the waterway safely and sustainably, providing excellent views down in to the scenic and deeply incised granite gorge.		
Why is it Used?		
It is used to provide a safe and sustainable crossing of a major waterway and to elevate trail and bridge infrastructure above possible flood height levels.		
Notes		
The current QPWS access track starting at Hartley’s Creek (adjacent to the Captain Cook Highway) would be used to transport equipment and materials required for the proposed suspension bridge. The type of construction equipment that can be used to build the bridge will be limited to the size of machinery and equipment that can be transported along this access track. Materials such as steel and concrete may be transported via helicopter to the bridge location where appropriate.		
Materials	Machinery / Equipment	
<ul style="list-style-type: none">• Subject to final design, but likely to include:<ul style="list-style-type: none">○ Decking materials – timber, steel mesh, FRP etc.;○ Framing materials – timber, steel, FRP etc.;○ Concrete for footings;○ Fixings.	<ul style="list-style-type: none">• Rubber Tracked Excavator• Crane• Bobcat• Carpentry and general construction equipment.• Winches• Helicopter	
Estimated Length of Treatment	Drawing Reference	
35 metres (of entire 82.15km length of trail)	S010 A	





- LEGEND:
- 1. 22mm DIAMETER GALVANISED STRAND CALBES.
 - 2. 139 CHS STEEL PORTAL FRAMES
 - 3. 12mm REID BAR HANGERS
 - 4. HARDWOOD TIMBER DECKING FRAME
 - 5. STEEL PORTAL BOLTED TO STABILISED ROCK FOUNDATION.
 - 6. STEEL ANCHOR BARS EPOXY GROUTED INTO THE ROCK BASE.

SECTION CA
SCALE 1:100



BRIDGE PLAN
SCALE 1:100

NOT FOR CONSTRUCTION




BLIGH TANNER <small>LEVEL 9, 269 WICKHAM STREET, PO BOX 612 FORTITUDE VALLEY QLD 4006 AUSTRALIA T 07 3251 8555 F 07 3251 8599</small>	REV	DATE	DESCRIPTION	DESIGN	DRAWN	CHECKED	APPROVED	RPEQ No.	PROJECT	DRAWING TITLE	SCALES
	A	03/09/2018	PRELIMINARY ISSUE	RB	MIC	RB			WANGETTI TRAIL	HARTLEYS CREEK CROSSING	1 : 100 AT A1
									LOCATION	ARCHITECT	JOB NO
									WANGETTI TRAIL, NORTH QLD		2018.0336
									CLIENT	ASSOCIATE CONSULTANT	DRAWING NUMBER REVISION
									DITID	WORLD TRAIL	S010 A

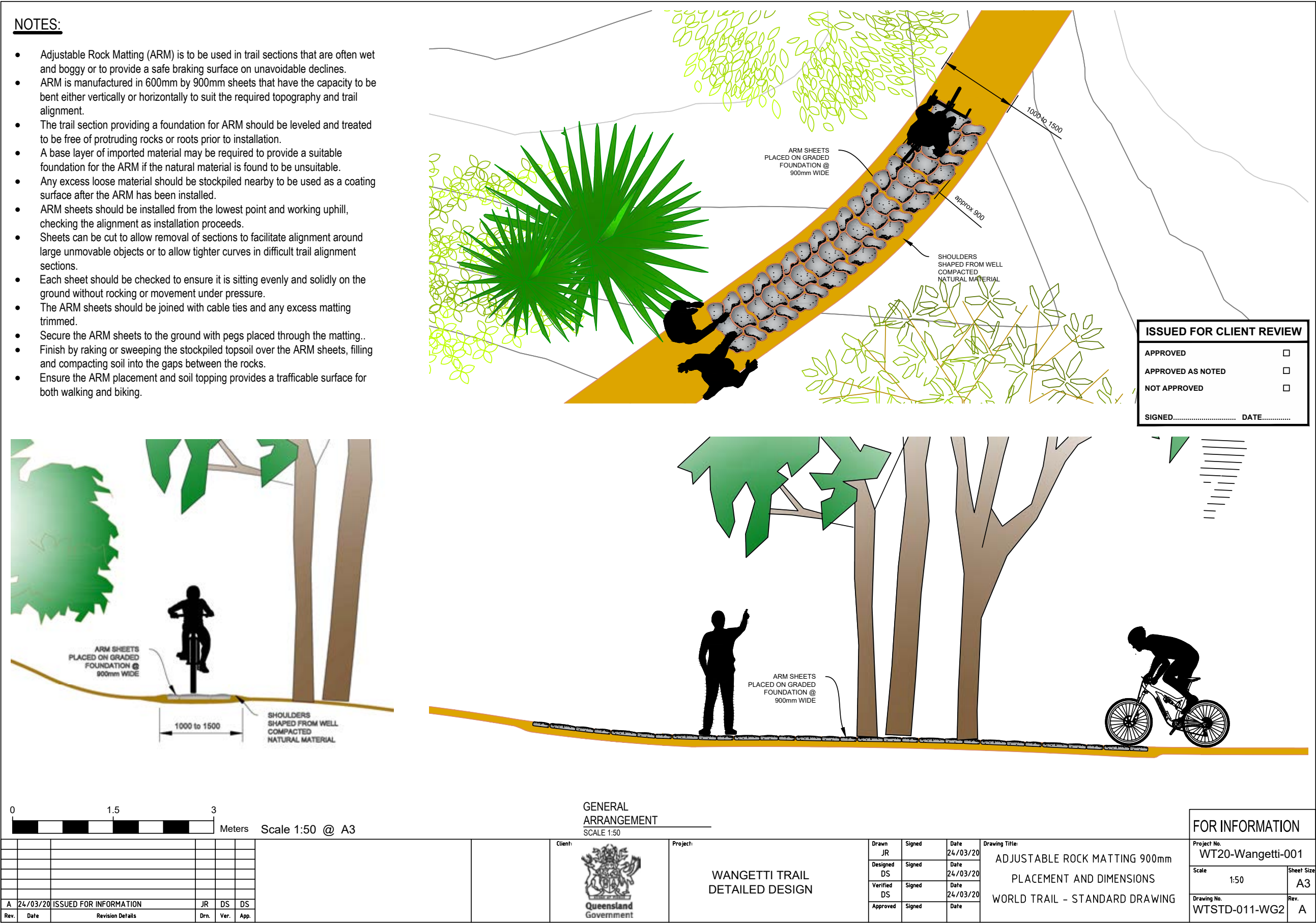
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5.5 CONSTRUCTION TREATMENTS – NOT SPECIFIED


5.5.1 Adjustable Rock Matting

What is it?		Examples
Adjustable Rock Matting (ARM) is a proprietary product that approximates the look and feel of natural Rock Armouring.		
When is it Used?		
It is used when Rock Armouring is required, but suitable natural stone is not easily/readily available. It should not be placed in permanent waterways.		
Why is it Used?		
It provides a cost-effective means of hardening the trail surface when normal Rock Armouring is not possible or cost effective.		
Notes		
ARM is made from pre-cast concrete and held together using 4mm nylon mesh.		
ARM comes in sheets of differing sizes, including 600mm and 1000mm widths, can be transported easily into most locations and approximates normal rock armouring in its installation, aesthetics and durability.		
It is approximately 150mm high and is embedded into the ground to provide a continuous level tread surface with the adjacent tread of the trail.		
Modules can be easily cut out to allow the sheets to curve around or mould into landscape features like large boulders.		
Materials	Machinery / Equipment	
<ul style="list-style-type: none">Adjustable Rock Matting sheets.	<ul style="list-style-type: none">Rubber tracked mini-excavator;Trail building hand tools including rakes, mattocks, rake hoes, leaf rakes, shovels etc.Rock work hand tools such as crow bars, rock bars, rock hammers, wedges etc.	
Estimated Length of Treatment	Drawing Reference	
Not specified.	WTSTD-011-WG2 Adjustable Rock Matting 900mm Placement and Dimensions	



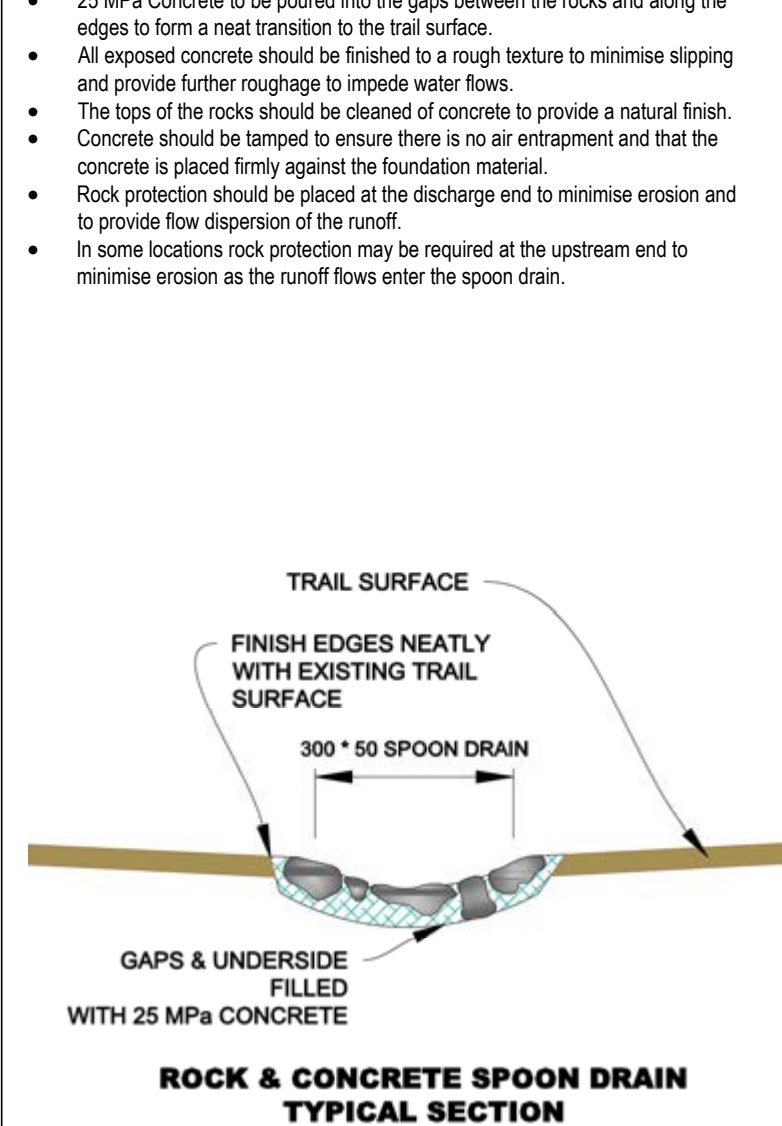


5.5.2 Rock and Concrete Spoon Drain

What is it?		<div>Examples</div> 
Rock and Concrete Spoon Drains are hardened sections of the trail, using concrete and rock, to manage water crossing the trail.		
When is it Used?		
Rock and Concrete Spoon Drains are used to convey surface runoff across the trail at a concentrated location. It could be used to manage the intersection of a small seasonal waterway and the trail, as per the description for Rock Armouring.		
Why is it Used?		
Rock and Concrete Spoon Drains can be used to cross small seasonal watercourses or drainage gullies, or to convey water from intercept drains across the trail.		
Notes		
Materials	Machinery / Equipment	
<ul style="list-style-type: none">• Rock (can be in situ or imported, subject to land manager requirements);• Concrete;• Mortar;• Geofabric;• Drainage materials as per drawing.	<ul style="list-style-type: none">• Rubber tracked mini-excavator;• Concrete mixer;• Trail building hand tools including rakes, mattocks, rake hoes, leaf rakes, shovels etc.• Rock work hand tools such as crow bars, rock bars, rock hammers, wedges etc.	
Estimated Length of Treatment	Drawing Reference	
Not specified	WTSTD-019-BF Rock & Concrete Spoon Drains Placement and Dimensions	

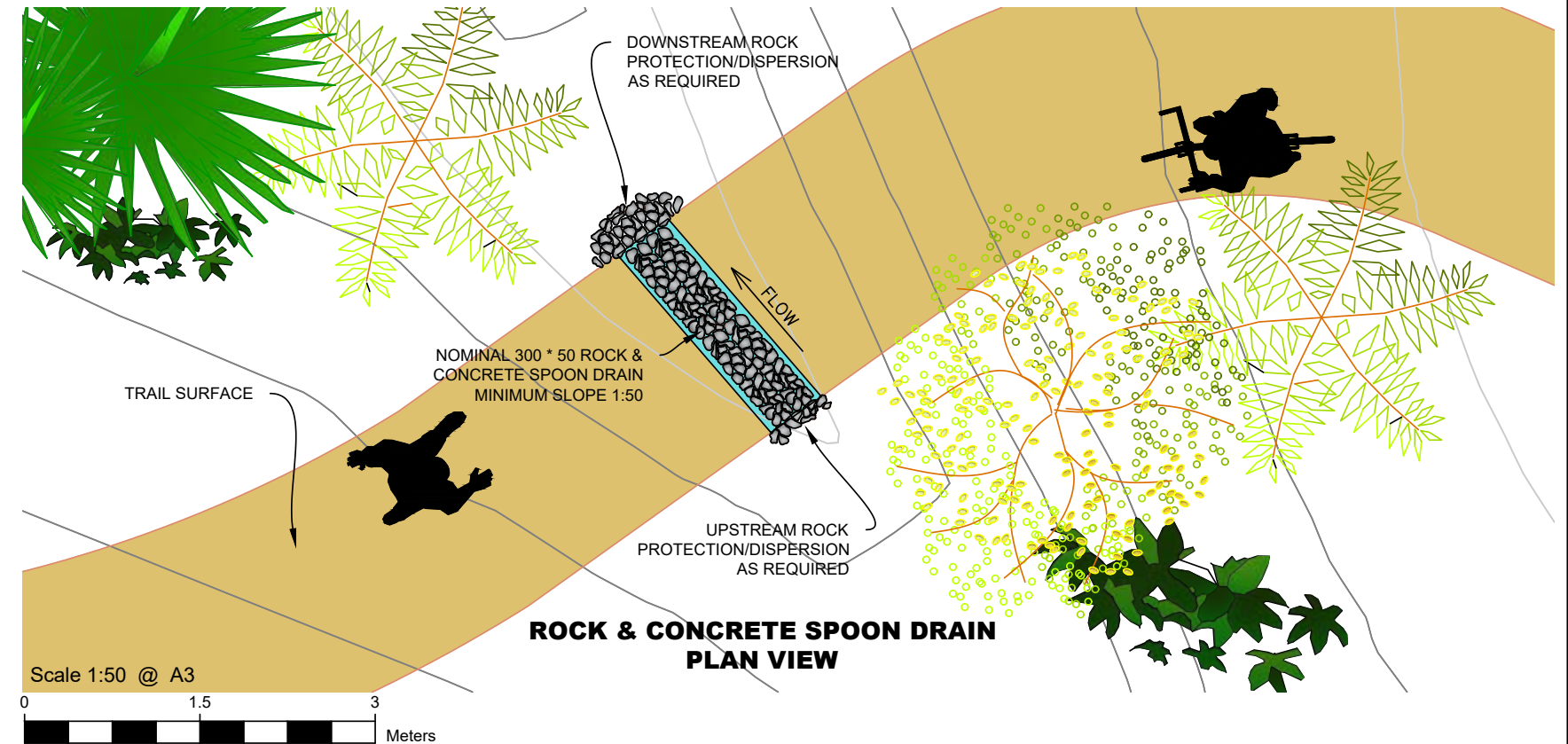
NOTES:

- Spoon Drains are to be used to convey surface runoff across the trail at a concentrated location without using below ground conduits while minimizing erosion.
- The spoon drain profile and alignment should be constructed in such a way that disturbances to trail walkability are minimized.
- Dimensions and layout depicted are nominal only and may vary to suit site topography and expected runoff surface flows.
- All dimensions are in millimeters unless advised otherwise.
- Rocks are to be placed in such a way that they are interlocked and well bedded into a 25 MPa concrete bed poured onto the spoon drain foundation.
- 25 MPa Concrete to be poured into the gaps between the rocks and along the edges to form a neat transition to the trail surface.
- All exposed concrete should be finished to a rough texture to minimise slipping and provide further roughage to impede water flows.
- The tops of the rocks should be cleaned of concrete to provide a natural finish.
- Concrete should be tamped to ensure there is no air entrapment and that the concrete is placed firmly against the foundation material.
- Rock protection should be placed at the discharge end to minimise erosion and to provide flow dispersion of the runoff.
- In some locations rock protection may be required at the upstream end to minimise erosion as the runoff flows enter the spoon drain.



Scale 1:10 @ A3

0 0.2 0.4 Meters




Scale 1:50 @ A3

0 1.5 3 Meters

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SIGNED..... DATE.....	

Rev.	Date	Revision Details	Dwn.	Ver.	App.
A	25/03/20	ISSUED FOR INFORMATION	JR		

GENERAL
ARRANGEMENT
SCALE varies

Client: 

Project: **WANGETTI TRAIL
DETAILED DESIGN**



Drawn JR	Signed	Date 25/03/20
Designed DS	Signed	Date 25/03/20
Verified DS	Signed	Date 25/03/20
Approved	Signed	Date

Drawing Title:
**ROCK & CONCRETE SPOON DRAINS
PLACEMENT AND DIMENSIONS
WORLD TRAIL - STANDARD DRAWING**

FOR INFORMATION	
Project No. WT20-Wangetti-001	
Scale varies	Sheet Size A3
Drawing No. WTSTD-019-BF	Rev. A

5.5.3 Handrails

What is it?		Examples
Handrails are structures made with imported materials such as timber, steel and concrete, used to provide support for hikers on steep inclines (e.g. a flight of steps) or on areas with steep drop-offs beside the trail. This treatment is not proposed for use as a handrail on a Minor Water Crossing or Major Water Crossing.		
When is it Used?		
It is used to provide support to hikers on steep inclines (e.g. a flight of steps) or on areas with steep drop-offs beside the trail. It can be installed on a single side or both sides of the trail.		
It is not generally used on mountain biking trails, as the handrails are located at a similar height to the rider’s handlebars and can pose a hazard.		
Why is it Used?		
To provide support for hikers on steep inclines, to provide a barrier where there is a steep drop-off beside the trail, or to help define the trail and keep people from going off-track.		
Notes		
Materials	Machinery / Equipment	
<ul style="list-style-type: none">Handrails and posts are constructed from a fibreglass/resin composite;Concrete for posts;Fixings as per drawing.	<ul style="list-style-type: none">Rubber tracked mini-excavator;Concrete mixer;Trail building hand tools including rakes, mattocks, rake hoes, leaf rakes, shovels etc.Carpentry and general construction equipment.	
Estimated Length of Treatment	Drawing Reference	
Not specified	WTSTD-013-WG2 Trail Handrail – Multi Section Placement and Dimensions WTSTD-014-WG2 Trail Handrail – Single Section Placement and Dimensions WTSTD-015-WG2 Handrail – Post & Rail Installation Placement and Dimensions	



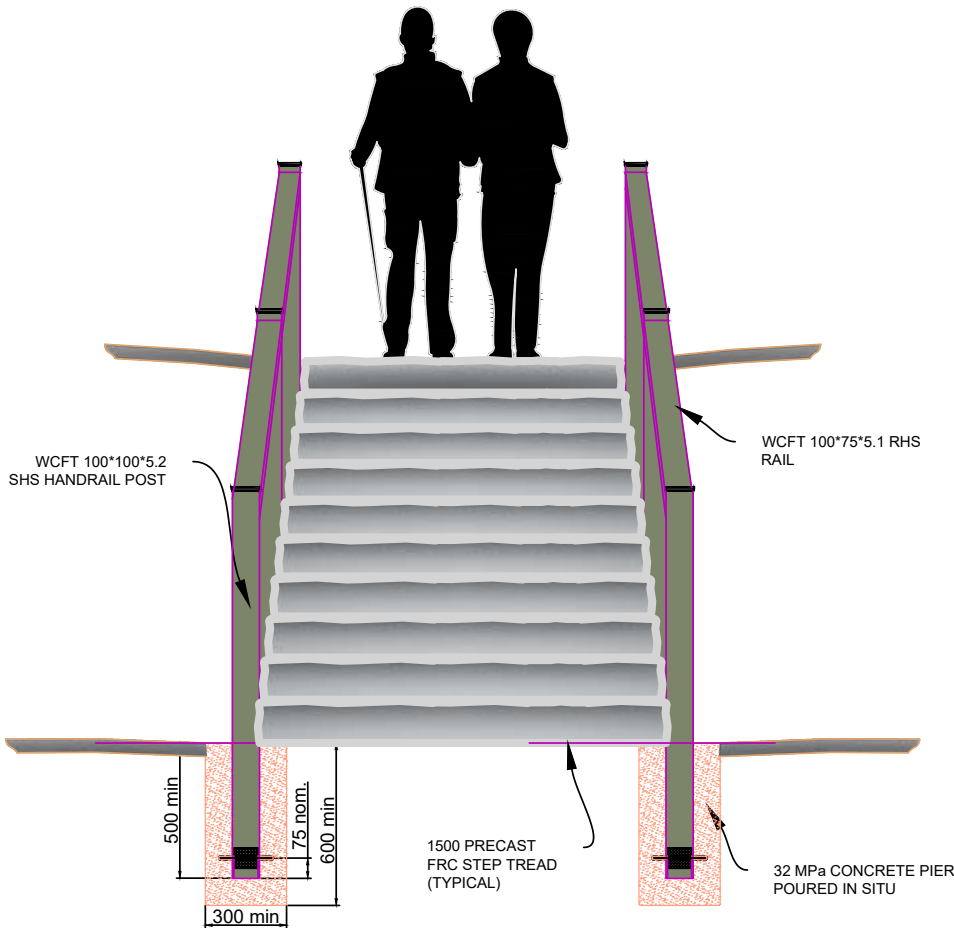
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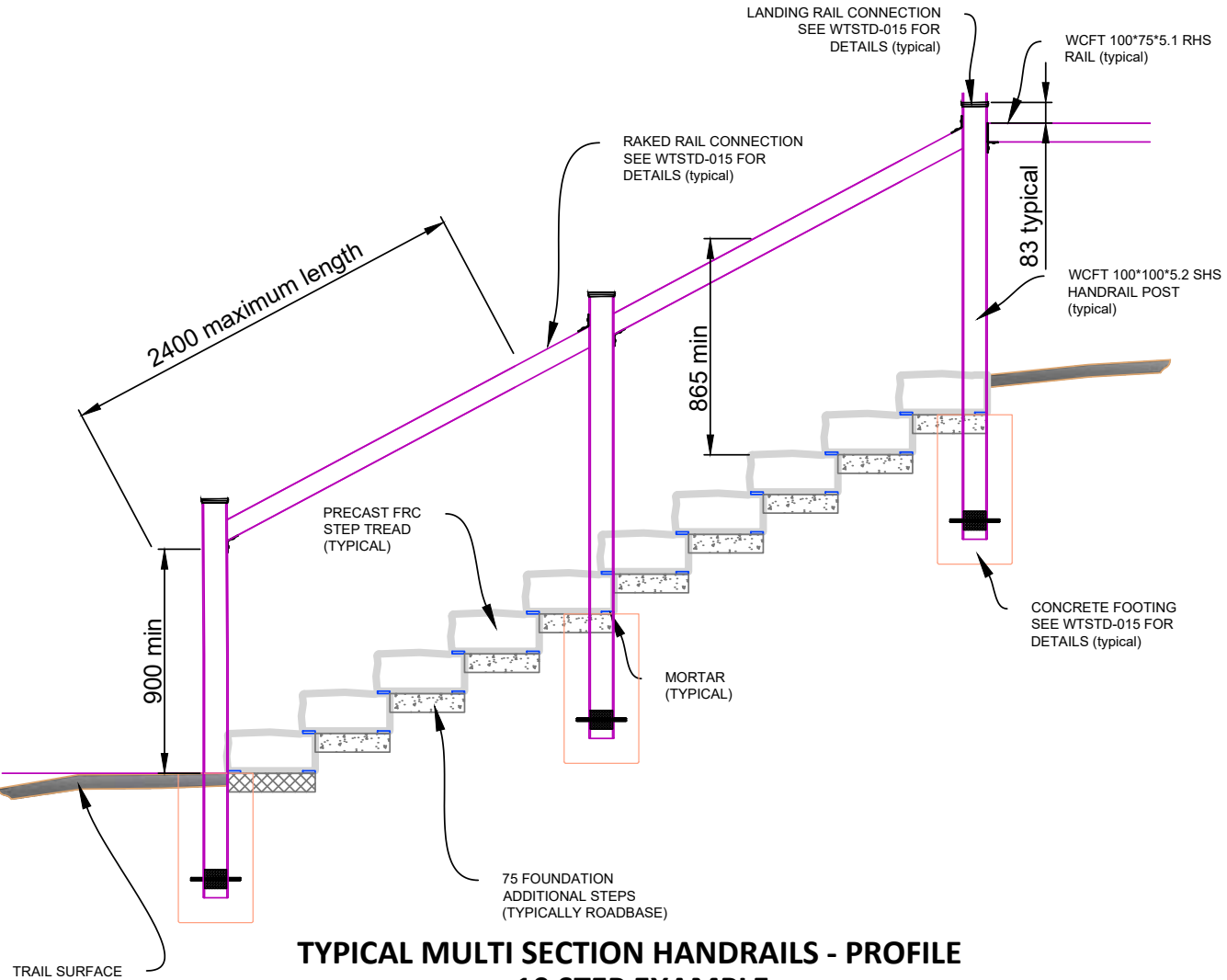
- The handrail layout depicted in this standard drawing is a typical layout for handrail sections with rails longer than 2400mm.
- Layouts in specific trail locations may vary considerably from that depicted however the design and construction requirements will still apply.
- The handrails depicted are to be placed in combination with the stair treads depicted in Standard drawing WTSTD-003-WG2 or along landings above, below or between these stair tread sections.
- The stairway example depicted in this standard drawing uses 1500mm wide precast treads. The design would also be appropriate for treads of other widths.
- This standard drawing must be used in conjunction with WTSTD-015-WG2 that defines the post placement and rail connection details.
- This standard drawing is suitable for stairs consisting of between 7 & 14 treads. See Standard drawing WTSTD-0014-WG2 for stairs consisting of 5 or less treads. Stairs of 15 or more treads would require an additional intermediate raking connection post to maintain a minimum rail length of 2400mm.
- Where the stair alignment has a corner at the top or the bottom of the stairway, double posts may be necessary to either protect entry/exit to the stairway or to connect neatly to horizontal railings.

HANDRAILS & POSTS:

- Handrails, posts and fixtures are supplied by Wagners CFT Manufacturing Pty Ltd, Toowoomba or equivalent as approved by the client or principle.
- Handrails and posts are constructed from a fibreglass/resin composite.
- All components must be installed as defined in this standard drawing and as described in Wagners Installation Guide, Rev. B - Sept 2010 or other installation documentation relevant to the supplier.



TYPICAL MULTI SECTION HANDRAILS - FRONT VIEW
10 STEP EXAMPLE



TYPICAL MULTI SECTION HANDRAILS - PROFILE
10 STEP EXAMPLE

NOTES CONTINUED:

HANDRAILS & POSTS:

Care should be taken to ensure posts do not touch or bind with the stair treads and they are aligned so that the rail is straight rather than being aligned to the edge of the stair treads.

CONCRETE FOOTINGS:

- Excavations for concrete footings must be cleaned out prior to pouring concrete so that they do not contain any loose material, tree roots or rocks or ponding water.
- Posts and concrete mix must be placed into the footing in such a way that the integrity of the excavation is maintained.
- Concrete should be tamped with a suitable rod after placement to ensure there is no air entrapment within the footing.
- Where footings are located adjacent to precast step treads, the post and concrete top surface should be placed and finished such that it does not impede the correct placement of the step tread.
- Standard Drawing - WTSTD-003-WG2 depicts the dimensions and installation requirements of the step treads.

GENERAL
ARRANGEMENT
SCALE 1:25

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Rev.	Date	Revision Details	Drn.	Ver.	App.
C	25/03/20	ADDITIONAL NOTES ADDED	JR		
B	01/08/19	ISSUED FOR INFORMATION	JR		
A	15/06/19	ISSUED FOR INFORMATION	JR		



Client:	Project:

Drawn	Signed	Date
JR		25/03/20
Designed	Signed	Date
DS		25/03/20
Verified	Signed	Date
DS		25/03/20
Approved	Signed	Date

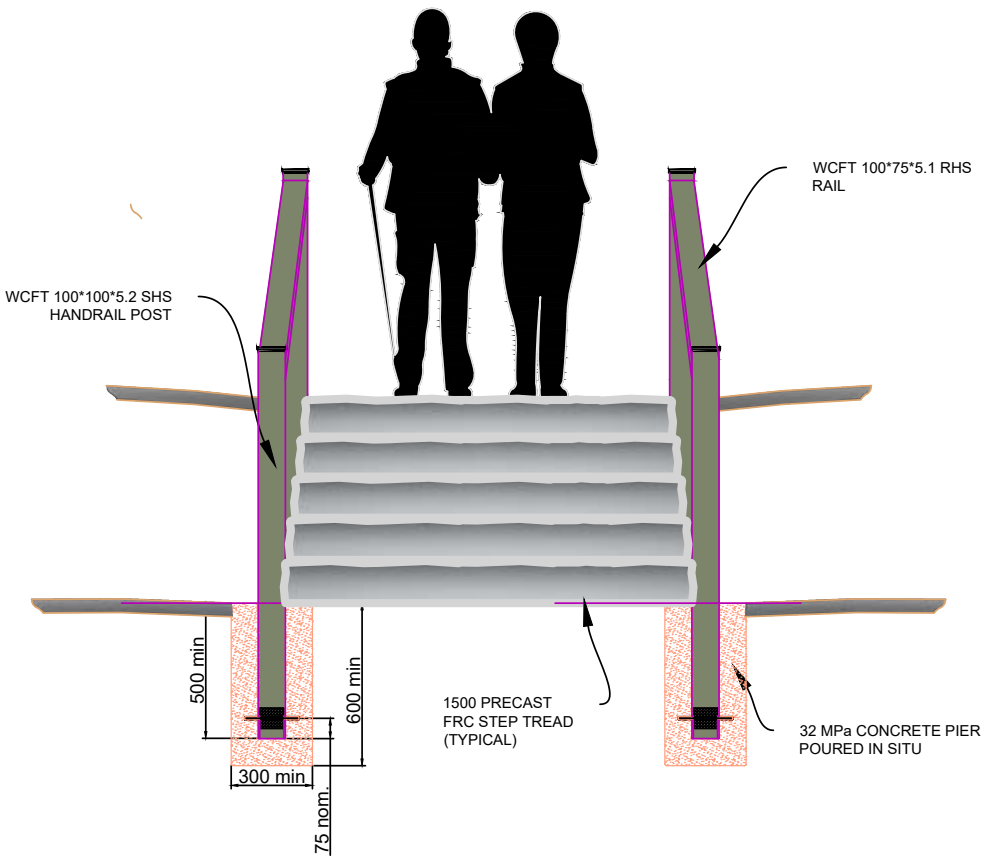
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TRAIL HANDRAIL - MULTI SECTION PLACEMENT AND DIMENSIONS STANDARD DRAWING

FOR INFORMATION	
Project No.	WT20-Wangetti-001
Scale	1:25
Sheet Size	A3
Drawing No.	WTSTD-013-WG2
Rev.	C

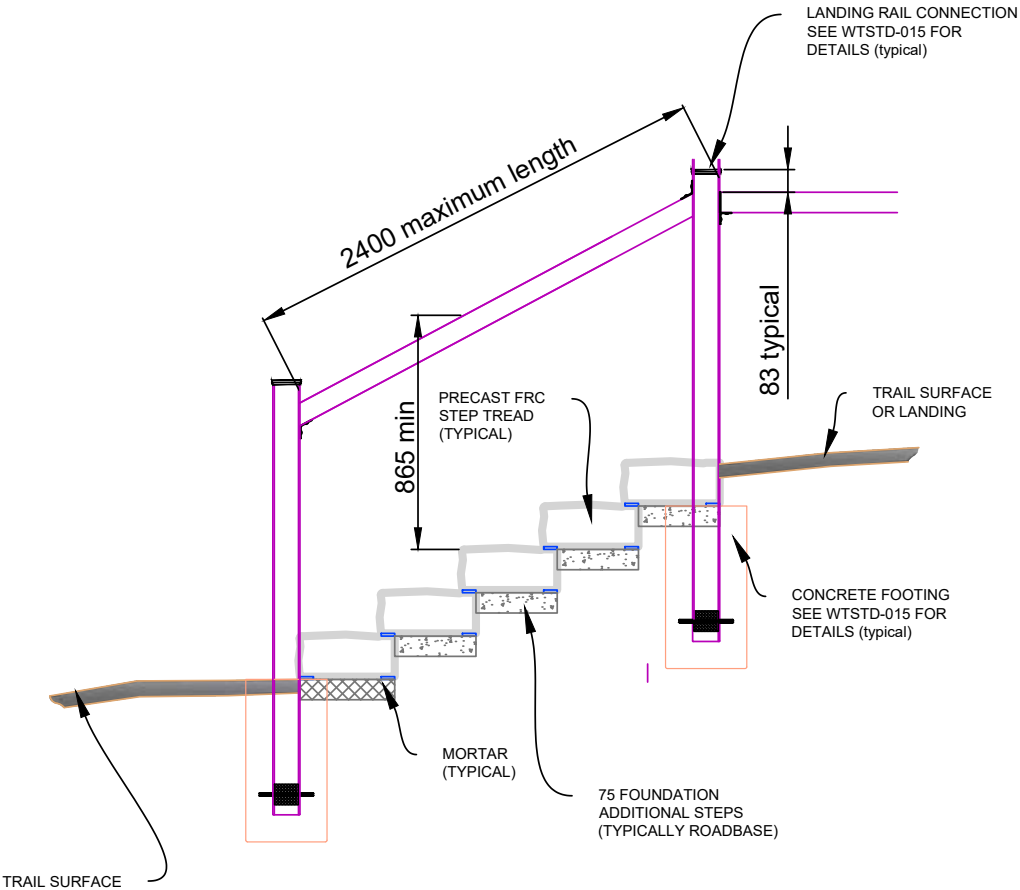
NOTES:

- GENERAL:
- The handrail layout depicted in this standard drawing is a typical layout for handrail sections with rails longer than 2400mm.
 - Layouts in specific trail locations may vary considerably from that depicted however the design and construction requirements will still apply.
 - The handrails depicted are to be placed in combination with the stair treads depicted in Standard drawing WTSTD-003-WG2 or along landings above, below or between these stair tread sections.
 - The stairway example depicted in this standard drawing uses 1500mm wide precast treads. The design would also be appropriate for treads of other widths.
 - This standard drawing must be used in conjunction with WTSTD-015-WG2 that defines the post placement and rail connection details.
 - This standard drawing is suitable for stairs consisting of between 2 & 6 treads. See Standard drawing WTSTD-013-WG2 for stairs consisting of 7 or more treads.
 - Where the stair alignment has a corner at the top or the bottom of the stairway, double posts may be necessary to either protect entry/exit to the stairway or to connect neatly to horizontal railings.

- HANDRAILS & POSTS:
- Handrails, posts and fixtures are supplied by Wagners CFT Manufacturing Pty Ltd, Toowoomba or equivalent as approved by the client or principle.
 - Handrails and posts are constructed from a fibreglass/resin composite.
 - All components must be installed as defined in this standard drawing and as described in Wagners Installation Guide, Rev. B - Sept 2010 or other installation documentation relevant to the supplier.



TYPICAL MULTI SECTION HANDRAILS - FRONT VIEW
5 STEP EXAMPLE

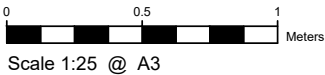


TYPICAL MULTI SECTION HANDRAILS - PROFILE
5 STEP EXAMPLE

NOTES CONTINUED:

- HANDRAILS & POSTS:
- Care should be taken to ensure posts do not touch or bind with the stair treads and they are aligned so that the rail is straight rather than being aligned to the edge of the stair treads.
- CONCRETE FOOTINGS:
- Excavations for concrete footings must be cleaned out prior to pouring concrete so that they do not contain any loose material, tree roots or rocks or ponding water.
 - Posts and concrete mix must be placed into the footing in such a way that the integrity of the excavation is maintained.
 - Concrete should be tamped with a suitable rod after placement to ensure there is no air entrapment within the footing.
 - Where footings are located adjacent to precast step treads, the post and concrete top surface should be placed and finished such that it does not impede the correct placement of the step tread.
 - Standard Drawing - WTSTD-003-WG2 depicts the dimensions and installation requirements of the step treads.

GENERAL
ARRANGEMENT
SCALE 1:25



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SIGNED..... DATE.....	

Rev.	Date	Revision Details	Orn.	Ver.	App.
C	25/03/20	ADDITIONAL NOTES ADDED		JR	
B	07/08/19	ISSUED FOR INFORMATION		JR	
A	15/06/19	ISSUED FOR INFORMATION		JR	



Client:	Project:

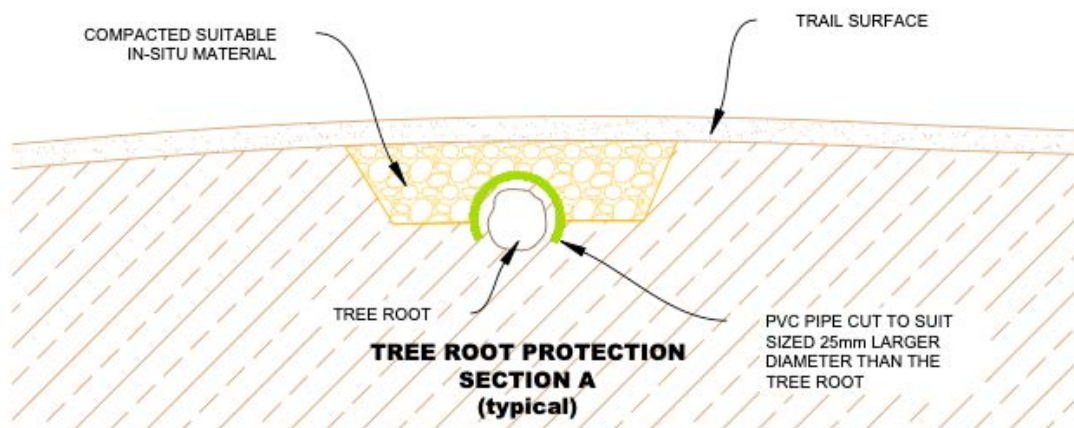
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Designed	Signed	Date
DS		25/03/20
Verified	Signed	Date
DS		25/03/20
Approved	Signed	Date

Drawing Title:
TRAIL HANDRAIL - SINGLE SECTION
PLACEMENT AND DIMENSIONS
STANDARD DRAWING

FOR INFORMATION	
Project No.	WT20-Wangetti-001
Scale	1:25
Sheet Size	A3
Drawing No.	WTSTD-014-WG2
Rev.	C

61




5.5.4 Tree Root Protection

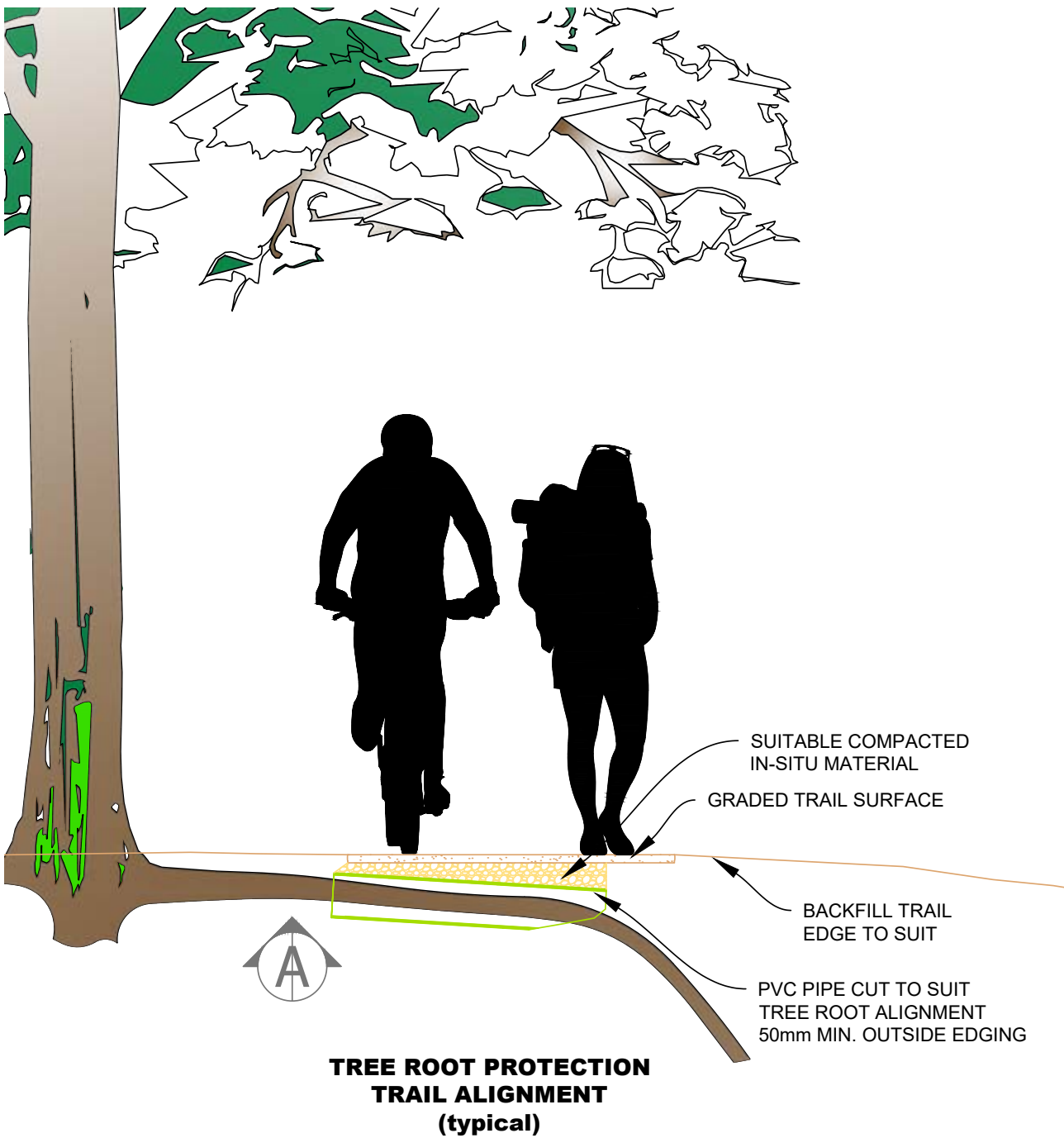
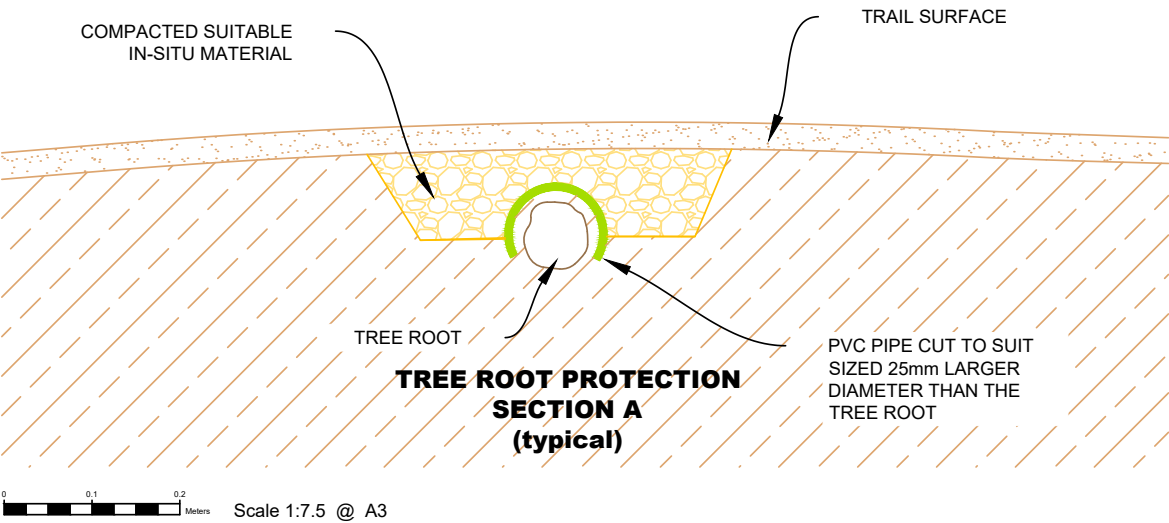
What is it?		
Tree Root Protection is used to protect significant tree roots that lie close to the ground surface from the impacts of trail construction.		
When is it Used?		
Tree Root Protection is to be used in locations where the trail alignment cannot be redirected to avoid significant tree roots just beneath the surface.		
Large, significant tree roots shouldn't be cut, as this could have detrimental impacts on the health of the tree. Furthermore, where significant tree roots are located within the top 100-200mm of soil, the construction of the trail over the top of the root can lead to compaction of the soil, which may impact on the health of the tree.		
Why is it Used?		
Tree Root Protection is used to prevent compaction of the soil around significant tree roots. The placement of the protective sleeve around the top of the root prevents the soil close to the root from becoming compacted.		
Notes		
Considerable efforts have been made during ground-truthing to ensure suitable offsets away from vegetation communities or species of high environmental significance. However, given the highly treed nature of areas of the study site, it is impossible to avoid constructing trails within the root zone of trees.		
Materials		Machinery / Equipment
<ul style="list-style-type: none">PVC pipe with internal diameter large enough to provide a 25mm clearance from the tree root	<ul style="list-style-type: none">Rubber tracked mini-excavator;Trail building hand tools including rakes, mattocks, rake hoes, leaf rakes, shovels etc.	
Estimated Length of Treatment		Drawing Reference
Not specified.		WTSTD-031-WG2 Trail – Tree Root Protection Placement and Dimensions

NOTES:


- GENERAL:
- Tree Root Protection is to be used in locations where the trail alignment cannot be redirected to avoid tree roots.
 - The tree root is to be encased in a "cut to suit" section of PVC pipe that has an internal diameter that provides a 25mm minimum clearance from the tree root.
 - The PVC pipe is to extend at least 50mm outside the edge or the trail ride line.
 - The PVC pipe must extend to a location where there can be a minimum of 30mm cover of in-situ material over the top of the pipe and where there can be no contact between trail ride line and the tree root.
 - The in-situ material used around the PVC pipe must be free of stones or vegetative matter and must be suitably graded material to provide a hard compacted surround to the pipe.
 - The in-situ material must be well compacted at the sides of the PVC sleeve to ensure there are no voids that could cause the PVC sleeve to move and wear against the tree root.
 - While this standard drawing provides information on the normal methodology for dealing with unavoidable tree roots, variations may be required for specific plant species or unusual root systems.
 - Dimensions in millimetres unless otherwise notated.

