



# OPTIONS ANALYSIS REPORT

WARNER STREET, PORT DOUGLAS

REV 03

16 AUGUST 2018

0184018



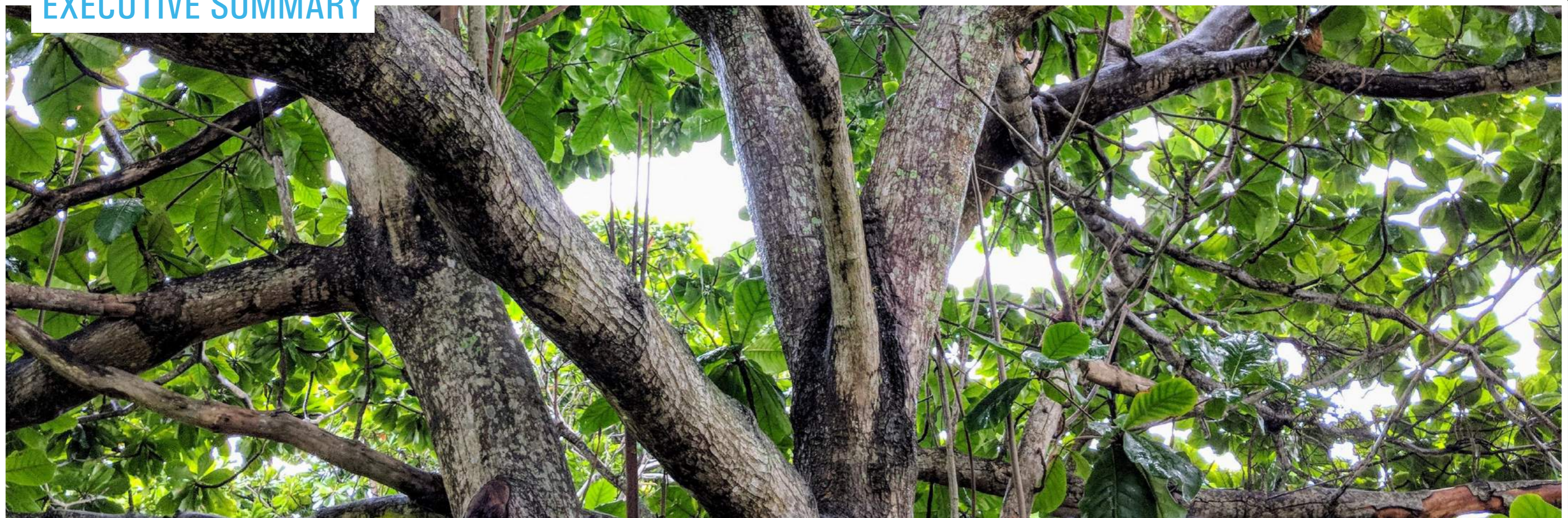


This Options Analysis Report consists of the following sections:

Executive Summary	3
1. Introduction and Objectives	6
2. Site Details, History and Characteristics	7
3. Stormwater and Flood Assessment	10
4. Landscape and Vegetation	12
5. Upgrade Options	15
6. Conclusion	18



# EXECUTIVE SUMMARY



## INTRODUCTION

Douglas Shire Council has commissioned Cardno to undertake an Options Analysis in relation to the upgrade of part of Warner Street to improve infrastructure and reduce the maintenance imposition on Council. Warner Street is located in Port Douglas, North Queensland to the South of the town's main thoroughfare, Macrossan Street. Warner Street is connected by Grant Street in the West and Owen Street in the East and is on an east-west alignment.

This Options Analysis Report ('the Report'):

- > Details the site characteristics, objectives, and possible outcomes with respect to the relevant section of Warner Street.
- > Provides a review of the current condition of all associated infrastructure within the street and nearby properties.
- > Details the possible outcomes that can be achieved including;
  - ✓ Pedestrian and vehicle movement options
  - ✓ Possible environmental impacts and mitigation
  - ✓ Stormwater and flooding trepidations and upgrade approaches
  - ✓ Landscaping concepts and strategies
- > Provides three (3) upgrade options for Council's consideration.

The key findings of the Report are as follows:

## FLOODING

Warner Street and adjoining land parcels are situated at a level which sits well below the Q100 defined flood level and the storm surge flood level. This causes significant drainage impacts in minor and major flood events, storm surge occurrences and during times of high tide, in these circumstances renders the street un-trafficable due to inundation.

## STREET TREES

The existing Rosewood trees are Warner Street's main attraction owing to the shade and sense of enclosure offered by the canopy, the Rosewood trees are located on each side of Warner Street and create a picturesque avenue leading towards the Marina (from Owen St.) The trees are privately planted Rosewood's which have caused a substantial amount of damage to the existing pavement, drainage infrastructure, services and each year cost Council an increasing amount in maintenance costs. This Report details a number of options which identify possible solutions.

## DRAINAGE INFRASTRUCTURE

Due to a number of factors, none more at fault than the existing street trees, the drainage infrastructure along Warner Street is in disrepair and in some cases non-existent. The following outlines the stormwater infrastructure assets currently in place along Warner Street:

- > Existing kerb and channel.
- > A damaged custom kerb inlet pit which outlets into a large pipe constructed across adjacent parkland through to Mowbray Street
- > A small number of blocked or damaged kerb inlet pits.

## TRAFFIC AND PEDESTRIAN MOVEMENTS

Warner Street is a mixed use thoroughfare with commercial businesses such as mechanics, cafes, hostels and hotels sited next to private dwellings. Currently, Warner Street has a single carriageway with a single lane in each direction shouldered by gravel un-marked parking areas. Footpaths on each side of Warner Street are poorly graded, potentially hazardous and regularly sodden in heavy rain. The road facilitates local access traffic movements and is an alternative minor access to the Marina and foreshore area. This Report explores 3 primary options for the treatment of this section of road and includes;

- > Dual lane re-build with shoulder parking constructed in 2 separate stages.
- > Pedestrian Landscaped zone with a dual lane carriageway.
- > Dual lane construction with centre parking.

## LANDSCAPE

It has been identified by Douglas Shire Council that an upgrade of Warner Street is necessary due to damaged road finishes and stormwater infrastructure that is in disrepair. The proposed upgrade seeks to provide a solution to these matters, as well as provide a revitalised streetscape that facilitates pedestrian use in a character iconic to Port Douglas.