LEGEND:

-  GRADED TRAIL SURFACE
-  IN-SITU MATERIAL
-  NATURAL GROUND


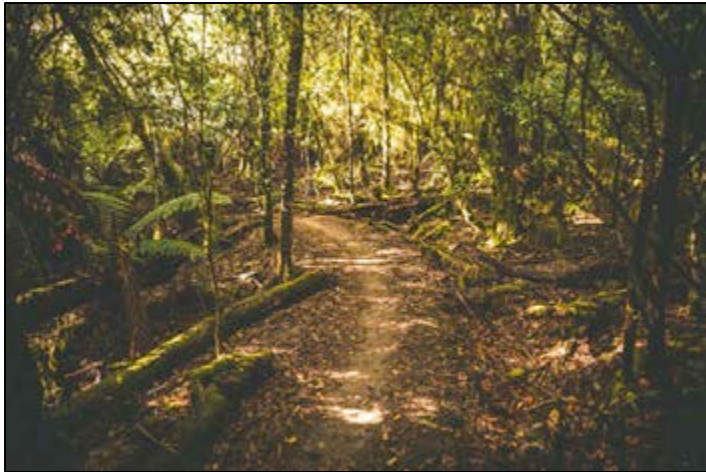


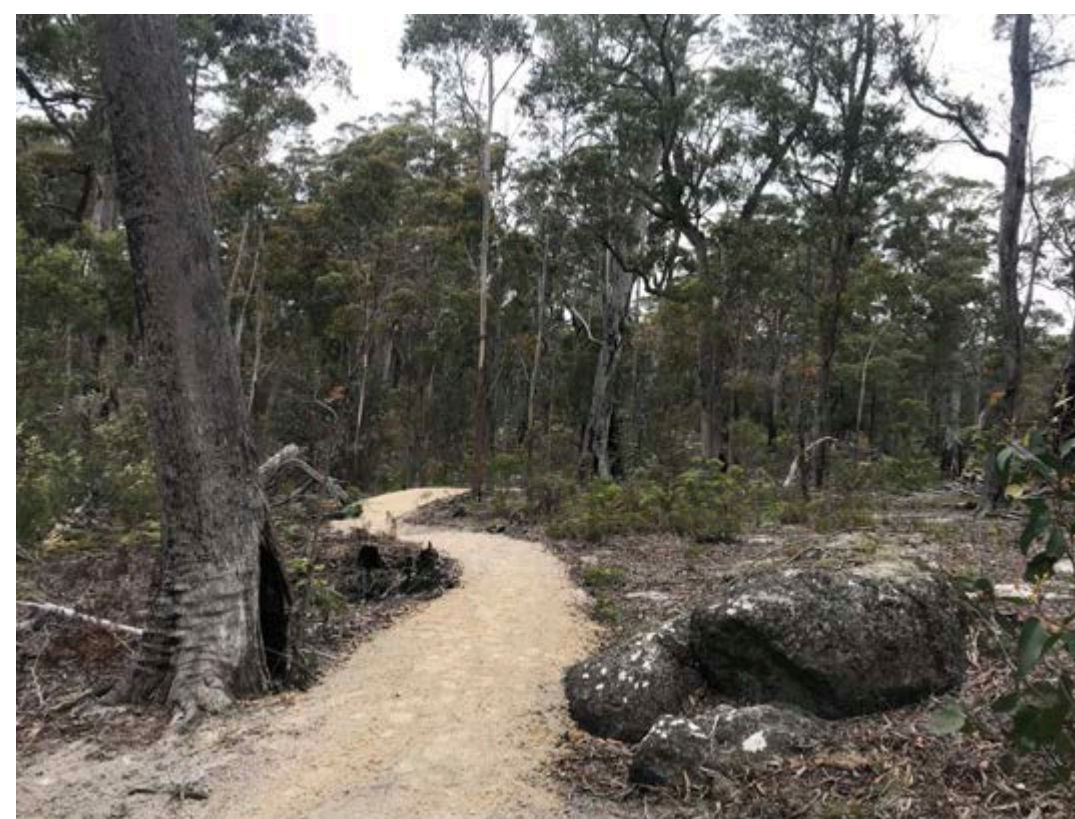
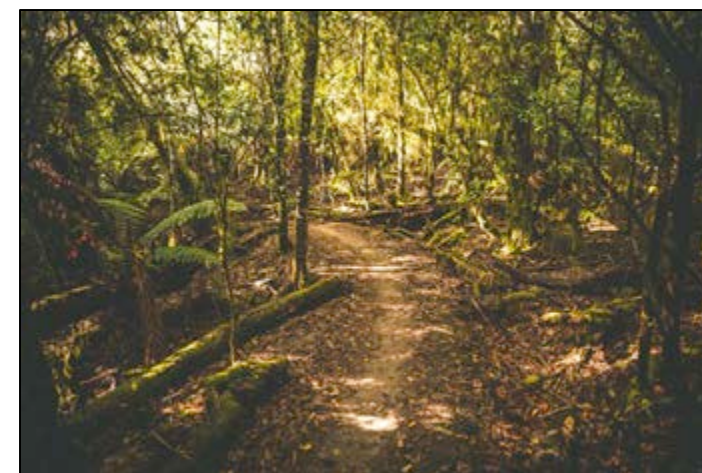
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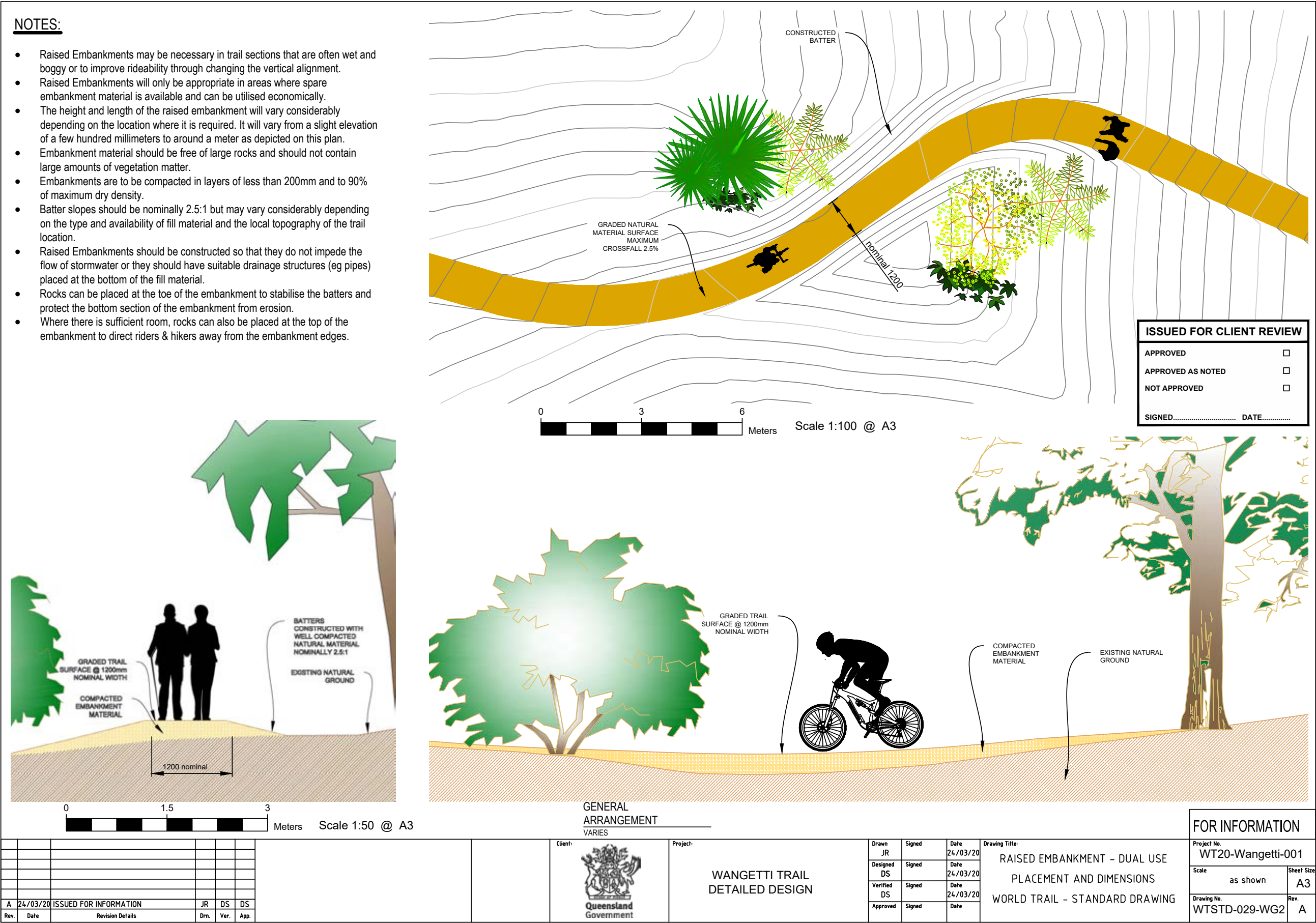
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						JR		24/03/20						WT20-Wangetti-001					
						Designed	Signed	Date						Scale	Sheet Size				
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5.5.5 Raised Embankment

What is it?		Examples
Raised Embankments use extra 'fill' material to build the trail tread up higher. The fill material is usually sourced from another area where there is an excess of material and moved along the trail to where it is required.		
When is it Used?		
Raised Embankments may be necessary in trail sections that are often wet and boggy, or to improve rideability through changing the vertical alignment.		
Raised Embankments are generally used where the ground surface is not suitable for typical cut and fill benching techniques. Examples include: 1. Areas with soft, boggy ground; 2. Areas that are very flat with no/little cross-slope to effect drainage; 3. Where additional fill/soil is used to 'ramp' up to a change in level – for example, where a trail is routed up and over a large rock slab.		
Why is it Used?		
It is used to ensure a smooth and consistent surface to the trail, using locally available surplus soil. Car needs to be taken to ensure that the Raised Embankment doesn't become a dam for surface flows.		
Notes		
Raised Embankments should be constructed so that they do not impede the flow of stormwater.		
Rocks can be placed at the toe of the embankment to stabilise the batters and protect the bottom section of the embankment from erosion.		
Borrow pits are not to be used to source material for Raised Embankments.		
Materials	Machinery / Equipment	
<ul style="list-style-type: none">In situ soil.	<ul style="list-style-type: none">Rubber tracked mini-excavator;Trail building hand tools including rakes, mattocks, rake hoes, leaf rakes, shovels etc.	
Estimated Length of Treatment	Drawing Reference	
Not specified	WTSTD-029-WG2 Raised Embankment – Dual Use Placement and Dimensions	









5.5.6 Sediment Control

What is it?		Examples
Sediment Control is a construction treatment used to prevent the movement of sediment from the constructed trail into the surrounding environment.		
When is it Used?		
It is generally used in the following situations: 1. Below the outlet point of a grade reversal; 2. Below the lower edge of the trail on the approach (approx. 5-10m) to and exit from any permanent waterways.		
Why is it Used?		
Sediment Control is used to catch any sediment carried by water off the constructed trail, into the surrounding environment, thus preventing sediment from accumulating in waterways or smothering vegetation. Sediment movement from trails that are constructed according to sustainable trail guidelines is minimal, and is usually greatest immediately at/after construction, decreasing with time as the trail settles and becomes stabilised.		
Notes		
Fibre Rolls and Silt Fencing both provide adequate sediment control and can be used interchangeably, or as directed by the Land Manager. Sediment Controls should remain in place while the trail until the end of the Trail Curing Period, when the trail is deemed ready to be opened to the public.		
Materials	Machinery / Equipment	
<ul style="list-style-type: none">As per drawings.	<ul style="list-style-type: none">Rubber tracked mini-excavator;Trail building hand tools including rakes, mattocks, rake hoes, leaf rakes, shovels etc.Carpentry and general construction equipment.	
Estimated Length of Treatment	Drawing Reference	
Not specified	WTSTD-040-WG2 Sediment Control – Fibre Rolls Placement and Dimensions WTSTD-041-WG2 Sediment Control – Silt Fence Placement and Dimensions WTSTD-042-WG-2 Sediment Control – Silt Fence Notes Placement and Dimensions	



NOTES:

INSTALLATION:

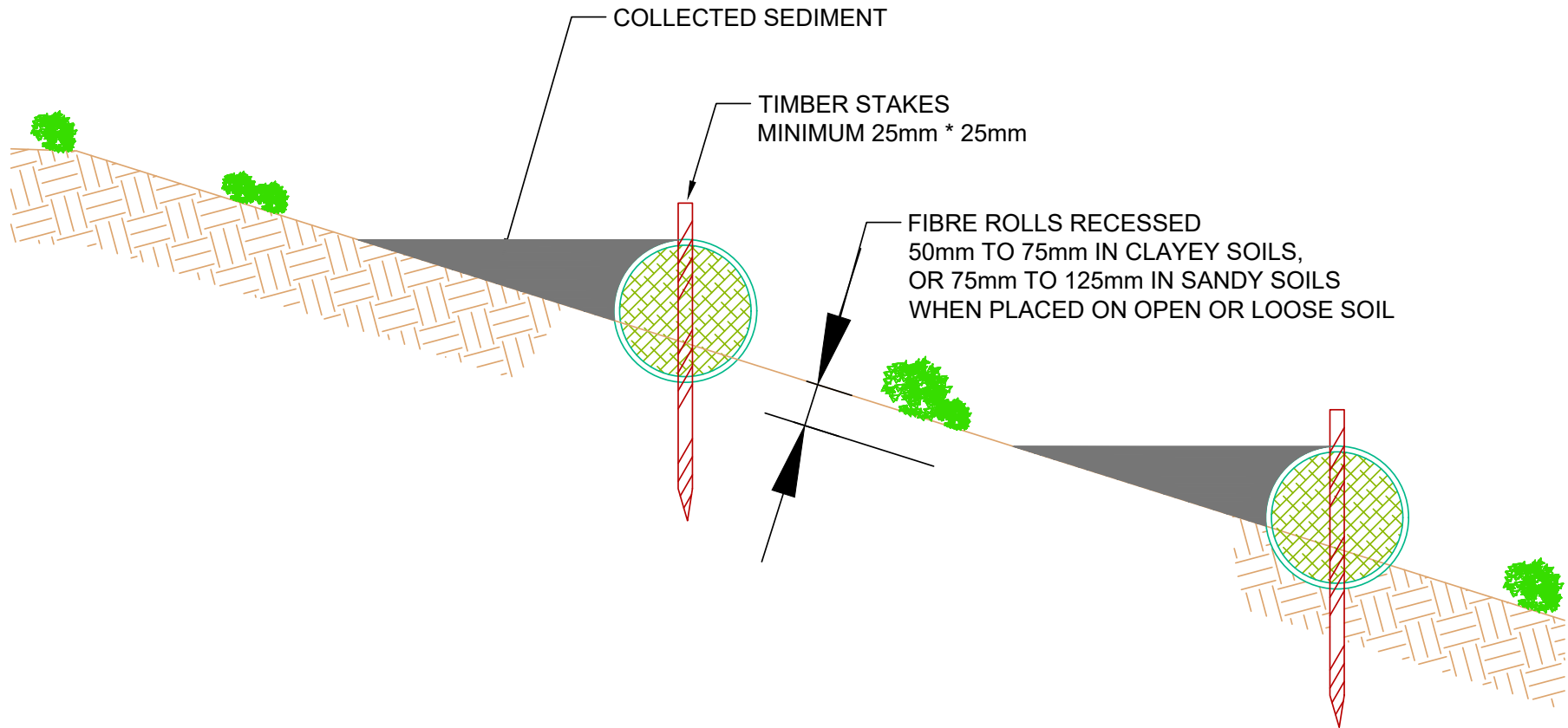
- Fibre Rolls are typically 200mm to 250mm Jute, Coir or Straw roll tied with synthetic biodegradable mesh.
- Fibre Rolls are to be installed as described in any project specific, approved plans. Any queries or alterations need to be provided by or approved by the clients engineer or on site representative.
- The rolls must be placed along the contour when placed across bare or newly seeded slopes.
- Ensure the outermost ends of a line of Fibre Rolls are turned up the slope to ensure ponding and minimise bypassing.
- When placed across the invert of minor drains ensure the rolls are spaced such that the crest of a downstream roll is level with or above the invert at the immediately upstream roll.
- When placed across the invert of minor drains ensure that each roll extends far enough up the banks on each side such that the crest of the roll in the center is lower than the ground height at the ends of the roll.
- Ensure the anchoring stakes are driven through the end of each roll and at a minimum spacing along the roll of the lesser of 1.2m spacings or 6 times the roll diameter.
- Stakes must be driven at a minimum spacing of 300mm when the rolls are being used to form a check dam.
- Adjoining rolls must be overlapped at least 450mm.

MAINTENANCE:

- All Fibre Rolls must be inspected at a minimum of once per week, always prior to a forecast rainfall event and at daily intervals during extended periods of rainfall.
- Any damaged or displaced Fibre Rolls must be replaced, relocated or repaired to ensure compliance with installation requirements.
- Collected sediment should be removed and disposed of in a suitable manner that will not cause erosion or detriment to water quality.

REMOVAL:

- Fibre Rolls are to be removed from site once they are no longer needed to provide their drainage or sediment control function.
- All excessive sediment must be removed from behind the rolls and disposed of as above, if it is likely to be washed away.
- Any biodegradable components of the Fibre Rolls may be suitable to remain on site as mulch.
- All materials that are not readily biodegradable must be removed from the site.



SECTION VIEW - TYPICAL INSTALLATION OF FIBRE ROLLS

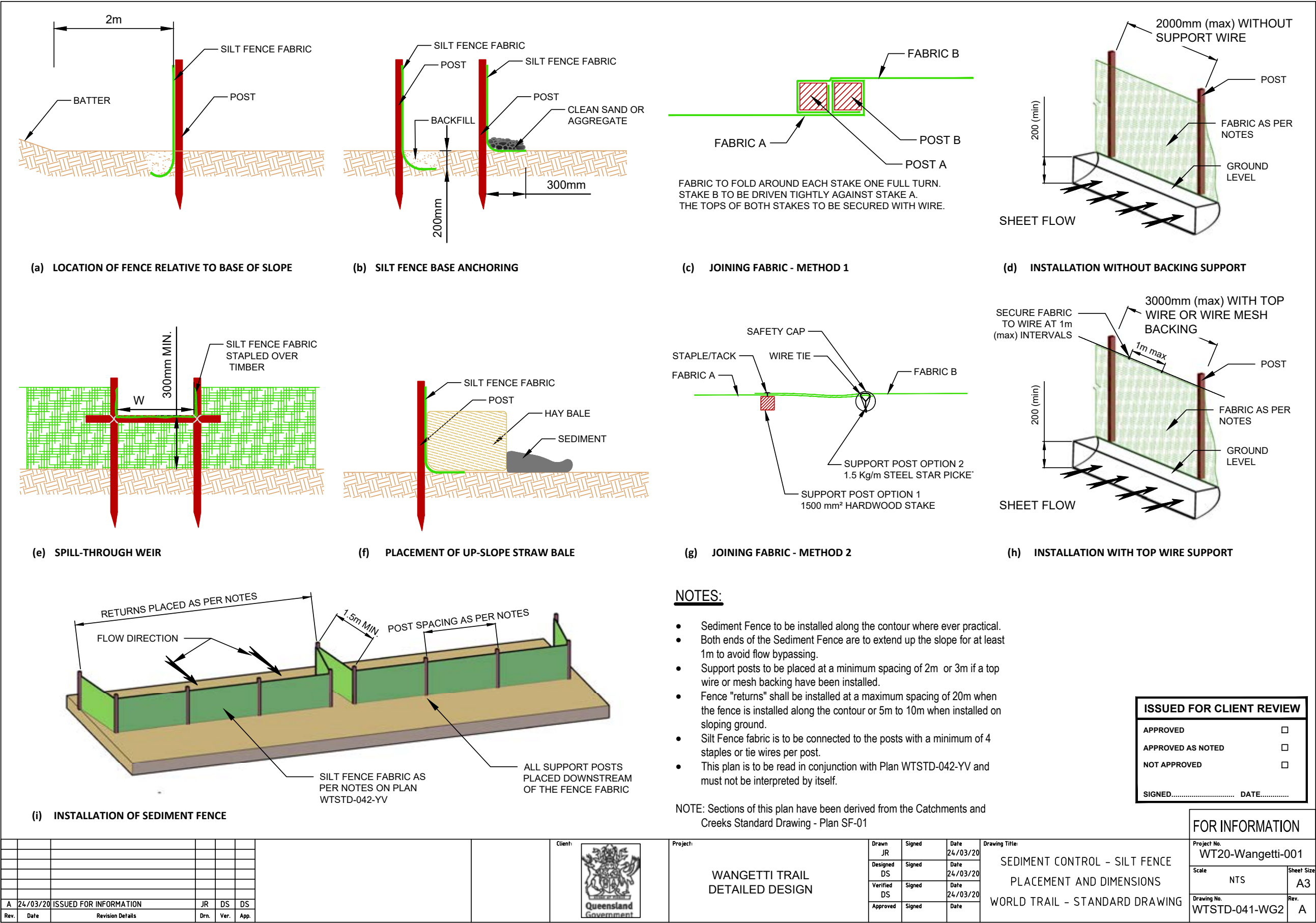
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NOTE: Sections of this plan have been derived from the Catchments and Creeks Standard Drawing - Plan FR-01

GENERAL
ARRANGEMENT
SCALE 1:25

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NOTES:

MATERIALS:

FABRIC:

- Polypropylene. Polyamide, Nylon, Polyester or Polyethylene woven or non-woven fabric at least 700mm in width and 140 gsm.
- All fabrics to contain ultraviolet inhibitors and stabilisers to provide a minimum of 5 months of usable construction life (Ultraviolet Stability exceeding 70%)

FABRIC REINFORCEMENT:

- Wire or steel mesh minimum 14-gauge with a maximum mesh spacing of 200mm.

SUPPORT POSTS/STAKES:

- Hardwood Posts minimum 1500mm²,
- or Softwood Posts minimum 2500mm²,
- or Steel Star Pickets, minimum 1.5 Kg/m, suitable for attaching fabric.

INSTALLATION:

- Silt Fences are to be installed as described in any project specific, approved plans. Silt Fence Fabric should comply with any specifications provided. Any queries or alterations need to be provided by or approved by the clients engineer or on site representative.
- To the maximum degree practical, and where the plans allow, ensure the fence is located:
 - (a) totally within the property boundaries
 - (b) along a line of constant elevation wherever practical
 - (c) at least 2m from the toe of any filling operations that may result in shifting soil/fill damaging the fence.
- Install returns within the fence at maximum 20m intervals if the fence is installed along the contour, or 5m to 10m maximum spacing (depending on slope) if the fence is installed at an angle to the contour. the 'returns' shall consist of either:
 - (a) v-shaped section extending at least 1.5m up the slope; or
 - (b) sandbag or rock/aggregate check dam a minimum 1/3 and maximum 1/2 fence height, and extending at least 1,5m up the slope.
- Ensure the extreme ends of the fence are turned up the slope at least 1.5m, or as necessary, to minimise water bypassing around the fence.
- Ensure the sediment fence is installed in a manner that avoids the concentration of flow along the fence, and the undesirable discharge of water around the ends of the fence.
- If the sediment fence is to be installed along the edge of existing trees, ensure care is taken to protect the trees and their root systems during installation of the fence. do not attach the fabric to the trees.
- Unless directed by the site supervisor or the approved plans, excavate a 200mm wide by 200mm deep trench along the proposed fence line, placing the excavated material on the up-slope side of the trench.

- Along the lower side of the trench, appropriately secure the stakes into the ground spaced no greater than 3m if supported by a top support wire or weir mesh backing, otherwise no greater than 2m.
- If specified, securely attach the support wire or mesh to the up-slope side of the stakes with the mesh extending at least 200mm into the excavated trench. ensure the mesh and fabric is attached to the up-slope side of the stakes even when directing a fence around a corner or sharp change of direction.
- Wherever possible, construct the sediment fence from a continuous roll of fabric. to join fabric either:
 - (a) attach each end to two overlapping stakes with the fabric folding around the associated stake one turn, and with the two stakes tied together with wire; or
 - (b) overlap the fabric to the next adjacent support post.
- Securely attach the fabric to the support posts using 25 x 12.5mm staples, or tie wire at maximum 150mm spacing.
- Securely attach the fabric to the support wire/mesh (if any) at a maximum spacing of 1m.
- Ensure the completed sediment fence is at least 450mm, but not more than 700mm high. if a spill-though weir is installed, ensure the crest of the weir is at least 300mm above ground level.
- Backfill the trench and tamp the fill to firmly anchor the bottom of the fabric and mesh to prevent water from flowing under the fence.

ADDITIONAL REQUIREMENTS FOR THE INSTALLATION OF A SPILL-THROUGH WEIR:

- Locate the spill-through weir such that the weir crest will be lower than the ground level at each end of the fence.
- Ensure the crest of the spill-through weir is at least 300mm above the ground elevation.
- Securely tie a horizontal cross member (weir) to the support posts/ stakes each side of the weir. Cut the fabric down the side of each post and fold the fabric over the cross member and appropriately secure the fabric.
- Install a suitable splash pad and/or chute immediately down-slope of the spill-through weir to control soil erosion and appropriately discharge the concentrated flow passing over the weir.

MAINTENANCE:

- Inspect the sediment fence at least weekly and after any significant rain. Make necessary repairs immediately.
- Repair any torn sections with a continuous piece of fabric from post to post.
- When making repairs, always restore the system to its original configuration unless an amended layout is required or specified.
- If the fence is sagging between stakes, install additional support posts.

- Remove accumulated sediment if the sediment deposit exceeds a depth of 1/3 the height of the fence.
- Dispose of sediment in a suitable manner that will not cause an erosion or pollution hazard.
- Replace the fabric if the service life of the existing fabric exceeds 6-months.

REMOVAL:

- When disturbed areas up-slope of the sediment fence are sufficiently stabilised to restrain erosion, the fence must be removed.
- Remove materials and collected sediment and dispose of in a suitable manner that will not cause an erosion or pollution hazard.
- Rehabilitate/revegetate the disturbed ground as necessary to minimise the erosion hazard.

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NOTE: Sections of this plan have been derived/copied from the Catchments and Creeks Standard Drawing - Plan SF-02

										FOR INFORMATION									
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														Designed DS	Signed	Date 24/03/20		Scale na	Sheet Size A3
														Verified DS	Signed	Date 24/03/20		Drawing No. WTSTD-042-WG2	Rev. A
														Approved	Signed	Date			
A	24/03/20	ISSUED FOR INFORMATION				JR													
Rev.	Date	Revision Details				Drn.	Ver.	App.											

6 MATERIALS

The previous section detailed the various different Construction Treatments, and listed the materials required for that treatment. This section provides some further guidance and comments around the sourcing and use of those materials.

The main materials proposed to construct the majority of the Wangetti Trail are naturally occurring in situ materials – mainly, soil and rock (including large rocks [boulders]), small rocks and rock slabs). Priority is always given to sourcing material from within the trail alignment and surrounding area, ensuring minimal disturbance to the environment.

Soil

The proposed finished surface or wearing course for the majority of the Wangetti Trail is the natural soil – that is, the in situ mineral earth soil already in place beneath the vegetation, leaf litter and organic topsoil. This is true for both standard and hand-built trail construction. Where extra soil is required, for example, to build up over a low depression or to fill in between roots or to rake into the cracks between rock armouring, it can usually be sourced from the balanced cut and fill process used to create the bench which becomes the finished trail. While overall the cut and fill process is balanced, locally, soil may be moved up or down the trail, to manage local excesses or deficiencies.

If sufficient soil is not available in situ, it may be necessary to import soil, with agreement from the land manager. This scenario is seen as unlikely and difficult to achieve, given the large volume of materials that would be required and the remote setting of the trail.

Where imported soil is required, preference must be given to local, approved suppliers. Imported material must be free of weeds and pathogens. All material brought onto site must be accompanied by a certificate indicating that it is free of *Phytophthora* and weed species, unless the source has been agreed to by the TDPD Project Manager.

The use of ‘borrow pits’ to source extra soil is not permitted.

Aggregate/Fine Crushed Rock

In some instances, trails can be surfaced with imported materials like fine crushed rock. This is generally done in high traffic areas (e.g. campsites) or areas requiring additional materials for structural or drainage purposes.

While the application of imported materials as a wearing course is not proposed to be widespread on the Wangetti Trail, it is specified in at least one Construction Treatment (Ballast Surfacing).

Preference must be given to local, approved suppliers and agreement from the land manager will be required. The imported material must be free of weeds and pathogens. All material brought onto site must be accompanied by a certificate indicating that it is free of *Phytophthora* and weed species, unless the source has been agreed to by the TDPD Project Manager.

Rock

Rock, including small rock and large rock (boulders), will be used for the construction of rock water crossings, rock armouring, retaining walls, rock walling and to corral and anchor steps.

Priority must always be given to rock sourced from within the track alignment or from the surrounding area in the first instance, rather than importing rock from outside.

All rock material used for these construction treatments must be of an appropriate shape, texture and colour to match the native rock and must provide a natural appearance relative to its location.

The intention is for all constructed rockwork to 'disappear' within the surrounding natural landscape. Where possible, constructed rockwork will tie back into existing site features.

Harvesting of rock will be undertaken in a manner which minimises disturbance to the surrounding natural environment and does not present an obvious visual intrusion or disturbance to the landscape. Harvesting of rock will be only in the quantities required to fully complete the works. Over-harvesting will not be permitted. Rock will be harvested in a sequential manner to the construction works, thereby minimising stockpiles of material. Where rock awaiting use is stored, it must pose minimal disturbance to the environment. The ideal scenario is that all rock used for construction purposes is surplus rock removed during the construction of the bench.

Where local in situ rock is not available, it may be necessary to import rock for construction of features. This scenario is seen as very unlikely, and would be difficult to achieve given the large volume of materials that would be required. Imported rock must be free of weeds and pathogens. All material will be brought onto site accompanied by a certificate indicating that it is free of *Phytophthora* and weed species, unless the source has been agreed to by the TDPD Project Manager.

Constructed slope stabilisation such as rock gabions are not specified along the Wangetti Trail. Rock walling/retaining walls are proposed.

When used in the construction of rock water crossings, boulders must be large enough to resist movement in high water flow. No imported materials are to be used in the construction of rock water crossings.

If insufficient suitable sized rock is available, large boulders may be split.

Concrete

Concrete will be used for the construction of retaining walls, pre-cast concrete steps and foundations for built structures such as bridges and boardwalks.

Where concrete is required, it must be of a style and colour that is sympathetic to the local environment.

Materials for Built Structures

Built structures require numerous imported materials (such as concrete, timber, steel, aluminium, FRP etc.). These imported materials must complement the look and style of the Wangetti Trail, must be durable and functional for their purpose and should ideally come from a local source.

7 PROCEDURES

7.1 CONSTRUCTION INDUCTION

At the commencement of construction, all staff members will be required to attend a Construction Induction.

Key items to be covered in the Construction Induction include (but are not limited to):

- Project Location, including staging areas, access roads, stockpile locations, emergency evacuation points etc.;
- Project Scope of Works, including desired outcome of the project, construction program, key milestones, completion etc.;
- Construction Specifications – i.e. this document;
- Project Management protocols around reporting, procedures to follow if there are issues with construction works or the design, variations, etc.;
- Construction Environmental Management Plan;
- Work Health and Safety Management Plan;
- Visitor risk management protocols to minimise the risk of visitors using the trail while it is under construction;
- Hygiene protocols to ensure any machinery or tools are free from contaminated soil, weeds or seeds;
- Cultural heritage protection protocols including Aboriginal heritage site stop-work instructions;
- Proposed materials.

Ideally, representatives from TDPD, WTMA, QPWS, Traditional Owners, Douglas Shire Council, Cairns Regional Council and Mareeba Shire Council will be present at the induction and may choose to include organisation-specific induction material. Individual land managers or regulatory agencies may choose to provide their own Construction Induction, in line with their own internal requirements.

At the completion of the Construction Induction, all staff members will be required to sign an attendance form indicating their presence and understanding of the information discussed.

Any new staff members arriving throughout the duration of the project will be required to undertake a shortened Construction Induction with the Contractor's Project Manager.

7.2 PRE-START TRAIL REVIEW

At the commencement of the construction of the Wangetti Trail, the entire trail should be broken into Construction Segments. These Construction Segments may correspond to the sections shown in Map 1 and Map 2 (on pages 4 and 5) or may be determined based on the preferred staging approach undertaken by the TDPD Project Manager, or land tenures, or some other variable. The purpose of creating Construction Segments is to break the project into smaller components, for ease of inspections, reporting, invoicing, practical completion and staged opening.

Before starting the construction of a Construction Segment, a Pre-Start Trail Review (PSTR) must be undertaken.

The purpose of the PSTR is to review and inspect the proposed alignment of the trail with the TDPD Project Manager, prior to construction starting, to confirm the exact alignment within the ground-truthed corridor¹, identify any specific environmental values to be protected and to discuss and agree on specific construction treatments.

The following personnel will be required to attend the PSTR:

- TDPD Project Manager;
- Contractor's Project Manager;
- Contractor's Trail Designer/Builder for that Construction Segment.

A representative of the respective land manager(s) (QPWS, WTMA, Douglas Shire Council, Cairns Regional Council and Mareeba Shire Council and the Traditional Owners) should be invited to attend the PSTR.

Other personnel may also be required – for example, if the trail is in close proximity to areas of high environmental values, qualified environmental specialists should be present to provide assistance in micro-siting the trail to avoid impacts to these values. In areas of high cultural heritage values, qualified archaeologists and/or Traditional Owners should be present.

Where the Construction Segment is very long, shorter agreed sub-segments may be used, or the PSTR may be staged over multiple days.

Prior to commencing the PSTR, known information about the Construction Segment should be gathered and assessed – length, proposed difficulty rating, likely construction treatments, known water-crossings and any environmental issues that have been identified. During the field component of the PSTR, any changes to the alignment, treatment or other issues that are identified must be documented accordingly along with maps, GPS coordinates, photos and sketches as required. This process could also be used to identify and document agreed likely variation items such as rock armouring.

¹ The ground-truthed corridor is defined as the flagged (where flagging tape is in place), GPS'd centre line, plus the agreed buffer of 20m to either side (i.e. a total corridor width of 40m). Where flagging tape is missing or sporadic, the GPS alignment can be used.

Where there is a known environmental issue (identified by WTMA or other reports) specific to the trail, the following protocol would apply:

- WTMA would be contacted prior to the field inspection for specific recommendations and invited to attend if required (for example, micro-siting to avoid threatened flora sites);
- During the field inspection, the scope of the environmental issue would be visually identified and then marked in the field as an exclusion zone (using different coloured flagging tape or bunting). The exact alignment of the trail to be constructed would be flagged in the field, ensuring an adequate buffer from the exclusion zone;
- Detailed documentation will be gathered, including photographs showing the pre-existing conditions on site before any works are undertaken. This allows for post-construction photos to be taken, which will enable before/after comparison.

On completion of the PSTR, the contractor will be required to record the outcomes. Specifically, they must document any proposed variations, any protection measures for areas of environmental or cultural heritage sensitivity, any changes to the alignment, or any other issues/decisions made during the PSTR. Documentation should include photos and specific GPS coordinates and should be signed by all attendees. A copy of the completed and signed PSTR report form must be provided to the TDPD Project Manager.

7.3 TEMPORARY CAMPSITES

Due to the remoteness of the trail, and the time taken to travel in and out to the work site, there may be occurrences when it is more cost and time effective for the trail builders to camp overnight. This would be at the discretion of the contractor, but may require some preparation ahead of time in order to obtain approvals.

If a contractor wishes to camp overnight, the following steps are to be taken to identify a temporary campsite location and obtain approval:

- Identify potential temporary campsite location. Look for locations with harder ground or sandier soils. Avoid low or poorly drained areas where soil or vegetation may be easily damaged. Consider whether mobile phone reception is available and/or necessary. Locations with nearby vehicle access and/or public amenities to be given priority;
- Notify/request approval from TDPD Project Manager and relevant land manager with following details:
 - Location of proposed temporary campsite;
 - Number of people/tents proposed to occupy temporary campsite;
 - Length of proposed duration of use of temporary campsite.

Once a temporary campsite is approved by the TDPD Project Manager and relevant land manager the following must be adhered to:

- Do not pitch tent underneath any loose, dead or overhanging tree limbs;
- Do not remove, or damage, any vegetation;
- No fires;
- Carry all rubbish out;
- Bury human waste at least 100m from streams and at least 15cm deep, or carry it out;
- Respect wildlife;
- No chainsaw use;
- Water:
 - Carry in enough water for the duration of the stay at the temporary campsite;
 - If unable to carry enough, collect water from streams and always boil for at least 5 minutes before drinking or use treatment tablets, a filter or UV treatment;
 - Wash at least 100m away from watercourses and scatter wash water.

On completion of use of temporary campsite, the following steps are to be taken:

- Take time to naturalise the site by covering scuffed areas with native materials (such as fallen leaves), brushing/raking out matted areas. This will help the site recover and also make it less obvious as a campsite;
- Compacted area is to be de-compacted to encourage regrowth;
- Scarification is to be perpendicular to the slope to reduce soil erosion. Logs, leaf litter and vegetation material are to be randomly spread over the site. On completion, the closed site must appear unusable to park visitors to discourage continued use.
- Carry out all rubbish;
- Any infrastructure/equipment brought in by the Contractor must be removed on completion;
- Advise TDPD Project Manager and relevant land manager the temporary campsite is no longer in use.

7.4 TRAIL COMPLETION PROCEDURE

Upon completion of a trail or Construction Segment, the following should occur:

- Remove all flagging tape that may still be visible;
- Removal any rubbish or construction debris;
- Remove all construction equipment and machinery;
- Leave in place any sediment control measures for a duration as agreed and determined by the TDPD Project Manager. As a minimum, sediment control measures should be retained until the Trail Curing Period has finished and the trail or Construction Segment is deemed ready to be opened to the public;
- Trim any tree branches that may protrude into the riding or walking corridor;
- Trim or remove any sharp tree stumps within the fall zone adjacent to the trail;
- Check that any imported surfacing materials or raised embankments have been compacted to a suitable level;
- Check that all rock work is stable and secure;
- Check that the trail is draining as intended – i.e. no puddling of water anywhere on the trail, all grade reversals have a clear outlet and are draining effectively with no blockages, that any outsloped sections of trail have the appropriate gradients and there are no blockages along the lower edge;
- If excavators and other plant/machinery are being relocated to another project or a different area, they are to be washed down at a commercial washdown facility or washdown facility at QPWS works depot.

Typically, at this stage, the contractor would arrange a walk-through inspection with the TDPD Project Manager, seeking Practical Completion for that trail or Construction Segment. Once Practical Completion has been achieved, the Trail Curing Period should commence.

Upon achieving practical completion, the trail or Construction Segment should remain closed for a period of 4-12 weeks (depending on weather, time of year and other variables) to allow for ‘curing’ of the trail surface. Signage and fencing should remain in place to restrict members of the public from accessing the trail during this time.

At the end of the Trail Curing Period, the trail will be ready for opening to the public. In the days just prior to opening the trail, a trail clean-up will be required. During the trail clean-up, the following activities are typically undertaken:

- Any large trees or branches that have fallen across the trail are removed;
- Leaves and other debris is removed – leaf blowers or grass rakes are ideal for this purpose;
- Removal of sediment control measures;
- Removal of any construction signage or fencing;
- Pruning of vegetation as required;
- Minor works to ensure the trail is draining as intended;
- Minor works to ensure no loose or uncompacted soil within the main trail tread.

Trail Completion Procedures may also have contractual implications. The procedure listed above relates to trail works, but DITID may put in place specific requirements around Practical Completion, a specified Defects Liability Period, the provision of ‘As Constructed’ drawings and the provision of specific reporting outputs against environmental or cultural heritage issues.

7.5 EMERGENCY PROCEDURES

Emergency procedures will vary depending on the nature of the incident.

The TDPD Project Manager will be verbally notified of any emergency incident within 2 hours of the Contractor's Project Manager becoming aware of the incident, and in writing within 24 hours. All notifications to the following authorities will be undertaken by TDPD:

- DITID;
- Department of Environment and Services / QPWS;
- State emergency services (Police / Fire / Ambulance / SES)
- Department of Transport and Main Roads (if necessary/proximal to Captain Cook Highway).

The Contractor will be required to provide an Emergency Response Plan and for this plan to be thoroughly communicated to all staff members in the Construction Induction. The Emergency Response Plan should identify evacuation routes, mustering points, communication protocols and provide key contact details for local authorities and services. It should be compatible with the internal emergency response protocols of the various land managers.

Environmental incidents and emergencies will be identified within individual environmental risk management plans. However, pro-active environmental risk management measures should be undertaken wherever possible, if events such as extreme rainfall or flooding are forecast.

When reporting environmental incidents to TDPD, the following information is to be provided:

- The name and contact details of the reporting person;
- The date and time the environmental incident occurred;
- The activity that was being undertaken when the incident occurred;
- How the incident occurred;
- Any containment measures put in place to reduce or contain environmental harm;
- An assessment of the amount of environmental harm that occurred;
- If any other stakeholders are aware of the incident.

7.6 HELICOPTER PROTOCOLS

Frequent helicopter usage will be critical for the timely and efficient construction of the Wangetti Trail. The main applications for helicopters include:

- Delivery of materials – while much of the Wangetti Trail will be constructed without imported materials, some of the Construction Treatments require imported materials. For example, minor water crossings and pre-cast concrete steps. Given the remote and difficult nature of the terrain, the only way of transporting materials for these Construction Treatments is by vehicle to the closest possible access road, then by hand/power carrier along the trail, or by helicopter;
- Air lifting mini-excavators across impassable terrain – from time to time, the trail crosses sections of terrain that are not safe for the passage of a mini-excavator. These areas include steep-sided rocky gullies where bridges have been specified (note – bridges will not be engineered to allow passage of a mini-excavator [approx. 1.7T]), or large expanses of steep side-sloping rock slabs. In some instances, it may be possible to track the mini-excavator back out along the finished track, transport it by road to another access point further along the trail and commence working backwards until reaching the other side of the impassable terrain. In other instances, the mini-excavator may be able to track around the impassable terrain, with minimal impact or risk. However, it is envisaged that there will be frequent impassable sections where there is no alternative other than to airlift the mini-excavator.

In order to maximise the efficient operation of helicopters and minimise costs, helicopter operations should be carefully controlled, and clustered into half or full day blocks. Ideally, helicopter operations would be scheduled to occur on a recurring fortnightly/monthly basis (as required), with operations organised in advance. Works requiring a helicopter would then be identified in advance and allocated to the next upcoming helicopter operations day. Deliveries of materials to staging areas could be scheduled to minimise time in storage and double handling. This also allows for clear flight plans to be prepared, identifying materials and drop locations, along with GPS coordinates.

A permit will be required to fly a helicopter below 1000m in the World Heritage Area. Low flying has the potential to compromise certain World Heritage values, such as the wilderness qualities of certain areas. For this reason, flying an aircraft for commercial purposes in the World Heritage Area less than 1000 feet above the ground level is prohibited. However, the Authority may issue a Permit under the Wet Tropics Management Plan in special circumstances, such as these.

The Contractor will need to work with the TDPD Project Manager to coordinate the use of helicopters and ensure all permits and approvals are obtained prior to operations commencing.

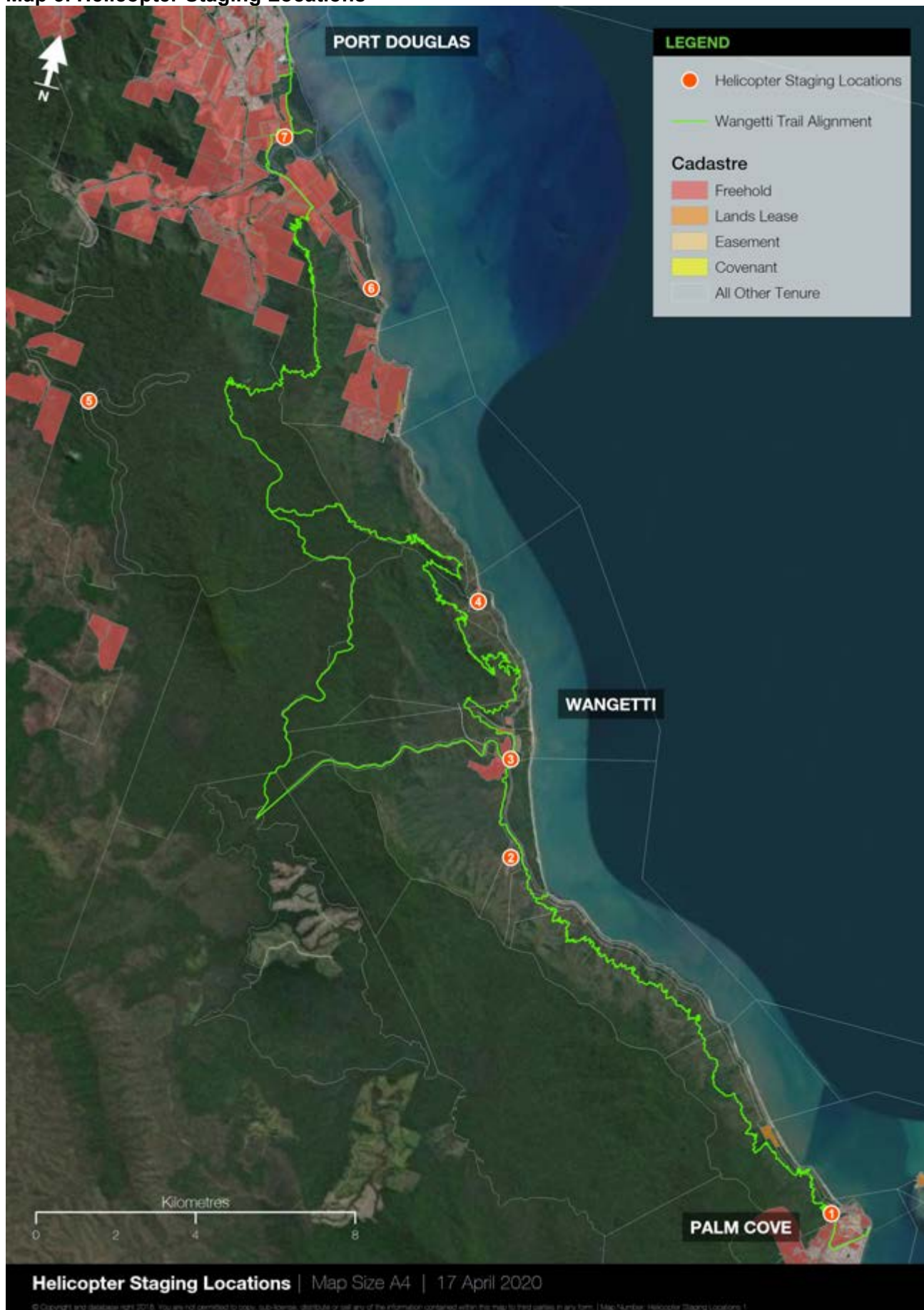
Nine separate Helicopter Staging Locations have been identified - see

Table 4. Helicopter Staging Area Locations below.

Map 3 on the following page shows their locations.

Table 4. Helicopter Staging Area Locations

Name	Location	GPS Coordinates	Comments
Location 1	SES Depot - Off Captain Cook Highway	Lat: -16.73889453, Long: 145.66242376	Provides safe access for truck deliveries and has adequate room for helicopter staging activities.
Location 2	Rifle Range – Off Captain Cook Highway	Lat: -16.68258754, Long: 145.57192468	Provides safe access for truck deliveries and has adequate room for helicopter staging activities. Permission would need to be gained from relevant Australian Defence Force department as this location is still an active range for parts of the year.
Location 3	Off Captain Cook Highway	Lat: -16.66210901, Long: 145.56612575	A cleared parcel of land adjacent to the Captain Cook Highway provides safe access for truck deliveries and has adequate room for helicopter staging activities.
Location 4	Off Captain Cook Highway	Lat: -16.63104893, Long: 145.54990777	Located close to Turtle Cove, this location can be used as a helicopter staging location. Access to this location would be limited to 4x4 utility vehicles.
Location 5	Twin Bridges Road	Lat: -16.61092623, Long: 145.45351588	Located on Twin Bridges road this location provides safe access for truck deliveries and has adequate room for helicopter staging activities. The road would need to be closed to the public if helicopter activities were undertaken at this location.
Location 6	Off Captain Cook Highway	Lat: -16.57169983, Long: 145.50838583	Located close to Yule Point, this location can be used as a helicopter staging location. Access to this location would be limited to 4x4 utility vehicles.
Location 7	Andreassen Road – Off Captain Cook Highway	Lat: -16.54516221, Long: 145.48039967	Located on the North side of the Mowbray River, this location provides safe access for truck deliveries and has adequate room for helicopter staging activities

Map 3. Helicopter Staging Locations

7.7 SITE ACCESS

Construction of the Wangetti Trail will most likely occur in multiple locations with multiple teams operating simultaneously. The Work Site for each team is generally defined as the location at which the rubber tracked mini-excavator is located, plus 50-100m ahead of the machine where vegetation clearing is being undertaken, plus 50-100m behind the machine where trail finishing works (rock armouring, drainage, trail clean-up etc.) are being undertaken. The Work Site is constantly moving, progressing forward in a linear fashion along the trail.

Day to day access to each work site for each particular team will be as follows:

- Construction vehicles will travel as close as possible to the work site using the approved access tracks. Construction vehicles to be parked in a suitable location along the access track, as close as possible to the intersection with the alignment of the Wangetti Trail. Vehicles must not be parked off-track but must also not be parked so as to obstruct the track;
- Construction personnel will walk along the completed section of trail to reach the work site. The use of mountain bikes (MTBs), electronic mountain bikes (eMTBs) or suitable motorbikes (e.g. farm or 'ag' bikes) to access the site is also acceptable, especially where the distance from the vehicles to the work site is large, or where construction personnel need to carry in fuel or water. The use of the completed trail for access to the work site provides a number of benefits:
 - Assists in compaction and 'curing' of the trail;
 - Prevents unnecessary impacts on vegetation caused by construction personnel travelling 'off-track' to and from their work site;
 - It is the safest way to access the work site;
 - Construction personnel are able to check the condition of the finished sections of the trail twice daily (start and end). If any issues or problems are identified, they can be easily rectified.

Points at which the Wangetti Trail crosses any vehicle tracks (whether they are open to the public or not) are the most likely potential ingress points for members of the public. Exclusion fencing (generally orange para-webbing, extending into the bush for 5-10m either side of the trail) and signage need to be erected at these points to discourage members of the public from accessing the trail prior to it being opened.

Map 4. Access Track Locations - South

Map 5. Access Track Locations - North

7.8 STOCKPILE LOCATIONS

The majority of the Wangetti Trail will be constructed using natural in-situ materials only – rock and soil predominantly. However, imported materials will be required from time to time and may need to be stockpiled temporarily.

Scheduling for any deliveries should be managed to minimise the length of time that stockpiles are required – i.e. deliver the materials as close as possible to the time at which it is required.

Table 5. Construction Materials Stockpile Summary

Construction Treatment	Materials Required	Location of Treatment	Importation Method	Stockpile Locations
Rock Armouring	<ul style="list-style-type: none"> Rock (can be in situ or imported, subject to land manager requirements). 	<ul style="list-style-type: none"> Multiple locations across all segments of the trail; Many in remote locations on steep hillsides and gullies. 	<ul style="list-style-type: none"> In situ rock to be sourced locally and moved to site along the constructed trail using power carrier. 	<ul style="list-style-type: none"> Stockpiled on the completed trail adjacent to the site of the Rock Armouring.
Rock Walling (Up To 500mm)	<ul style="list-style-type: none"> Rock (can be in situ or imported, subject to land manager requirements). 	<ul style="list-style-type: none"> Multiple locations across all segments of the trail; Many in remote locations on steep hillsides and gullies. 	<ul style="list-style-type: none"> In situ rock to be sourced locally and moved to site along the constructed trail using power carrier. 	<ul style="list-style-type: none"> Stockpiled on the completed trail adjacent to the site of the Rock Walling (Up To 500mm).
Retaining Walls (Up To 1000mm)	<ul style="list-style-type: none"> Rock (can be in situ or imported, subject to land manager requirements); Concrete; Mortar; Geofabric; Drainage materials as per drawing. 	<ul style="list-style-type: none"> Multiple locations across all segments of the trail; Many in remote locations on steep hillsides and gullies. 	<ul style="list-style-type: none"> In situ rock to be sourced locally and moved to site along the constructed trail using power carrier; All other materials to be imported, either manually along the constructed trail, or by helicopter, depending on quantity and remoteness. 	<ul style="list-style-type: none"> Stockpiled on the completed trail adjacent to the site of the Retaining Wall (Up To 1000mm).
Ballast Surfacing	<ul style="list-style-type: none"> Ballast rock for base course; Fine crushed rock for wearing course; Geofabric. 	<ul style="list-style-type: none"> Mainly in low-lying areas; Main location to the immediate south of Wangetti township. 	<ul style="list-style-type: none"> Ballast rock for base course and fine crushed rock for wearing course to be imported using trucks and machinery. 	<ul style="list-style-type: none"> To be determined upon construction, but ideally materials will be dropped on the vehicle track exactly at the required locations and spread immediately.

Construction Treatment	Materials Required	Location of Treatment	Importation Method	Stockpile Locations
Pre Cast Concrete Steps	<ul style="list-style-type: none"> Pre-cast concrete steps (available in different sizes); Concrete for foundation of base step; Road base for foundation of mid-flight steps; Mortar; Large rocks as corrals and anchors to sides of flight of steps. 	<ul style="list-style-type: none"> Generally in difficult, steep elevated terrain. 	<ul style="list-style-type: none"> All materials will likely need to be imported by helicopter, given remote and difficult setting. 	<ul style="list-style-type: none"> Stockpiled on the completed trail adjacent/ below the site of the Steps (Pre Cast Steps)
Natural Rock Seats	<ul style="list-style-type: none"> Rock (can be in situ or imported, subject to land manager requirements); Concrete; Mortar; Geofabric; Drainage materials as per drawing. 	<ul style="list-style-type: none"> Multiple locations across all segments of the trail; Generally in locations with good views. 	<ul style="list-style-type: none"> In situ rock to be sourced locally and moved to site along the constructed trail using power carrier; All other materials to be imported, either manually along the constructed trail, or by helicopter, depending on quantity and remoteness. 	<ul style="list-style-type: none"> Stockpiled on the completed trail adjacent to the site of the Trail Furniture (Stone Seats).
Minor Water Crossing	<ul style="list-style-type: none"> Subject to final design, but likely to include: Decking materials – timber, steel mesh, FRP etc.; Framing materials – timber, steel, FRP etc.; Concrete for footings; Fixings. 	<ul style="list-style-type: none"> Multiple locations across all segments of the trail; Many in remote locations on steep hillsides and gullies. 	<ul style="list-style-type: none"> Manually carried in along the completed trail; Lifted in by helicopter. 	<ul style="list-style-type: none"> Stockpiled on the completed trail adjacent to the site of the Minor Water Crossing.
Major Water Crossing	<ul style="list-style-type: none"> Subject to final design 	<ul style="list-style-type: none"> Crossing of Hartley's Creek, upstream of Wangetti township. 	<ul style="list-style-type: none"> All materials to be imported using trucks and machinery, along nearby access route. 	<ul style="list-style-type: none"> To be determined.

There are a number of different stockpile types/scenarios to consider:

1. Major stockpiles at staging areas – given the size of the project, the Contractor will need to set up their own secure staging area/s. These staging areas will likely need fencing, containers for storage of equipment, a site office, toilet facilities, power and water, car parking and a clearly defined and designated stockpile area that is truck accessible. The staging area should also have a large cleared space, from which any helicopter lifting operations can take place. Given the large area covered by the Wangetti Trail it is recommended that staging areas be identified at three different locations – south/Palm Cove, mid/Wangetti and north/Mowbray. Depending on project scheduling, these different staging areas wouldn't all need to be operational at the same time. The Contractor will need to work with the TDPD Project Manager to identify suitable locations for these three staging areas;
2. Truck accessible stockpiles – truck accessible stockpiles can be placed at locations where the Wangetti Trail crosses over a vehicle access track that is suitable for 2WD truck access. Given the majority of the access roads throughout the area are probably not suitable for 2WD truck access, the number of these stockpile locations is very limited. These stockpile locations are likely to be located in areas where the trail comes down to lower altitude, for example, closer to the Captain Cook Highway;
3. 4WD accessible stockpiles – 4WD accessible stockpiles can be placed at locations where the Wangetti Trail crosses over a vehicle access track that is suitable for 4WD vehicle access. Given the majority of the access roads throughout the area are more suited to 4WD, the number of these stockpile locations is greater, but they are of limited value as standard 4WD vehicles have limited capabilities for delivery of bulky materials;
4. Helicopter drop-off locations – during ground-truthing fieldwork, clearings were identified as having potential as helicopter drop-off locations were recorded. These helicopter drop-off locations are generally located close to the trail, but should be reviewed by the Contractor for usefulness. While some may appear close to the trail, if they are located steeply downhill from the trail or with dense vegetation between, they may not have much value for material delivery. The ideal scenario is for any materials being delivered by helicopter to be dropped as close as possible to their required location, preferably on a section of completed trail.

Upon commencement, it is recommended that the Contractor review all access roads in the area to determine their suitability for vehicle access and delivery of materials.

As a general rule, no spoil will be required to be stockpiled. The construction of the trail is a balanced cut to fill methodology, requiring no spoil to be stockpiled or removed from site. Any stockpiling that occurs is temporary and very minor in nature and would be undertaken by stockpiling on the cut bench of the trail.

No waste will need to be stockpiled. Generally speaking, there is minimal waste produced during trail construction. Trail builders are responsible for removing all of their own personal waste daily. Construction of structures such as bridges or boardwalks can generate small amounts of waste that need to be removed, but this should ideally be limited through sound design and fabrication processes, so as to limit bringing in surplus or unnecessary materials in the first place.

Stockpiles should not be placed on native vegetation. Ideally, stockpiles are to be located in previously cleared areas, such as on road verges or cleared, completed sections of trail. If this is not possible, the placement of a plastic tarp may be necessary beneath the stockpile. Any stockpiles of soil or fine crushed rock or similar will require the use of sediment control measures to be put in place.

Camp sites – the construction and operation of the campsites will require vehicle access in most cases. While the clearing of vegetation for the campsites should be limited to the smallest possible footprint around the various pieces of infrastructure (i.e. walkways, tent pads, common area/shelter, toilets etc.), a small staging area will need to be cleared for construction purposes. This staging area would be the stockpiling location for all materials required for the construction of the campsites.

8 GLOSSARY OF TERMS

Term	Definition
Australian Standards (AS)	Voluntary documents that set out specifications, procedures and guidelines that aim to ensure products, services and systems are safe, consistent and reliable.
Australian Walking Track Grading Systems (AWTGS)	System used to grade walking trails on a difficulty scale from grades one to five, operating at two distinct tiers: <ol style="list-style-type: none"> 1. Technical grading determined by land manager using set of technical questions based on the AS 2156.1-2001 Walking Tracks – Classification and Signage; 2. Plain English language description to describe the walk to the public.
Bill of Quantities	Detailed statement of work, dimensions and other details for construction of a trail.
Cairns Shire Council	Local Government Authority for Cairns Shire and land manager for some sections of the Wangetti Trail.
Conceptual Design	Plan developed by specialist trail planners based on outcomes of site assessment and discussions, used to illustrate what the trail may look like, address key strategic priorities and provide high-level cost estimates for construction.
Construction Corridor	Total footprint of impact of construction of the trail. Extends from the top of the upslope batter to the toe of the downslope batter and generally has a height of 2 metre from the ground surface.
Construction Environmental Management Plan (CEMP)	Document prepared by the Contractor outlining how they will avoid, minimise or mitigate effects on the environment and surrounding area.
Construction Induction	Meeting held on or off-site with all project staff members (Contractor and others) prior to any construction work commencing. The meeting purpose is to share and discuss specific project information relating to trail construction.
Construction Methodology	Document prepared to provide high-level guidance to construction activities and information for the Contractor to inform the CEMP.
Construction Segment	A smaller component of the overall trail, allowing for ease of inspections, reporting, invoicing, practical completion and staged opening.
Construction Specifications	Document(s) providing relevant details for the work required to be completed in a trail construction project. This includes information such as materials, scope of work, construction process and quality of work.
Contractor	Person or company that undertakes contract to perform trail construction as set out in construction specifications and tender documents.
Department of Innovation and Tourism Industry Development Tourism Development Projects Division (TDPD)	Queensland state government department charged with a goal to build a thriving state economy and make new ideas and diversification a reality in the changing Queensland job market.
Detailed Design	Plan developed by specialist trail planners demonstrating definitive trail lines and construction specifications to enable construction work to be undertaken.
TDPD Project Manager	Responsible for planning, procurement and execution of the project.
Douglas Shire Council	Local Government Authority for Douglas Shire and land manager for some sections of the Wangetti Trail.

Term	Definition
Electric Mountain Bike (e-MTB)	Mountain bikes with a battery-powered “assist” that comes via pedalling.
Fibre Reinforced Plastic (FRP)	Composite material used in trail construction, often as a decking mesh or beam support structure.
Global Positioning System (GPS)	Navigation satellite system that provides geolocation and time information to a GPS receiver.
GHD	Consulting company contracted to prepare Environmental Assessment, Baseline Ecology Report for Wangetti Trail.
Ground-truthing	Process taken to identify, flag and map the exact route in the field for a proposed trail.
Ground-truthed Corridor	Area consisting of the flagged centre line, plus the agreed 20m buffer to either side (i.e. a total corridor width of 40m).
International Mountain Bicycling Association (IMBA)	An organisation for trail advocacy.
Mareeba Shire Council	Local Government Authority for Mareeba Shire and land manager for some sections of the Wangetti Trail.
Matters of National Environmental Significance (MNES)	Nine components of the environment in Australia that are protected under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> .
Matters of State Environmental Significance (MSES)	Certain environmental values that are protected under Queensland legislation.
Mountain Bike (MTB)	A bicycle with a light sturdy frame, broad deep-treaded tyres, and multiple gears, designed for riding on mountainous terrain.
Mountain Bike Australia (MTBA)	The national governing body for mountain biking.
Pre-Start Trail Review (PSTR)	On-site review and inspection of the proposed alignment of the trail, undertaken prior to construction commencing with Contractor and TDPD Project Manager.
Project Location	Proposed Wangetti Trail, extending from Port Douglas to Palm Cove.
Project Scope of Works	Agreed work to be undertaken to successfully complete the project.
Queensland Parks and Wildlife Service (QPWS)	Queensland state government agency within the Department of Environment and Science, charged with managing the parks estate.
Sediment Control Measures	Processes and materials put in place to minimise site disturbance and the potential for erosion.
Tourism Development Projects Division (TDPD)	Division within DITID.
Traditional Owners	Aboriginal people who have ongoing traditional and cultural connections to Country. The Traditional Owners for the Country the proposed Wangetti Trail passes through are the Yirrganydji people.
Trail Difficulty Rating System	System used to grade trails with similar levels of technical difficulty. Trails are graded on width, grade (maximum and average), surface, natural obstacles and Technical Trail Features (TTFs). Other factors such as enclosure and exposure can also influence classification.
Wangetti Trail	Proposed trail of 94km, extending from Port Douglas to Palm Cove.

Term	Definition
Wet Tropics Management Authority	Joint Commonwealth and Queensland governments agency charged with managing the Wet Tropics World Heritage Area according to Australia's obligations under the World Heritage Convention.
Wet Tropics Management Plan	Developed in 1998, it provides the legal framework for management of the Wet Tropics of Queensland World Heritage Area.
Work Health and Safety Management Plan	Document prepared by the principal contractor to assist in managing their workplace health and safety obligations.
Wet Tropics World Heritage Area	An outstanding example of the world's natural or cultural heritage, as determined by the United Nations Educational, Scientific and Cultural Organisation (UNESCO). The Area covers almost 900,000 hectares and extends from Cooktown to Townville.

9 REFERENCES

- Australian Walking Track Grading System, Victorian Government, 2010;
- Australian Mountain Bike Trail Guidelines, Mountain Bike Australia, 2019;
- Australian Standard for Walking Tracks, Part 1: Classification and Signage (AS 2156.1-2001);
- Environmental Assessment Stage 2 Wangetti Trail, Matters of National Environmental Significance SP2 Baseline Ecology Report, GHD, 2019;
- Environmental Assessment Stage 2 Wangetti Trail, Wet Tropics Permit Application, GHD, December 2019;
- Trail Difficulty Rating System, Australian Mountain Bike Trail Guidelines, Mountain Bike Australia, 2019;
- Trail Solutions: IMBA's Guide to Building Sweet Singletrack, International Mountain Bicycling Association, 2004;
- TTMS website: <https://www.ttms.com.au/>;
- Wangetti Trail Concept Plan, World Trail, 2017;
- Wangetti Trail - Detailed Design, World Trail, 2018;
- QPWS Walking Track manual produced in 1980s by Peter Savage.

GHD

8th floor Cairns Corporate Tower 15 Lake Street
PO Box 819

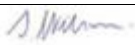
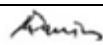
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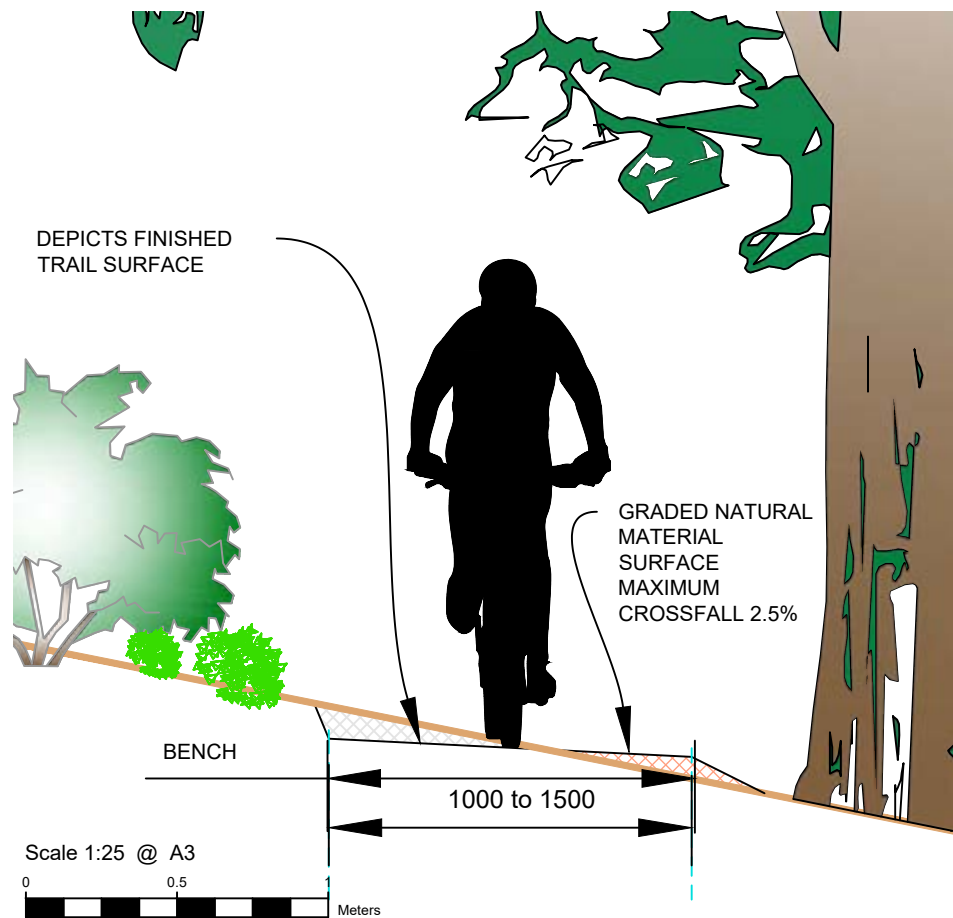
Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	N Schulz/ B Steytler	S Wilson		G Squires		20/1/2021

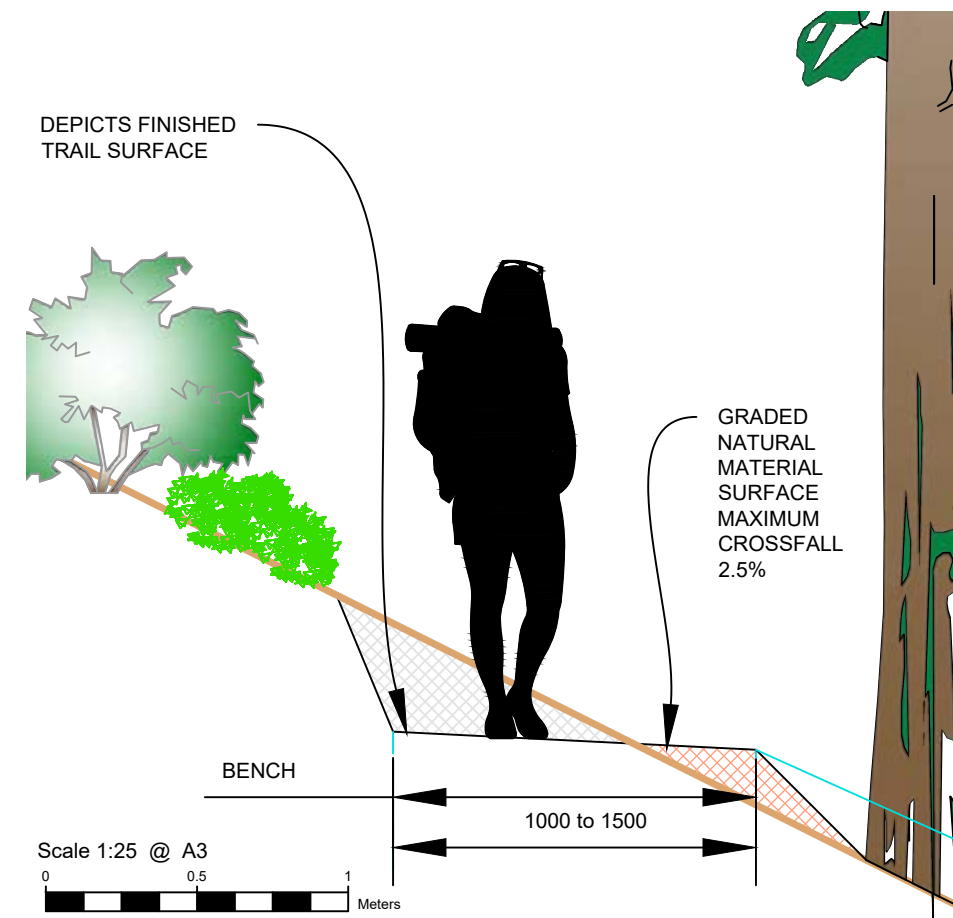
www.ghd.com



Appendix C – Wangetti South Section A Design Drawings



TYPICAL SECTION - 5:1 (20%) CROSS SLOPE
FILL BATTER SLOPE - 2:1



TYPICAL SECTION - 2:1 (50%) CROSS SLOPE
FILL BATTER SLOPE - 1:1

NOTES:

GENERAL:

- The trail will provide access along a slightly modified, natural environment alignment, with little provision of interpretive signage and few facilities.
- Users can expect occasional encounters with others.
- Locate and protect any underground or overhead services prior to commencement of works.
- Trail excavation is to be cut and fill.
- Naturally occurring rock is to be used to protect the uphill cut and the downhill toe where available and appropriate.
- Dimensions in millimetres unless otherwise notated.
- Trail excavation is to be cut and fill.
- Cut batters are at 67.5°. Fill batters are as defined.
- Rocks can be used in the toe of the fill batter to provide additional stabilisation at steeper slopes.
- Rocks and/or plants can be placed (or remain) in the bench area between the Ride & Hike Line and the Fill Batter to guide riders and hikers into the appropriate alignment.
- Cut material will need to be transported along the trail from steeper trail cross slope areas.
- All site clearing is to be restricted to the trail alignment and nominal clearances for cut and fill works.
- Trail layout is to be undertaken using the "Sustainability Guidelines" as defined by the MTBA and as summarised below. More detailed information should be obtained through the MTBA.
- The trail is to be constructed to Class 3 Standard, as defined in AS 2156.1-2001.
- The trail is to be constructed in accordance with the "Blue Square" difficulty rating as defined in the *IMBA - Australia, Trail Difficulty Rating System, 2014, version 2.0*.

NOTES:

MTBA TRAIL SUSTAINABILITY GUIDELINES

THE HALF RULE

- A trail's grade shouldn't exceed half the grade of the hill slope or sideslope that the trail traverses.
- Grades exceeding the half rule may cause water to flow along the trail causing erosion.

THE TEN PERCENT AVERAGE GUIDELINE

- The overall grade of a trail should be 10% or less.
- Some sections may be steeper than 10% and some less steep.
- The ten percent average guideline may need to be adjusted to suit different soil types.

MAXIMUM SUSTAINABLE GRADE

- The maximum sustainable grade is typically 15% to 20% but is dependent on a wide range of factors.
- These factors include soil type, annual rainfall, vegetation and topography constraints and the level of difficulty for users.

GRADE REVERSALS - (see Standard Drawing WTSTD-046-WG2 for details)

- Grade reversals are points at which the trail gradient changes from down to up (or up to down), creating a low point where water is pushed off the trail.
- The more frequent the grade reversals, the smaller the amount of water that needs to cross at each point thereby reducing the potential erosion and the need for drainage infrastructure.

OUTSLOPE

- Outslope is the grading of the trail to a cross slope of 5% following the general slope direction of the local terrain.
- Outsloping enables stormwater to flow across the trail as a sheet rather than as concentrated flow.
- Outslopes will not be appropriate near berms or banked turns or in some loose soil types.

LEGEND:

- AREA OF CUT
- AREA OF FILL
- NATURAL GROUND SURFACE

Rev.	Date	Revision Details	Drn.	Ver.	App.
B	07/04/20	MAJOR LAYOUT & NOTES CHANGES			
A	24/03/20	ISSUED FOR INFORMATION	JR		

Client:



Project:

WANGETTI TRAIL
DETAILED DESIGN

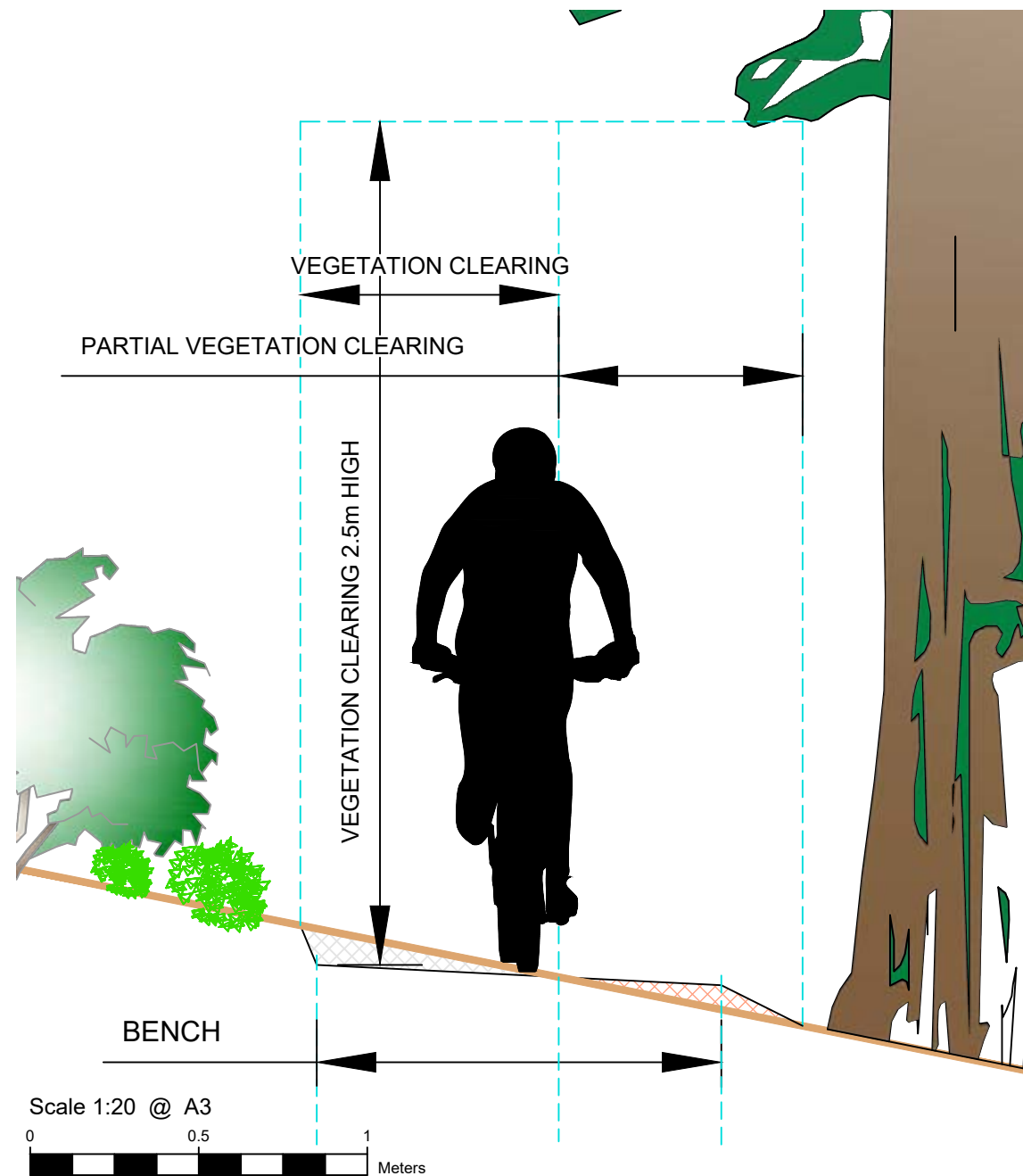
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JR		07/04/20
Designed	Signed	Date
DS		07/04/20
Verified	Signed	Date
DS		07/04/20
Approved	Signed	Date

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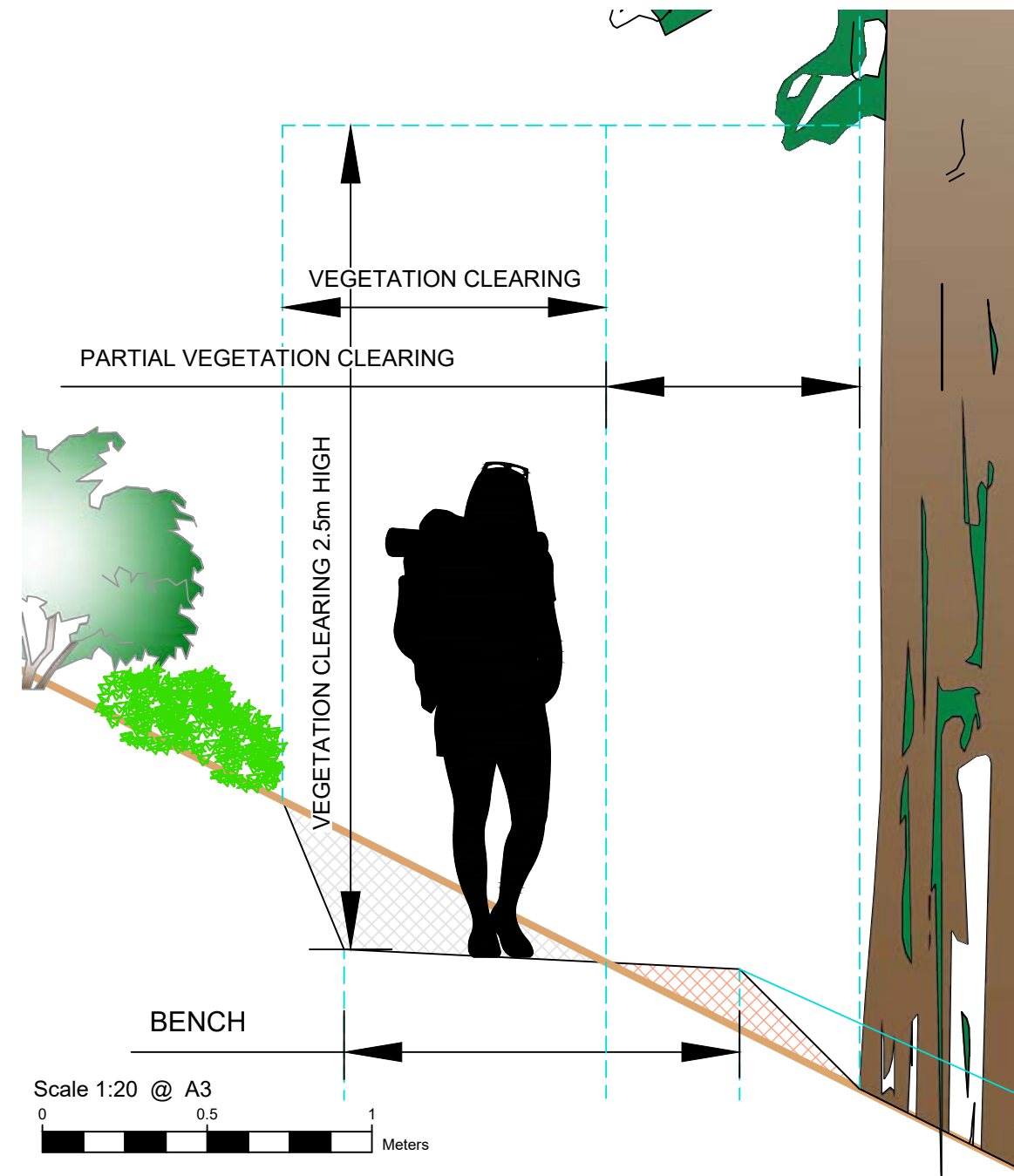
TYPICAL TRAIL BENCHING
STANDARD DRAWING

FOR INFORMATION

Project No.	WT20-Wangetti-001
Scale	1:25
Sheet Size	A3
Drawing No.	WTSTD-001-WG2
Rev.	B



TYPICAL SECTION - 5:1 (20%) CROSS SLOPE
FILL BATTER SLOPE - 2:1



TYPICAL SECTION - 2:1 (50%) CROSS SLOPE
FILL BATTER SLOPE - 1:1

NOTES:

GENERAL:

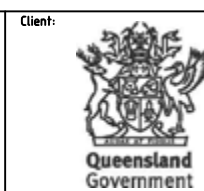
- Vegetation Clearing should be kept to a minimum.
- Vegetation clearing should not be undertaken outside the Areas depicted on this plan unless approved by the Project Principle.
- Vegetation clearing should be undertaken as defined in AS 4970 - 2009 (Incorporating Amendment No. 1).
- No windrows or stockpiles should be created during vegetation clearing.
- Cut vegetation must be scattered into the surrounding environment, without smothering existing vegetation.

CONSTRUCTION ZONES VERSUS TERRAIN SIDE SLOPE				
TERRAIN CROSS SLOPE	BENCH WIDTH	VEG. CLEARING WIDTH	PARTIAL VEG. CLEARING WIDTH	TOTAL IMPACT WIDTH
5:1 (20%)	1-1.5 m	0.77 m	0.72 m	1.49 m
2:1 (50%)	1-1.5 m	0.98 m	0.77 m	1.75 m

LEGEND:

- AREA OF CUT
- AREA OF FILL
- NATURAL GROUND SURFACE

Rev.	Date	Revision Details	Drn.	Ver.	App.
B	07/04/20	CHANGES TO LAYOUT & NOTES	JR	DS	
A	25/03/20	ISSUED FOR INFORMATION	JR	DS	



Project:
**WANGETTI TRAIL
DETAILED DESIGN**

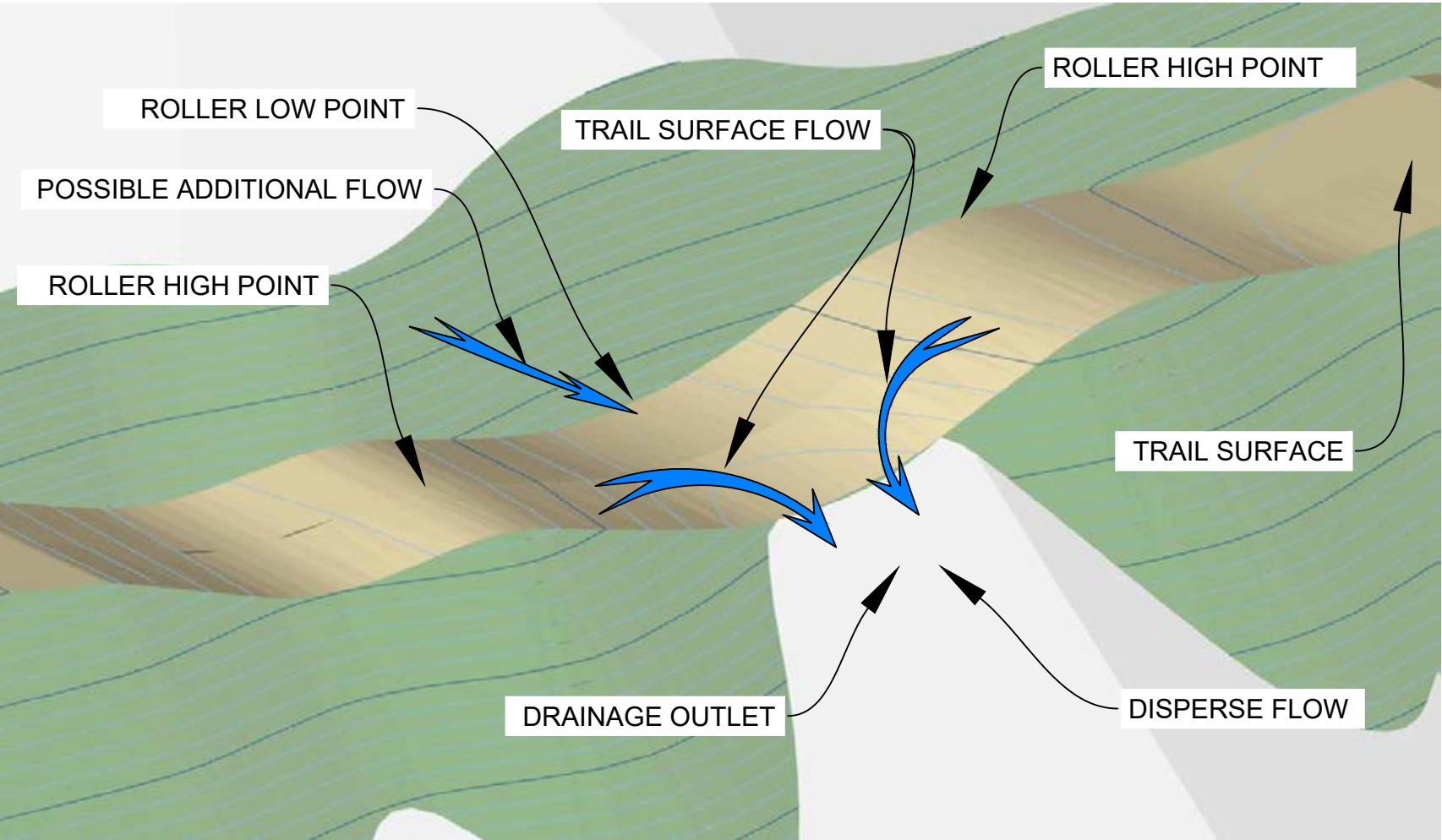
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Designed DS	Signed	Date 07/04/20
Verified DS	Signed	Date 07/04/20
Approved	Signed	Date

Drawing Title:
**VEGETATION CLEARING
STANDARD DRAWING**

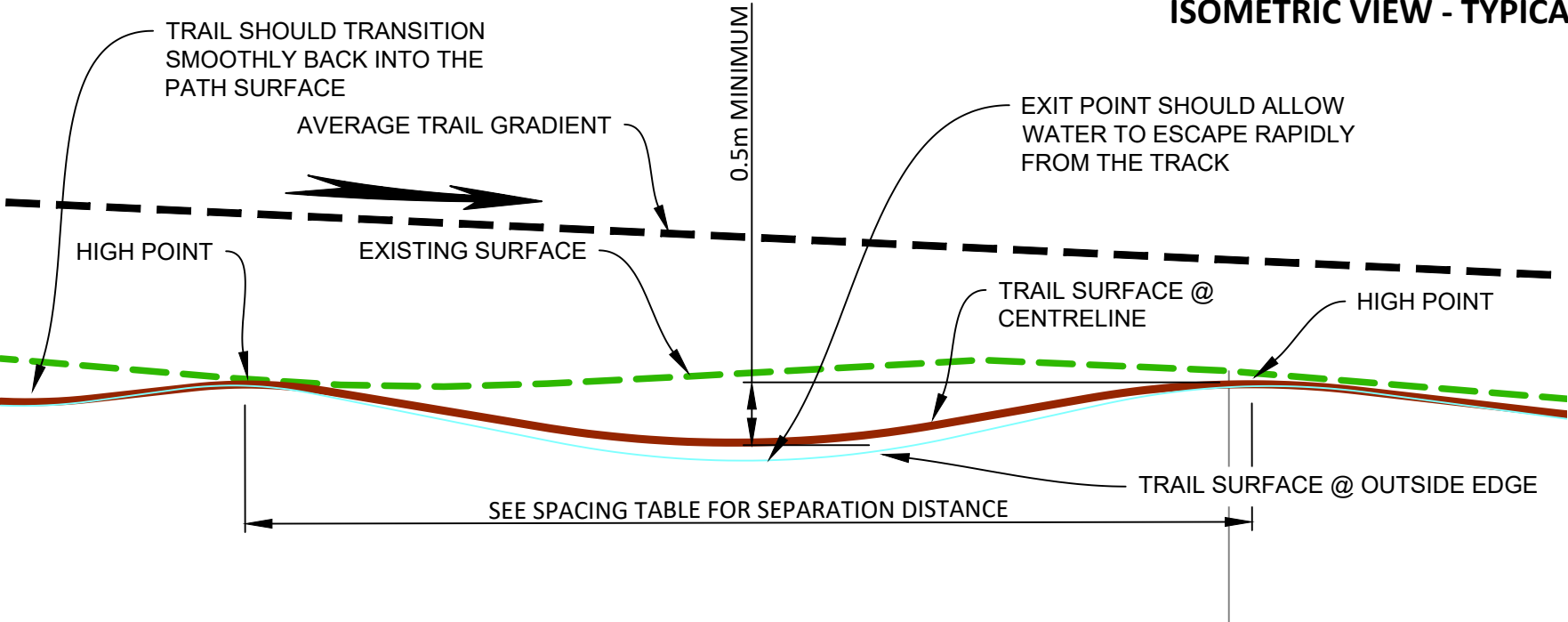
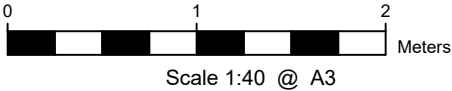
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Drawing No. WTSTD-033-WG2	Rev. B	

NOTES:

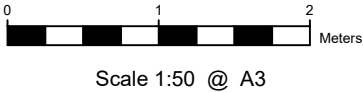
- Grade Reversals can be used on trails for walking, biking or dual use.
- Dimensions and setout of the swale may vary considerably from that depicted, depending on cross slopes, trail gradients and potential stormwater volumes.
- Water should exit the swale at the drainage outlet, ensuring rapid removal of flows from the trail.
- The drainage outlet should disperse water along the contour or across a broad discharge area to reduce velocities and allow for sediment dropout.
- Additional flows may occur from uphill of the grade reversal low point and should be considered in any sizing or erosion protection required.
- Erosion protection, generally using rock, may be required if the location constraints make it difficult to disperse flows.
- Grade reversals should not be confused with waterbars. A grade reversal is one of the most crucial parts in trail construction, both shedding water and also helping to shed speed.
- If a section of trail is on a low gradient with long arc to arcs then the grade reversal is longer and flatter.
- If a section of trail is on a steep gradient with shorter arc to arcs, then the grade reversal needs to be more aggressive, higher and deeper.
- Grade reversals need to be made sustainable and sized correctly to cope with factors like weather, time and riders wear.
- The recommended high point spacing table below provides guidance on these separations.
- Standard grade reversals should always be rollable by both novice and experienced riders.
- Experienced riders should be able to transfer across reverse grades if they are traveling at the necessary pace.
- Grade reversals should not be short, steep and kicky, as this can lead to abrasion, forced risk, injury and a substandard ride experience.
- The grade reversal shape should never force a less experienced rider into the air.
- Contours depicted are at 100mm intervals.