Council's intent is to keep the street a casual pedestrian place, where barefoot locals and tourists mingle in a tropical landscaped setting. It is envisaged that Warner Street will form a part of the town centre's green spine, where pedestrians are the priority, and the relaxed character is preserved



# EXECUTIVE SUMMARY



## WHAT IF COUNCIL LEAVE WARNER STREET AS IT IS?

Leaving Warner Street in its current condition presents a number of issues.

For the existing Rosewood trees to remain in place Council must resolve to undertake no substantial upgrade works to improve the operational function of the street, which as with other roads is to safely convey pedestrians, cyclists and motorised residents.

The consequences of no action on behalf of Council, in seeking to retain the Rosewood trees is identified in the following.

### Stormwater

No new stormwater infrastructure will be constructed in order to remedy the drainage issues on Warner Street. Standard Council maintenance will continue, however this maintenance will increase each year with the damaging root systems of the Rosewood trees, further impacting drainage infrastructure. Swampy areas of standing water will remain and provide continued opportunity for biting insects to thrive.

### Trees

As discussed in the Landscape and vegetation section of this report, retention of the existing trees will result in further future harm to the trees as also described by the Central Tree Service's Arborist in the *Pre-planning Tree Health and Condition Report* (2018);

*"Few of the trees along Warner Street have been planted with an allowance for root development in proximity to the trees. In the longer term this will eventually lead to a progressive decrease in tree vigour along with a heightened potential for pathogen establishment"* **Pre-planning Tree Health and Condition Report** (2018)

### Pedestrians and Vehicles

The facilities on Warner Street will remain unchanged. Lack of pathways for pedestrian movements will continue to encourage pedestrians onto the road pavement and into the traffic/bicycle lanes. Lack of identified parking will remain and vehicles will continue to park on the street tree's exposed roots further impacting tree health.

### Maintenance and Cost

Significant maintenance costs are attributed annually to the maintenance of Warner Street including; tree maintenance, pavement repairs and drainage infrastructure maintenance and replacement works.

While this outcome requires no upfront funding changes, the ongoing maintenance costs bring into question the cost/benefit of retaining the Rosewood trees.



## OPTION 01: STAGED APPROACH 2 STAGES OF CONSTRUCTION

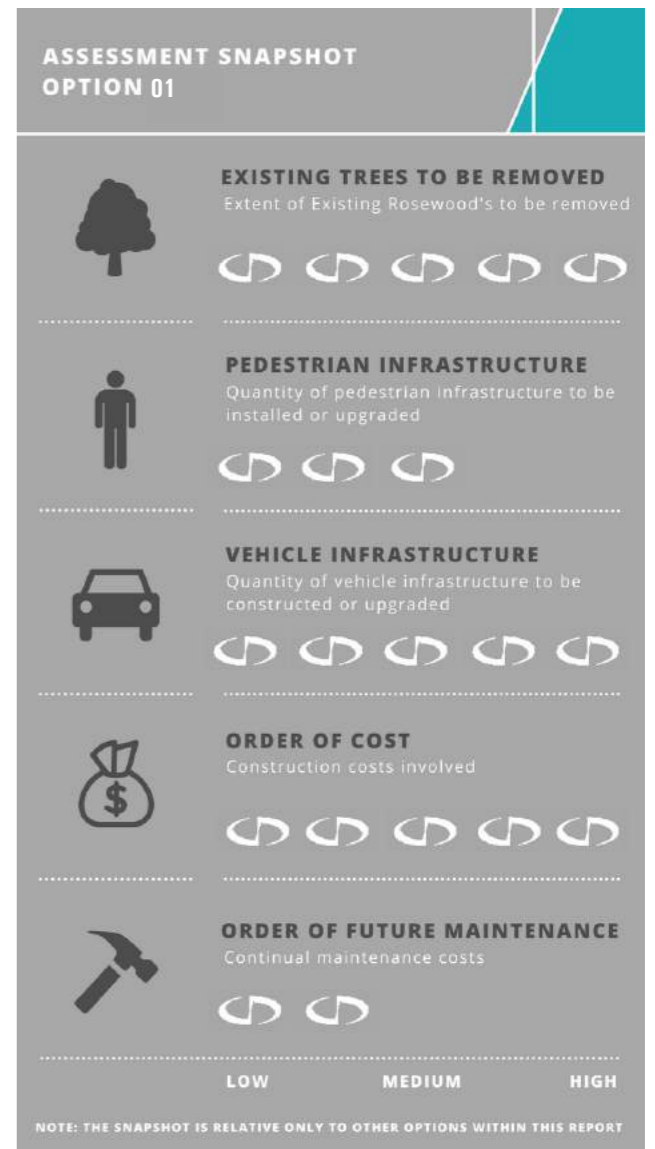
- > Stage 1 - Northern side of Warner Street to be upgraded as detailed while leaving the Southern side unconstructed.
- > Stage 2 - Southern Side of Warner Street to be upgraded to be consistent with the Northern side.
- > Staged construction timeline - reduces impact on visual amenity of street and eases public into upgraded design.
- > 16 new trees offset to form single canopy effect.
- > Staging sides can be interchanged to suit.
- > 90 angled parking spots

### Advantages

- > Reduced impact on traffic and pedestrian movement.
- > Reduced impact of visual amenity of street in one hit.
- > Roadway upgraded to FNQROC standard where possible.