ISOMETRIC VIEW - TYPICAL GRADE REVERSAL @ 8m SPACING



PLAN VIEW - TYPICAL REVERSE GRADE



GENERAL
ARRANGEMENT
SCALE: 1:50

RECOMMENDED REVERSE GRADE SPACING
TABLE

TRAIL GRADIENT (%)	HIGH POINT SPACING (m)
less than 5	20 - 40
5 - 10	16 - 19
10 - 15	12 - 15
15 - 20	8 - 11

A	07/04/20	ISSUED FOR INFORMATION	JR	DS	DS
Rev.	Date	Revision Details	Drn.	Ver.	App.



Project:

WANGETTI TRAIL
DETAILED DESIGN

Drawn	Signed	Date
JR		07/04/20
Designed	Signed	Date
DS		07/04/20
Verified	Signed	Date
DS		07/04/20
Approved	Signed	Date

Drawing Title:

TRAIL GRADE REVERSALS
PLACEMENT AND DIMENSIONS
STANDARD DRAWING

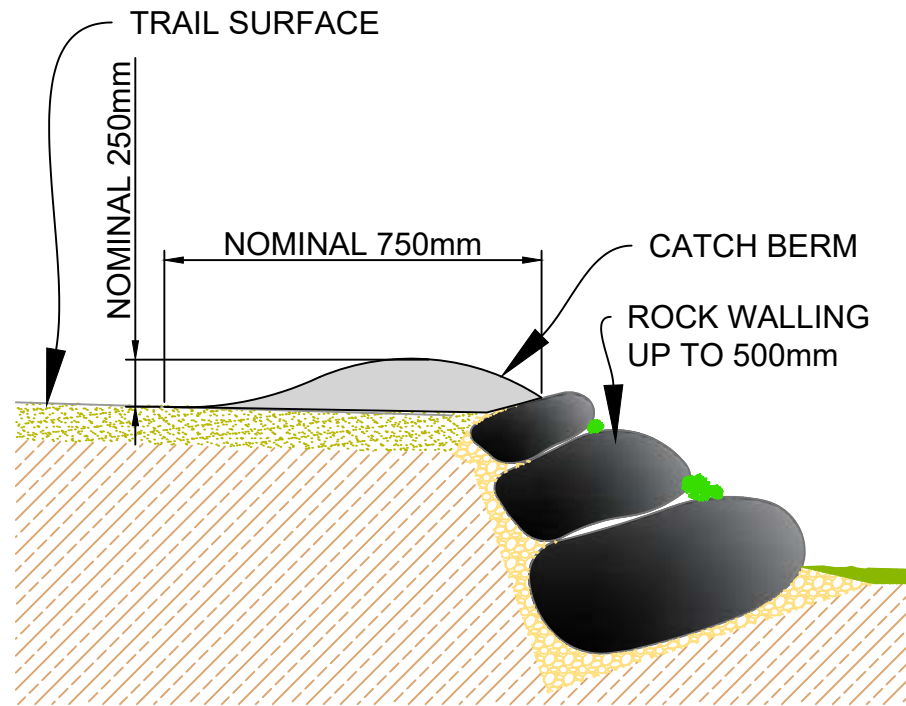
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Scale	1:50
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Drawing No.	WTSTD-046-WG2
Rev.	A

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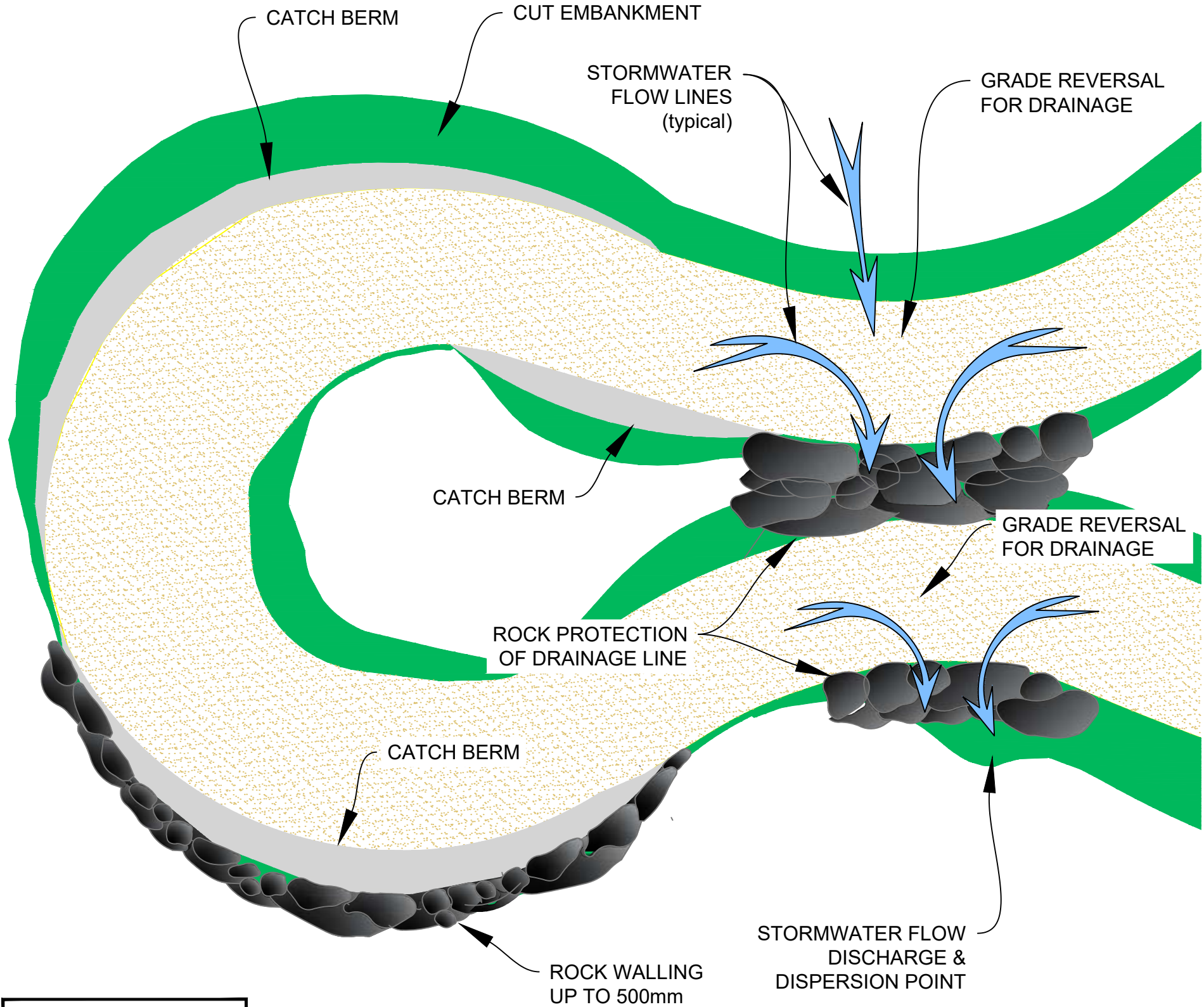
GENERAL:

- The rock walled switchback is for steeper cross slopes where rock retaining is required to provide elevation to downhill trail edges.
- The switchback depicted is indicative only and large variations in shape and dimensions are expected due to the large variations in the topography and hydrology of switchback locations along a trail.
- This switchback is most suitable for cross slopes of 20% to 33%.
- Rock Walling will be 500mm or less in height. Refer to WTSTD-034-WG2 for details of rock wall installation.
- Embankment "Cut" sidewalls should not exceed 1.5m in height.
- Trail gradients through the switchback should comply with the general trail construction requirements.
- Trail widening will be required around the arc of the switchback with between 400mm & 700mm wider than the standard trail width common.
- Radii of inside trail edge in the switchback may vary from 0.8m to 4m around the asymmetric arc.
- See details below for "Catch Berms" that are located at strategic locations to provide a riding edge to direct the ride line.
- The Catch Berms are constructed of well compacted trail wear surface material.
- The drainage outlet should disperse water along the contour or across a broad discharge area to reduce velocities and allow for sediment dropout.
- Additional flows may occur from uphill of the switchback low point and should be considered in any sizing or erosion protection required.
- Erosion protection downstream of the outlet, generally using rock, may be required if the location constraints make it difficult to disperse flows.



CATCH BERM & ROCK WALL - SECTION VIEW

0 0.4 0.8 Meters Scale 1:20 @ A3



ROCK WALL SWITCHBACK - PLAN VIEW

GENERAL ARRANGEMENT AS SHOWN

0 1 2 Meters Scale 1:50 @ A3

ISSUED FOR CLIENT REVIEW	
APPROVED	<input type="checkbox"/>
APPROVED AS NOTED	<input type="checkbox"/>
NOT APPROVED	<input type="checkbox"/>
SIGNED.....	DATE.....

A	07/04/20	ISSUED FOR INFORMATION	JR	DS	DS
Rev.	Date	Revision Details	Drn.	Ver.	App.



Project: WANGETTI TRAIL DETAILED DESIGN

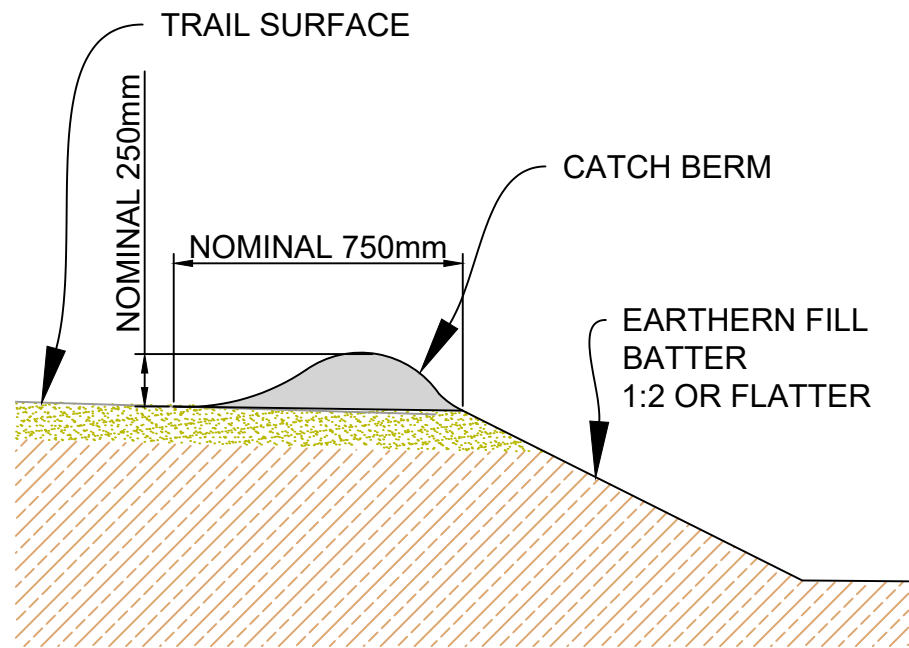
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DS		07/04/20
Approved	Signed	Date

Drawing Title: ROCK WALLED SWITCHBACK PLACEMENT AND DIMENSIONS STANDARD DRAWING

FOR INFORMATION	
Project No.	WT20-Wangetti-001
Scale	AS SHOWN
Sheet Size	A3
Drawing No.	WTSTD-047-WG2
Rev.	A

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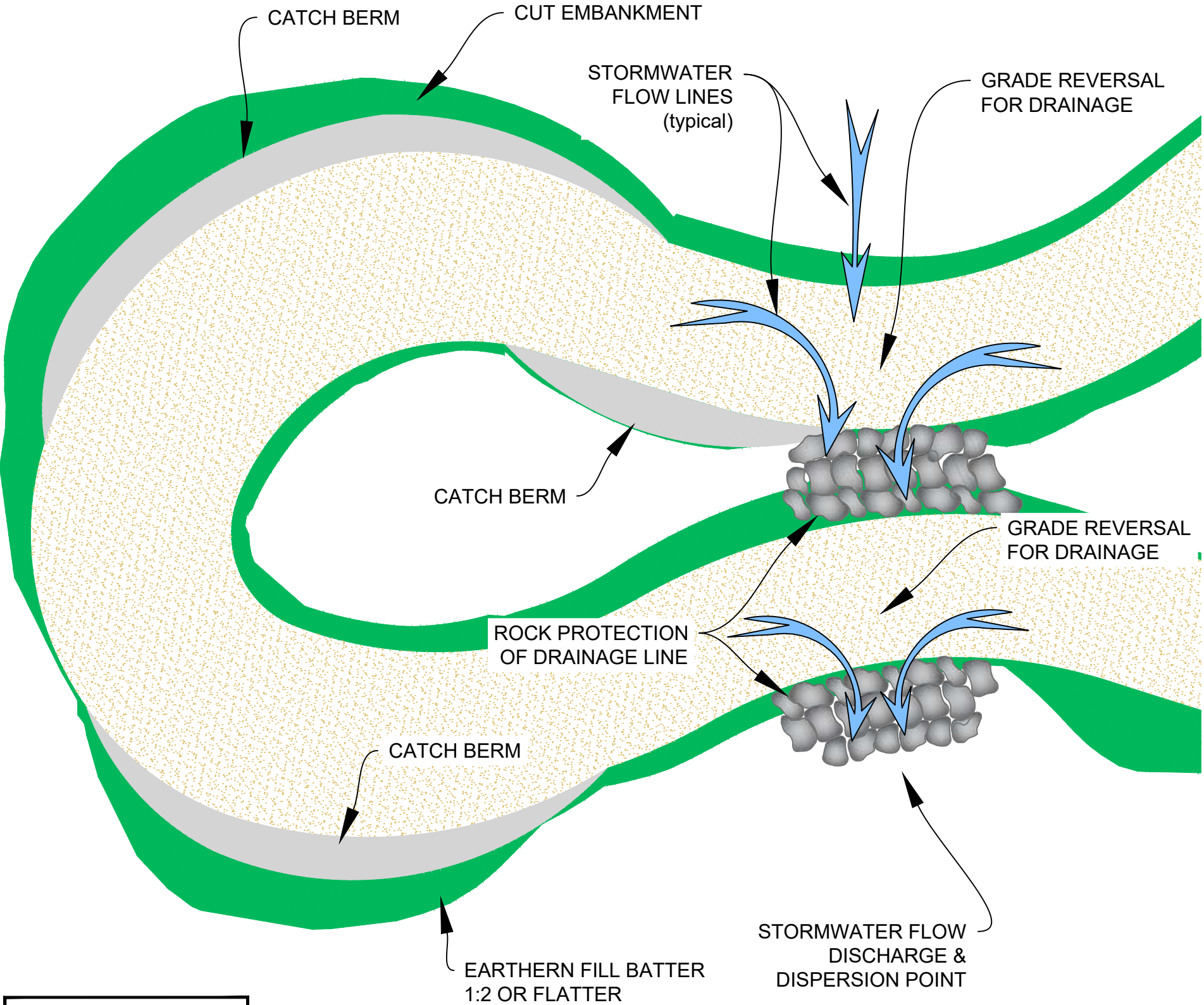
- GENERAL:
- The standard switchback is for flatter cross slopes where earthen batters are sufficient to provide elevation to downhill trail edges.
 - The switchback depicted is indicative only and large variations in shape and dimensions are expected due to the large variations in the topography and hydrology of switchback locations along a trail.
 - This switchback is most suitable for cross slopes flatter than 25%.
 - Embankment fill batters vary from 25% to 50%. Any fill batters steeper than 50% may require structural support and erosion protection depending on the fill material used.
 - Embankment "Cut" sidewalls should not exceed 1.5m in height.
 - Trail gradients through the switchback should comply with the general trail construction requirements.
 - Trail widening will be required around the arc of the switchback with between 400mm & 700mm wider than the standard trail width common.
 - Radii of inside trail edge in the switchback may vary from 0.8m to 4m around the asymmetric arc.
 - See details below for "Catch Berms" that are located at strategic locations to provide a riding edge to direct the ride line.
 - The Catch Berms are constructed of well compacted trail wear surface material.
 - The drainage outlet should disperse water along the contour or across a broad discharge area to reduce velocities and allow for sediment dropout.
 - Additional flows may occur from uphill of the switchback low point and should be considered in any sizing or erosion protection required.
 - Erosion protection downstream of the outlet, generally using rock, may be required if the location constraints make it difficult to disperse flows.



CATCH BERM & FILL BATTER - SECTION VIEW

0 0.4 0.8 Meters Scale 1:20 @ A3

ISSUED FOR CLIENT REVIEW	
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APPROVED AS NOTED	<input type="checkbox"/>
NOT APPROVED	<input type="checkbox"/>
SIGNED.....	DATE.....



STANDARD SWITCHBACK - PLAN VIEW

GENERAL ARRANGEMENT AS SHOWN

0 1 2 Meters Scale 1:50 @ A3

A	07/04/20	ISSUED FOR INFORMATION	JR	DS	DS
Rev.	Date	Revision Details	Drn.	Ver.	App.



Project: WANGETTI TRAIL DETAILED DESIGN

Drawn	Signed	Date
JR		07/04/20
Designed	Signed	Date
DS		07/04/20
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DS		07/04/20
Approved	Signed	Date

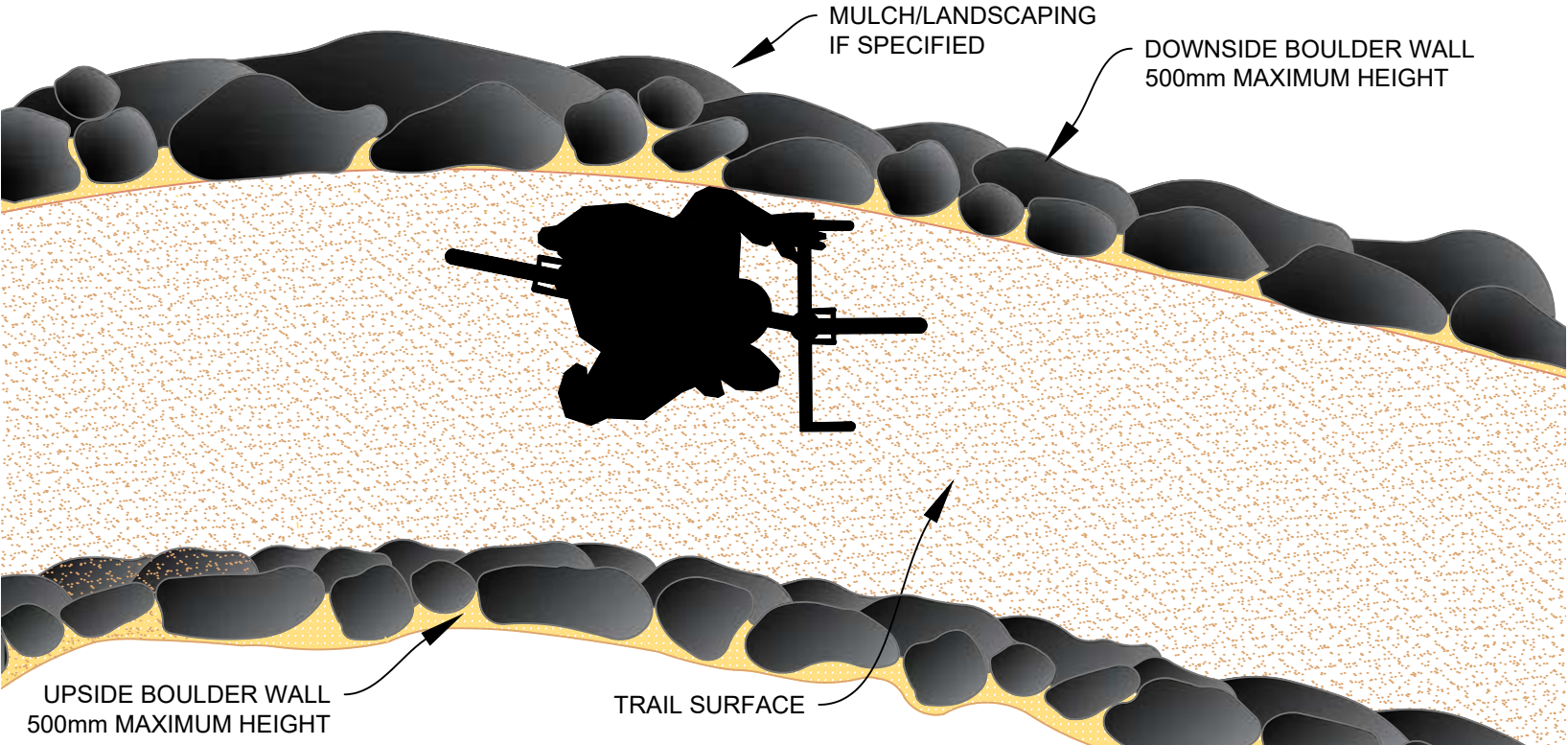
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FOR INFORMATION	
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Scale	AS SHOWN
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Drawing No.	WTSTD-048-WG2
Rev.	A

NOTES:

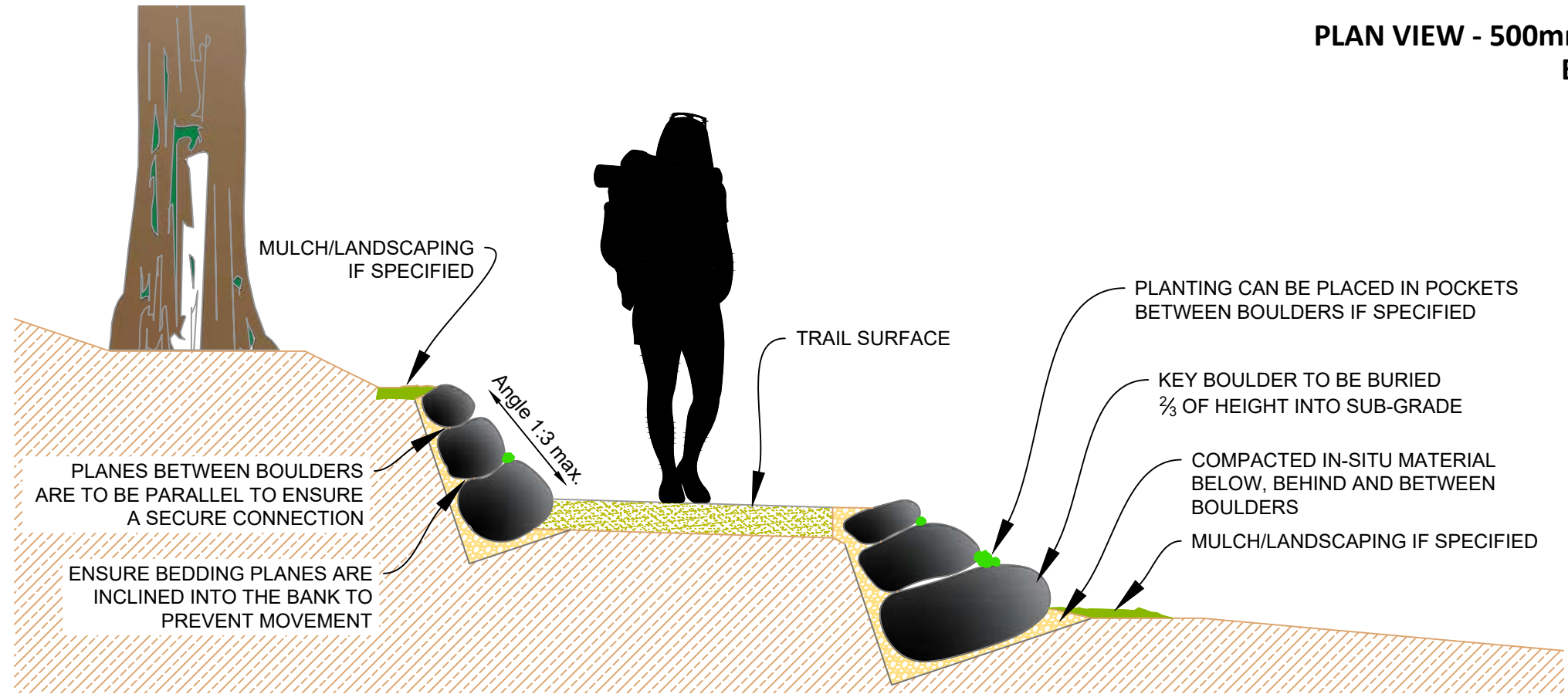
GENERAL:

- Boulders used for the retention wall to be a minimum size of 300mm * 300mm * 300mm.
- The approved boulder type used to form the wall shall be of one consistent type. Typically Granite, Sandstone, Volcanic Red Rock, Phorphyry or other Natural BushRock Boulders unless specified otherwise.
- Boulders as specified with the best and most natural surfaces exposed.
- Sharp / Angled edges are not acceptable.
- Boulder wall to be constructed by an experienced contractor and must not exceed 500mm in height.
- Refer to Standard Drawing WTSTD-004-WG2 for locations where the rock wall needs to be over 500mm.
- Fill used under, behind and between boulders to be in-situ material or equivalent approved material.
- In-situ material is to be compacted to 90% Modified Maximum Dry Density to AS1289.5.4.1.
- This plan depicts boulder walls on both the upside and downside of the track. In many locations only the upside or the downside walls will be required. This plan is meant to be used for the construction of one or the other or both types of retention depending on the local topography.



PLAN VIEW - 500mm BOULDER RETAINING WALL
BOTH SIDES

Scale 1:25 @ A3



LEGEND:

- TRAIL SURFACE
- SELECT FILL
- NATURAL GROUND

ISSUED FOR CLIENT REVIEW

APPROVED	<input type="checkbox"/>
APPROVED AS NOTED	<input type="checkbox"/>
NOT APPROVED	<input type="checkbox"/>
SIGNED..... DATE.....	

TYPICAL SECTION - 500mm BOULDER RETAINING WALL
BOTH SIDES

GENERAL
ARRANGEMENT
SCALE 1:25

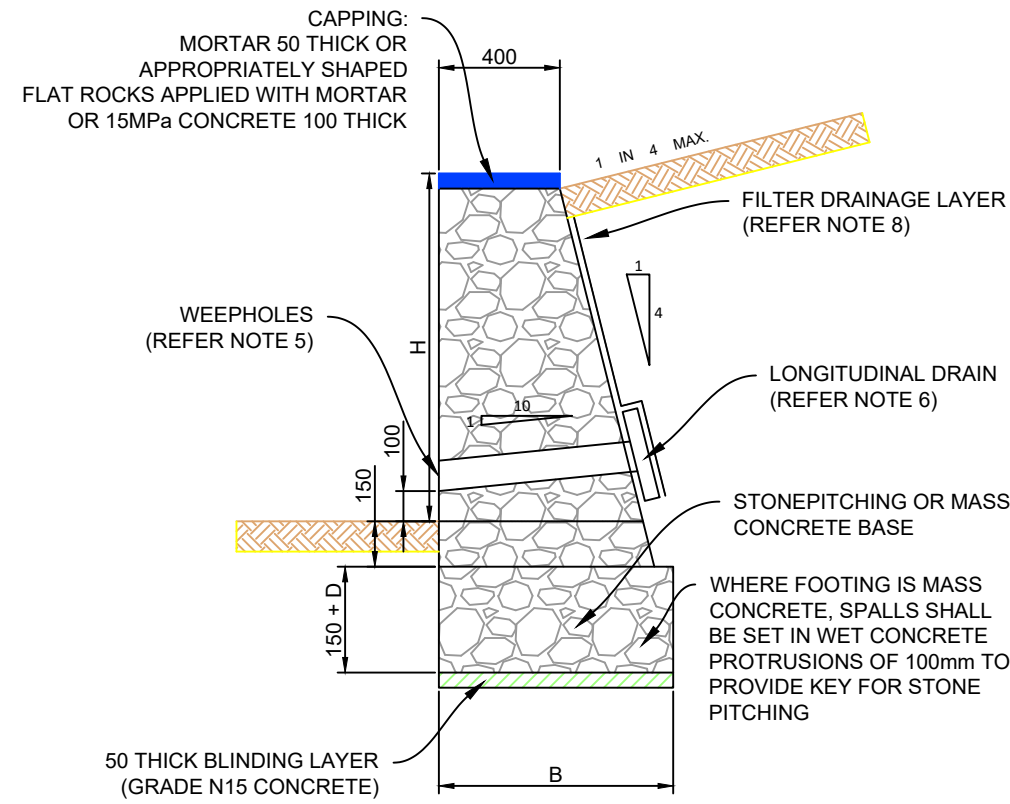
FOR INFORMATION

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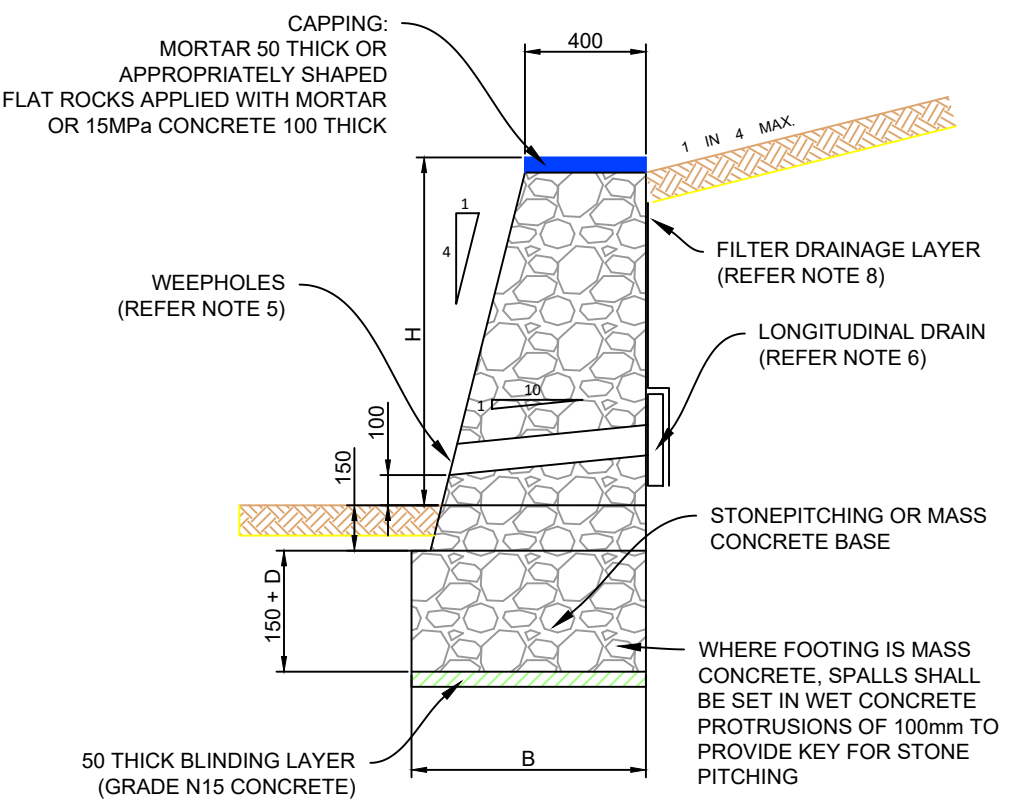
NOTES:

- The wall dimensions shown assume a minimum allowable bearing capacity of 100 KPa is available on site.
- Mortar to be 1 part cement to 3 parts sand (by volume). Face joints to be 25mm nominal width.
- Rocks to be selected spalls set in cement mortar beds in horizontal layers. Unless specified otherwise open faced stonepitching to be used where the concrete is recessed 50mm behind the stone facing. If closed face stonepitching is specified, concrete to be flush with stone facing. Select spalls to avoid sharp edges.
- The standard building regulation 1993 requires that a building application be lodged for earth retaining structures >1000mm high. A geotechnical assessment by a suitably qualified engineer is required for all walls founded in poor materials eg. bearing capacity <100 KPa.
- Install weepholes in addition to the longitudinal drain for maintenance and overflow purposes. Weepholes to be 100mm dia upvc at 1000mm max centres, positioned at approx 100mm constant height above ultimate ground level and connected to the longitudinal drain using standard manufacturers fittings.
- Longitudinal drain shall be 300mm * 50mm megaflow or 100mm dia corrugated perforated polyethylene pipe, encased with geofabric (BIDIM A29 or equivalent). The invert of the longitudinal drain and the weephole inlet shall be aligned to allow direct discharge via the weephole.
- All connection, including the joining of lengths of megaflow or corrugated perforated polyethylene pipe, shall be made using standard manufacturers fittings.
- Filter drainage layer for full height and length of wall to be Cordrain or equivalent with Geofabric (BIDIM A29 or equivalent) adhered to both sides. Alternately, a 300mm thick, free draining filter sand/gravel layer separated from insitu material by a type 2 geofabric layer.
- Backfill shall be freedraining, non plastic predominantly granular material with minimum friction angles of 38° and 27° where founding materials are sand or other materials respectively. Do not place backfill behind the wall until at least 10 days after wall construction.
- The 50mm blinding layer can be replaced with a 200 micron IR2 polyethylene sheet when the bottom off the footing excavation is in stable sound material.
- Drawings are not to scale.
- Dimensions in millimetres unless otherwise notated.

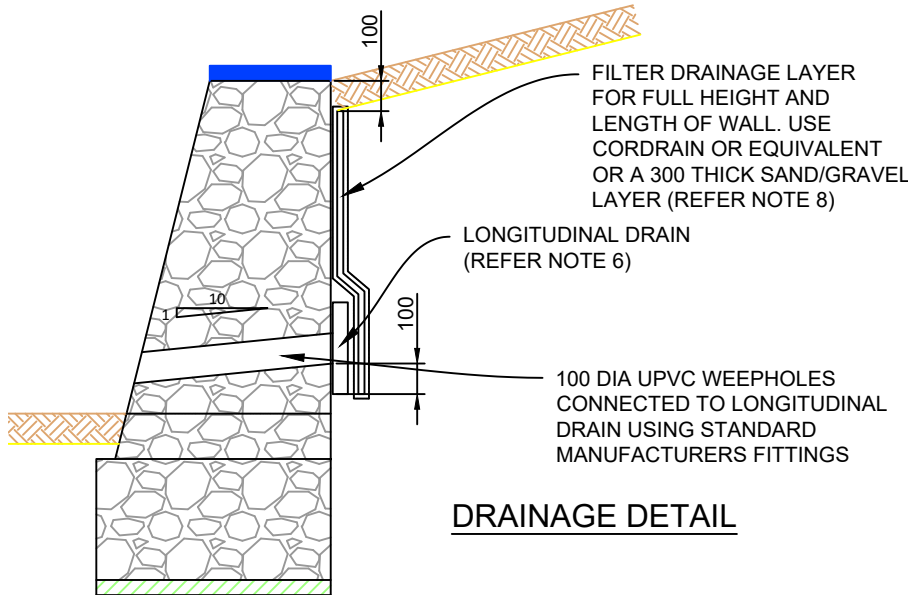
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NOT APPROVED	<input type="checkbox"/>
SIGNED..... DATE.....	



STONEPITCHED RETAINING WALL
VERTICAL FACE
UNSTABLE INSITU MATERIAL RETAINED



STONEPITCHED RETAINING WALL
4 IN 1 FACE SLOPE
UNSTABLE INSITU MATERIAL RETAINED

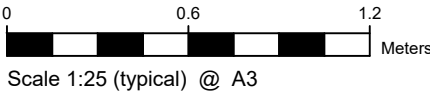


DRAINAGE DETAIL

GENERAL
ARRANGEMENT
SCALE 1:25

WALL DIMENSIONS

SLOPING BACKFILL - 1 IN 4 (MAX) OR LEVEL WITH 5 kPa SURCHARGE		
H	B	D
0 - 400	600	0
401 - 750	660	0
751 - 1000	775	200



Rev.	Date	Revision Details	Drn.	Ver.	App.
A	24/03/20	ISSUED FOR INFORMATION	JR	MB	DS



Project:
WANGETTI TRAIL
DETAILED DESIGN

Drawn JR	Signed	Date 24/03/20
Designed DS	Signed	Date 24/03/20
Verified DS	Signed	Date 24/03/20
Approved	Signed	Date

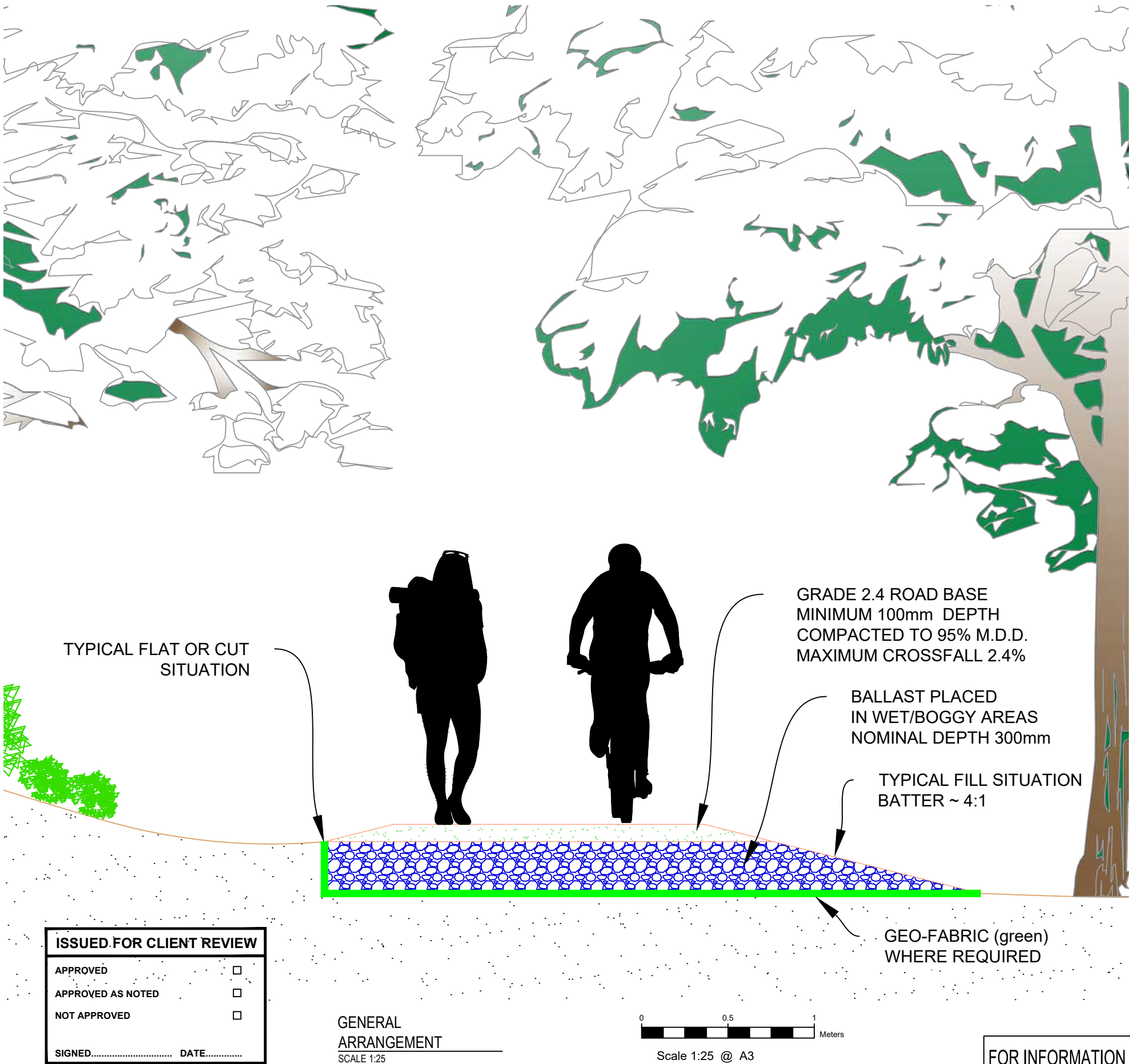
Drawing Title:
ROCK RETAINING WALL UP TO 1000mm
PLACEMENT AND DIMENSIONS
STANDARD DRAWING

FOR INFORMATION	
Project No. WT20-Wangetti-001	Sheet Size A3
Scale 1:25	Rev. A
Drawing No. WTSTD-004-WG2	

NOTES:

- GENERAL:
- Dual direction (two way) trail.
 - Dual use trail for walking and biking.
 - The trail will provide access along a slightly modified, natural environment alignment, with little provision of interpretive signage and few facilities.
 - Ballast surfacing is to be used in wet & boggy locations to provide a solid platform for the trail wearing course layer.
 - Ballast is to be placed in such a way that it does not severely impede local stormwater flows.
 - Locations where the placement of Ballast might impede the natural connectivity of fauna corridors should be identified and remediation infrastructure such as pipes or sections of boulder crossing implemented in a way that will mitigate the blockage.
 - Dimensions in millimetres unless otherwise notated.

- BALLAST PLACEMENT:
- Ballast shall be clean, durable crushed rock with a size distribution of 13mm to 63mm. The majority of particles shall be greater than 37.5mm in size.
 - The Ballast rock shall be hard, non - flaky material with a Bulk Density greater than 1200 Kg/m³ and a Particle Density of greater than 2500 Kg/m³.
 - The nominal depth of 300mm depicted may vary considerably, depending on the depth of unsuitable sub-grade material at each location.
 - Trail width may increase from the general width in the sections with Ballast Surfacing. This is to allow additional shoulder width for trail users through these unsuitable locations.
 - The width of the Ballast may extend up to 3m in particularly boggy areas to provide a stable platform for trail construction.
 - Geofabric underlay of a suitable class may be required under the Ballast to minimise the intrusion of unsuitable material up into the Ballast embankment.
 - Ballast should be compacted using wheel or track rolling, until the particles are firmly meshed and void spaces are minimised.
 - In extreme locations and where low velocity water flows are possible, Geo-Fabric of a suitable class may also be required on top of the Ballast and under the Trail wearing course layer. In these locations the wearing course layer thickness may need to be increased to 150mm or 200mm.



A	07/04/20	ISSUED FOR INFORMATION	JR	DS	DS
Rev.	Date	Revision Details	Drn.	Ver.	App.



Project:

WANGETTI TRAIL
DETAILED DESIGN

Drawn	Signed	Date
JR		07/04/20
Designed	Signed	Date
DS		07/04/20
Verified	Signed	Date
DS		07/04/20
Approved	Signed	Date

Drawing Title:

BALLAST SURFACING
PLACEMENT AND DIMENSIONS
STANDARD DRAWING

FOR INFORMATION		
Project No. WT20-Wangetti-001		
Scale 1:25	Sheet Size A3	
Drawing No. WTSTD-045-WG2	Rev. A	

NOTES:

STEP TREADS:

- Step treads are to be supplied by the Paving Group Pty Ltd trading as Stone Directions or equivalent treads as approved by the client or project principle.
- Step treads are precast from a 4:1 white Portland cement mix using screened crushed granite, high grade quartz/sandstone washed sand and fibre reinforcing.
- Steps meets around 55MPa material strength.
- Step treads are available in 4 widths: 1500mm, 1200mm, 900mm & 600mm.
- Other dimensions are as depicted on this plan and include a 50mm overlap between treads.
- In accordance with AS 2156.2 - 2001 Table 4, a Class 3 Walking Track can include up to 36 steps in a row before a landing is required.
- Landings will be a minimum of 900mm in length.
- The specifications of the precast concrete steps depicted in this drawing result in an overall slope/gradient of 28°.
- In some locations, ground conditions may not be conducive to this preset slope. Three options can be considered in these circumstances:
 1. Using hand tools, excavate the insitu ground to form the required slope.
 2. Import and compact suitable road base to form the ideal slope.
 3. Use landings (of varying lengths) to suit the existing slope of the work area.

HANDLING:

- Step treads should be handled using techniques appropriate to the item weight. See the adjacent table for approx. tread weights.
- Treads should be handled in a manner that minimizes the risk of cracking or fracture as treads must be undamaged or weakened before track use.

SITE FOUNDATION MATERIALS:

- The foundation materials on which the stairway is to be constructed must be carefully assessed for foundation rigidity.
- If foundation material conditions are not obvious or the site includes dangerous fall conditions a geotechnical analysisof the foundation materials should be undertaken.
- The foundation materials need to be assessed as to whether they are "Unstable or Sandy" or "Stable".
- Placement methodologies vary depending on this classification.

PLACEMENT:

UNSTABLE or SANDY FOUNDATION MATERIALS:

- The first step must be laid on a concrete slab footing of minimum 75mm depth.
- Concrete is to be minimum 15 MPa which allows the use of post mix or rapid set premix concrete.
- This slab footing must be a minimum of the length and breadth of the precast tread unit.
- The tread unit should be laid level apart from a slight fall to the

- front on the footing using 10 to 15mm of 4:1 mortar mix.
- Additional tread units should be laid with a 50mm overlap over the previous tread and with either another slab footing the size of the tread or at a minimum a strip footing along the sides and back of the tread.
- The strip footing should be a minimum of 100mm wide by 75 mm deep.
- The additional tread should again be laid on a 10 to 15mm mortar bed and levelled to provide a slight fall to the front of around 10mm.
- More additional treads can be added using a similar methodology.
- All slab and strip footings should be laid in an excavation or bounded with suitable rocks or local material to ensure concrete overflow does not impede backfill against the finished stairway using soils or rock protection.