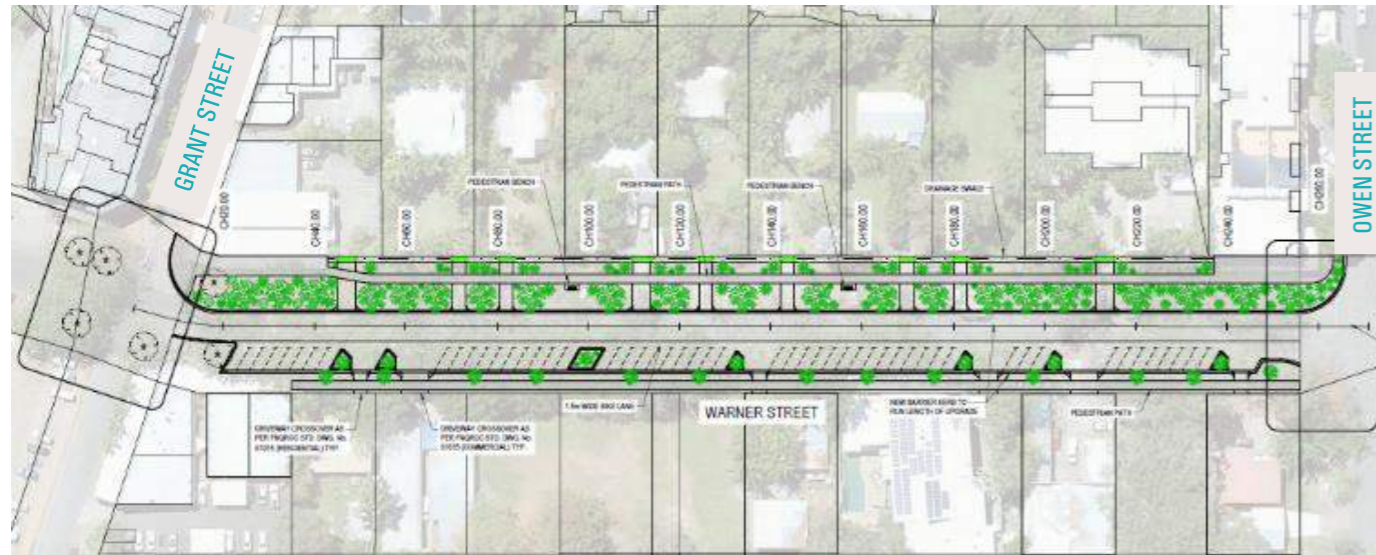
### Disadvantages

- > Street under construction for extended period.
- > Expenses involved in matching new with existing infrastructure, upgrading services while maintaining existing infrastructure.
- > Expenses involved with double mobilisation and site setup costs.
- > Trees left remaining on the Southern side of Warner Street will be impacted by the works on the Northern side.
- > Duplication of impact on the community.





# EXECUTIVE SUMMARY



## OPTION 02: DUAL LANE WITH LANDSCAPED PEDESTRIAN ZONE

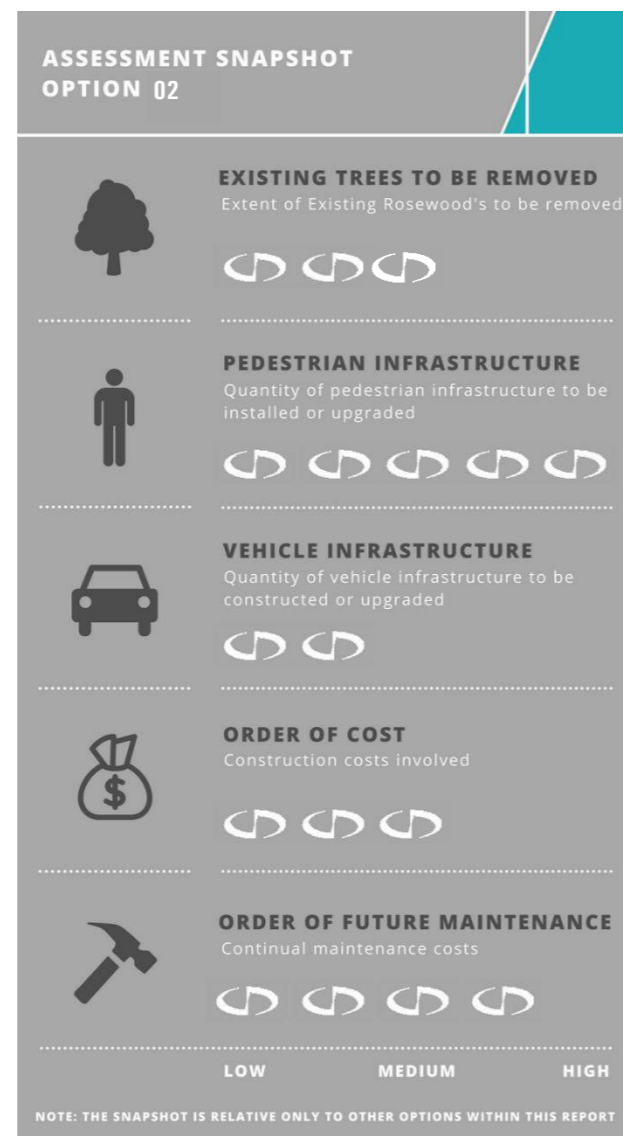
- > Warner Street continues to grow as a pedestrian thoroughfare, however inadequate pathways discourages use, leading to pedestrians walking on the road which causes increases safety risks.
- > An off-centre dual lane option would see half of Warner Street's corridor utilised as vehicle lanes and parking and the other half as a landscaped pedestrian zone.
- > The Landscaped pedestrian zone is to contain appropriate plant species and the possibility of keeping a selection of existing Rosewood trees (subject to tree health)

### Advantages

- > Warner Street will become a signature pedestrian experience in Port Douglas if undertaken to full extent, improving amenity and safety. (Parking and verge configuration can be interchanged)
- > Cost benefits of minimising pavement rebuild and median construction.
- > Localised canopy effect – Approx. 42 new street trees
- > 51 angled carparks

### Disadvantages

- > Increased pedestrian movements on Northern side of road, lack of street visuals and driveways crossing landscaped zone (safety).
- > Option incurs most future ongoing maintenance requirements of landscaped zone.



## OPTION 03: CENTRE PARKING FULL RECONSTRUCTION TO FNQROC STD.

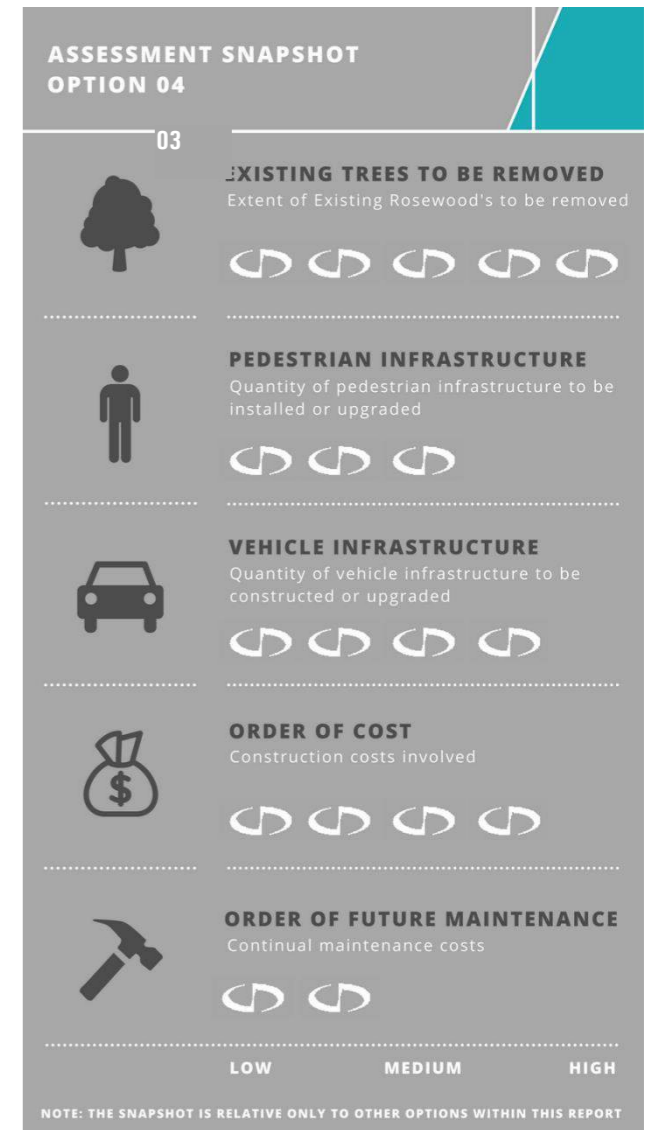
- > Warner Street does not currently comply with FNQROC or other current standard. Option 3 would bring Warner Street in alignment with current street standards.
- > Full dual lane street rebuild with kerbing, verges and pathways, centre parking and appropriate street tree and garden vegetation.
- > Would solve majority of infrastructure and maintenance issues collectively, however would cause most impact on community and visual amenity.