STABLE FOUNDATION MATERIALS:

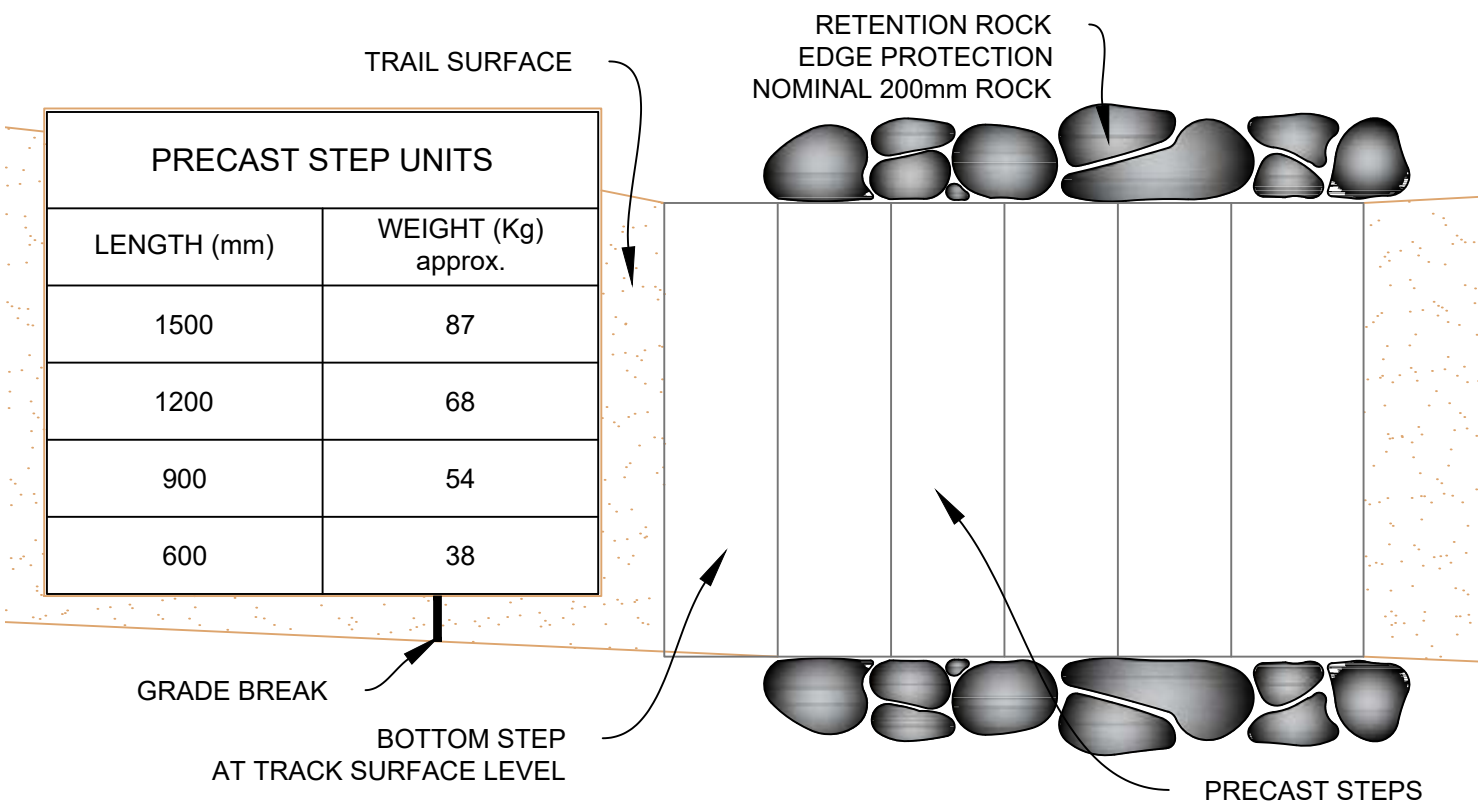
- Treads may be laid directly onto hard stable surfaces (eg shale or granite type materials) plumbed and leveled using a 4:1 mortar mix.
- Treads may be laid directly onto a well compacted 75mm layer of good quality road base again using a 4:1 mortar mix.
- The road base must be contained within an excavation or by appropriate retention rocks to facilitate compaction.
- Where this containment is not possible a concrete slab footing must be used particularly on the bottom tread.
- The contained road base or concrete footing must be at least the full size of the tread.
- Additional treads can be laid on well compacted road base using 10-15mm 4:1 mortar mix with a 50mm overlap over the previous tread.

GENERAL PLACEMENT

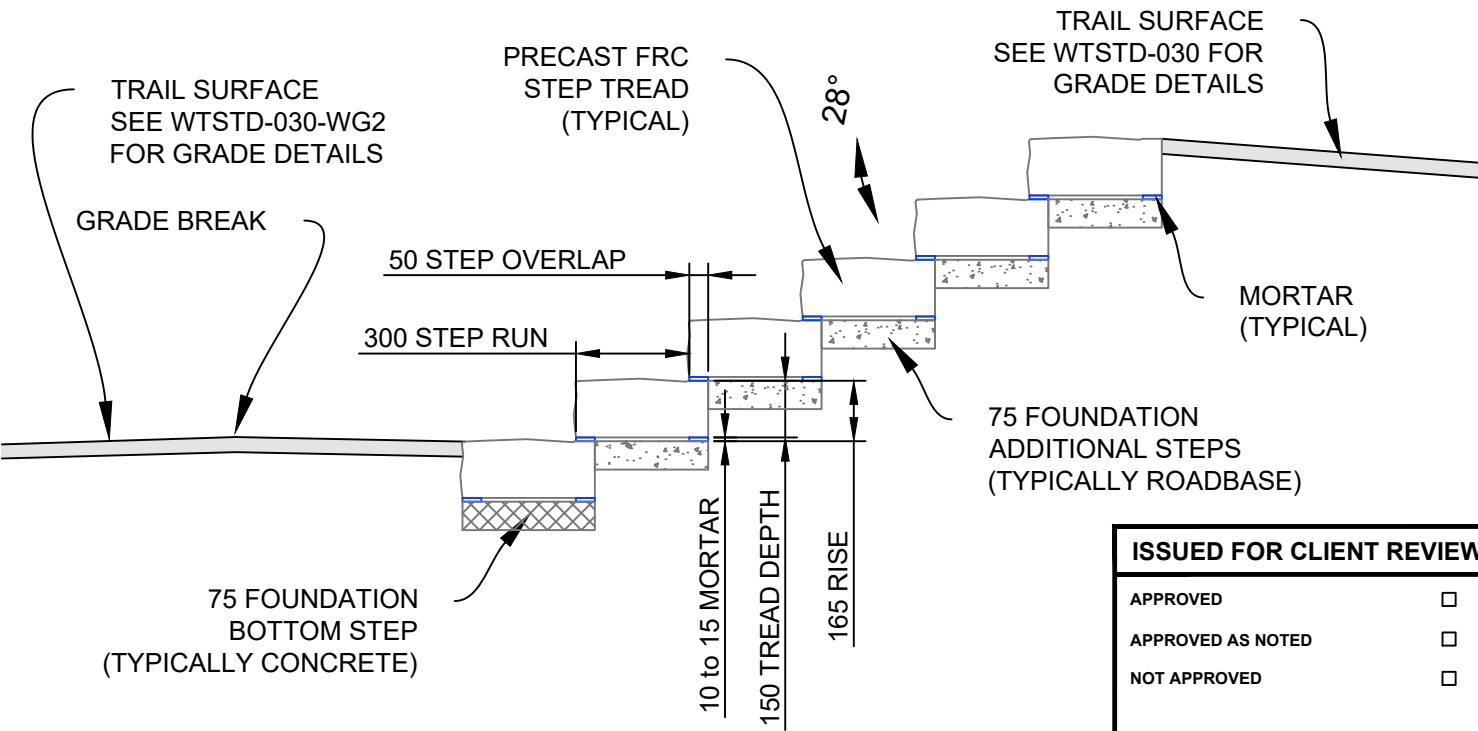
- The mortar mix should be continuous around the bottom edge of the tread unit with some mortar will overflow up and into the hollow part of the tread unit to assist in holding the tread in place.
- The mortar mix must be placed on solid material with all flaky or loose material removed to ensure good bonding.
- The treads are designed to have a 300mm run and a 165mm rise. The mortar depth is critical in achieving this run/rise ratio.
- Additional side support to ensure the treads remain in place can be provided through backfill against the sides using soils or retention rock.
- Retention rock should be used in areas where water flows are likely to occur. Retention rock can be bound in place using a 4:1 mortar mix.
- Step treads are supplied with 3 pattern styles. Ensure styles are mixed and matched to avoid any obvious symmetry and maximize a "natural look".
- Dimensions in millimetres unless otherwise notated.

TRAIL ALIGNMENT

- See WTSTD-030-WG2 for details on trail grading requirements above, below & at landings between stair sections.

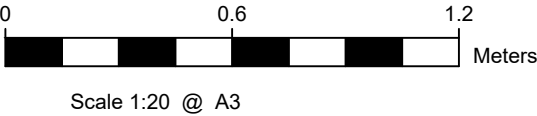


TYPICAL PLAN VIEW - PRECAST STEPS WITH RETENTION ROCK



TYPICAL SECTION PRECAST STEPS - 5 STEP EXAMPLE

GENERAL ARRANGEMENT
SCALE 1:20



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Rev.	Date	Revision Details	Drn.	Ver.	App.
E	07/04/20	TRAIL GRADE & BOTTOM STEP ALTERED	JR	DS	DS
D	14/08/19	ADDITIONAL NOTES ADDED	JR	DS	DS
C	07/08/19	RETENTION ROCK PLAN VIEW ADDED	JR	DS	DS
B	17/12/18	ADDITIONAL NOTES ADDED	JR	DS	DS
A	22/11/18	ISSUED FOR INFORMATION	JR	DS	DS



Client:	
Project:	
WANGETTI TRAIL DETAILED DESIGN	

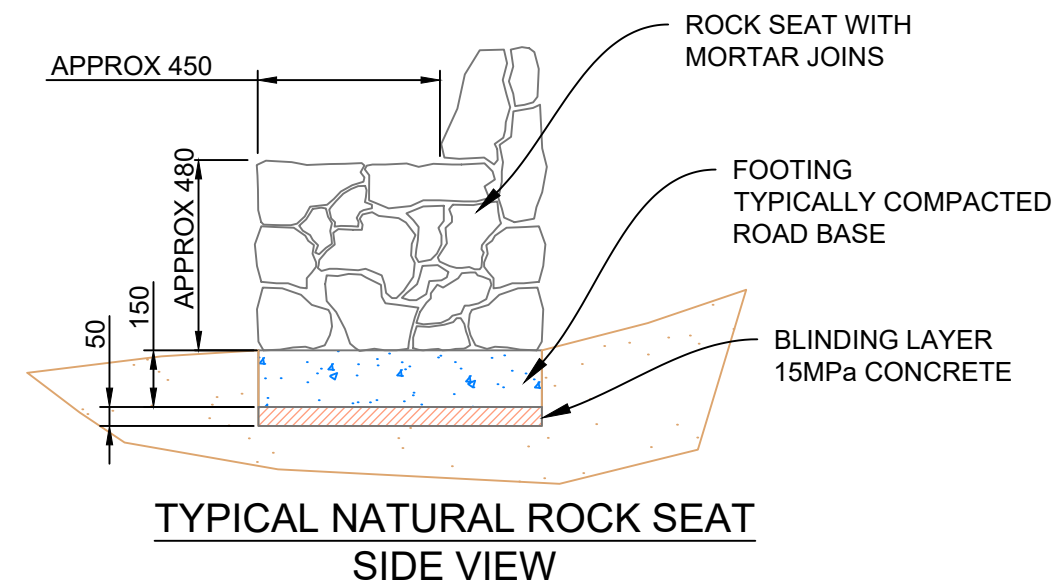
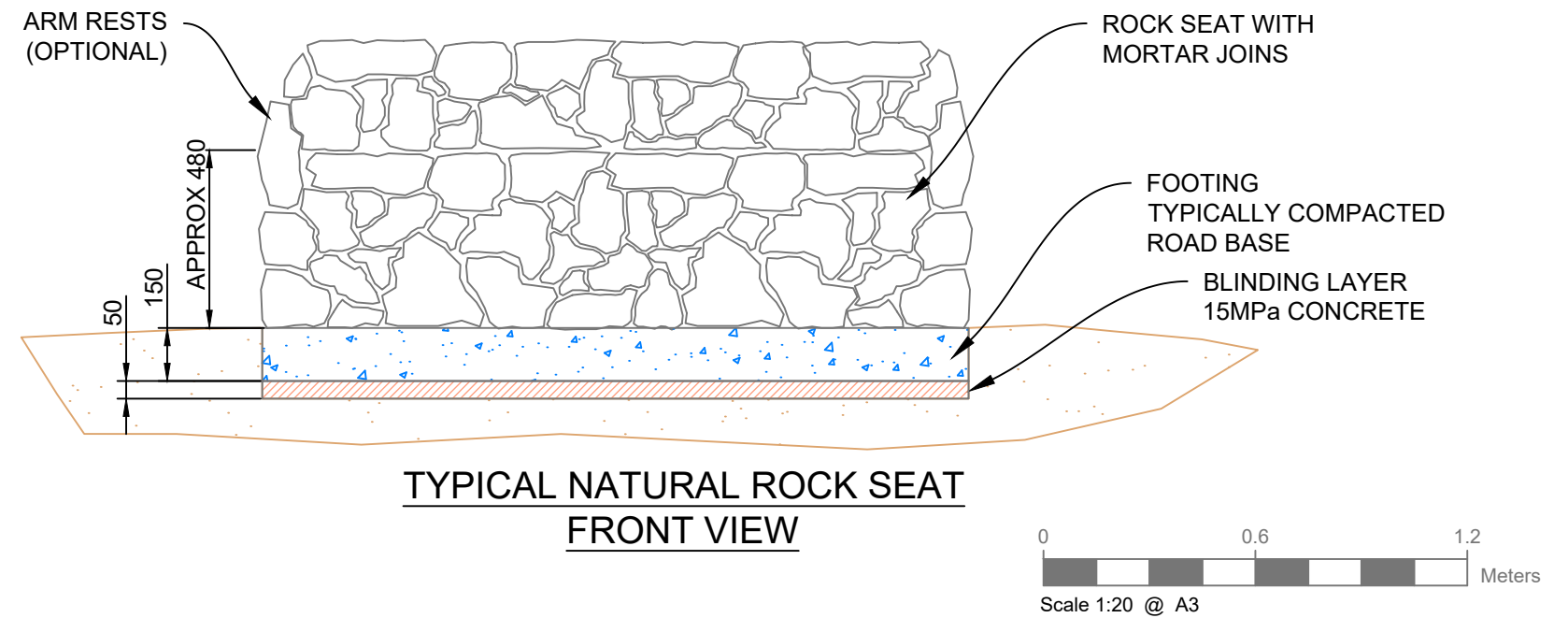
Drawn JR	Signed	Date 07/04/20
Designed DS	Signed	Date 07/04/20
Verified DS	Signed	Date 07/04/20
Approved	Signed	Date

Drawing Title:	
PRECAST CONCRETE STEPS PLACEMENT AND DIMENSIONS STANDARD DRAWING	

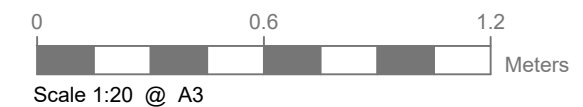
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Project No. WT20-Wangetti-001	
Scale 1:20	Sheet Size A3
Drawing No. WTSTD-003-WG2	Rev. E

NOTES:

- The seat design depicted is a single seat layout that represents a whole range of possible configurations.
- Seats may in a line, curved, built into a retaining wall and can be anywhere from 1 to many metres in length.
- Seats may have a back rest as depicted or may be constructed as a bench with no backrest at all. When associated with a retaining wall, the wall can become the backrest.
- Rock used for seat construction must be of an appropriate shape, texture and colour to match the native rock and must provide a natural appearance relative to its location .
- Mortar to be 1 part cement to 3 parts sand (by volume). Face joints to be 25mm nominal width.
- Rocks to be selected spalls set in cement mortar beds in horizontal layers. Unless specified otherwise open faced stone pitching to be used where the concrete is recessed 50mm behind the stone facing. If closed face stonepitching is specified, concrete to be flush with stone facing. Select spalls to avoid sharp edges.
- Where the seat is associated with a retaining wall it must not impede the drainage system constructed behind and through the wall.
- Weepholes from the retaining wall must continue through the seat through 100mm dia upvc at 1000mm max centres, positioned at a slope of 1 in 10.
- All connection, including the joining of lengths of megaflo or corrugated perforated polyethylene pipe, shall be made using standard manufacturers fittings.
- In stable foundation materials the 150mm seat footing can be constructed using well compacted road base. The outer edges must be scraped back to a clean hard surface so that the bottom layer of mortar will adhere to the surface.
- In unstable or high clay foundations the footing must be constructed using 15MPa concrete and the bottom row of rocks are to be embedded around 100mm into the concrete.
- The core of the seat can be filled with well compacted good quality granular material with minimal clay content.
- The 50mm blinding layer can be replaced with a 200 micron IR2 polyethylene sheet when the bottom off the footing excavation is in stable sound material.
- Dimensions in millimetres unless otherwise notated.



GENERAL
ARRANGEMENT
SCALE 1:20



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Rev.	Date	Revision Details	Drn.	Ver.	App.



Project: **WANGETTI TRAIL
DETAILED DESIGN**

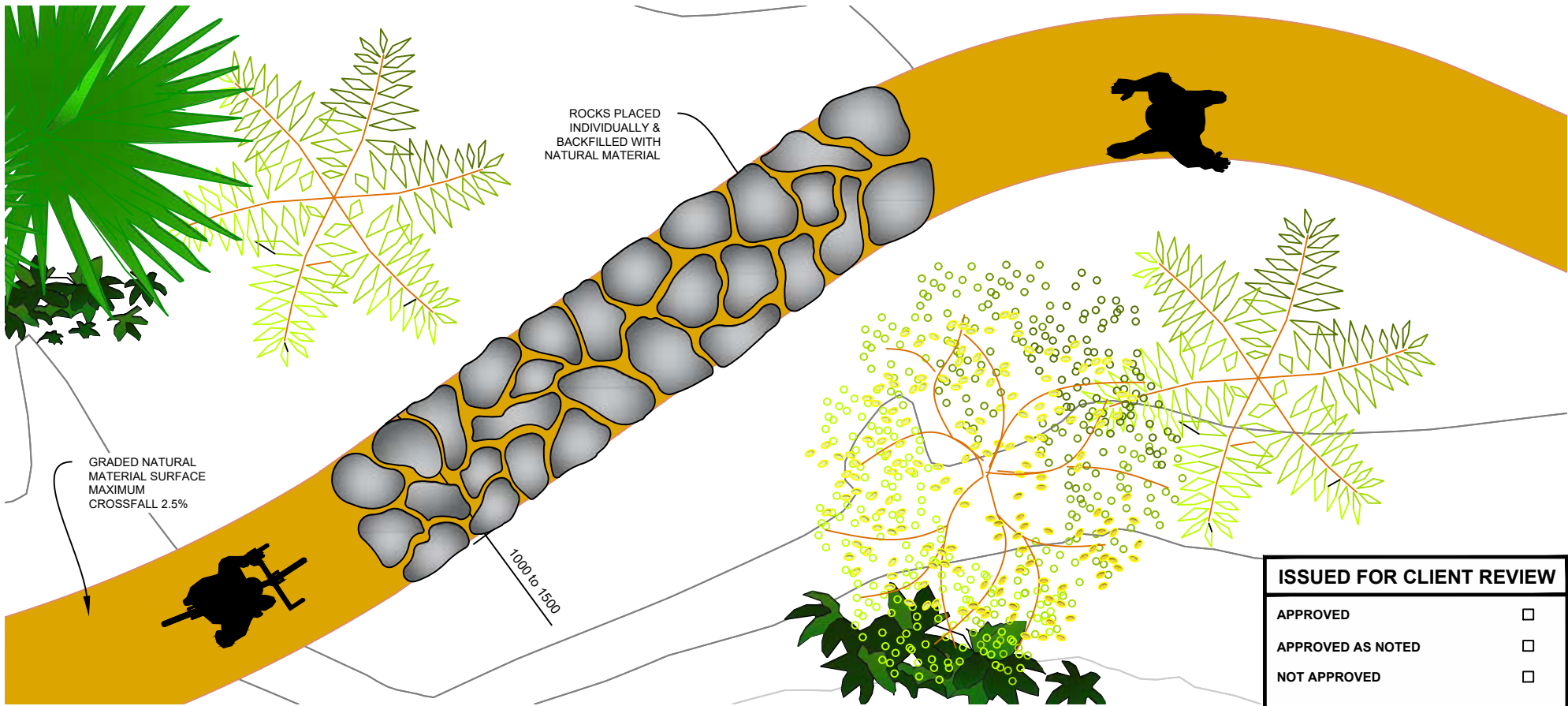
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Designed	Signed	Date
DS		24/03/20
Verified	Signed	Date
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Approved	Signed	Date

Drawing Title: **NATURAL ROCK SEAT
PLACEMENT AND DIMENSIONS
STANDARD DRAWING**

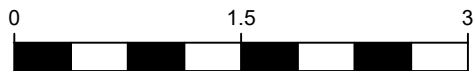
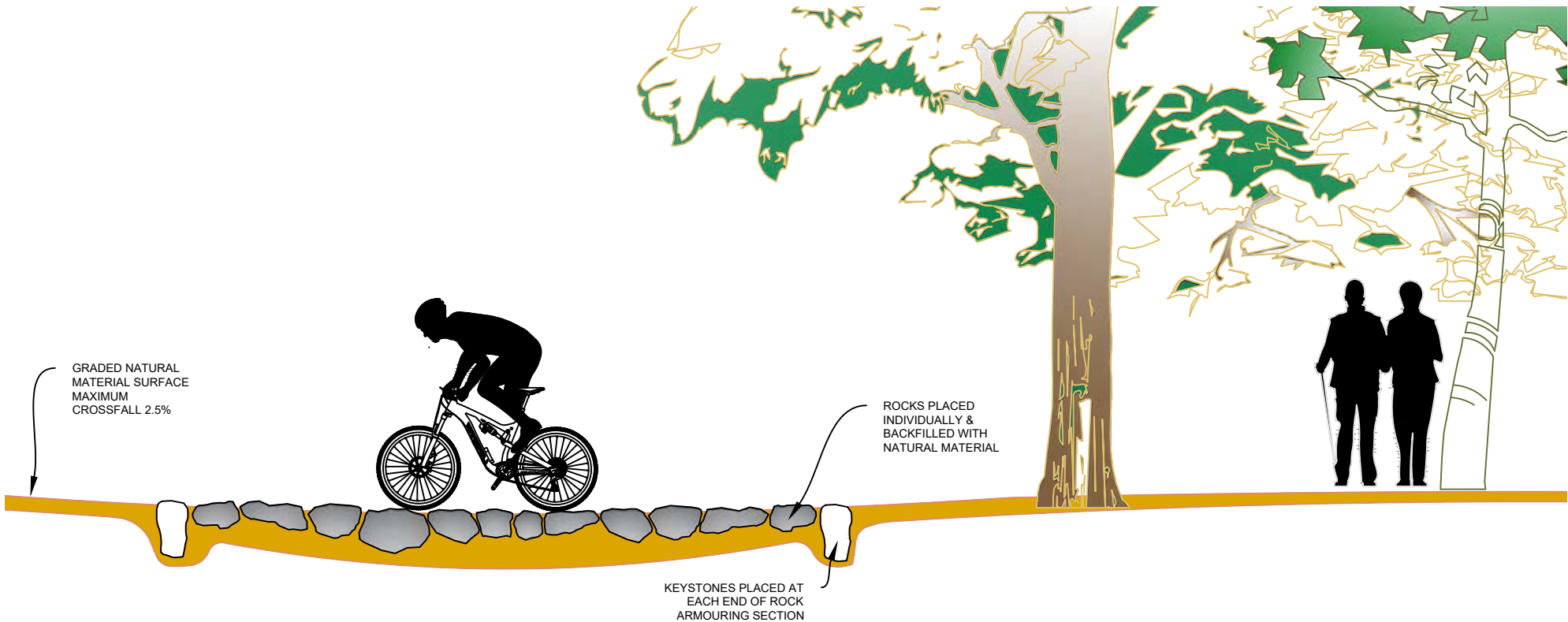
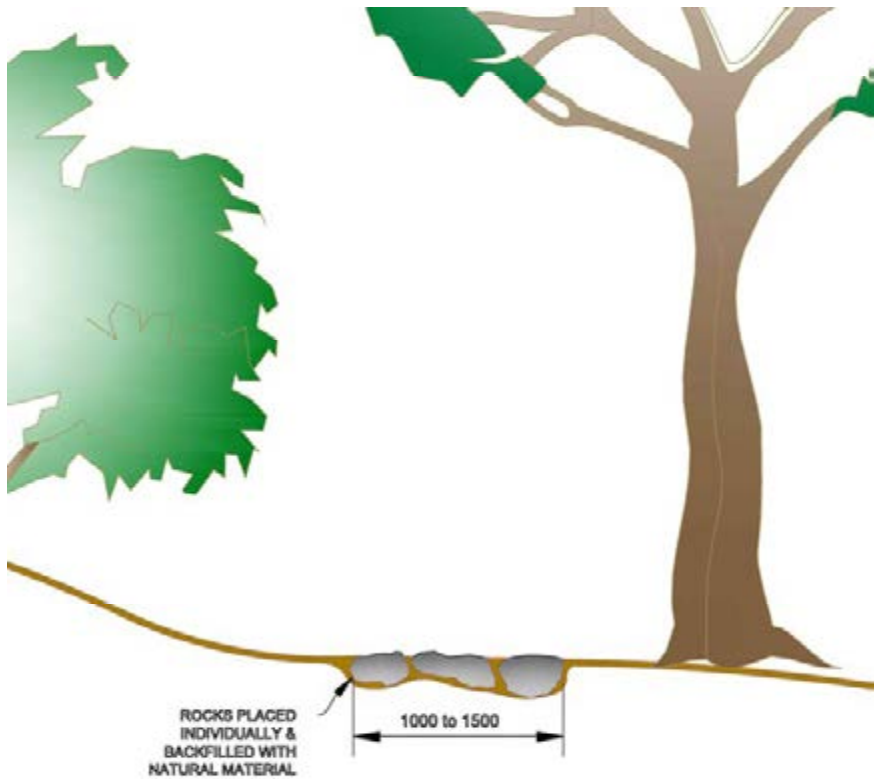
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Sheet Size	A3
Drawing No.	WTSTD-005-WG2
Rev.	A

NOTES:

- Rock Armouring (RA) is to be used in trail sections that are often wet and boggy or to reduce erosion and increase traction on steeper trail sections.
- RA consists of natural or imported rock depending on availability with a minimum size of 400mm and up to 800mm.
- Typical dimensions for rock armoured areas would be 1200mm (minimum) wide and often 5000mm long
- RA sections may be straight or curved depending on the local topography and the track alignment at that location.
- Rocks are to be placed into the wet foundation material and backfilled with dry graded local material that is of a similar consistency to the general track surface.
- Each rock should be bedded into graded foundation material in such a way that it will remain stable with no rocking or misplacement.
- Rocks used for armouring should be of an appropriate shape, texture and colour to match the native rock and must provide a natural appearance relative to its location .
- Rocks should be placed so that the top surface provides reasonable traction for cycle and foot traffic. Distance between rocks will depend on the degree of "bogginess" and the ability of the foundation material to hold up the backfill material between the individual rocks.
- The texture of the top surface of the rocks should allow for reasonable traction for cycle and foot traffic with minimal slippage.
- Once the rocks have been placed, natural topsoil should be raked or swept into the gaps between the rocks and compacted to minimise future slumping or rock instability.



ISSUED FOR CLIENT REVIEW	
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APPROVED AS NOTED	<input type="checkbox"/>
NOT APPROVED	<input type="checkbox"/>
SIGNED..... DATE.....	



Scale 1:50 @ A3

GENERAL
ARRANGEMENT
SCALE 1:50

A	07/04/20	ISSUED FOR INFORMATION	JR	DS	DS
Rev.	Date	Revision Details	Drn.	Ver.	App.



Project:

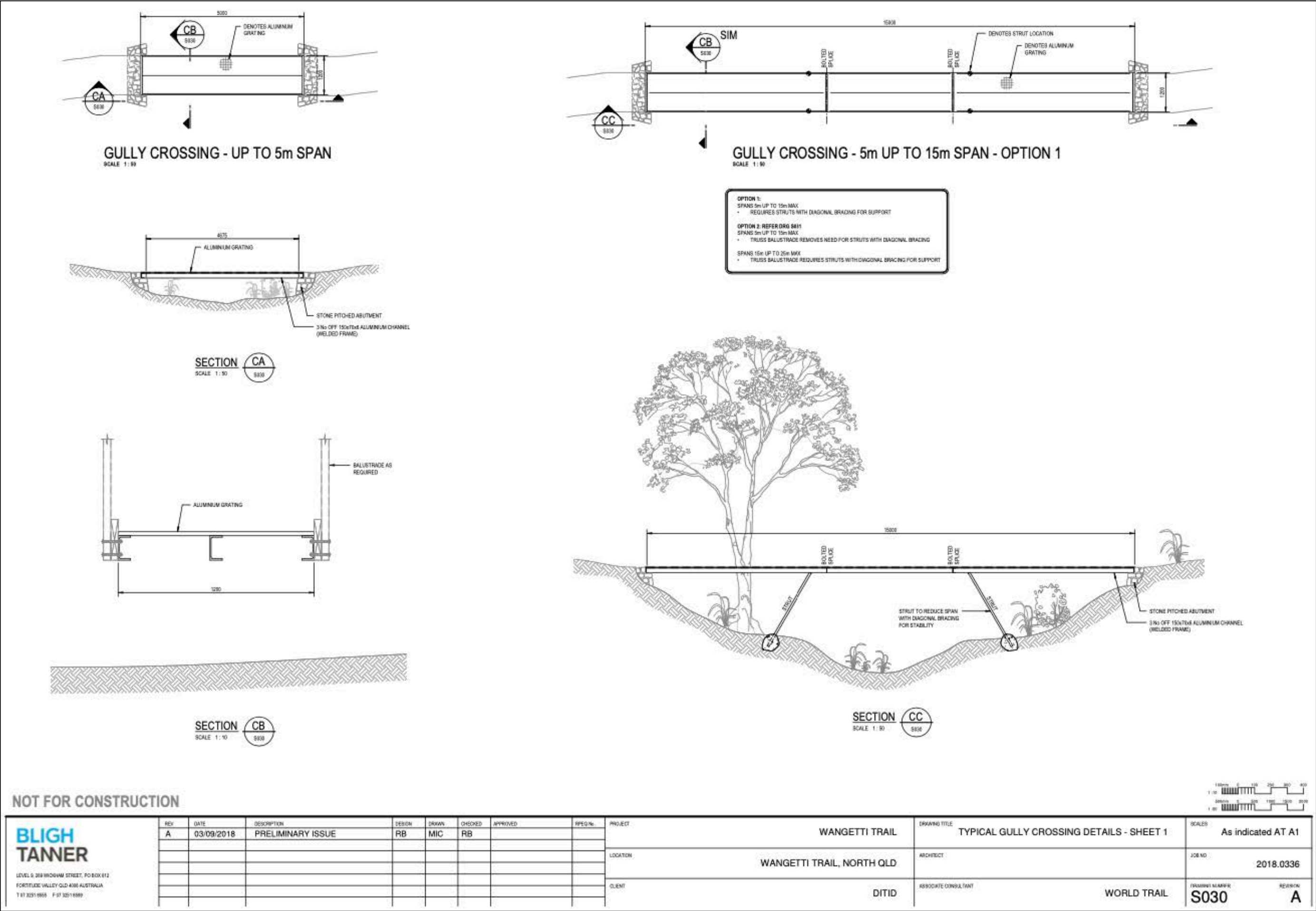
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DETAILED DESIGN

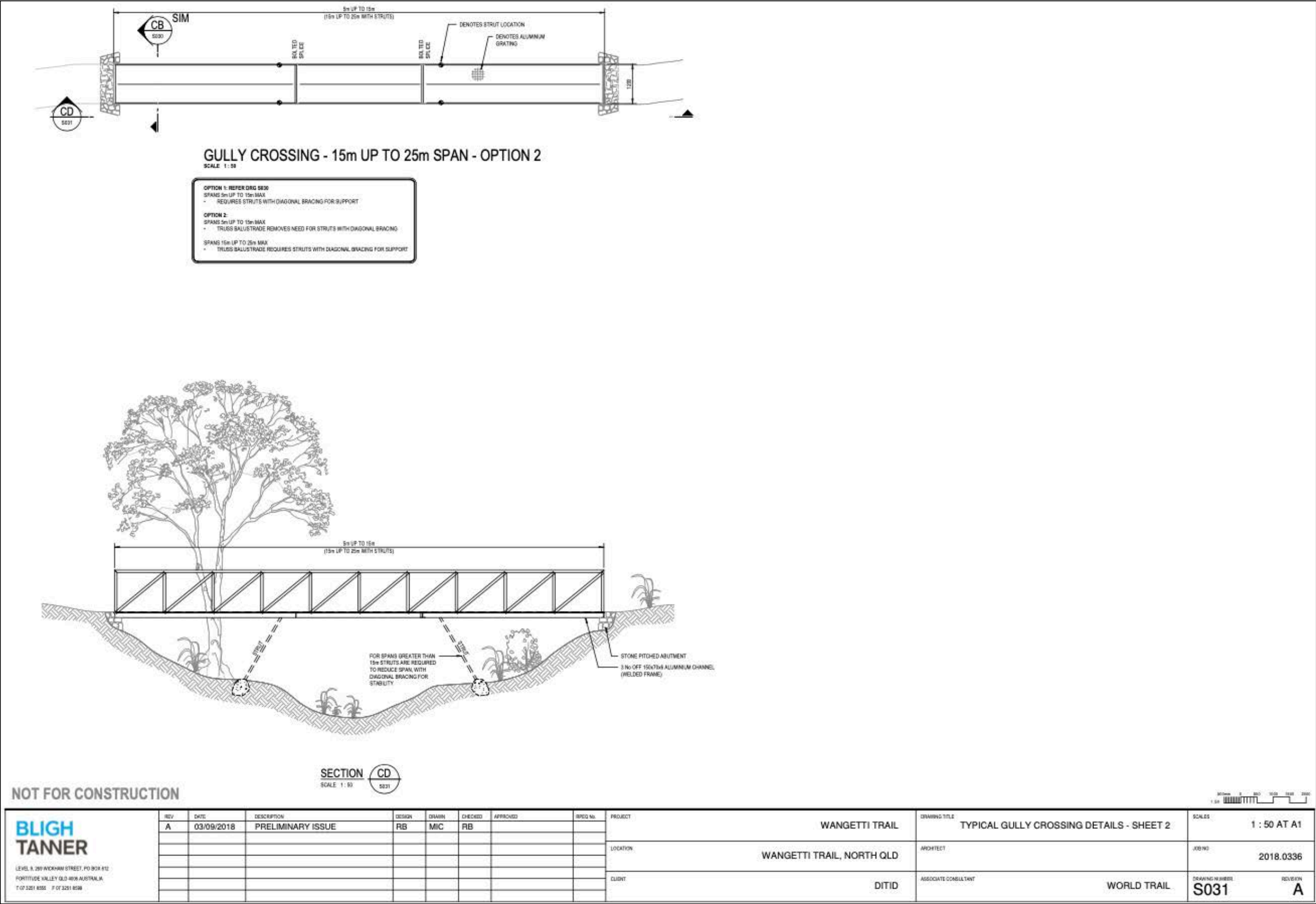
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Designed	Signed	Date
DS		07/04/20
Verified	Signed	Date
DS		07/04/20
Approved	Signed	Date

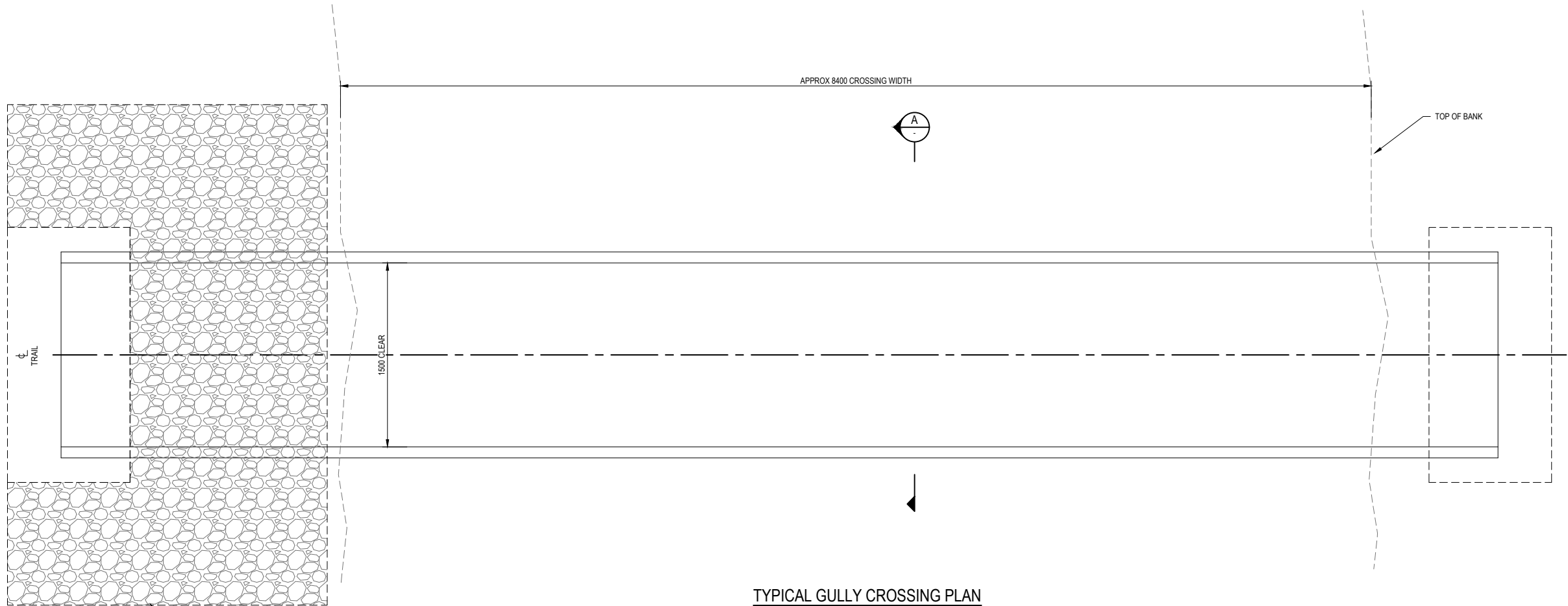
Drawing Title:

ROCK ARMOURING - DUAL USE
PLACEMENT AND DIMENSIONS
STANDARD DRAWING

FOR INFORMATION	
Project No.	WT20-Wangetti-001
Scale	1:50
Sheet Size	A3
Drawing No.	WTSTD-007-WG2
Rev.	A

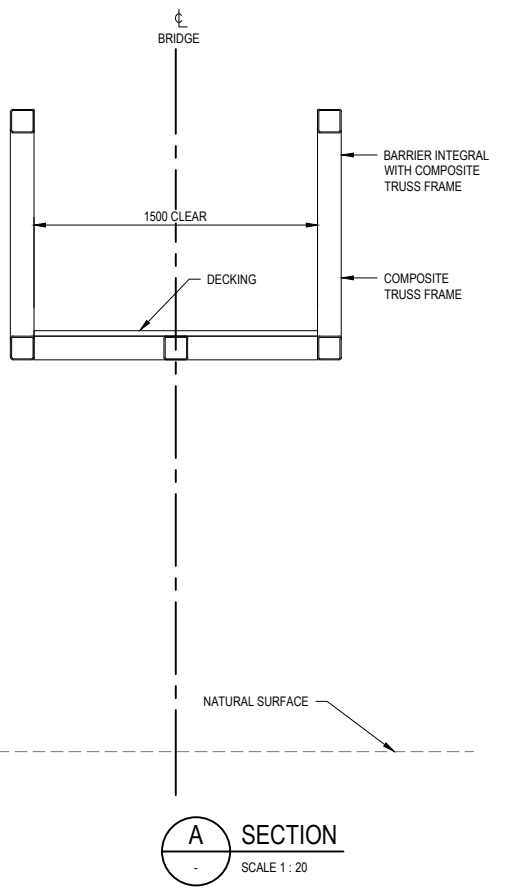






TYPICAL GULLY CROSSING PLAN

SCALE 1:20



SECTION A

SCALE 1:20



PRELIMINARY

rev	description	app'd	date
A	CONCEPT ISSUE	*AA	16.05.19

DEPARTMENT OF INNOVATION, TOURISM INDUSTRY DEVELOPMENT
WANGETTI TRAIL
CONCEPT GULLY CROSSINGS
GA - OPTION

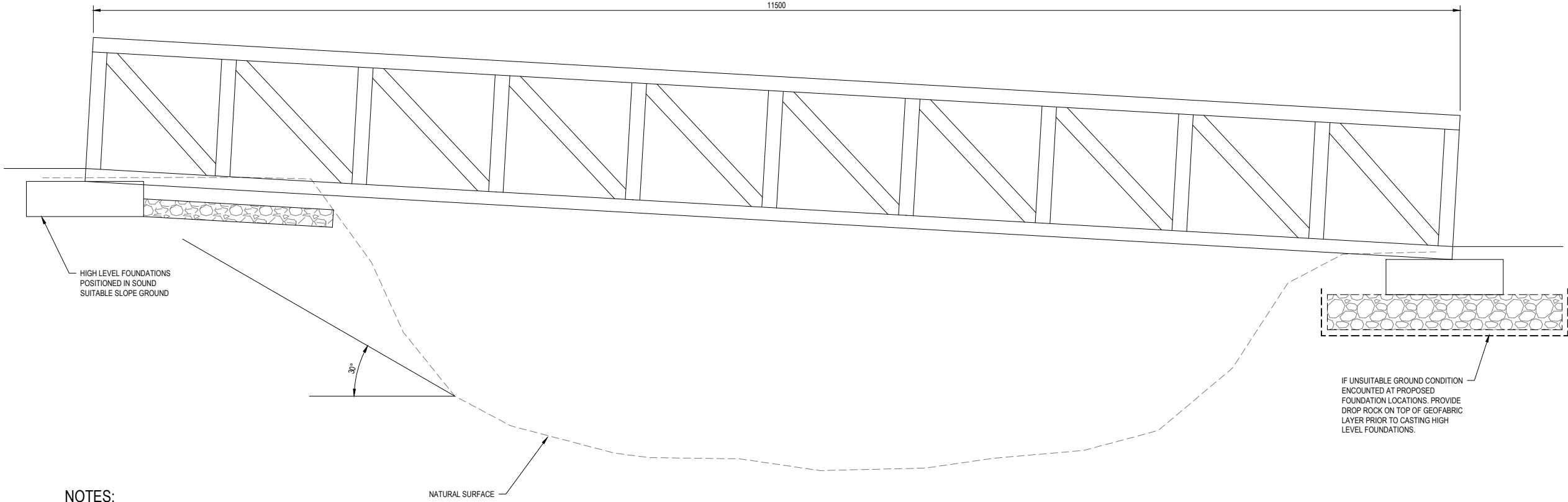


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scale	AS SHOWN for A1	job no.	42-21067
date	MAY 2019	rev no.	A

approved (PD) SK017



TYPICAL GULLY CROSSING SECTION

SCALE 1:20

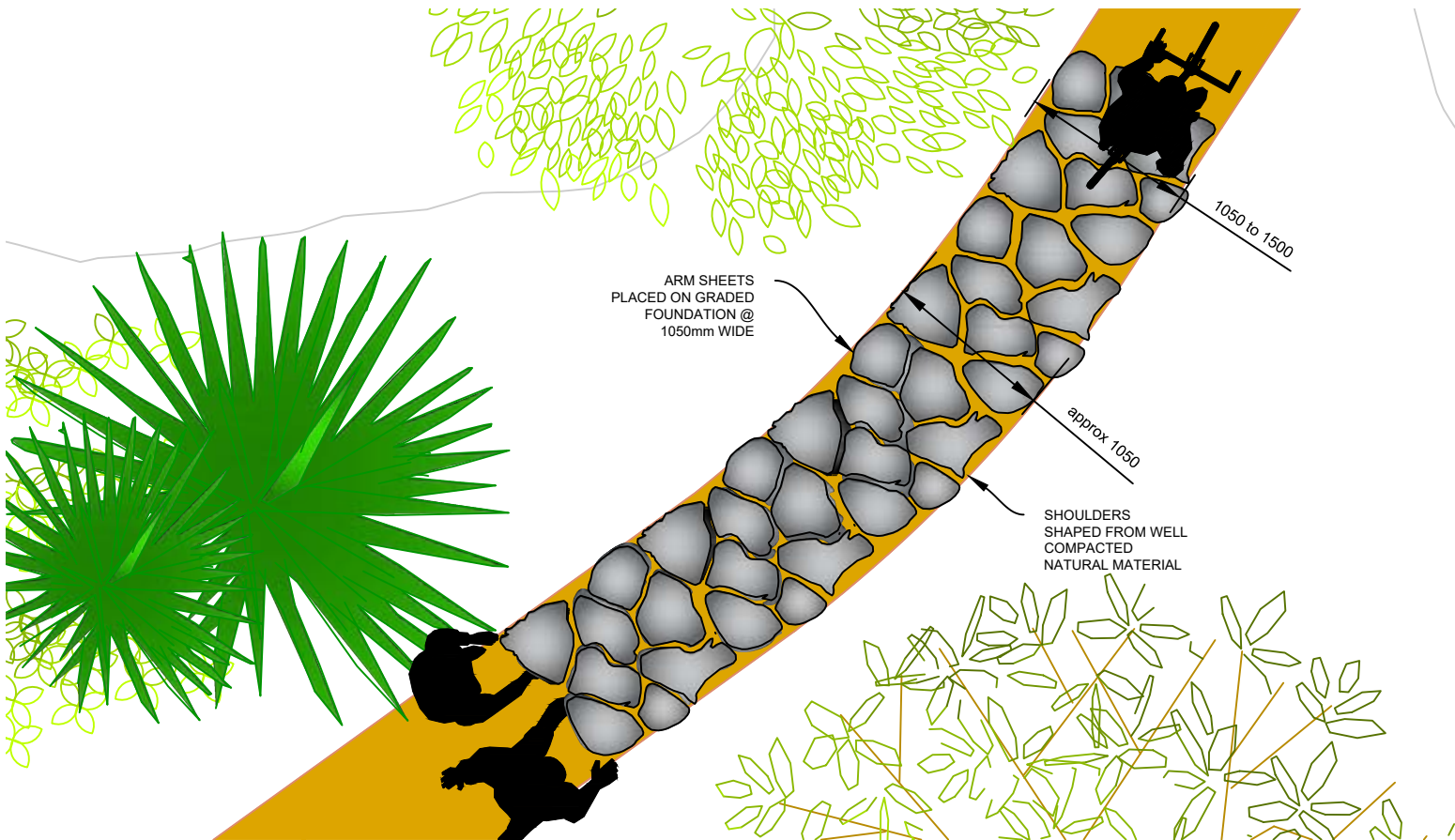
CONCEPT GULLY CROSSING SHOWN FOR B41
CONCEPT CROSSING B40 - 5.3m APPROX CROSSING WIDTH SIMILAR
CONCEPT CROSSING B39 - 6.0m APPROX CROSSING WIDTH SIMILAR

NOTES:
PROPOSED WORKS OUTCOMES

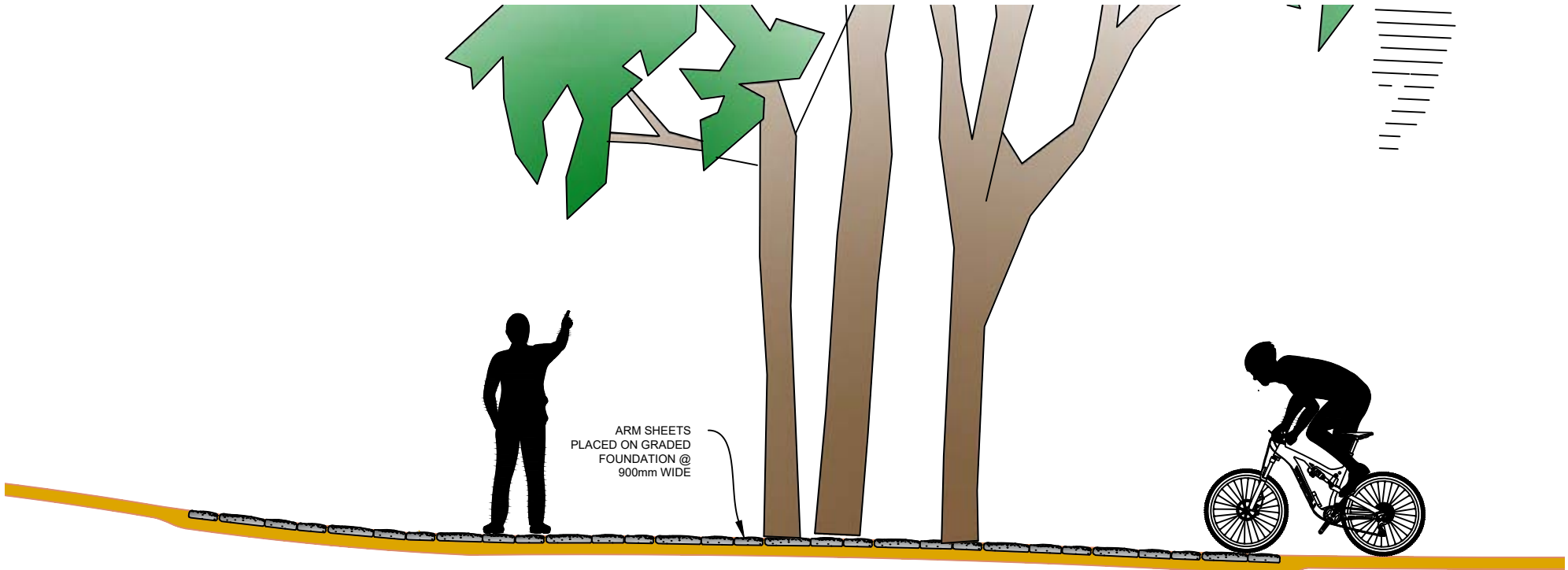
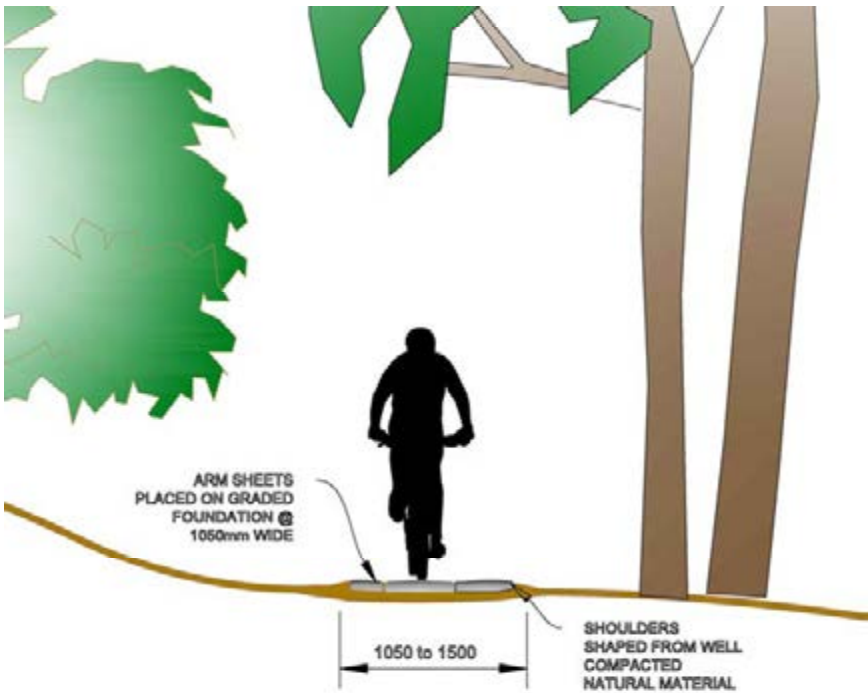
- LIVE LOAD TO AS2156.2 - 4 kPa FOR VIEWING PLATFORMS AND 3kPa FOR ACCESS WAYS FOR TRACKS CLASS 3
- PROPOSED CLEAR WIDTH ON PATH TO BE 1.5m.