### Advantages

- > 1 period of construction
- > Majority of design issues solved collectively.
- > Problem trees removed and replaced with appropriate species. Localised Canopy effect – Approx. 41 new street trees.
- > Less traffic impacts
- > Least amount of on-going maintenance
- > 80 centre parking spots

### Disadvantages

- > Requires the removal of most rose wood trees. (Four healthy trees at the corner of Warner and Grant Street will remain as they are planted with root barriers and sufficient room to thrive)
- > New vegetation planting will be juvenile and will take some time to grow and create similar street visual amenity.



\* As the Rosewood Trees are removed and replaced, juvenile trees and vegetation will be planted and require a period of time before establishing similar amenity currently



# 1. INTRODUCTION AND OBJECTIVES



## INTRODUCTION

Warner Street, Port Douglas has evolved into a notable avenue in Port Douglas. Currently fronted by a range of different land users including private dwellings, commercial development, tourism operators, hotels and cafes. The street's character, in part, is due to the 66 Rosewood trees which were privately planted some years ago. These established trees have resulted in a picturesque avenue, however the trees are also the cause of significant damage to the existing infrastructure and continue to incur substantial maintenance costs and resourcing in order to maintain them.

Douglas Shire Council has commissioned Cardno to prepare an Options Analysis Report in relation to the possibility of upgrading Warner Street to improve infrastructure and reduce ongoing costly maintenance.

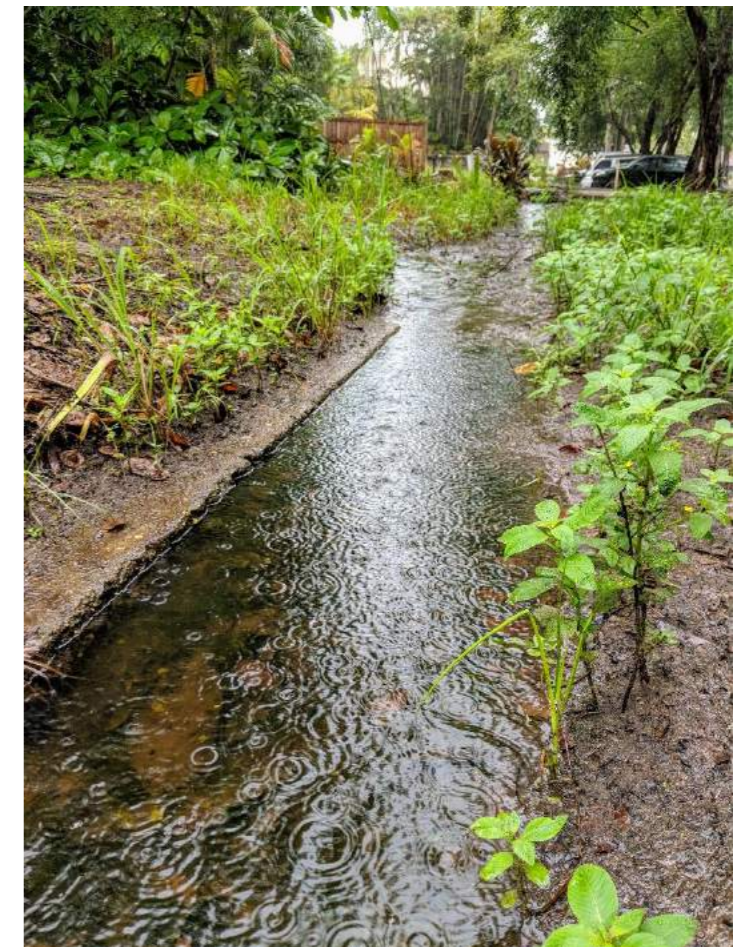
This report will serve as the basis for discussion to be held between Douglas Shire Council and the community regarding future works to Warner Street.



## OBJECTIVES

The objectives of this Report are to:

- > Detail the site characteristics, objectives, and possible outcomes of upgrading part of Warner Street.
- > Provide a review of the current condition of all associated infrastructure within the street and nearby properties.
- > Detail the community objectives, pedestrian and vehicle movement intentions, site environmental impacts, stormwater and flooding considerations, upgrade approaches and the landscaping results that can be achieved.
- > Provide three (3) upgrade options for Council's consideration.





## 2. SITE DETAILS, HISTORY AND CHARACTERISTICS



### SITE SUMMARY

#### Site Address:

Warner Street, Port Douglas (Between Grant Street and Owen Street)

#### Street Precincts Classification

Village Centre Precinct



Figure 2-1: Warner Street Trees

### SITE HISTORY

#### Location and Context

Warner Street, Port Douglas has evolved into a notable avenue in Port Douglas. Currently fronted by a range of different land users including private dwellings, commercial development, tourism operators, hotels and cafes. The street's character, in part, is due to the 66 Rosewood trees which were privately planted some years ago. These established trees have resulted in a picturesque avenue, however the trees are also the cause of significant damage to the existing infrastructure and continue to incur substantial maintenance costs and resourcing in order to maintain them.

The eastern end of Warner Street, the subject of this report, is a low key road providing mainly for local access to the various land users along the road.

Whilst it continues westwards toward the Marina and the Wharf Street foreshore area, most traffic, not of a local nature, is understood to be generated by commercial development on Warner Street to the west such as the large Coles complex. Traffic from Owen Street is limited by a tee-junction.

Pedestrian activity is high, however pedestrian pathways require to be upgraded. Paths along the verges of the road are in a dilapidated state, are poorly formed with only gravel or soil surfacing and regularly sodden in rainfall. It appears that pedestrians frequently opt for walking along the carriageway rather than the verges as a result, increasing safety concerns.

#### Drainage

The section of Warner Street between Grant and Owen Streets has, in the past, been the subject of various studies. Council has provided copies of the following reports all by DHI Water and Environment Pty Ltd:

- > Port Douglas Drainage Study - Interim Report, August 2005
- > Port Douglas Drainage Study -Model Development and Design Assessment, March 2006
- > Port Douglas Drainage Study – Preliminary Cost Estimates and Stormwater Management Plan, June 2006

The first report highlighted the lack of available survey data and identified Council's priorities for review. Warner Street was the 2<sup>nd</sup> priority listed out of 4 for Council.

The second report summarised the development of a flood model of combined pipe and overland flows in the northern section of the Port Douglas Township. An assessment of the system performance and design capacity was made to assist Council in prioritising mitigation measures. The third and most recent report provided estimates of cost for undertaking the selected upgrade options.

#### Options affecting Warner Street

Two options were identified which would improve drainage in the section of Warner Street being studied here.

- a) Option F – This option was developed to provide a suitable outlet for the trunk drainage at the southern end of Owen Street. Currently the outlet of the Owen Street drainage system is silted up and the open drain outlet is overgrown

by mangroves. This drain would need to be opened all the way to the sea. Alternatively a new open channel could be constructed to the marina.

- b) Option FB – This option involved replacing the drainage line between the outlet at the southern end of Owen Street, referred to above, northwards up to Warner Street.
- c) Option F4 – This option involved a new underground pipe system from the northern side of Warner Street at about the mid-point between Grant and Owen Streets extending south to Mowbray and then west to connect to an open drain in Grant Street just south of its intersection with Mowbray Street.

#### Flooding

The Queensland Reconstruction Authority (QRA) commissioned Aecom to prepare a report and a level 2 study for flood mapping in the Port Douglas area. This report was prepared in 2013 and resulted in maps indicating the extent of flooding in the township for a 100 year ARI (Average Recurrence Interval) event and also the increased extent of flooding which could come about from increased surge levels as a result of climate change.

Fig 3-2 indicates the areas of the town which would be flooded by the two events. It can be seen that Warner Street east is inundated on both events. Unfortunately there is little information to determine the actual level of immunity existing at present. Council has acknowledged that these current options will be limited in improving flood levels and indeed drainage based on current plans and budgets.



# 2. SITE DETAILS AND CHARACTERISTICS

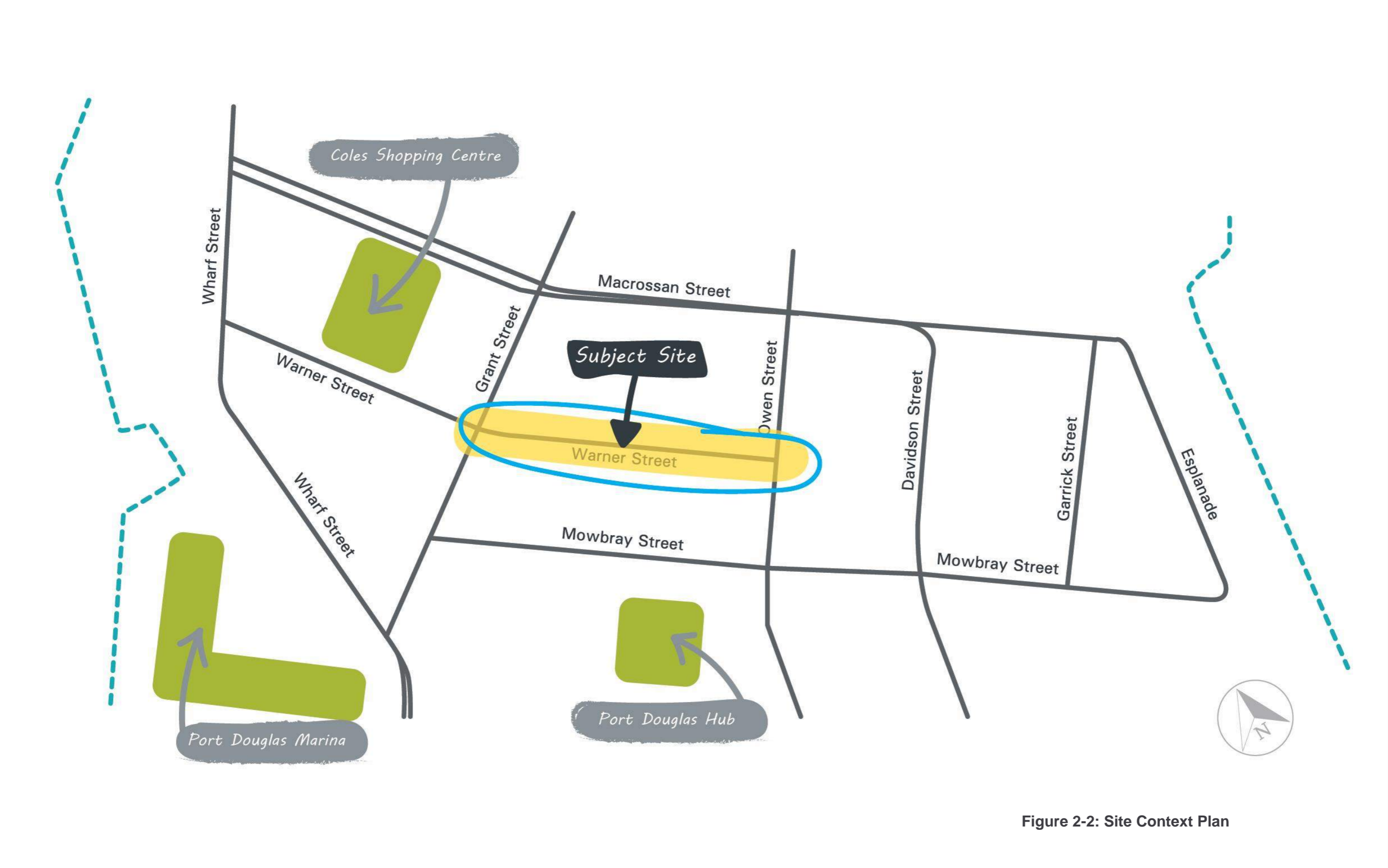


Figure 2-2: Site Context Plan



# 2. SITE DETAILS AND CHARACTERISTICS

## Northern Side



Figure 2-3: Northern kerb section



Figure 2-4: Driveway Culvert



Figure 2-5: Northern verge section



Figure 2-6: Northern kerb section



Figure 2-7: Northern shoulder section



Figure 2-8: Northern carpark entrance

## Southern Side



Figure 2-9: Local business with raised paths



Figure 2-10: Southern medians and kerb



Figure 2.12: Warner Street



Figure 2-11: Southern driveway crossover



Figure 2.13: Pavement damage



# 3. STORMWATER AND FLOOD ASSESSMENT



## SITE DESCRIPTION

Currently the street is drained by a dilapidated system of kerbing and channelling, stormwater pits and some underground drainage.