NOTES:

- Adjustable Rock Matting (ARM) is to be used in trail sections that are often wet and boggy or to provide a safe braking surface on unavoidable declines.
- ARM is manufactured in 1050mm by 1050mm sheets that have the capacity to be bent either vertically or horizontally to suit the required topography and trail alignment.
- The trail section providing a foundation for ARM should be leveled and treated to be free of protruding rocks or roots prior to installation.
- A base layer of imported material may be required to provide a suitable foundation for the ARM if the natural material is found to be unsuitable.
- Any excess loose material should be stockpiled nearby to be used as a coating surface after the ARM has been installed.
- ARM sheets should be installed from the lowest point and working uphill, checking the alignment as installation proceeds.
- Sheets can be cut to allow removal of sections to facilitate alignment around large unmovable objects or to allow tighter curves in difficult trail alignment sections.
- Each sheet should be checked to ensure it is sitting evenly and solidly on the ground without rocking or movement under pressure.
- The ARM sheets should be joined with cable ties and any excess matting trimmed.
- Secure the ARM sheets to the ground with pegs placed through the matting..
- Finish by raking or sweeping the stockpiled topsoil over the ARM sheets, filling and compacting soil into the gaps between the rocks.
- Ensure the ARM placement and soil topping provides a trafficable surface for both walking and biking.



ISSUED FOR CLIENT REVIEW	
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APPROVED AS NOTED	<input type="checkbox"/>
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SIGNED..... DATE.....	



GENERAL
ARRANGEMENT
SCALE 1:50

B	07/04/20	ARM SIZE CHANGE TO 1050mm	JR	DS	DS
A	24/03/20	ISSUED FOR INFORMATION	JR	DS	DS
Rev.	Date	Revision Details	Drn.	Ver.	App.



Project:

WANGETTI TRAIL
DETAILED DESIGN

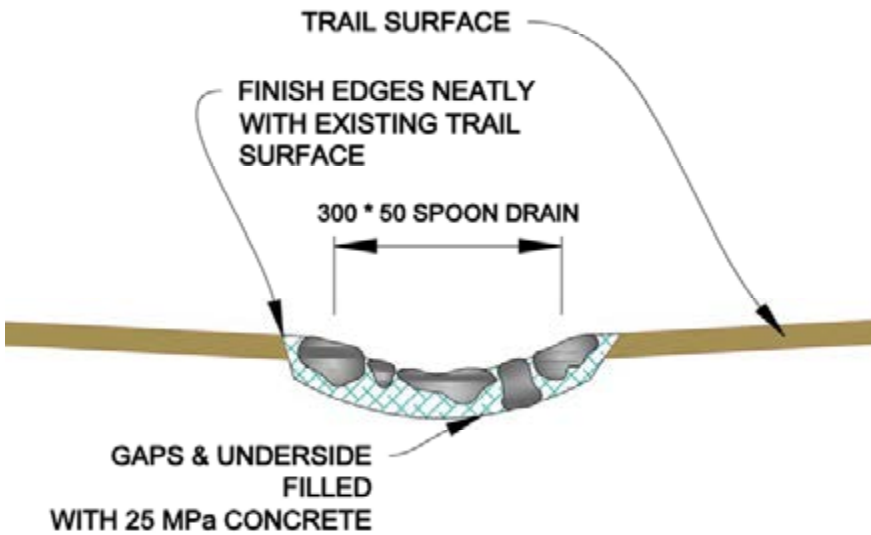
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JR		07/04/20
Designed	Signed	Date
DS		07/04/20
Verified	Signed	Date
DS		07/04/20
Approved	Signed	Date

Drawing Title:
ADJUSTABLE ROCK MATTING 1050mm
PLACEMENT AND DIMENSIONS
STANDARD DRAWING

FOR INFORMATION	
Project No.	WT20-Wangetti-001
Scale	1:50
Sheet Size	A3
Drawing No.	WTSTD-011-WG2
Rev.	B

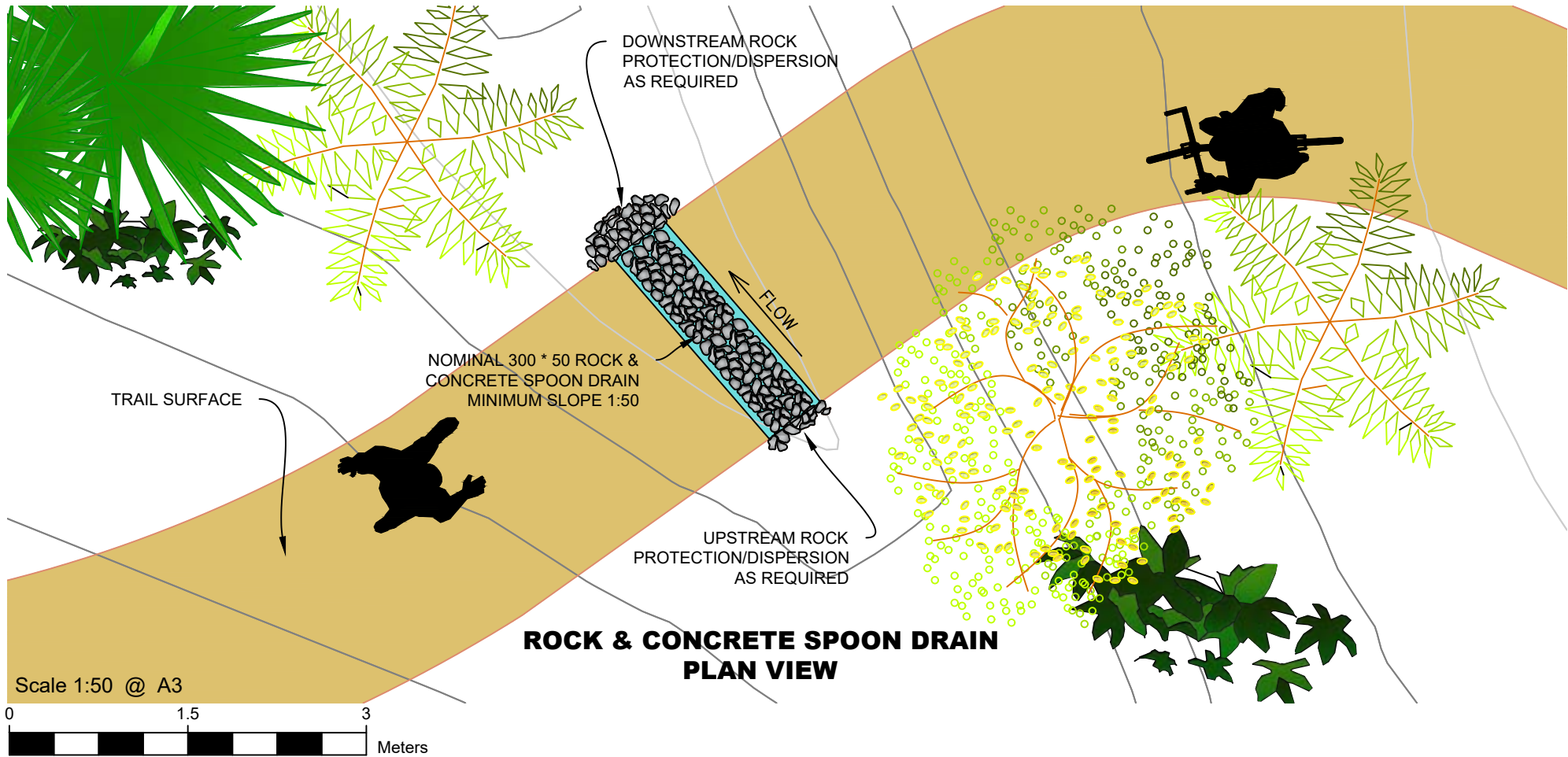
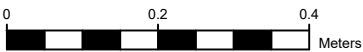
NOTES:

- Spoon Drains are to be used to convey surface runoff across the trail at a concentrated location without using below ground conduits while minimizing erosion.
- The spoon drain profile and alignment should be constructed in such a way that disturbances to trail walkability are minimized.
- Dimensions and layout depicted are nominal only and may vary to suit site topography and expected runoff surface flows.
- All dimensions are in millimeters unless advised otherwise.
- Rocks are to be placed in such a way that they are interlocked and well bedded into a 25 MPa concrete bed poured onto the spoon drain foundation.
- 25 MPa Concrete to be poured into the gaps between the rocks and along the edges to form a neat transition to the trail surface.
- All exposed concrete should be finished to a rough texture to minimise slipping and provide further roughage to impede water flows.
- The tops of the rocks should be cleaned of concrete to provide a natural finish.
- Concrete should be tamped to ensure there is no air entrapment and that the concrete is placed firmly against the foundation material.
- Rock protection should be placed at the discharge end to minimise erosion and to provide flow dispersion of the runoff.
- In some locations rock protection may be required at the upstream end to minimise erosion as the runoff flows enter the spoon drain.



ROCK & CONCRETE SPOON DRAIN
TYPICAL SECTION

Scale 1:10 @ A3



ROCK & CONCRETE SPOON DRAIN
PLAN VIEW

ISSUED FOR CLIENT REVIEW

APPROVED	<input type="checkbox"/>
APPROVED AS NOTED	<input type="checkbox"/>
NOT APPROVED	<input type="checkbox"/>
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FOR INFORMATION

Project No. WT20-Wangetti-001	
Scale varies	Sheet Size A3
Drawing No. WTSTD-019-WG2	Rev. A

A	25/03/20	ISSUED FOR INFORMATION	JR		
Rev.	Date	Revision Details	Drn.	Ver.	App.

GENERAL
ARRANGEMENT
SCALE varies



Project:

WANGETTI TRAIL
DETAILED DESIGN

Drawn JR	Signed	Date 25/03/20
Designed DS	Signed	Date 25/03/20
Verified DS	Signed	Date 25/03/20
Approved	Signed	Date

Drawing Title:

ROCK & CONCRETE SPOON DRAINS
PLACEMENT AND DIMENSIONS
STANDARD DRAWING

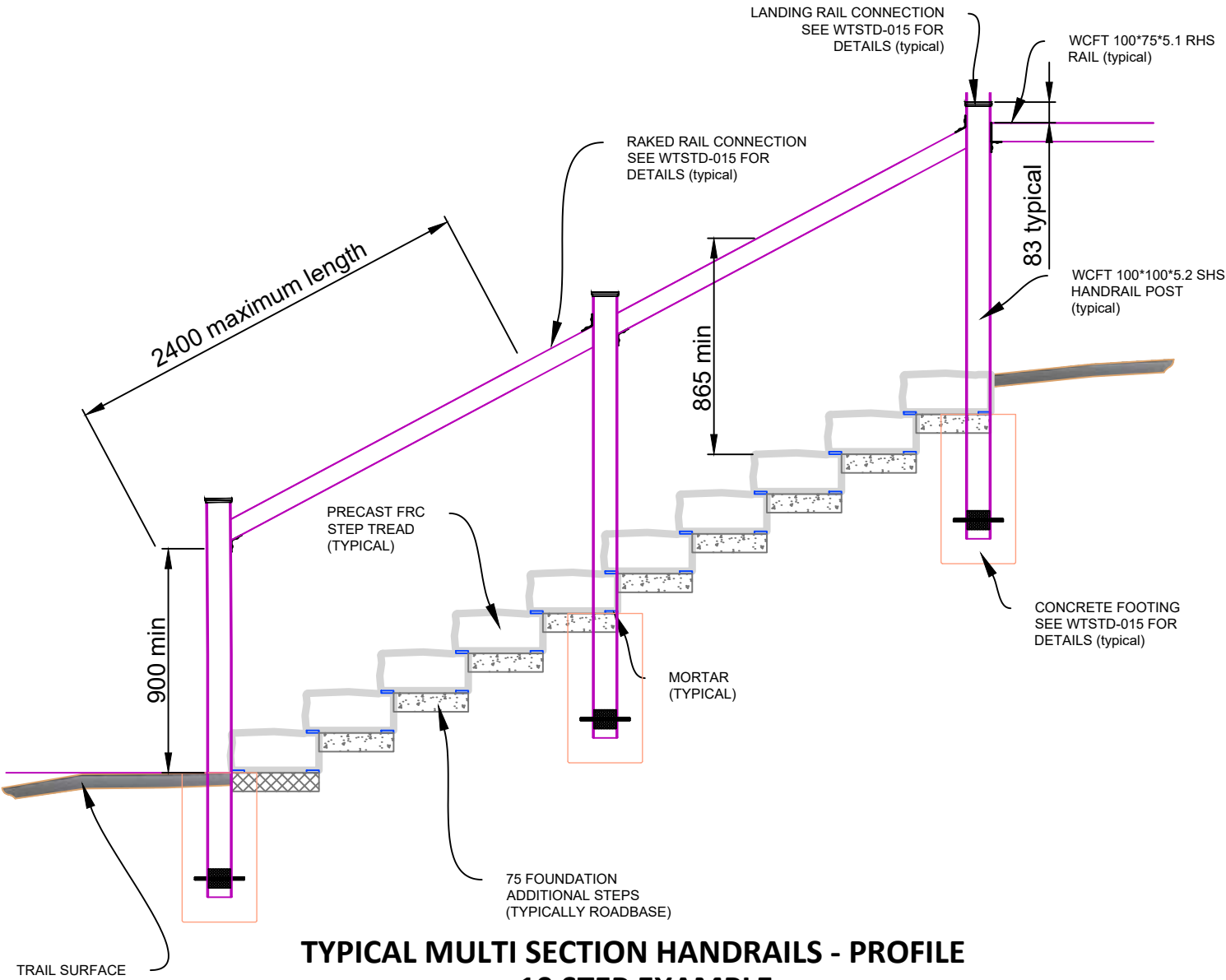
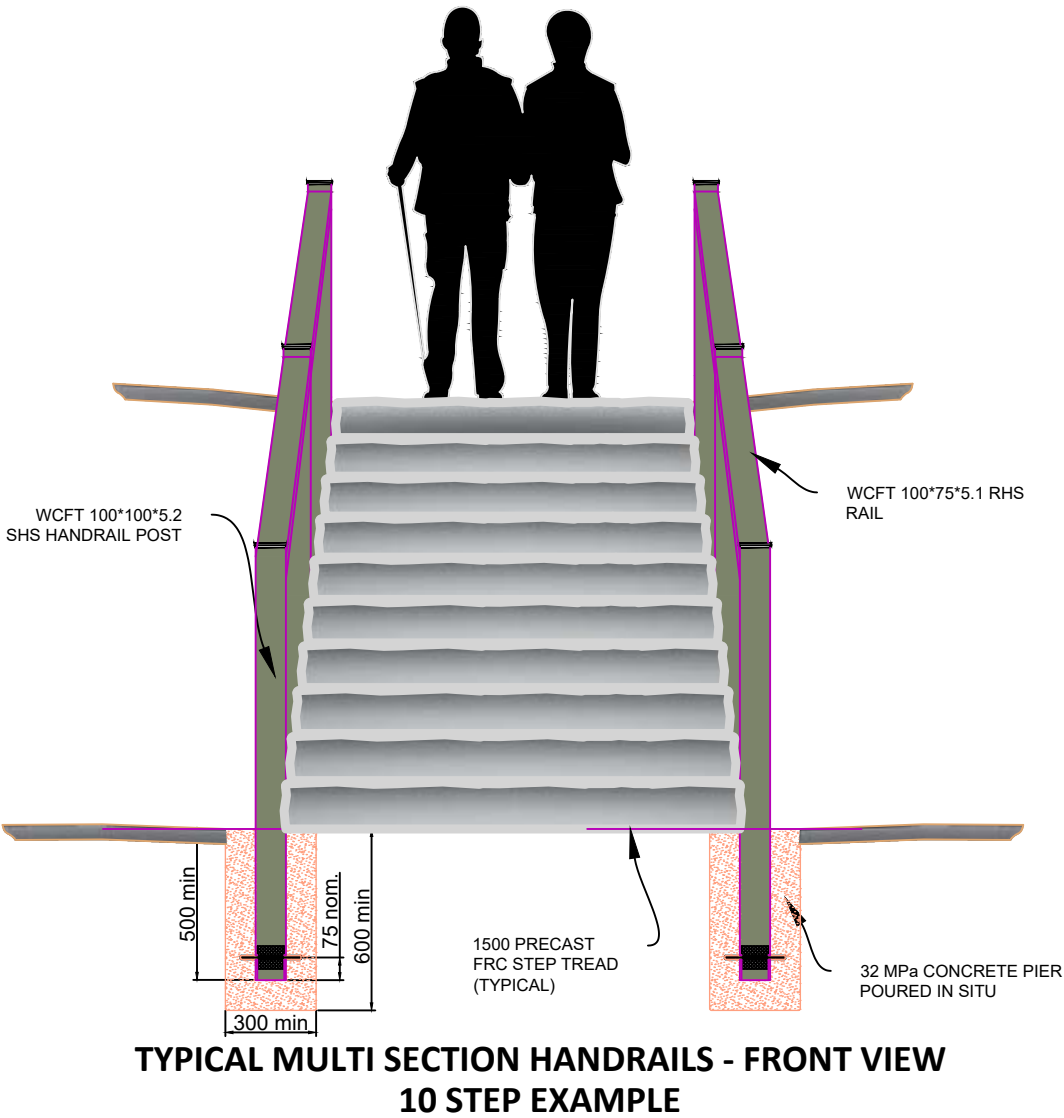
NOTES:

GENERAL:

- The handrail layout depicted in this standard drawing is a typical layout for handrail sections with rails longer than 2400mm.
- Layouts in specific trail locations may vary considerably from that depicted however the design and construction requirements will still apply.
- The handrails depicted are to be placed in combination with the stair treads depicted in Standard drawing WTSTD-003-WG2 or along landings above, below or between these stair tread sections.
- The stairway example depicted in this standard drawing uses 1500mm wide precast treads. The design would also be appropriate for treads of other widths.
- This standard drawing must be used in conjunction with WTSTD-015-WG2 that defines the post placement and rail connection details.
- This standard drawing is suitable for stairs consisting of between 7 & 14 treads. See Standard drawing WTSTD-0014-WG2 for stairs consisting of 5 or less treads. Stairs of 15 or more treads would require an additional intermediate raking connection post to maintain a minimum rail length of 2400mm.
- Where the stair alignment has a corner at the top or the bottom of the stairway, double posts may be necessary to either protect entry/exit to the stairway or to connect neatly to horizontal railings.

HANDRAILS & POSTS:

- Handrails, posts and fixtures are supplied by Wagners CFT Manufacturing Pty Ltd, Toowoomba or equivalent as approved by the client or principle.
- Handrails and posts are constructed from a fibreglass/resin composite.
- All components must be installed as defined in this standard drawing and as described in Wagners Installation Guide, Rev. B - Sept 2010 or other installation documentation relevant to the supplier.



NOTES CONTINUED:

HANDRAILS & POSTS:

Care should be taken to ensure posts do not touch or bind with the stair treads and they are aligned so that the rail is straight rather than being aligned to the edge of the stair treads.

CONCRETE FOOTINGS:

- Excavations for concrete footings must be cleaned out prior to pouring concrete so that they do not contain any loose material, tree roots or rocks or ponding water.
- Posts and concrete mix must be placed into the footing in such a way that the integrity of the excavation is maintained.
- Concrete should be tamped with a suitable rod after placement to ensure there is no air entrapment within the footing.
- Where footings are located adjacent to precast step treads, the post and concrete top surface should be placed and finished such that it does not impede the correct placement of the step tread.
- Standard Drawing - WTSTD-003-WG2 depicts the dimensions and installation requirements of the step treads.

GENERAL
ARRANGEMENT
SCALE 1:25

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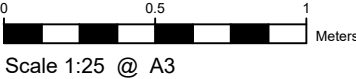
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B	01/08/19	ISSUED FOR INFORMATION	JR		
A	15/06/19	ISSUED FOR INFORMATION	JR		
Rev.	Date	Revision Details	Drn.	Ver.	App.



Client:
Project:
WANGETTI TRAIL
DETAILED DESIGN

Drawn	Signed	Date
JR		07/04/20
Designed	Signed	Date
DS		07/04/20
Verified	Signed	Date
DS		07/04/20
Approved	Signed	Date

Drawing Title:
TRAIL HANDRAIL - MULTI SECTION
PLACEMENT AND DIMENSIONS
STANDARD DRAWING



FOR INFORMATION	
Project No.	WT20-Wangetti-001
Scale	1:25
Sheet Size	A3
Drawing No.	WTSTD-013-WG2
Rev.	C

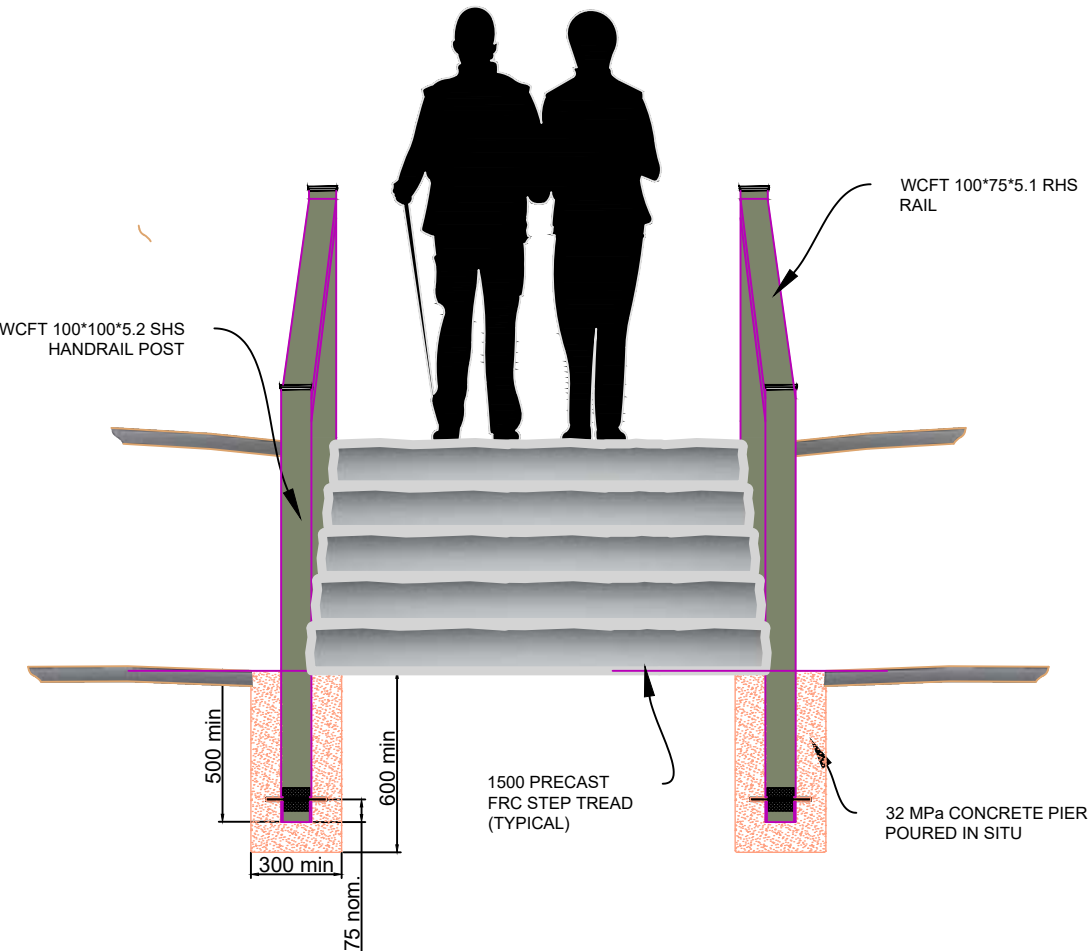
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GENERAL:

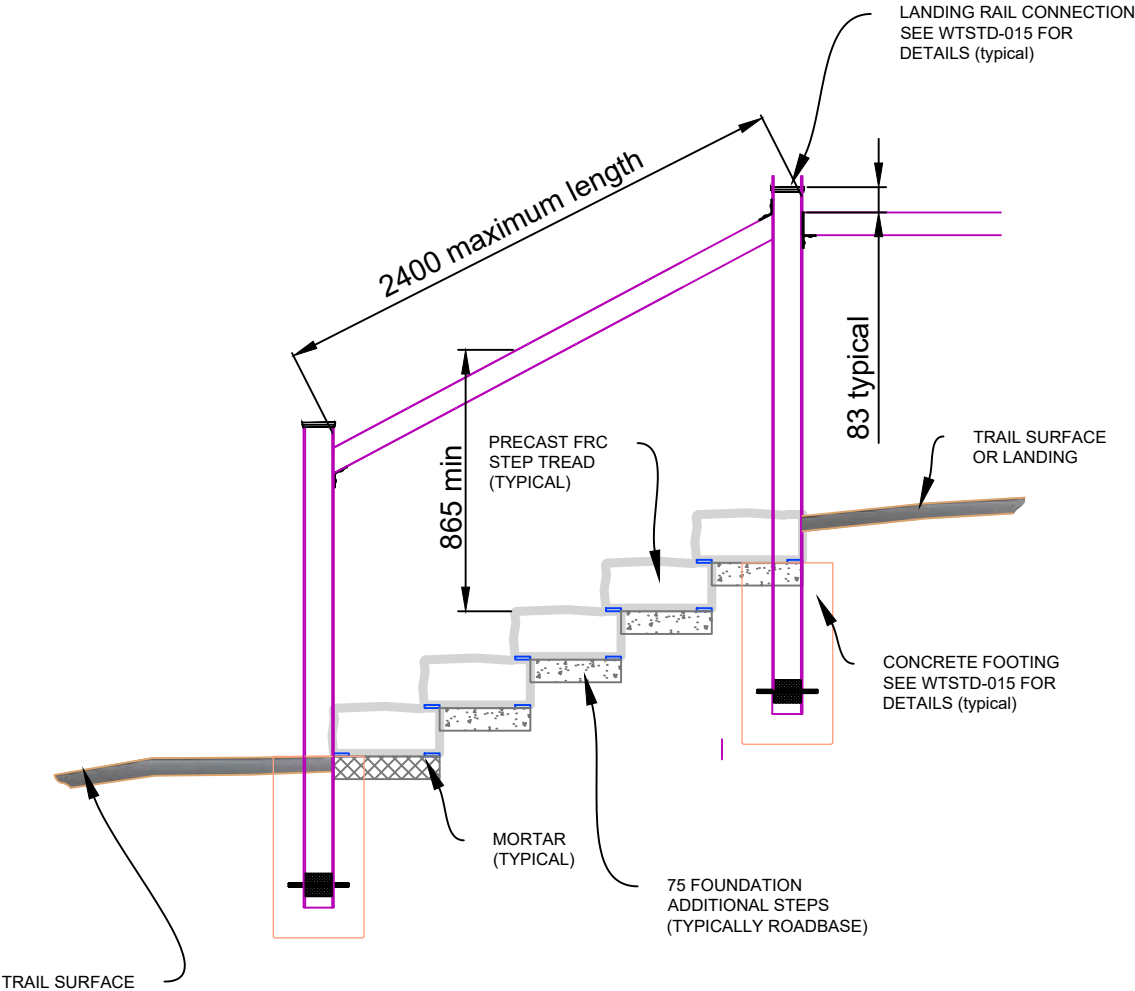
- The handrail layout depicted in this standard drawing is a typical layout for handrail sections with rails longer than 2400mm.
- Layouts in specific trail locations may vary considerably from that depicted however the design and construction requirements will still apply.
- The handrails depicted are to be placed in combination with the stair treads depicted in Standard drawing WTSTD-003-WG2 or along landings above, below or between these stair tread sections.
- The stairway example depicted in this standard drawing uses 1500mm wide precast treads. The design would also be appropriate for treads of other widths.
- This standard drawing must be used in conjunction with WTSTD-015-WG2 that defines the post placement and rail connection details.
- This standard drawing is suitable for stairs consisting of between 2 & 6 treads. See Standard drawing WTSTD-013-WG2 for stairs consisting of 7 or more treads.
- Where the stair alignment has a corner at the top or the bottom of the stairway, double posts may be necessary to either protect entry/exit to the stairway or to connect neatly to horizontal railings.

HANDRAILS & POSTS:

- Handrails, posts and fixtures are supplied by Wagners CFT Manufacturing Pty Ltd, Toowoomba or equivalent as approved by the client or principle.
- Handrails and posts are constructed from a fibreglass/resin composite.
- All components must be installed as defined in this standard drawing and as described in Wagners Installation Guide, Rev. B - Sept 2010 or other installation documentation relevant to the supplier.



TYPICAL MULTI SECTION HANDRAILS - FRONT VIEW
5 STEP EXAMPLE



TYPICAL MULTI SECTION HANDRAILS - PROFILE
5 STEP EXAMPLE

NOTES CONTINUED:

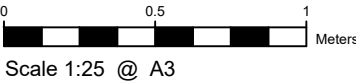
HANDRAILS & POSTS:

Care should be taken to ensure posts do not touch or bind with the stair treads and they are aligned so that the rail is straight rather than being aligned to the edge of the stair treads.

CONCRETE FOOTINGS:

- Excavations for concrete footings must be cleaned out prior to pouring concrete so that they do not contain any loose material, tree roots or rocks or ponding water.
- Posts and concrete mix must be placed into the footing in such a way that the integrity of the excavation is maintained.
- Concrete should be tamped with a suitable rod after placement to ensure there is no air entrapment within the footing.
- Where footings are located adjacent to precast step treads, the post and concrete top surface should be placed and finished such that it does not impede the correct placement of the step tread.
- Standard Drawing - WTSTD-003-WG2 depicts the dimensions and installation requirements of the step treads.

GENERAL
ARRANGEMENT
SCALE 1:25



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NOT APPROVED	<input type="checkbox"/>
SIGNED..... DATE.....	

C	07/04/20	ADDITIONAL NOTES ADDED	JR		
B	07/08/19	ISSUED FOR INFORMATION	JR		
A	15/06/19	ISSUED FOR INFORMATION	JR		
Rev.	Date	Revision Details	Drn.	Ver.	App.



Client: **WANGETTI TRAIL**
Project: **DETAILED DESIGN**

Drawn	Signed	Date
JR		07/04/20
Designed	Signed	Date
DS		07/04/20
Verified	Signed	Date
DS		07/04/20
Approved	Signed	Date

Drawing Title:
TRAIL HANDRAIL - SINGLE SECTION
PLACEMENT AND DIMENSIONS
STANDARD DRAWING

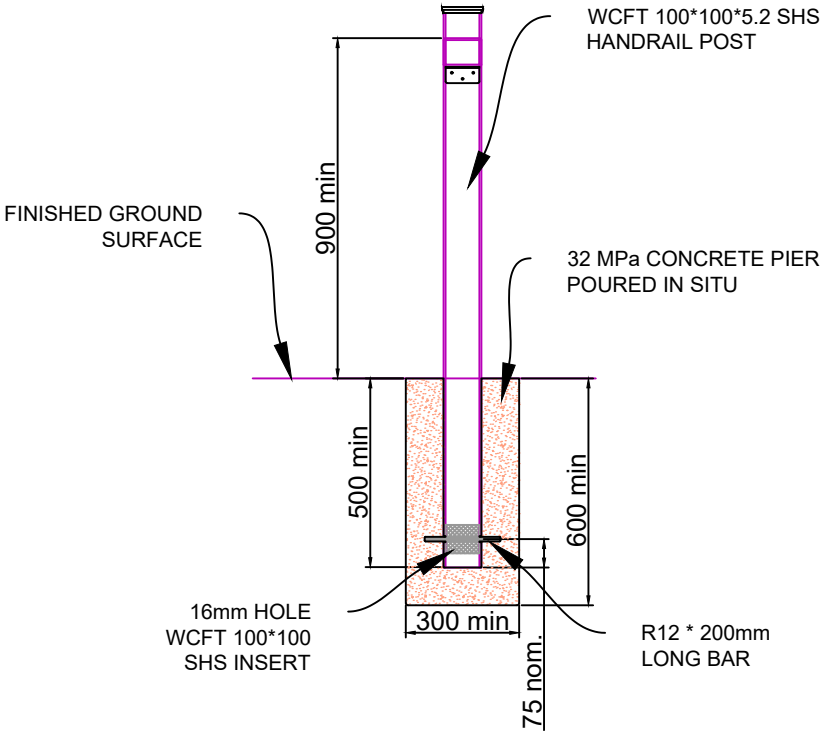
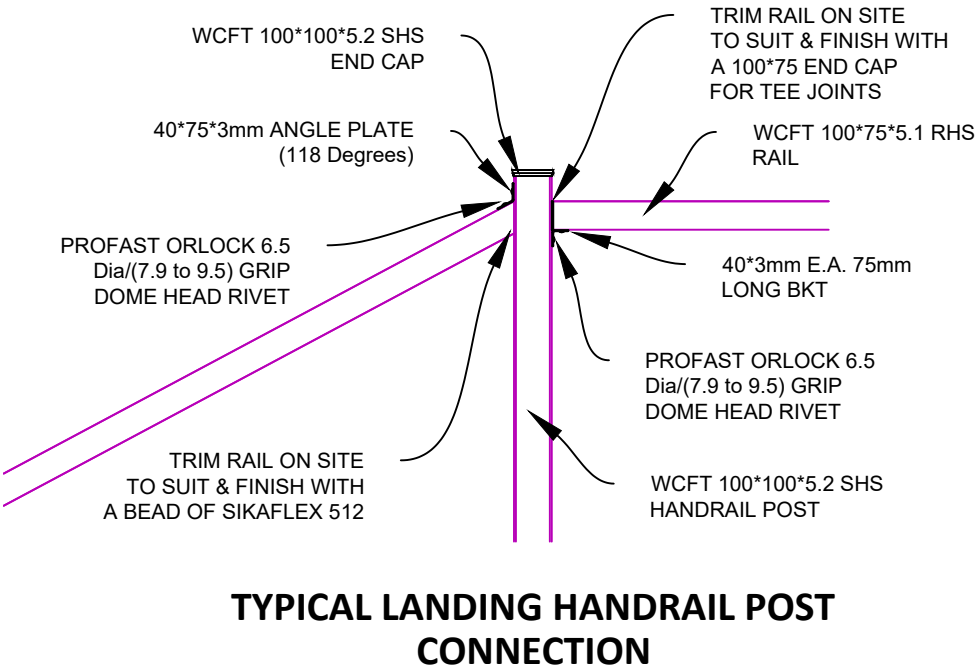
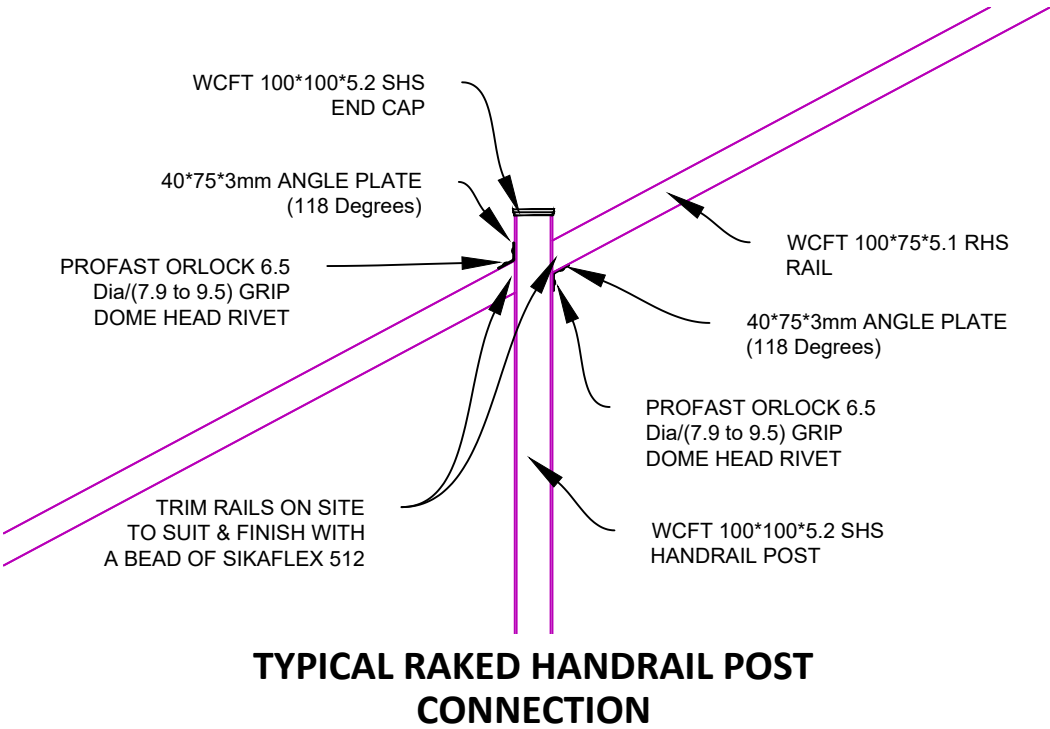
FOR INFORMATION	
Project No.	WT20-Wangetti-001
Scale	1:25
Sheet Size	A3
Drawing No.	WTSTD-014-WG2
Rev.	C

NOTES:

- GENERAL:
- The handrail layout depicted in this standard drawing is a typical layout for handrails built in conjunction with the precast step treads depicted in Standard Drawing - WTSTD-003-WG2.
 - The post installation and handrail connections depicted in this plan are to be used in combination with Standard drawings WTSTD-013-WG2 or WTSTD-014-WG2.
 - Other handrail layouts may require different angles, footing dimensions of connection fixtures than those defined in this drawing.
 - Where the stair alignment has a corner at the top or the bottom of the stairway, double posts may be necessary to either protect entry/exit to the stairway or to connect neatly to horizontal railings.
 - All materials and fixtures should be checked on site for damage or incorrect dimensions prior to assembly of the handrail.
 - Specific components depicted on this plan may be replaced by equivalent products if the replacement is approved by the client or principle.
 - All dimensions depicted on this plan are in millimeters unless otherwise noted.

- HANDRAILS & POSTS:
- Handrails, posts and fixtures are as supplied by Wagners CFT Manufacturing Pty Ltd, Toowoomba or equivalent product as approved by council.
 - Handrails and posts are constructed from a fibreglass/resin composite.
 - All components must be installed as defined in this standard drawing and as described in Wagners Installation Guide, Rev. B - Sept 2010 or equivalent installation guides applicable to selected equivalent products.
 - Other dimensions are as depicted on this plan and include a 50mm overlap between treads.
 - Angular rail to post joints may be finished with a modified 100*100 end cap for tee joints instead of a bead of silicon. This will require some cutting on site to provide neat fitment of the modified end cap.
 - The top of rail must be kept at least 900mm above the walkable surface at all locations.
 - Post end caps are to be installed as described in the Wagners Installation Guide which involves cutting a groove in the post using a specialist tool and using heat during placement or installed as defined in the insallation guide of an approved equivalent product.

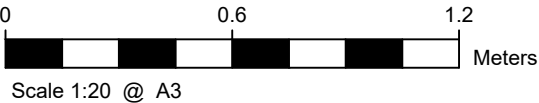
- CONCRETE FOOTINGS:
- Excavations for concrete footings must be cleaned out prior to pouring concrete so that they do not contain any loose material, tree roots or rocks or ponding water.
 - Posts and concrete mix must be placed into the footing in such a way that the integrity of the excavation is maintained.
 - Concrete should be tamped with a suitable rod after placement to ensure there is no air entrapment within the footing.
 - Where footings are located adjacent to precast step treads, the post and concrete top surface should be placed and finished such that it does not impede the correct placement of the step tread.
 - Standard Drawing - WTSTD-003-WG2 depicts the dimensions and installation requirements of the step treads.



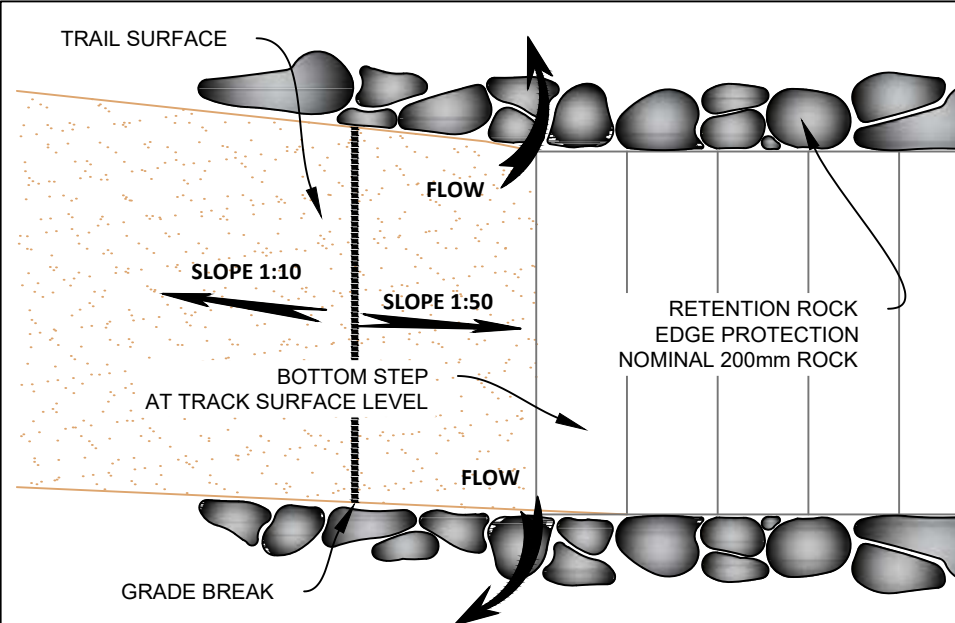
TYPICAL HANDRAIL POST INSTALLATION

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NOT APPROVED	<input type="checkbox"/>
SIGNED.....	DATE.....

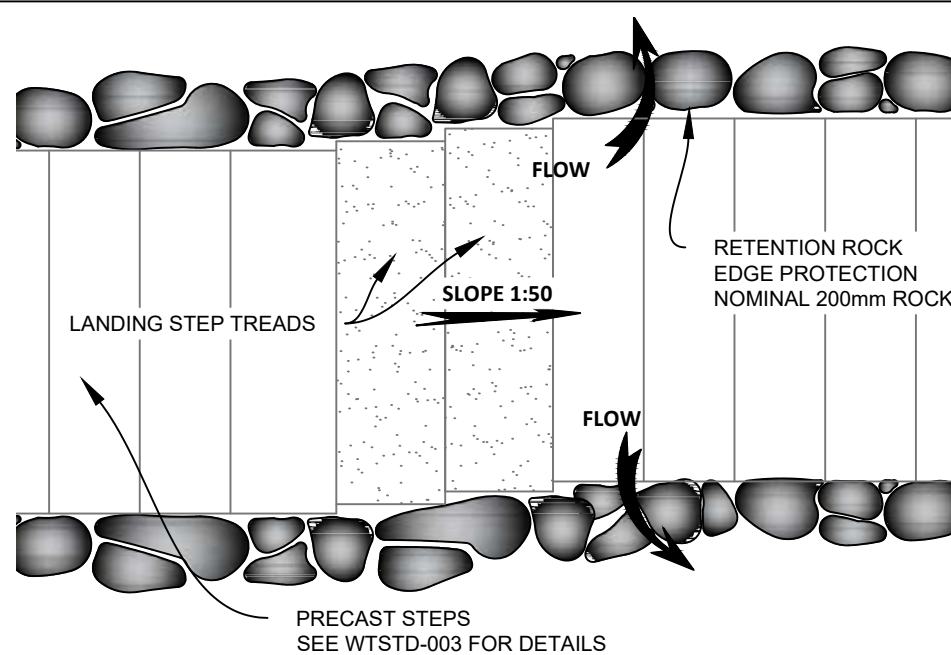
GENERAL
ARRANGEMENT
SCALE 1:20



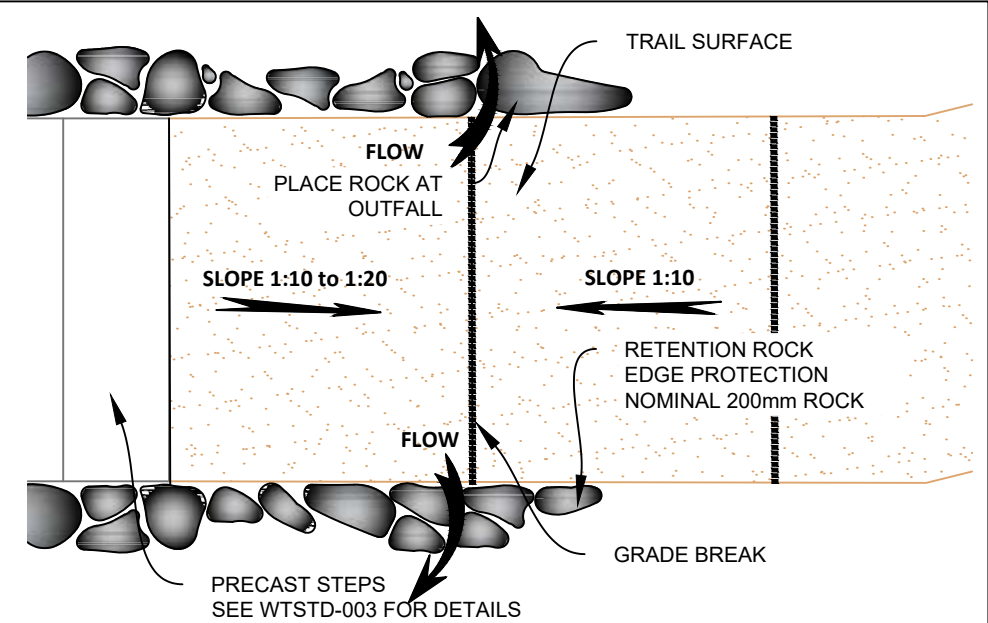
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								DS		07/04/20	PLACEMENT AND DIMENSIONS			Scale	
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Rev.	Date	Revision Details		Drn.	Ver.	App.								Rev.	
B	07/04/20	ALTERATIONS MADE TO NOTES		JR										A3	
A	07/08/19	ISSUED FOR INFORMATION		JR										B	



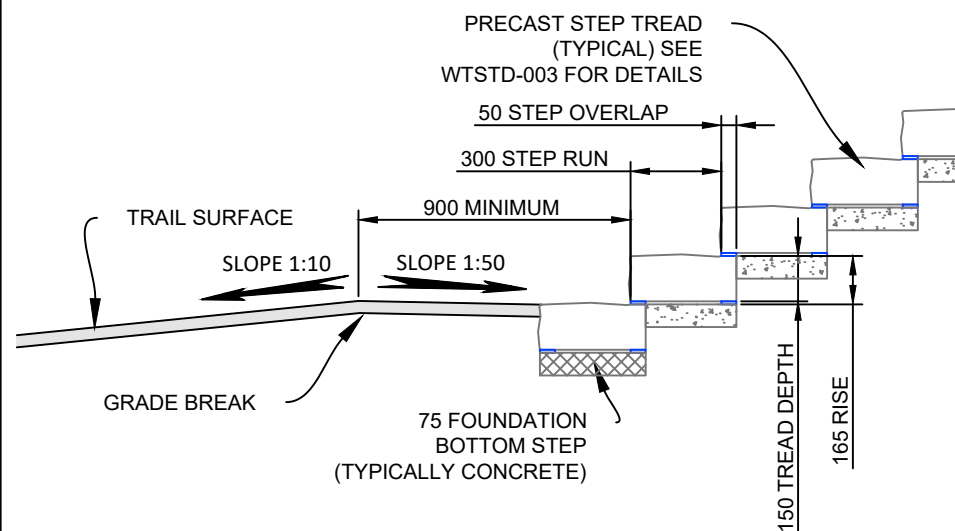
TYPICAL PLAN VIEW - TRAIL BELOW PRECAST STEPS



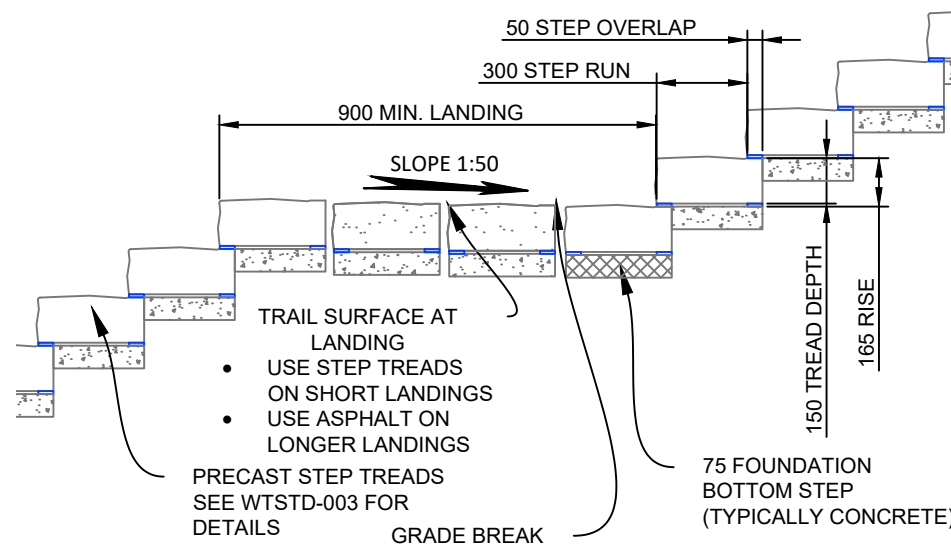
TYPICAL PLAN VIEW - PRECAST STEPS WITH LANDING



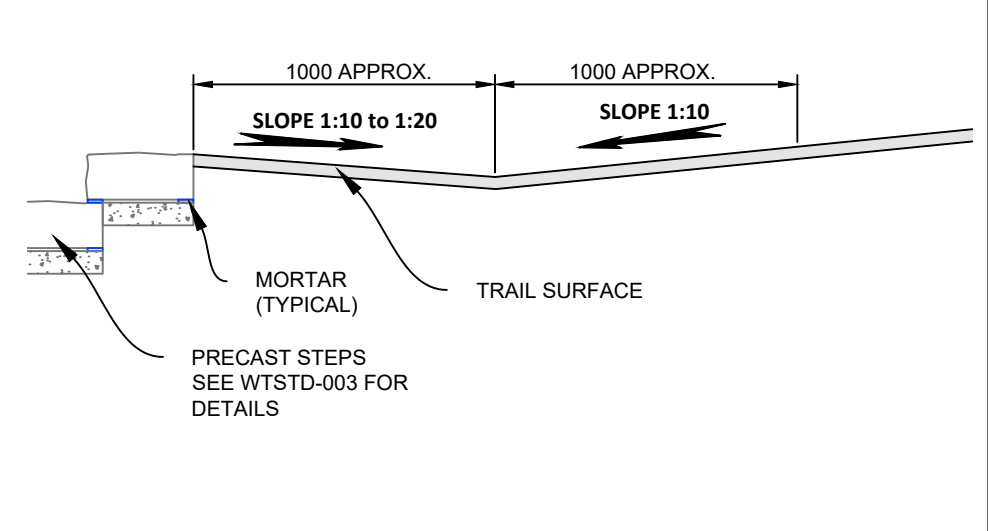
TYPICAL PLAN VIEW - TRAIL ABOVE PRECAST STEPS



TYPICAL SECTION - TRAIL BELOW PRECAST STEPS



TYPICAL SECTION - PRECAST STEPS WITH LANDING



TYPICAL SECTION - TRAIL ABOVE PRECAST STEPS

NOTES:

GENERAL:

- The main objective of the grading guidelines depicted is to provide solutions to minimise linear stormwater flows cascading down the steps and along the trail alignment.
- The main principle in avoiding this is to shed small amounts away from the trail alignment before they can concentrate into large volume flows.
- By shedding water above, between and below stairs, the flows down the stairways will be minimised.
- Details of placement of the precast step units depicted can be found in WTSTD-003-WG2.
- The dimensions and slopes depicted in this drawing may need to

- be modified to suit the particular topography and natural water flows identified at the specific location of the structure.
- On landings less than 1400mm long, step treads or concrete infill may be used instead of asphalt.
- Any major deviations from these layouts must be approved by the project principle or their relevant responsible officer.

EROSION PROTECTION

- The locations where water flows are shedded from the trail alignment need to be protected by rock and constructed in such a way as to disperse the discharging stormwater in a way that will not cause scouring in the receiving environment.
- Careful consideration needs to be given to assessing the type of material at the discharge location for its likelihood of scouring.
- Additional consideration must also be given to ensure the flow of

- water is not causing scouring, erosion or flooding further down the flowpath from the trail outfall point.
- Where the material in the discharge path has a high potential to scour, additional measures such as rock chutes, reinforcement or dispersion channels may be required.
- The need for additional protection may be identified and requested by the project principle or their relevant responsible officer.
- Any additional protection measures must be approved by the project principle or their relevant responsible officer.

GENERAL
ARRANGEMENT
SCALE 1:25

Scale 1:25 @ A3

ISSUED FOR CLIENT REVIEW	
APPROVED	<input type="checkbox"/>
APPROVED AS NOTED	<input type="checkbox"/>
NOT APPROVED	<input type="checkbox"/>
SIGNED.....	DATE.....

Rev.	Date	Revision Details	Drn.	Ver.	App.
A	07/04/20	ISSUED FOR INFORMATION	JR	DS	DS



Project:
**WANGETTI TRAIL
DETAILED DESIGN**

Drawn JR	Signed	Date 07/04/20
Designed DS	Signed	Date 07/04/20
Verified DS	Signed	Date 07/04/20
Approved	Signed	Date

Drawing Title:
**PRECAST CONCRETE STEPS
TRAIL GRADING GUIDELINES
STANDARD DRAWING**

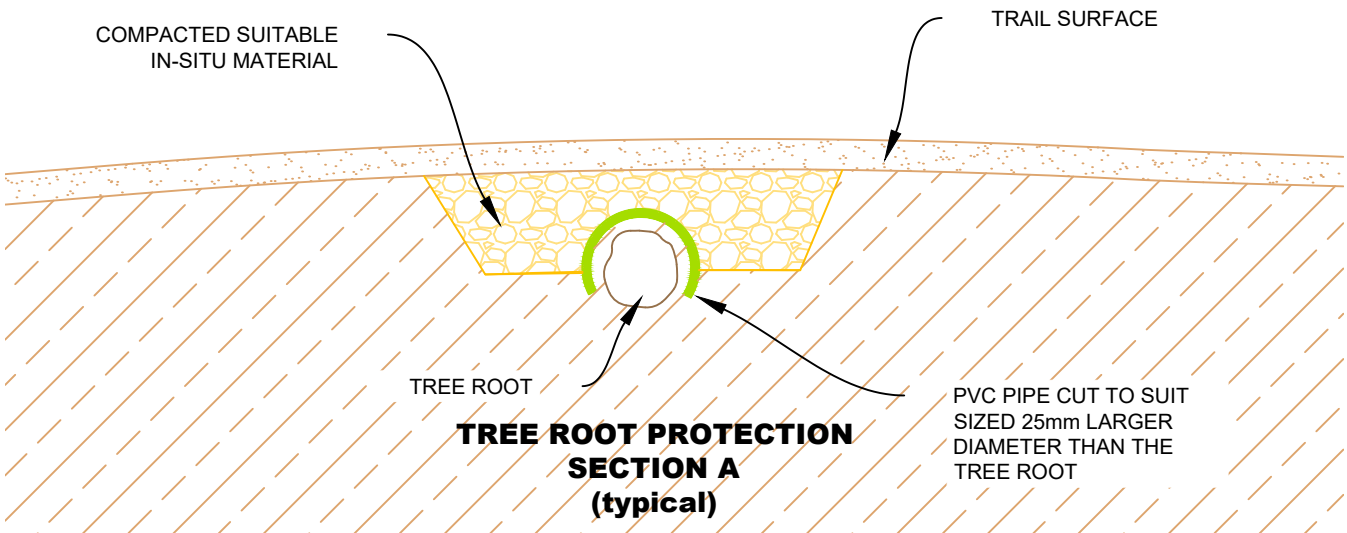
FOR INFORMATION	
Project No. WT20-Wangetti-001	Sheet Size A3
Scale 1:25	Rev. A
Drawing No. WTSTD-030-WG2	

NOTES:

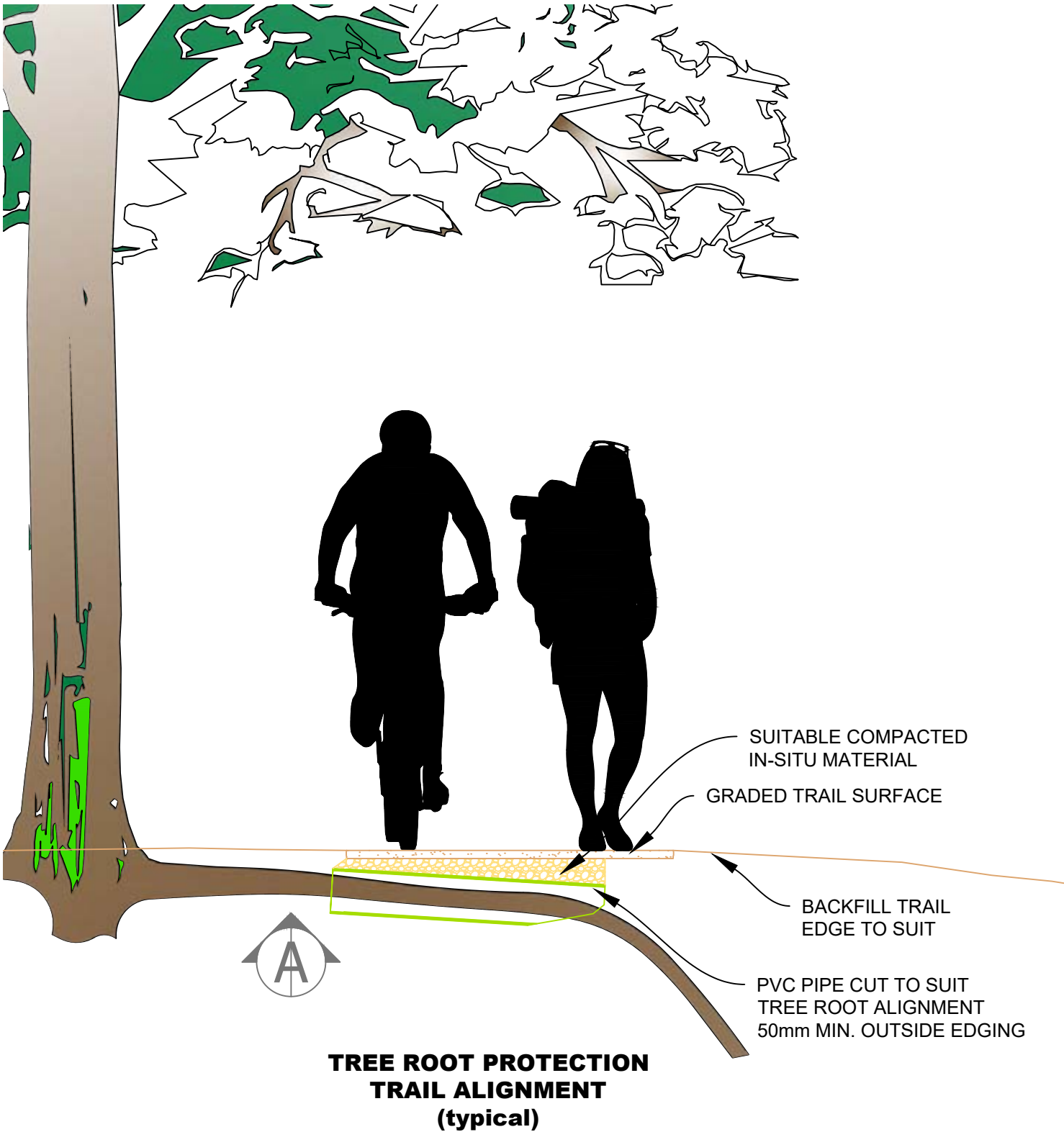
- GENERAL:
- Tree Root Protection is to be used in locations where the trail alignment cannot be redirected to avoid tree roots.
 - The tree root is to be encased in a "cut to suit" section of PVC pipe that has an internal diameter that provides a 25mm minimum clearance from the tree root.
 - The PVC pipe is to extend at least 50mm outside the edge or the trail ride line.
 - The PVC pipe must extend to a location where there can be a minimum of 30mm cover of in-situ material over the top of the pipe and where there can be no contact between trail ride line and the tree root.
 - The in-situ material used around the PVC pipe must be free of stones or vegetative matter and must be suitably graded material to provide a hard compacted surround to the pipe.
 - The in-situ material must be well compacted at the sides of the PVC sleeve to ensure there are no voids that could cause the PVC sleeve to move and wear against the tree root.
 - While this standard drawing provides information on the normal methodology for dealing with unavoidable tree roots, variations may be required for specific plant species or unusual root systems.
 - Dimensions in millimetres unless otherwise notated.

LEGEND:

- GRADED TRAIL SURFACE
- IN-SITU MATERIAL
- NATURAL GROUND



Scale 1:7.5 @ A3



Scale 1:20 @ A3

GENERAL ARRANGEMENT SCALE AS SHOWN

ISSUED FOR CLIENT REVIEW	
APPROVED	<input type="checkbox"/>
APPROVED AS NOTED	<input type="checkbox"/>
NOT APPROVED	<input type="checkbox"/>
SIGNED..... DATE.....	

FOR INFORMATION	
Project No.	WT20-Wangetti-001
Scale	as shown
Sheet Size	A3
Drawing No.	WTSTD-031-WG2
Rev.	A

Rev.	Date	Revision Details	Drn.	Ver.	App.
A	24/03/20	ISSUED FOR INFORMATION	JR	DS	DS



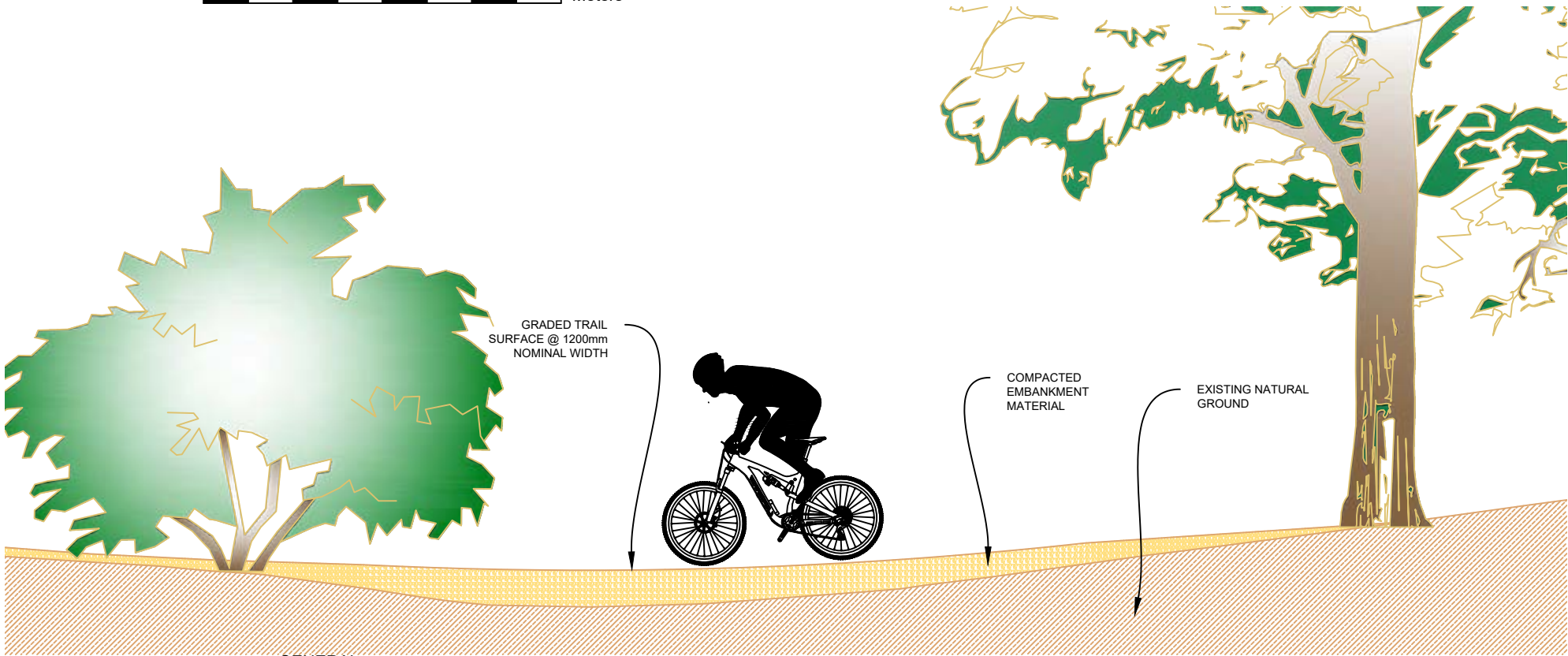
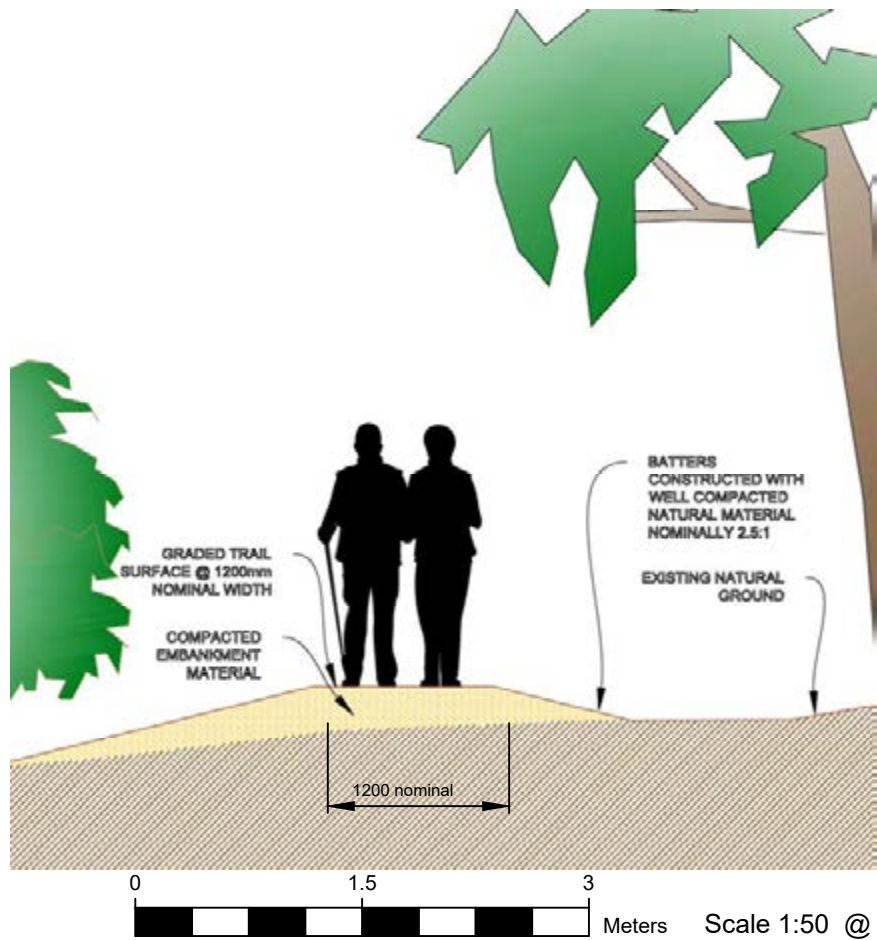
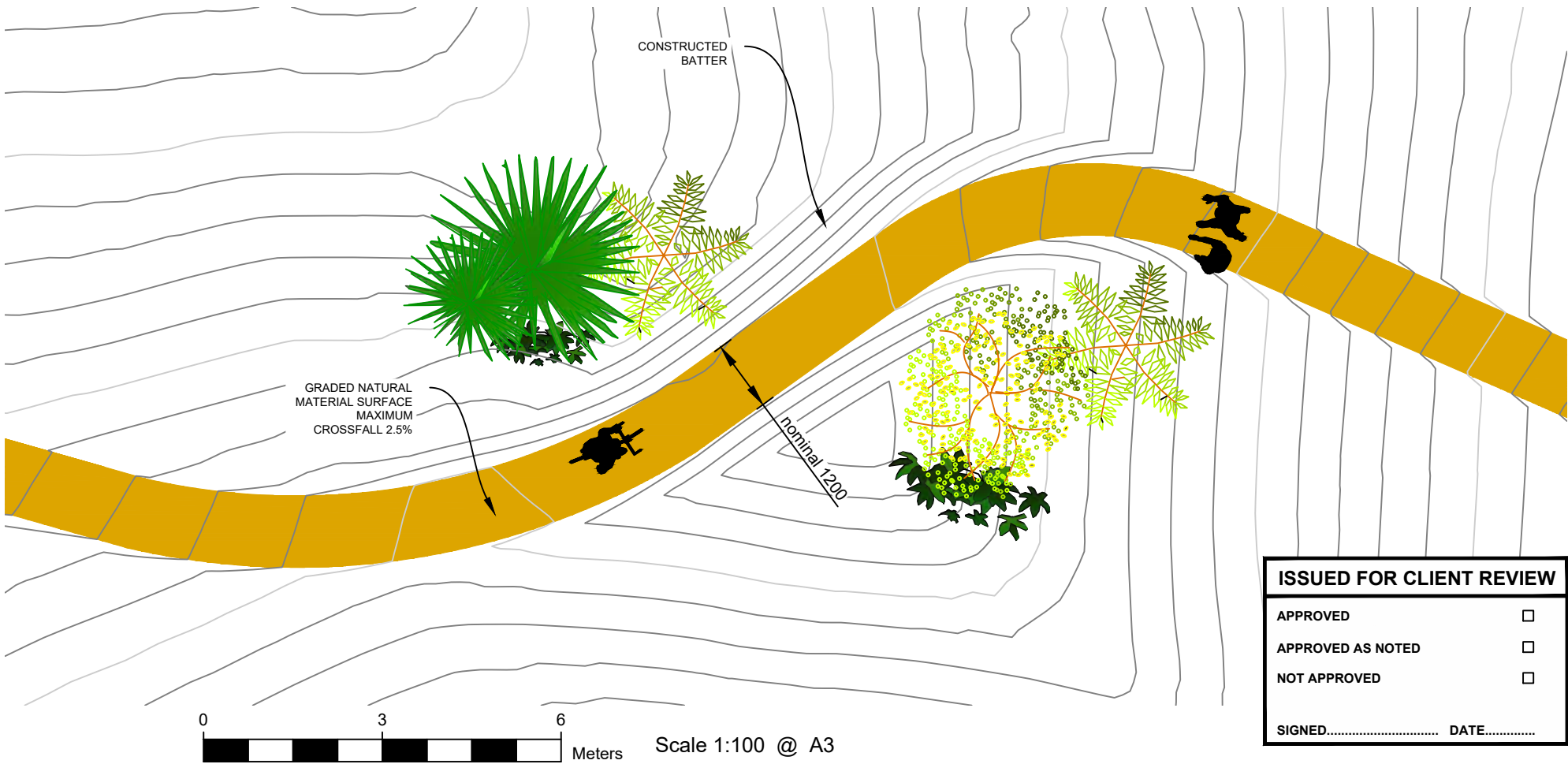
Project: WANGETTI TRAIL DETAILED DESIGN

Drawn	Signed	Date
JR		24/03/20
Designed	Signed	Date
DS		24/03/20
Verified	Signed	Date
DS		24/03/20
Approved	Signed	Date

Drawing Title: TRAIL - TREE ROOT PROTECTION PLACEMENT AND DIMENSIONS STANDARD DRAWING

NOTES:

- Raised Embankments may be necessary in trail sections that are often wet and boggy or to improve rideability through changing the vertical alignment.
- Raised Embankments will only be appropriate in areas where spare embankment material is available and can be utilised economically.
- The height and length of the raised embankment will vary considerably depending on the location where it is required. It will vary from a slight elevation of a few hundred millimeters to around a meter as depicted on this plan.
- Embankment material should be free of large rocks and should not contain large amounts of vegetation matter.
- Embankments are to be compacted in layers of less than 200mm and to 90% of maximum dry density.
- Batter slopes should be nominally 2.5:1 but may vary considerably depending on the type and availability of fill material and the local topography of the trail location.
- Raised Embankments should be constructed so that they do not impede the flow of stormwater or they should have suitable drainage structures (eg pipes) placed at the bottom of the fill material.
- Rocks can be placed at the toe of the embankment to stabilise the batters and protect the bottom section of the embankment from erosion.
- Where there is sufficient room, rocks can also be placed at the top of the embankment to direct riders & hikers away from the embankment edges.



GENERAL
ARRANGEMENT
VARIES

A	24/03/20	ISSUED FOR INFORMATION	JR	DS	DS
Rev.	Date	Revision Details	Drn.	Ver.	App.

Client:



Project:

WANGETTI TRAIL
DETAILED DESIGN

Drawn

JR

Signed

DS

Verified

DS

Approved

Signed

Date

24/03/20

Date

24/03/20

Date

Drawing Title:

RAISED EMBANKMENT - DUAL USE
PLACEMENT AND DIMENSIONS
STANDARD DRAWING

FOR INFORMATION

Project No.

WT20-Wangetti-001

Scale

as shown

Sheet Size

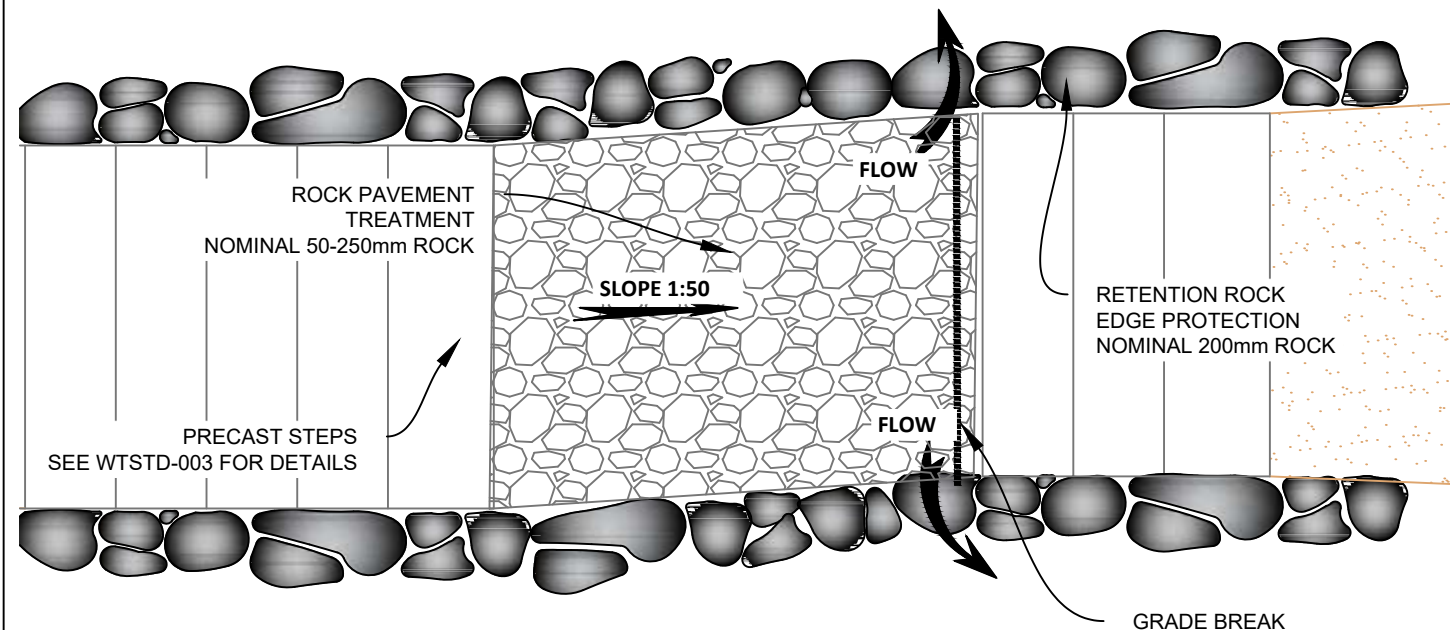
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Drawing No.

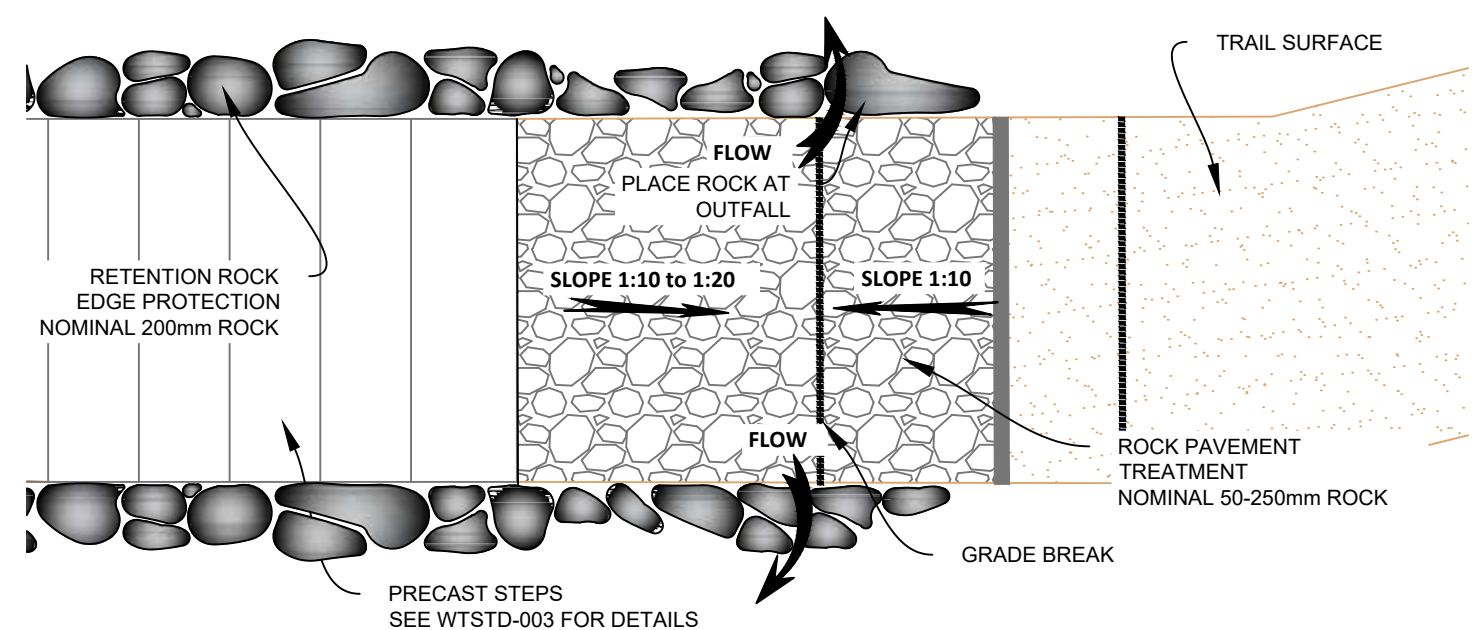
WTSTD-029-WG2

Rev.

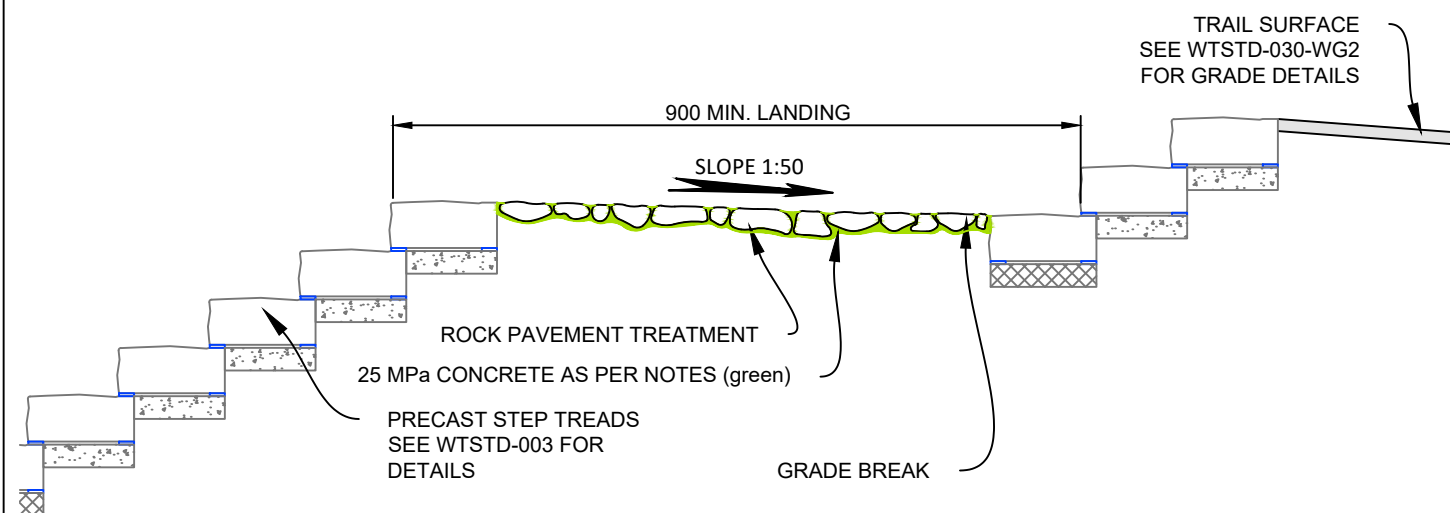
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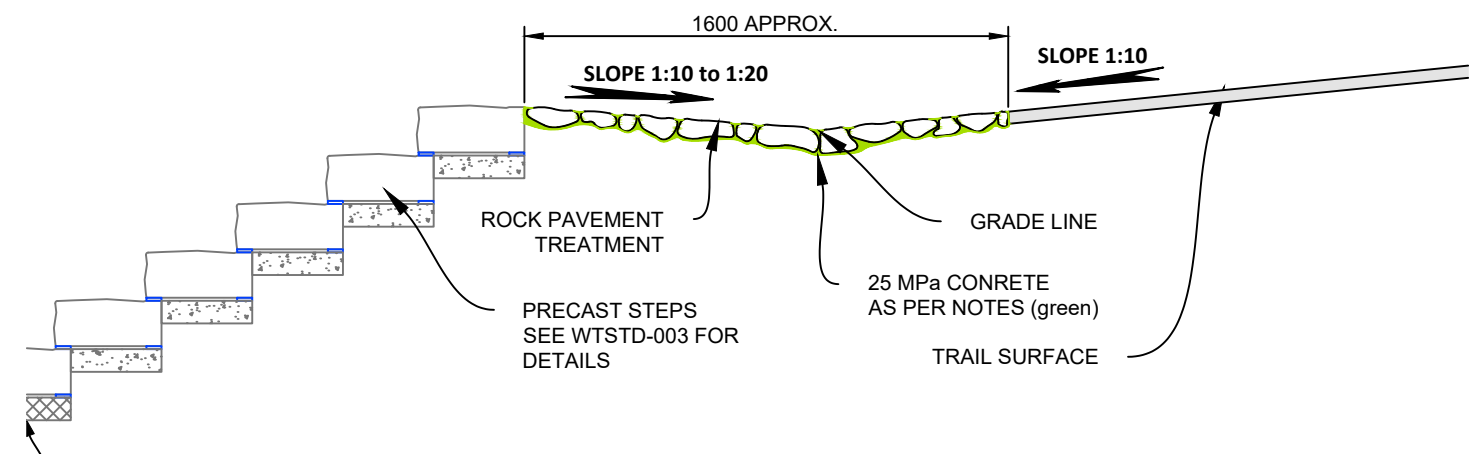
TYPICAL PLAN VIEW - ROCK PAVEMENT TREATMENT AT LANDING



TYPICAL PLAN VIEW - TREATMENT ABOVE PRECAST STEPS



TYPICAL SECTION - ROCK PAVEMENT TREATMENT AT LANDING



TYPICAL SECTION - TREATMENT ABOVE PRECAST STEPS

NOTES:

GENERAL:

- The main objective of the rock pavement treatment is to minimise linear stormwater flows cascading down steps and along the trail alignment.
- The main principle in avoiding this is to provide a protected surface near grade changes where water flows may concentrate.
- While this treatment is mainly to be used above or between precast steps, it may be appropriate to other grade change or susceptible sections of a trail.
- While rock armouring, see WTSTD-007-WG2, is similar, it is proposed for use in areas where water transversely crosses the trail. It would require larger rock due to the higher flow velocities expected at those locations.
- Rock Pavement Treatment is the use of smaller, preferably flat, rocks

to provide a walkable, hardened trail surface that will not erode through smaller localised stormwater flows.

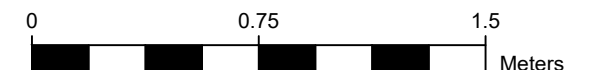
- The dimensions and slopes depicted in this drawing may need to be modified to suit the particular topography and natural water flows identified at the specific location of the treatment.
- Rock Pavement Treatment can be used in landings.
- The rock pavement treatment should interlink and mesh into the rock treatment along the edges of staircases as depicted in WTSTD-030-WG2.
- The rock treatment should follow the Grading Guidelines depicted in WTSTD-030-WG2.
- While not depicted in this drawing, the rock pavement treatment may be appropriate at the bottom of staircases where the ground is prone to softness and muddiness.
- Any major deviations from these layouts must be approved by the project principle or their relevant responsible officer.

PLACEMENT:

- Rock is to be nominally 100mm to 250mm in size with at least one reasonable flat face to enable a finished, walkable surface.
- Rocks are to be placed in such a way that they are interlocked and well bedded into a 25 MPa concrete bed poured onto the spoon drain foundation.
- 25 MPa Concrete to be poured into the gaps between the rocks and along the edges to form a neat transition to the trail surface.
- All exposed concrete should be finished to a rough texture to minimise slipping and provide further roughage to impede water flows.
- The tops of the rocks should be cleaned of concrete to provide a natural finish.
- Concrete should be tamped to ensure there is no air entrapment and that the concrete is placed firmly against the foundation material.

ISSUED FOR CLIENT REVIEW

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SIGNED.....	DATE.....