Pits and pipes are located at the intersections of Grant and Owen Streets and also a dilapidated pit is located at the low point in Warner Street about midway between Grant and Owen Streets. The damage to the existing infrastructure makes it difficult to determine current adequacy and levels.

It is also noted that there are various springs and overland flows from the north, which currently run across the verge on the northern side of the street making the verge impassable to pedestrians during wet weather.

On the south side a number of lots become inundated when the kerbing overtops in less than significant rain events.



Figure 3-1: Northern side of Warner Street kerb flooding.

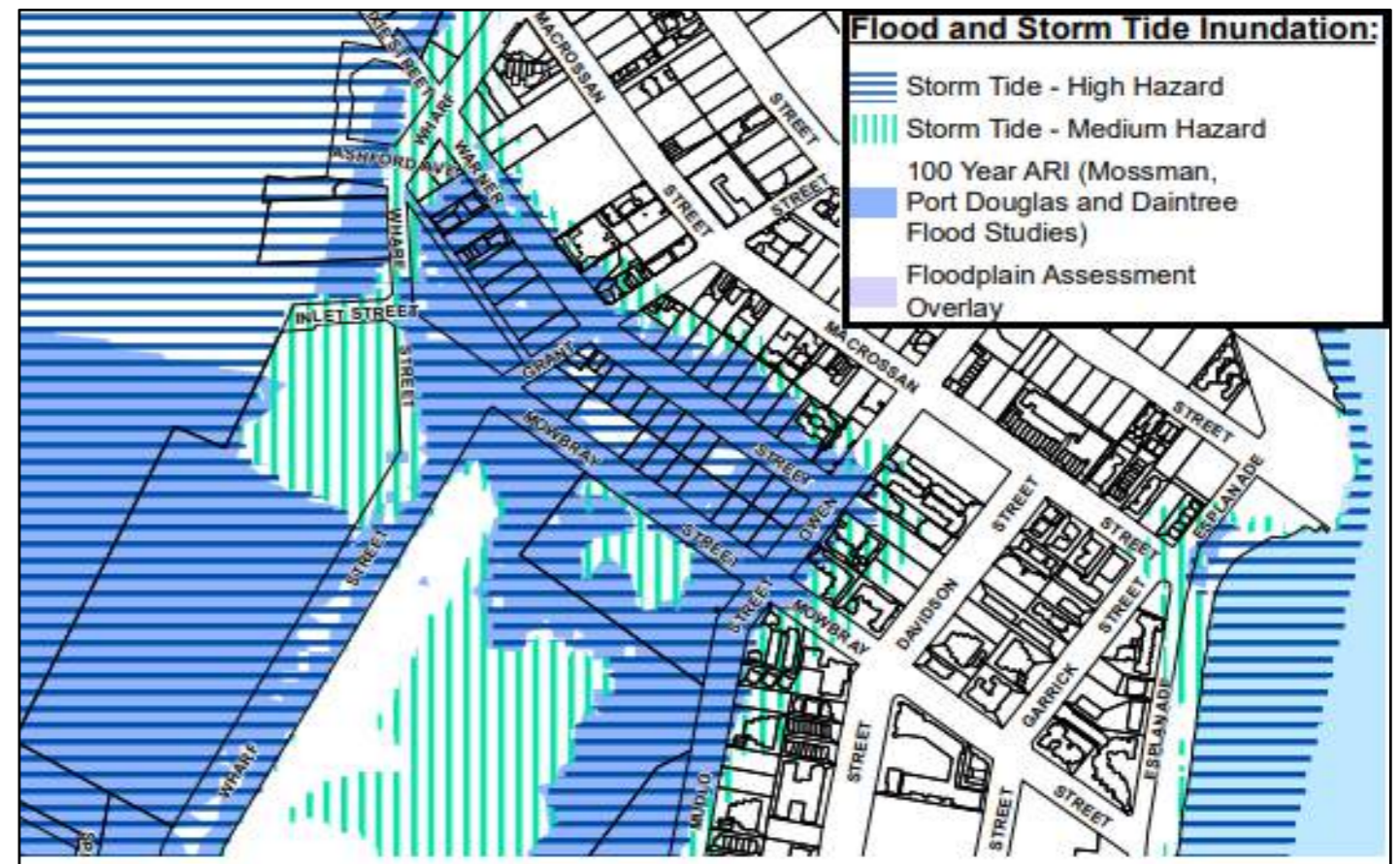


Figure 3-2: Warner Street Flood and Storm tide Inundation extract from Douglas Shire Council mapping.



# 3. STORMWATER AND FLOOD ASSESSMENT

## EXISTING STORMWATER INFRASTRUCTURE

On Owen Street, recent development on the northern corner has raised the intersection level to above footpath levels and exacerbated street drainage issues.

On Grant Street, a new development on the south western corner appears to be upgrading some of the existing drainage, however no details are currently available for this work.

At the midpoint of the street the existing drainage flows underground through an easement to Mowbray Street. It is currently unclear how effective the underground drainage is.

## NEW STORMWATER INFRASTRUCTURE

The various options developed as a result of this report will all be based on improving the current drainage infrastructure. At the minimum there will be new kerbing and channelling with associated pits and underground pipes.

The previous drainage reports have indicated options to improve the Warner Street drainage and instructions will be taken from Council as to the extent of upgrading that will be required.

FNQROC specifies that underground drainage in CBD and commercial areas should be designed to a 10 year ARI (Average Recurrence Interval). We understand that the previous reports provided options based on that premise, however it would appear that unless major outlet works and pipe upgrades are undertaken, it may not be possible to achieve significant improvement in the system.

## FLOODING

It is noted that the previous reports referred to raising road levels to assist in improving drainage. However unless Council adopts a policy related to minimum floor levels along the street then raising of road levels will exacerbate current flooding problems.

Also as previously noted, the whole area is subject to flooding in extreme events. In fact in the recent heavy rainfall experienced in Port Douglas, flood levels in Warner Street near the corner of Grant Street nearly reached floor level of the shops which are well above street level. Refer the photo in Fig 3-3.



Figure 3-3: Warner Street near the corner of Grant Street flood level indicator left on building



## 4. LANDSCAPE AND VEGETATION



### INTRODUCTION

With the continued growth of Port Douglas, Warner Street forms a part of the streetscape character of the town. Running parallel with Macrossan Street, one of the main thoroughfares of Port Douglas, Warner Street has become increasingly populated with locals and tourists, pedestrians and vehicles, resulting in an activated and well used corridor.

It has been identified by Council that an upgrade of Warner Street is necessary due to damaged road finishes and stormwater infrastructure. The proposed upgrade will not only provide a solution to these matters, but the redevelopment will provide a revitalised streetscape that facilitates pedestrian use in the character iconic to Port Douglas.

### APPRECIATION FOR STREETScape

Pursuant to the landscape character the significance of this upgrade within Port Douglas cannot be overstated. Contributions of Warner Street, and the iconic setting that is Port Douglas, a high amenity corridor is required to the benefit of locals and visitors alike, to contribute to the established character of Port Douglas.

It is Cardno's understanding that Council seek to keep the street a 'casual' pedestrian avenue, where barefoot locals and tourists mingle with a green canopy overhead, and abundant tropical foliage. It is envisaged that Warner Street will form a part of the town centre's green spine, where pedestrians are the priority, and the relaxed character is preserved.

To maintain the enjoyable tropical Queensland experience within Port Douglas, the proposed Warner Street upgrade must reflect the regional character. This will be achieved through various design techniques whereby elements of the local ecology and local characteristics are echoed in the built form.

### EXISTING TREES

The existing Rosewood trees have become a popular attraction along Warner Street however their health is in decline due to the restrictive nature of their planting. Retaining the existing trees will result in further future harm to the trees themselves as discussed by the Central Tree Service's Arborist in the *Pre-planning Tree Health and Condition Report* completed in 2018. Below is an extract from the report which describes the future impact of retaining the existing trees:

*Few of the trees along Warner Street have been planted with an allowance for root development in proximity to the trees. In the longer term this will eventually lead to a progressive decrease in tree vigour along with a heightened potential for pathogen establishment, unless rectified by re-engineering the current surrounds in favour of longer term tree protection.*

**Central Tree Service's - Pre-planning Tree Health and Condition Report, 2018**

On the Arborist's recommendation, any construction activity required around the trees may result in the majority of them requiring removal as they will not survive the impact, as identified below:

> *The majority of trees have extensive surface and structural roots throughout the proposed areas to be upgraded.*

> *The trees have been planted with minimal preparation for long-term root development in proximity to urban infrastructure. As such, root development has taken place in all directions and cannot feasibly be rectified in order to allow retention of the trees following any construction activity.*

> *Remedial options such as crown reduction or root barrier installation would be unsuitable given the points already raised above.*

**Central Tree Service's - Pre-planning Tree Health and Condition Report, 2018**

The Arborist's report is supported by aerial images taken on behalf of Douglas Shire Council. As shown in the aerial image below, the Rosewood trees along Warner Street are in stark contrast to the surrounding canopy in Port Douglas due to their grey, sickly colour. This is indicative of trees under stress and restriction. (Note: Rosewoods on Grant Street intersection are of the same species, however as they have been planted in their own garden bed and free from other vegetation they are healthier)



## 4. LANDSCAPE AND VEGETATION



Figure 4-1: Aerial image of Port Douglas highlighting lack of tree health on Warner Street.



# 4. LANDSCAPE AND VEGETATION

## PROPOSED VEGETATION OPTIONS

A number of options have been proposed in this report whereby removal of the existing Rosewood trees is a necessity. With the removal of these intrusive species of tree, which have grown to create the streets popular visual amenity new species must be planted in order to achieve a similar appeal along Warner Street. Possible Species of Vegetation include but are not limited to

### Melaleuca Trees



Figure 4-2: Melaleuca tree examples on Nautilus St.

### Dwarf Fan Palm



Figure 4-3: Dwarf Fan Palm.

### Golden Bouquet Tree



Figure 4-4: Golden Bouquet Tree example flower

### Other acceptable plant species as defined in the Port Douglas Waterfront Masterplan

Iconic Native Tree/Palm Species:	
Botanic Name	Common Name
Deplanchea tetraphylla	Golden Bouquet Tree
Livistonia muellerii	Dwarf Fan Palm
Dillenia alata	Red Beach
Melaleuca leucadendra	Weeping Paperbark
Melaleuca dealbata	
Melaleuca viridiflora	Broad Leaved Paperbark
Melaleuca quinquenervia	Broad Leaved Paperbark
Terminalia ssp.	
Callophyllum ssp.	
Barringtonia ssp.	
Alstonia scholaris	Milky pine
Peltophorum pterocarpum	Yellow Poinciana/Copper Pod
Ficus ssp.	Fig Trees
Iconic Exotic Tree/Palm Species	
Delonix regia	Poinciana
Plumeria ssp.	Frangipani
Elaeis guineensis	African Oil Palm
Pterocarpus indicus	Indian Padauk

Table 4-1: Extract from the 'Port Douglas Waterfront Masterplan'

## STREETSCAPING OPTIONS

Streetscapes create the pedestrian experience from the paths to the street furniture. A number of different design techniques will be utilised throughout each option dependent on the solution established.

Paving treatments which reflect nature in its design will be utilised to enhance the visual amenity of the concrete areas necessary as detailed in the below example:



Figure 4-5: Nature reflected in design

### Local Elements

Cardno Landscaping team will look to utilise as many local elements throughout the landscaping design for the chosen option. This increases the unique local design element which matches the unique town Port Douglas is.



Figure 4-6: Local elements in the landscape design.