Scale 1:25 @ A3

GENERAL
ARRANGEMENT
SCALE 1:25

FOR INFORMATION

Project No. WT20-Wangetti-001	Sheet Size A3
Scale 1:25	Rev. A
Drawing No. WTSTD-043- WG2	

Rev.	Date	Revision Details	Drn.	Ver.	App.
A	07/04/20	ISSUED FOR INFORMATION	JR	DS	DS



Client:
Project:
WANGETTI TRAIL
DETAILED DESIGN

Drawn JR	Signed	Date 07/04/20
Designed DS	Signed	Date 07/04/20
Verified DS	Signed	Date 07/04/20
Approved	Signed	Date

Drawing Title:
ROCK PAVEMENT TREATMENT
TRAIL CONSTRUCTION
STANDARD DRAWING

NOTES:

INSTALLATION:

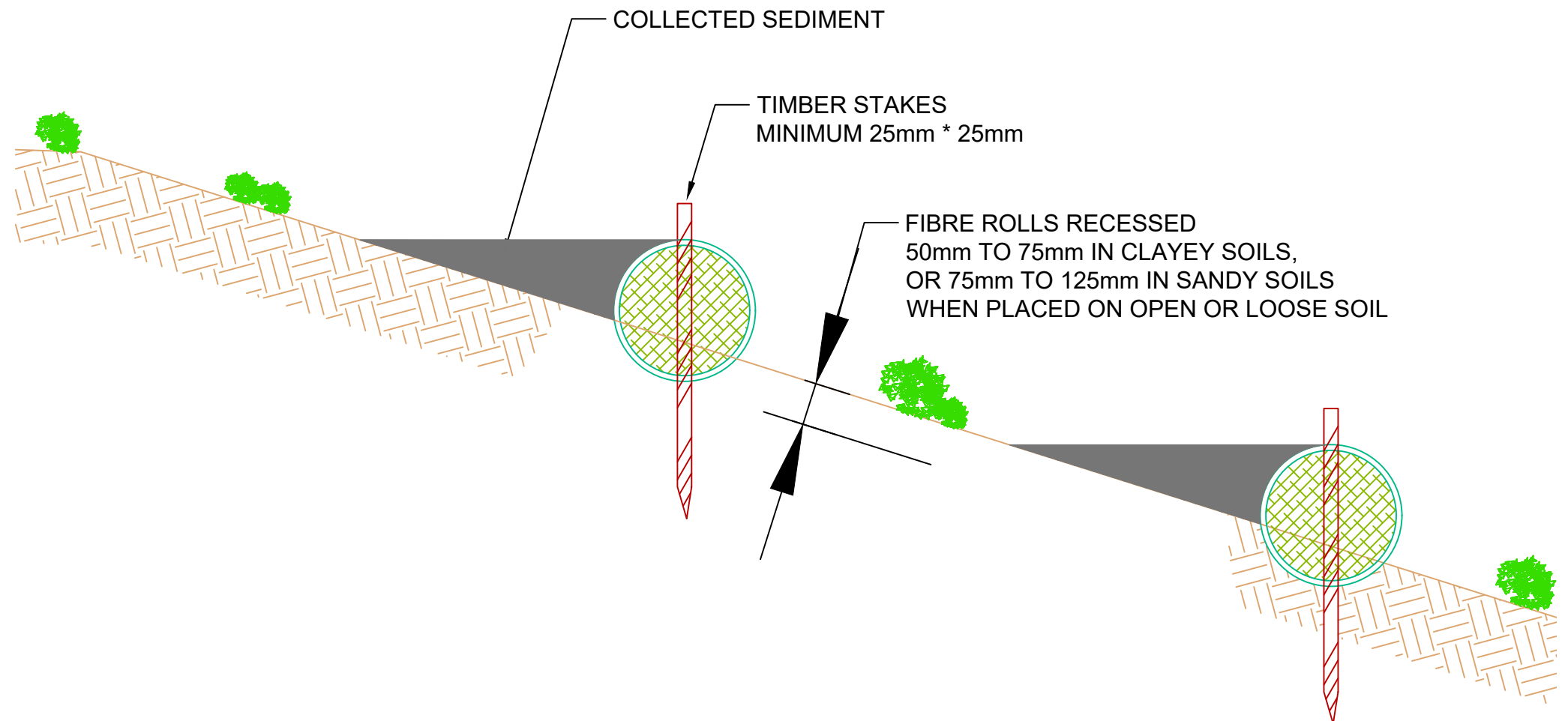
- Fibre Rolls are typically 200mm to 250mm Jute, Coir or Straw roll tied with synthetic biodegradable mesh.
- Fibre Rolls are to be installed as described in any project specific, approved plans. Any queries or alterations need to be provided by or approved by the clients engineer or on site representative.
- The rolls must be placed along the contour when placed across bare or newly seeded slopes.
- Ensure the outermost ends of a line of Fibre Rolls are turned up the slope to ensure ponding and minimise bypassing.
- When placed across the invert of minor drains ensure the rolls are spaced such that the crest of a downstream roll is level with or above the invert at the immediately upstream roll.
- When placed across the invert of minor drains ensure that each roll extends far enough up the banks on each side such that the crest of the roll in the center is lower than the ground height at the ends of the roll.
- Ensure the anchoring stakes are driven through the end of each roll and at a minimum spacing along the roll of the lesser of 1.2m spacings or 6 times the roll diameter.
- Stakes must be driven at a minimum spacing of 300mm when the rolls are being used to form a check dam.
- Adjoining rolls must be overlapped at least 450mm.

MAINTENANCE:

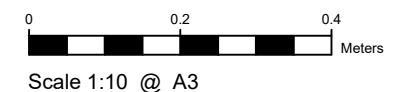
- All Fibre Rolls must be inspected at a minimum of once per week, always prior to a forecast rainfall event and at daily intervals during extended periods of rainfall.
- Any damaged or displaced Fibre Rolls must be replaced, relocated or repaired to ensure compliance with installation requirements.
- Collected sediment should be removed and disposed of in a suitable manner that will not cause erosion or detriment to water quality.

REMOVAL:

- Fibre Rolls are to be removed from site once they are no longer needed to provide their drainage or sediment control function.
- All excessive sediment must be removed from behind the rolls and disposed of as above, if it is likely to be washed away.
- Any biodegradable components of the Fibre Rolls may be suitable to remain on site as mulch.
- All materials that are not readily biodegradable must be removed from the site.



SECTION VIEW - TYPICAL INSTALLATION OF FIBRE ROLLS

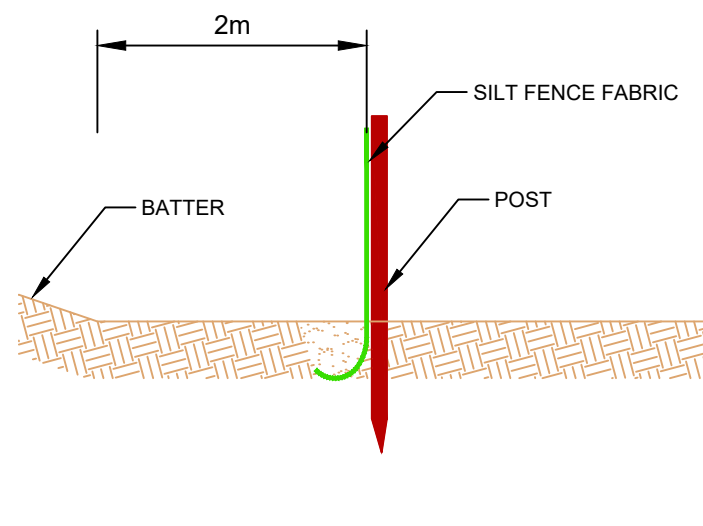


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SIGNED..... DATE.....	

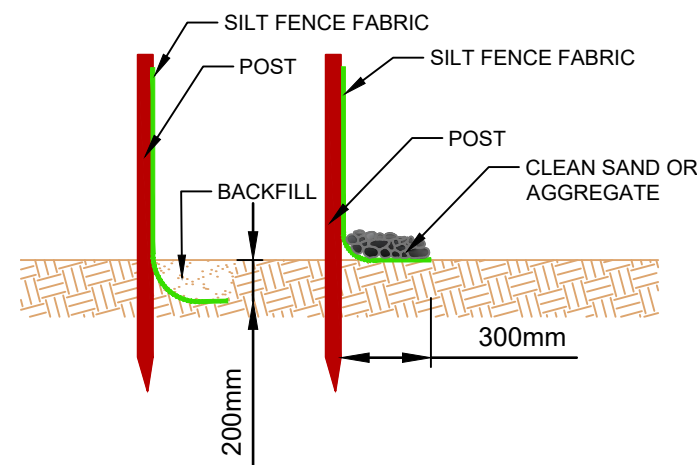
NOTE: Sections of this plan have been derived from the Catchments and
Creeks Standard Drawing - Plan FR-01

GENERAL
ARRANGEMENT
SCALE 1:25

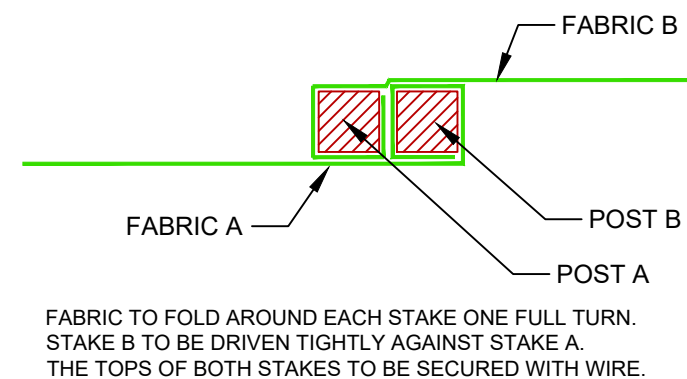
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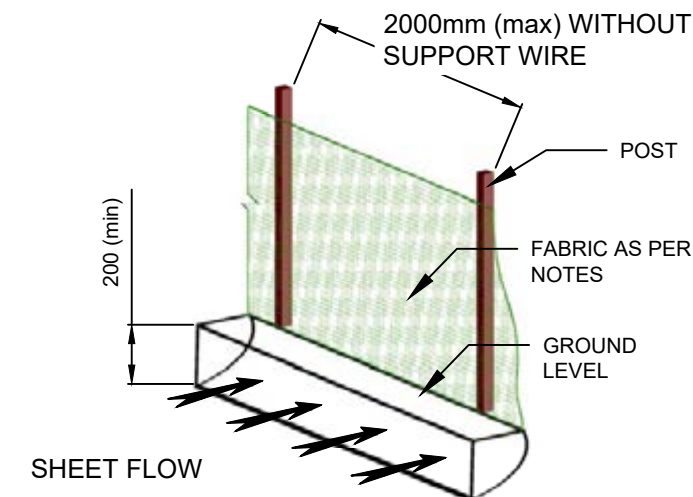
(a) LOCATION OF FENCE RELATIVE TO BASE OF SLOPE



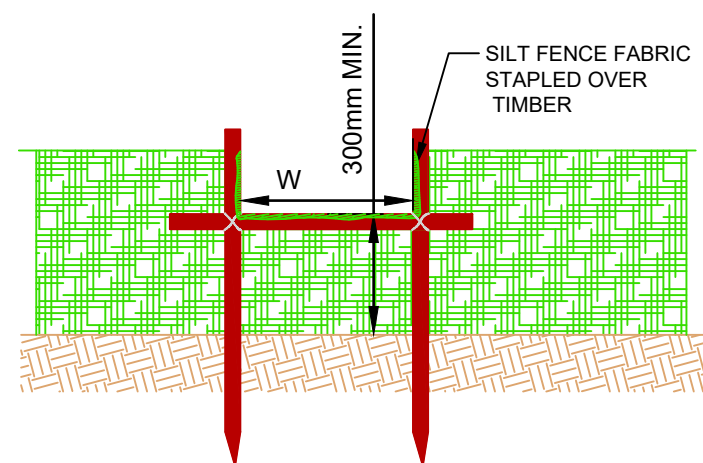
(b) SILT FENCE BASE ANCHORING



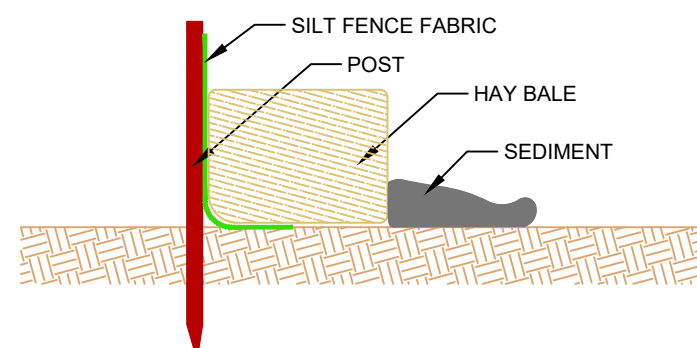
(c) JOINING FABRIC - METHOD 1



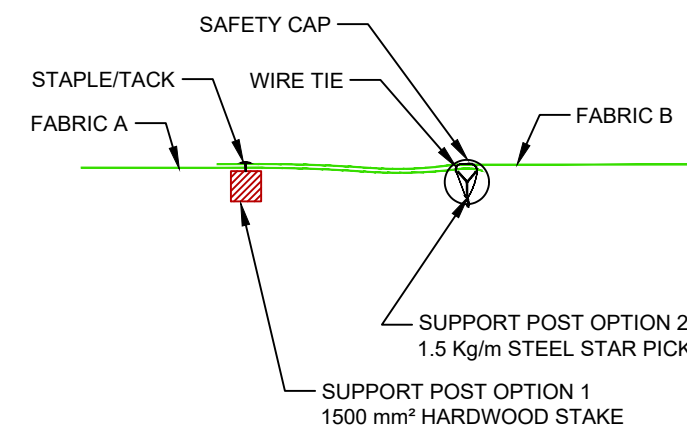
(d) INSTALLATION WITHOUT BACKING SUPPORT



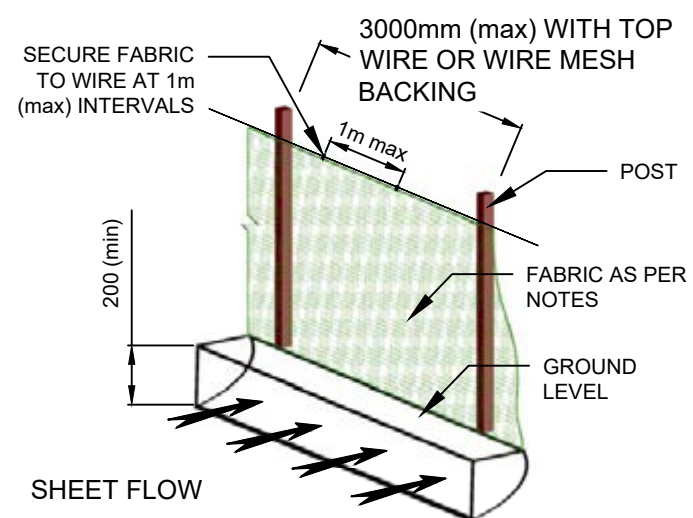
(e) SPILL-THROUGH WEIR



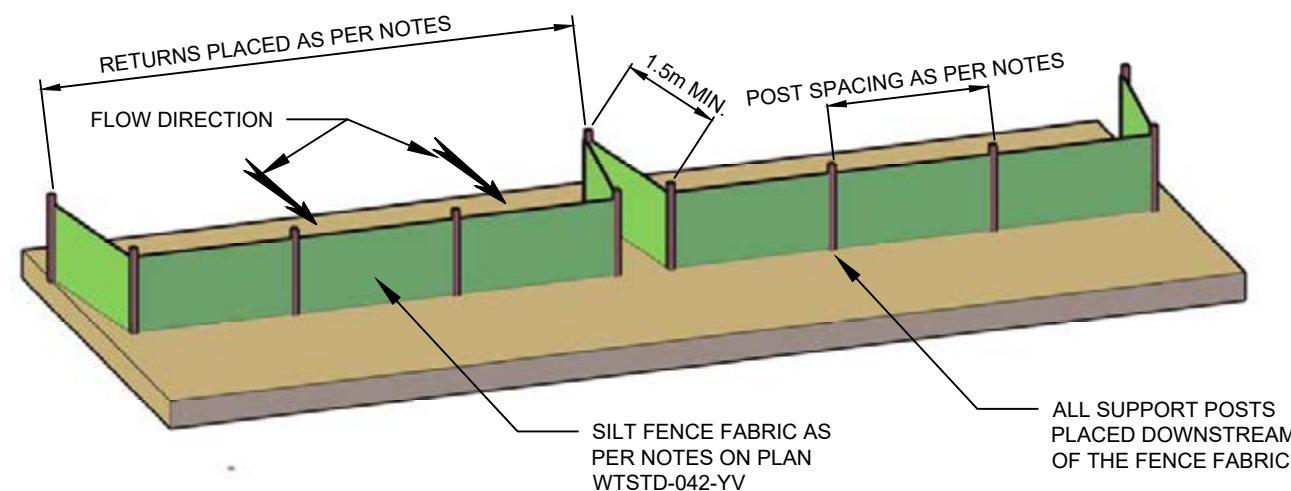
(f) PLACEMENT OF UP-SLOPE STRAW BALE



(g) JOINING FABRIC - METHOD 2



(h) INSTALLATION WITH TOP WIRE SUPPORT



(i) INSTALLATION OF SEDIMENT FENCE

NOTES:

- Sediment Fence to be installed along the contour where ever practical.
- Both ends of the Sediment Fence are to extend up the slope for at least 1m to avoid flow bypassing.
- Support posts to be placed at a minimum spacing of 2m or 3m if a top wire or mesh backing have been installed.
- Fence "returns" shall be installed at a maximum spacing of 20m when the fence is installed along the contour or 5m to 10m when installed on sloping ground.
- Silt Fence fabric is to be connected to the posts with a minimum of 4 staples or tie wires per post.
- This plan is to be read in conjunction with Plan WTSTD-042-YV and must not be interpreted by itself.

NOTE: Sections of this plan have been derived from the Catchments and Creeks Standard Drawing - Plan SF-01

ISSUED FOR CLIENT REVIEW	
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FOR INFORMATION

Project No. WT20-Wangetti-001	
Scale NTS	Sheet Size A3
Drawing No. WTSTD-041-WG2	Rev. A

Rev.	Date	Revision Details	Drn.	Ver.	App.
A	24/03/20	ISSUED FOR INFORMATION	JR	DS	DS



Project:
WANGETTI TRAIL
DETAILED DESIGN

Drawn JR	Signed	Date 24/03/20
Designed DS	Signed	Date 24/03/20
Verified DS	Signed	Date 24/03/20
Approved	Signed	Date

Drawing Title:
SEDIMENT CONTROL - SILT FENCE
PLACEMENT AND DIMENSIONS
STANDARD DRAWING

NOTES:

MATERIALS:

FABRIC:

- Polypropylene. Polyamide, Nylon, Polyester or Polyethylene woven or non-woven fabric at least 700mm in width and 140 gsm.
- All fabrics to contain ultraviolet inhibitors and stabilisers to provide a minimum of 5 months of usable construction life (Ultraviolet Stability exceeding 70%)

FABRIC REINFORCEMENT:

- Wire or steel mesh minimum 14-gauge with a maximum mesh spacing of 200mm.

SUPPORT POSTS/STAKES:

- Hardwood Posts minimum 1500mm²,
- or Softwood Posts minimum 2500mm²,
- or Steel Star Pickets, minimum 1.5 Kg/m, suitable for attaching fabric.

INSTALLATION:

- Silt Fences are to be installed as described in any project specific, approved plans. Silt Fence Fabric should comply with any specifications provided. Any queries or alterations need to be provided by or approved by the clients engineer or on site representative.
- To the maximum degree practical, and where the plans allow, ensure the fence is located:
 - (a) totally within the property boundaries
 - (b) along a line of constant elevation wherever practical
 - (c) at least 2m from the toe of any filling operations that may result in shifting soil/fill damaging the fence.
- Install returns within the fence at maximum 20m intervals if the fence is installed along the contour, or 5m to 10m maximum spacing (depending on slope) if the fence is installed at an angle to the contour. the 'returns' shall consist of either:
 - (a) v-shaped section extending at least 1.5m up the slope; or
 - (b) sandbag or rock/aggregate check dam a minimum 1/3 and maximum 1/2 fence height, and extending at least 1.5m up the slope.
- Ensure the extreme ends of the fence are turned up the slope at least 1.5m, or as necessary, to minimise water bypassing around the fence.
- Ensure the sediment fence is installed in a manner that avoids the concentration of flow along the fence, and the undesirable discharge of water around the ends of the fence.
- If the sediment fence is to be installed along the edge of existing trees, ensure care is taken to protect the trees and their root systems during installation of the fence. do not attach the fabric to the trees.
- Unless directed by the site supervisor or the approved plans, excavate a 200mm wide by 200mm deep trench along the proposed fence line, placing the excavated material on the up-slope side of the trench.

- Along the lower side of the trench, appropriately secure the stakes into the ground spaced no greater than 3m if supported by a top support wire or weir mesh backing, otherwise no greater than 2m.
- If specified, securely attach the support wire or mesh to the up-slope side of the stakes with the mesh extending at least 200mm into the excavated trench. ensure the mesh and fabric is attached to the up-slope side of the stakes even when directing a fence around a corner or sharp change of direction.
- Wherever possible, construct the sediment fence from a continuous roll of fabric. to join fabric either:
 - (a) attach each end to two overlapping stakes with the fabric folding around the associated stake one turn, and with the two stakes tied together with wire; or
 - (b) overlap the fabric to the next adjacent support post.
- Securely attach the fabric to the support posts using 25 x 12.5mm staples, or tie wire at maximum 150mm spacing.
- Securely attach the fabric to the support wire/mesh (if any) at a maximum spacing of 1m.
- Ensure the completed sediment fence is at least 450mm, but not more than 700mm high. if a spill-through weir is installed, ensure the crest of the weir is at least 300mm above ground level.
- Backfill the trench and tamp the fill to firmly anchor the bottom of the fabric and mesh to prevent water from flowing under the fence.

ADDITIONAL REQUIREMENTS FOR THE INSTALLATION OF A SPILL-THROUGH WEIR:

- Locate the spill-through weir such that the weir crest will be lower than the ground level at each end of the fence.
- Ensure the crest of the spill-through weir is at least 300mm above the ground elevation.
- Securely tie a horizontal cross member (weir) to the support posts/ stakes each side of the weir. Cut the fabric down the side of each post and fold the fabric over the cross member and appropriately secure the fabric.
- Install a suitable splash pad and/or chute immediately down-slope of the spill-through weir to control soil erosion and appropriately discharge the concentrated flow passing over the weir.

MAINTENANCE:

- Inspect the sediment fence at least weekly and after any significant rain. Make necessary repairs immediately.
- Repair any torn sections with a continuous piece of fabric from post to post.
- When making repairs, always restore the system to its original configuration unless an amended layout is required or specified.
- If the fence is sagging between stakes, install additional support posts.

- Remove accumulated sediment if the sediment deposit exceeds a depth of 1/3 the height of the fence.
- Dispose of sediment in a suitable manner that will not cause an erosion or pollution hazard.
- Replace the fabric if the service life of the existing fabric exceeds 6-months.

REMOVAL:

- When disturbed areas up-slope of the sediment fence are sufficiently stabilised to restrain erosion, the fence must be removed.
- Remove materials and collected sediment and dispose of in a suitable manner that will not cause an erosion or pollution hazard.
- Rehabilitate/revegetate the disturbed ground as necessary to minimise the erosion hazard.

ISSUED FOR CLIENT REVIEW	
APPROVED	<input type="checkbox"/>
APPROVED AS NOTED	<input type="checkbox"/>
NOT APPROVED	<input type="checkbox"/>
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NOTE: Sections of this plan have been derived/copied from the Catchments and Creeks Standard Drawing - Plan SF-02

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NOTES:

GENERAL:

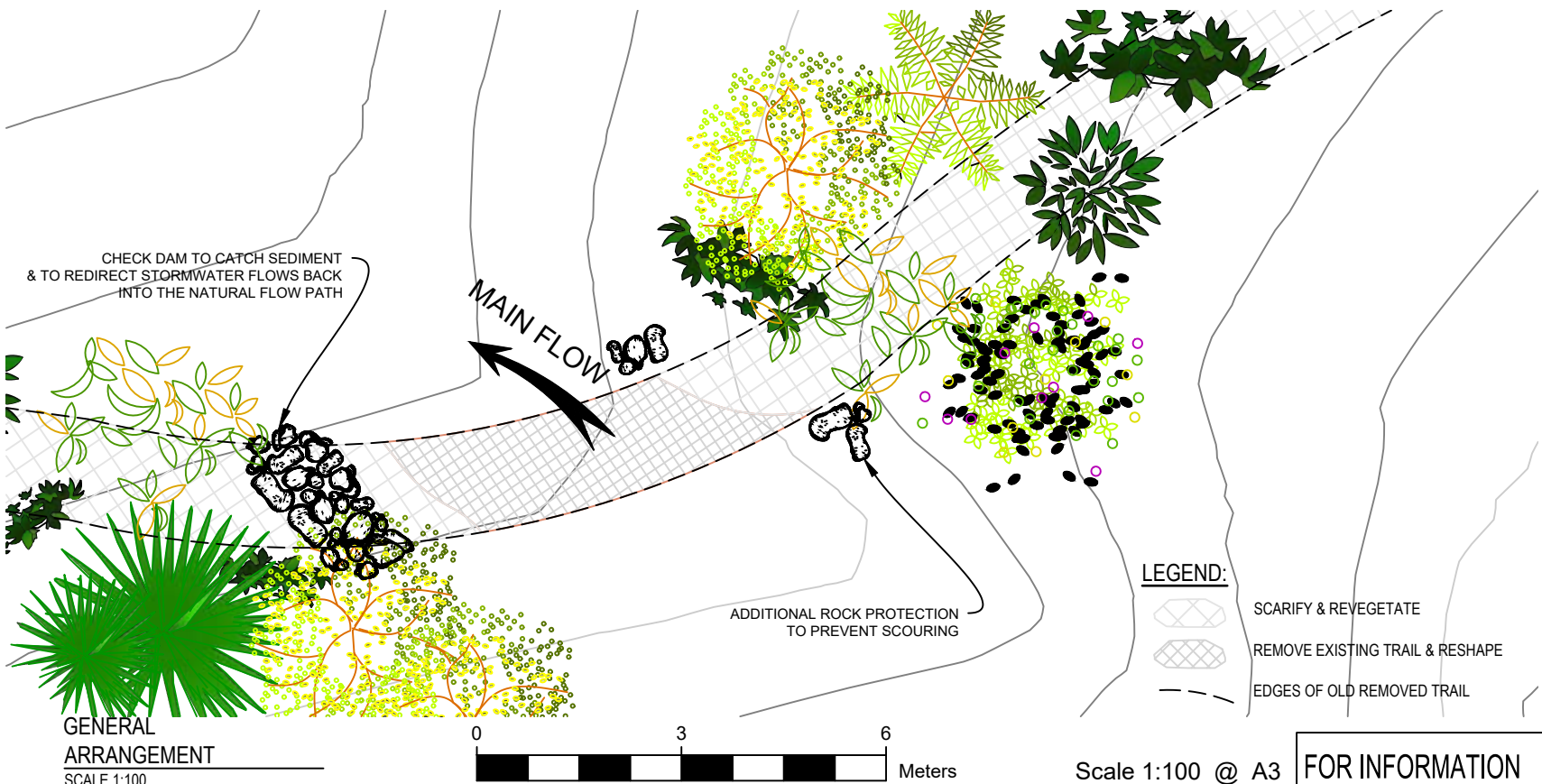
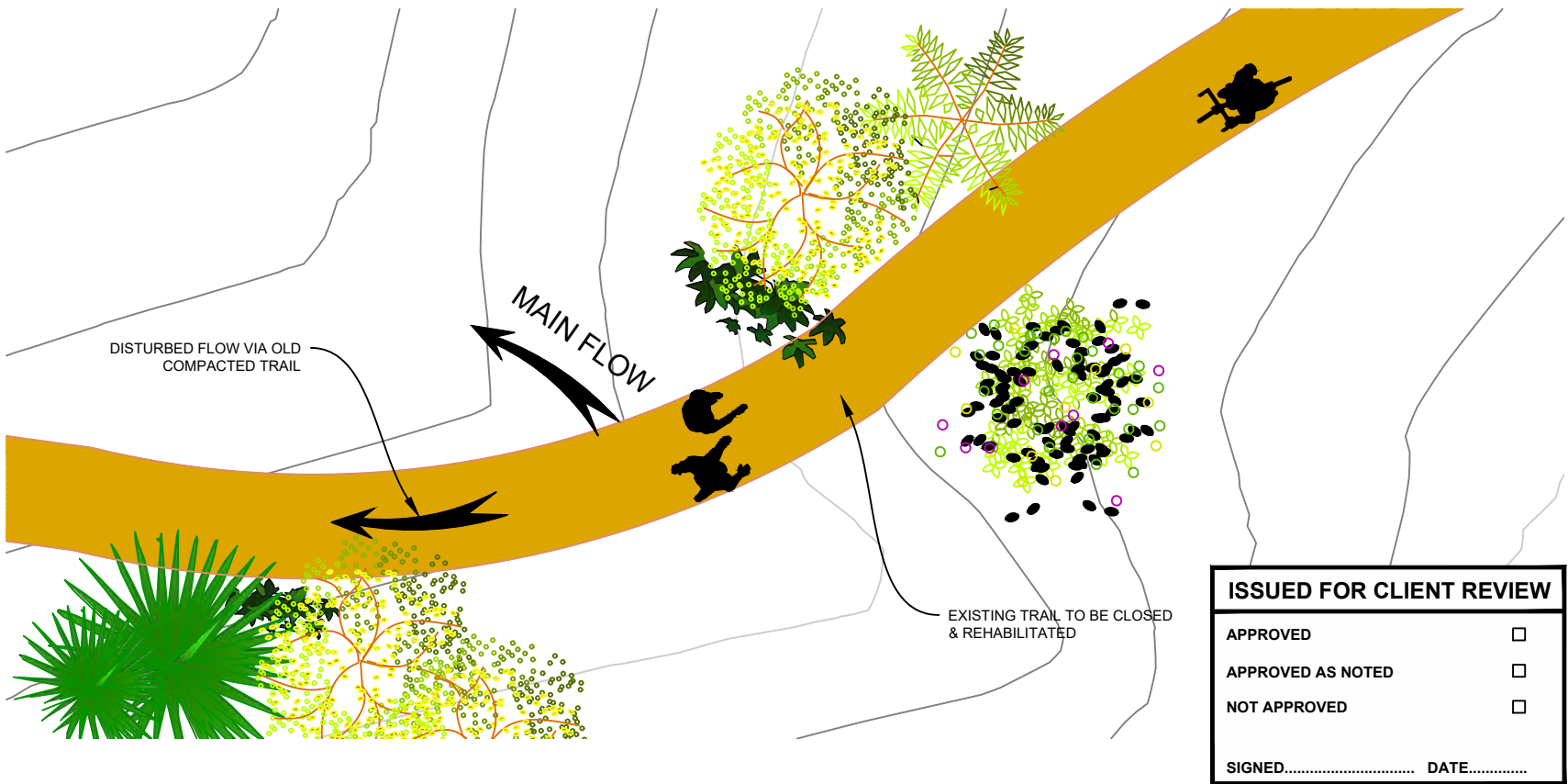
- The example depicted below is one of many trail closure and rehabilitation layouts that might be found when closing an old trail.
- The examples and methodologies depicted in this drawing may be applicable to a wide range of other layouts and trail closure instances.
- Old trails often cause compacted laneways that attract water flows and can redirect natural flows away from their original alignment.
- Closure & Rehabilitation should include a decompaction of the surface, reinstatement of suitable vegetation and the realignment of any water flow paths back to their natural alignments.

CONSTRUCTION:

- The original trail material should be removed and spread in such away to enhance a natural shape and to allow a water flow path that follows the original natural alignment and that resembles the cross sectional shape that would have existed prior to initial trail establishment.
- Where applicable, check dams should be placed to stop sediment transport down the old trail pathway and to assist in redirecting flows back to the original alignment.
- Check dams can be constructed from rocks (as depicted), earthen mounds or logs with rock anchoring to improve stability.
- The upstream section of the old trail should be filled in to recreate a natural shape that ties in with the surrounding ground surface.
- Similarly the downstream stream section of the old trail behind any check dams or diversion structures, should be filled in to recreate a natural shape that ties in with the surrounding ground surface.
- All soil surface areas that are not exposed to concentrated water flows should be scarified by machine and revegetated.
- Additional rocks should be placed, where appropriate, at the sides of the flow path to minimise erosion or the flow path banks.

REVEGETATION:

- All areas outside the main creek flow path should be revegetated including any rock or earthen check dams or check dam anchors.
- Revegation should be undertaken using transplanted local species where possible.
- Plants used for transplantation should be selected from approved areas adjacent to the site and selected in such a way as to leave the source areas with an appropriate amount of remaining stock for natural replenishment.
- Revegetated areas should be maintained through watering and weed management as required until they are established.
- Where plant materials are needed to be sourced from external sources all diversity, botanical, health and plant security requirements applicable to the area or the clients requirements must be complied with.
- In the case where relocation or importation of plant species for revegetation is not possible, a similar result can be achieved over time through natural germination of existing endemic vegetation. Please note all other trail closure techniques must be followed to achieve a best practice rehabilitation result.



A	25/03/20	ISSUED FOR INFORMATION	JR		
Rev.	Date	Revision Details	Drn.	Ver.	App.

Client:



Queensland Government

Project:

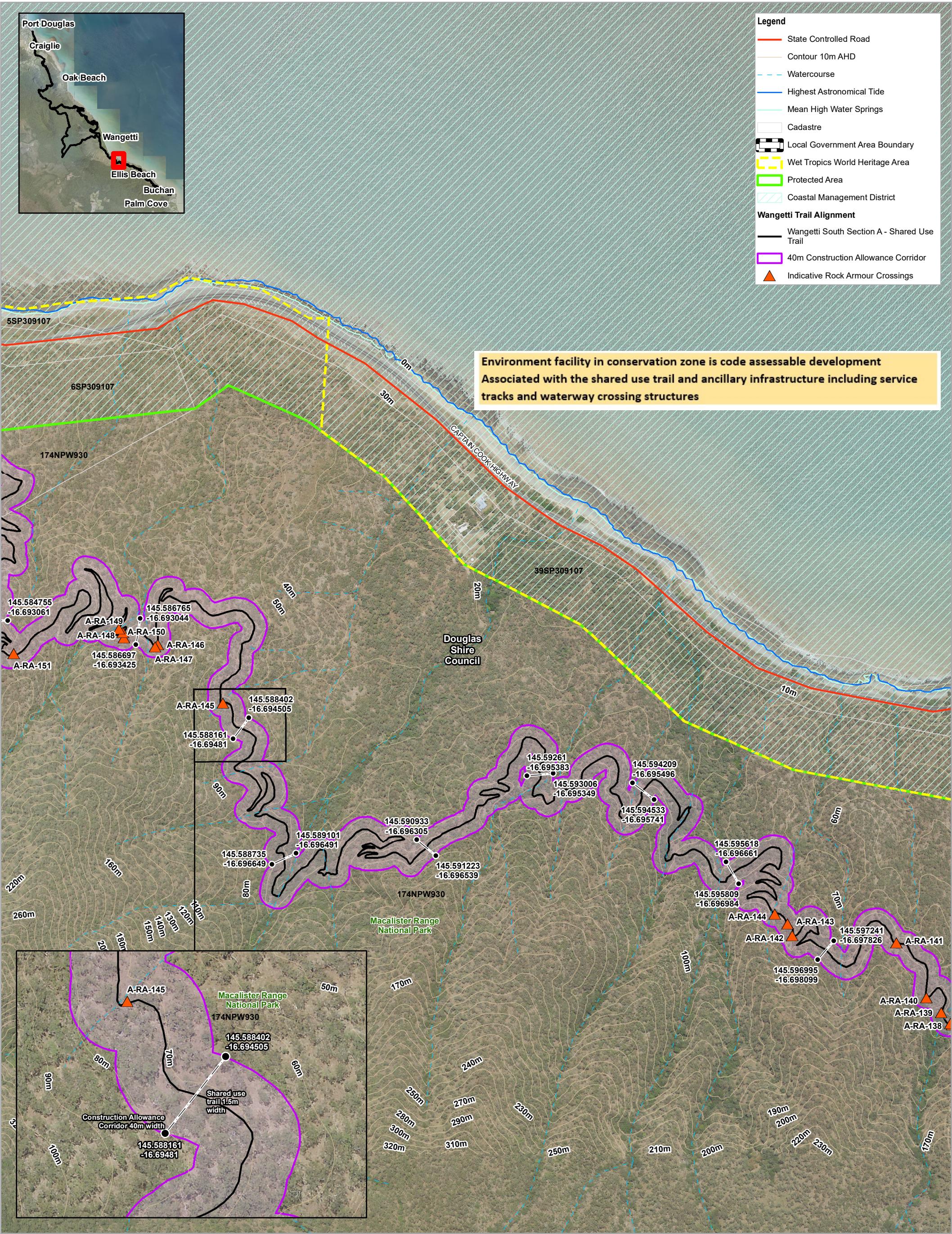
WANGETTI TRAIL
DETAILED DESIGN

Drawn	Signed	Date
JR		25/03/20
Designed	Signed	Date
DS		25/03/20
Verified	Signed	Date
DS		25/03/20
Approved	Signed	Date

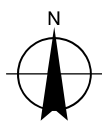
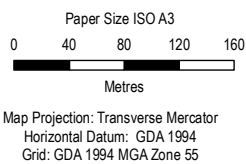
Drawing Title:

TRAIL CLOSURE & REHABILITATION
PLACEMENT AND DIMENSIONS
STANDARD DRAWING

FOR INFORMATION	
Project No.	WT20-Wangetti-001
Scale	1:100
Sheet Size	A3
Drawing No.	WTSTD-021-WG2
Rev.	A



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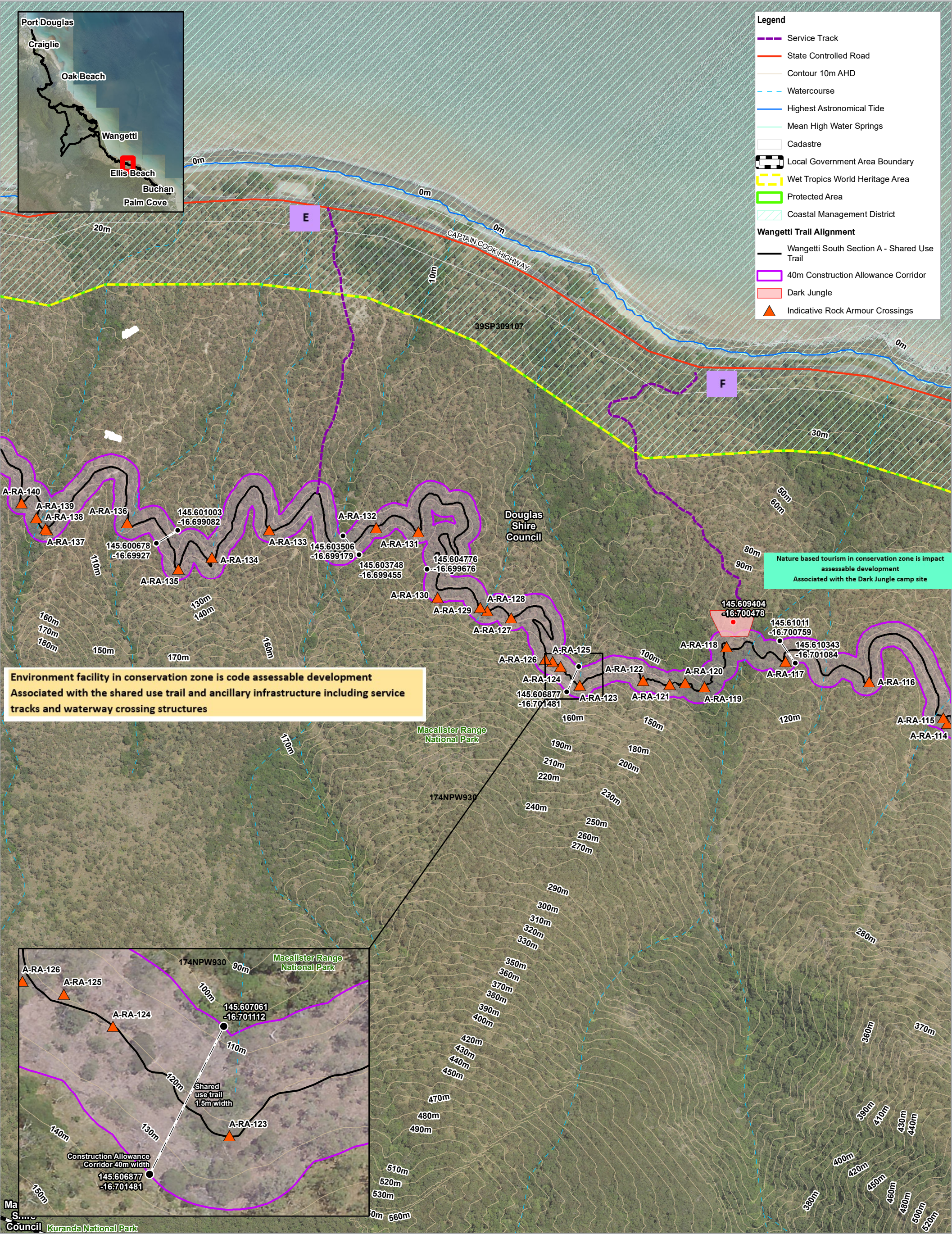


DITID
Environment Assessment Stage 2 Wangetti Trail

Wangetti Trail South Section A
Locality Plan - shared use trail, waterway
crossings, service tracks and trail head

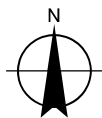
Project No. 41-32458
Revision No. B
Date 23/03/2021

Plan - 3 of 5



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0 40 80 120 160
Metres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

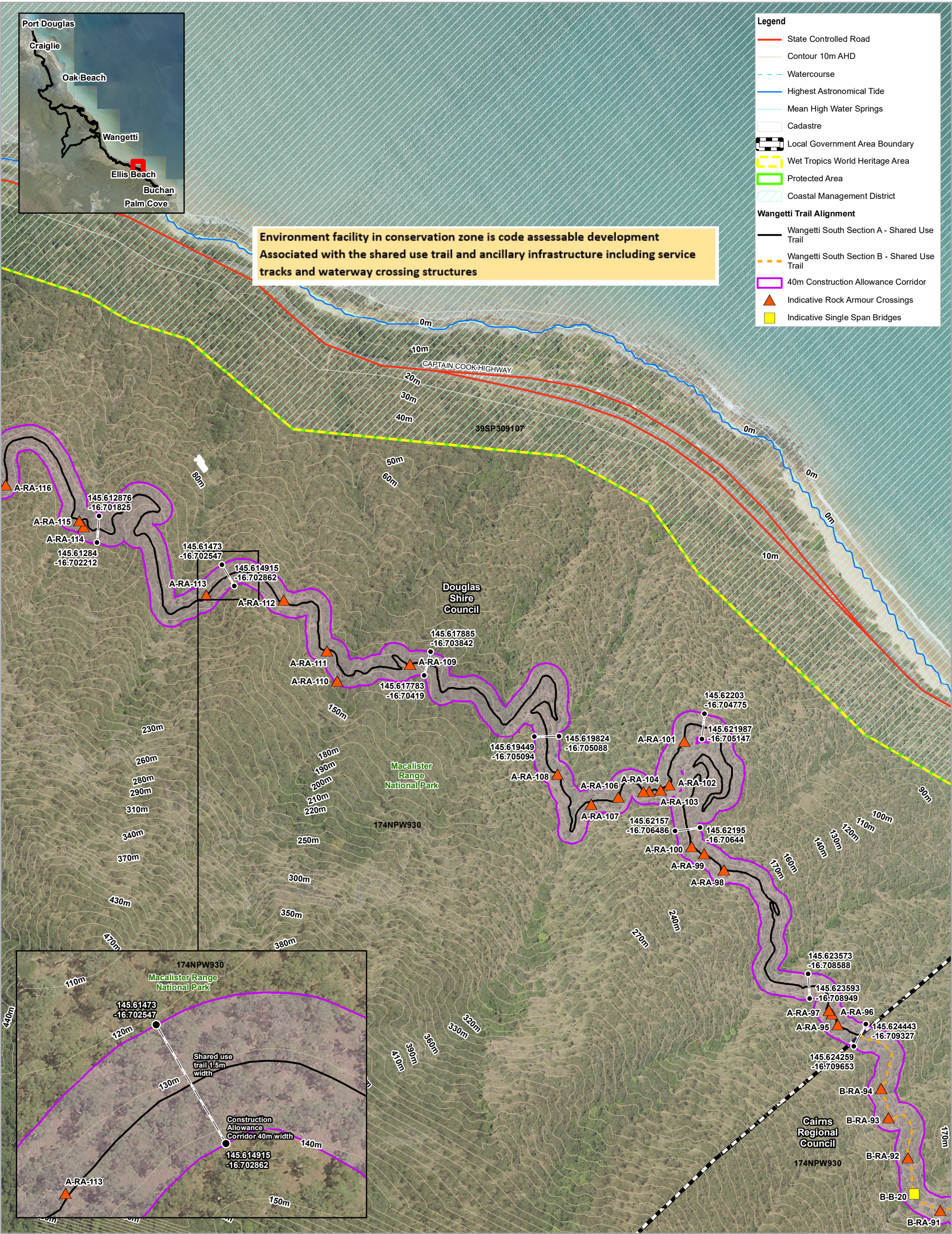


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Environment Assessment Stage 2 Wangetti Trail

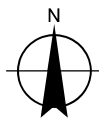
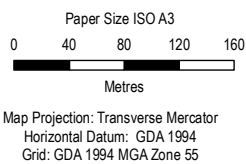
**Wangetti Trail South Section A
Locality Plan - shared use trail, waterway
crossings, service tracks and trail head**

Project No. 41-32458
Revision No. B
Date 23/03/2021

Plan - 4 of 5



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DITID
Environment Assessment Stage 2 Wangetti Trail

**Wangetti Trail South Section A
Locality Plan - shared use trail, waterway
crossings, service tracks and trail head**

Project No. 41-32458
Revision No. B
Date 23/03/2021

Plan - 5 of 5

GHD

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Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	A.Hestehauge	S.Wilson	On file	P.Bradley	On file	4/3/21

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