# 5. UPGRADE OPTIONS

# OPTION 1

## STAGED APPROACH 2 STAGES OF CONSTRUCTION

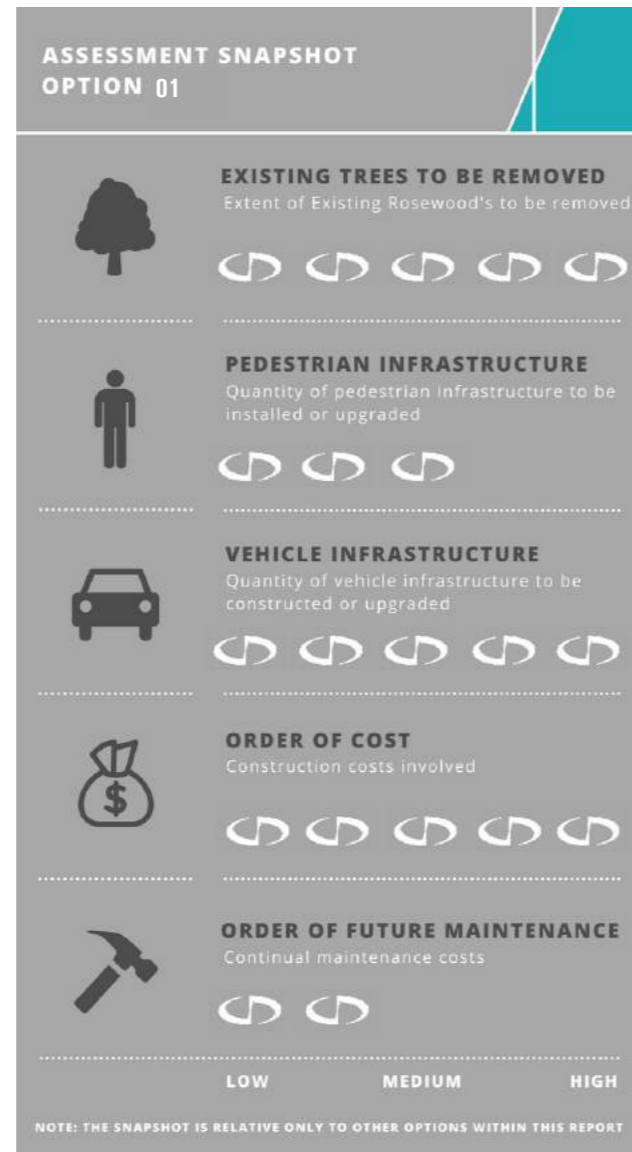
**Option Summary**

A staged approach to the upgrade works would see a two part construction design. Cardno suggests that if this option is successful, Council would undertake the construction of one side of Warner Street and retain the remaining side in its existing condition. Following the stage 1 upgrade, the existing side could then be upgraded to a similar standard.

Staging sides can be interchangeable.

This option allows the street and the community to adjust to the necessary tree removal by allowing the newly upgraded side time to develop before upgrading the remaining side and removing the last of the trees.

This option will allow for a number of healthy Rosewood trees to be maintained, where appropriate space permits for the existing root system to be protected.



**Stormwater**

This option would require the drainage infrastructure on Warner Street to be upgraded including pits, kerbs, crossovers and a number of pipes. This would happen in 2 stages per the drawing attached, which shows the northern portion of Warner Street upgraded first. The majority of the issues Warner Street faces from a drainage perspective would be mitigated with this option, with the exception of major flooding events (Q100 and storm surge flooding). The drainage design for this option will bring Warner Street closer to the FNQROC standard, as stated in the preceding sections; obtaining the 1 in 10 year ARI event immunity is unlikely a result of this option.

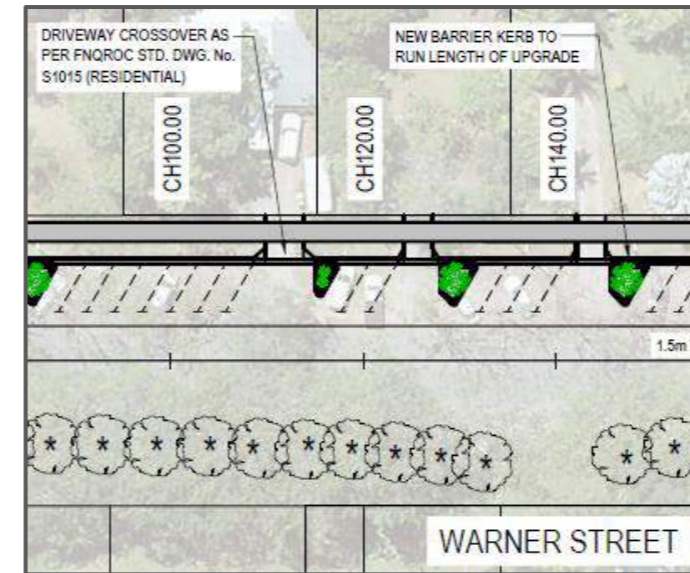


Figure 5-2-a: Snapshot from Drawing Q184018-001-CI-2001 showing Stage 1 of proposed works. Refer to Page 16a & 16b for plan and sections.

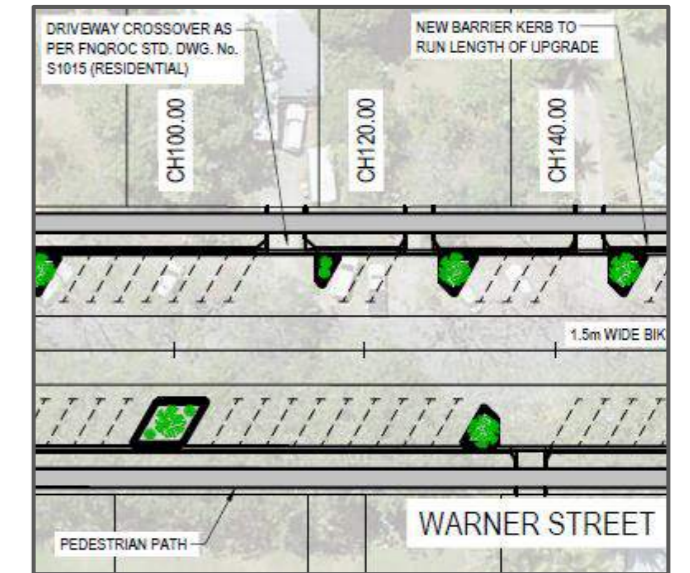


Figure 5-2-b: Snapshot from Drawing Q184018-001-CI-2001 showing Stage 2 of proposed works. Refer to Page 16a & 16b for plan and sections.

**Trees**

With the exception of approx. 6 trees near to the Grant/Warner intersection, the majority of the existing Rosewood trees would require removal due to construction activity in their vicinity. However, due to the staged nature of this option, one side of the trees will remain during construction further minimising detrimental impacts on the visual amenity of the street. Once the upgraded side has matured, the subsequent southern row of trees would then be removed for Stage 2 of construction. The six trees identified by the arborist as possible specimens to save are provided separate garden beds and have been able to maintain their health for this reason. Approx. 16 new street trees offset from each other will form a canopy single canopy effect.

**Pedestrians and Vehicles**

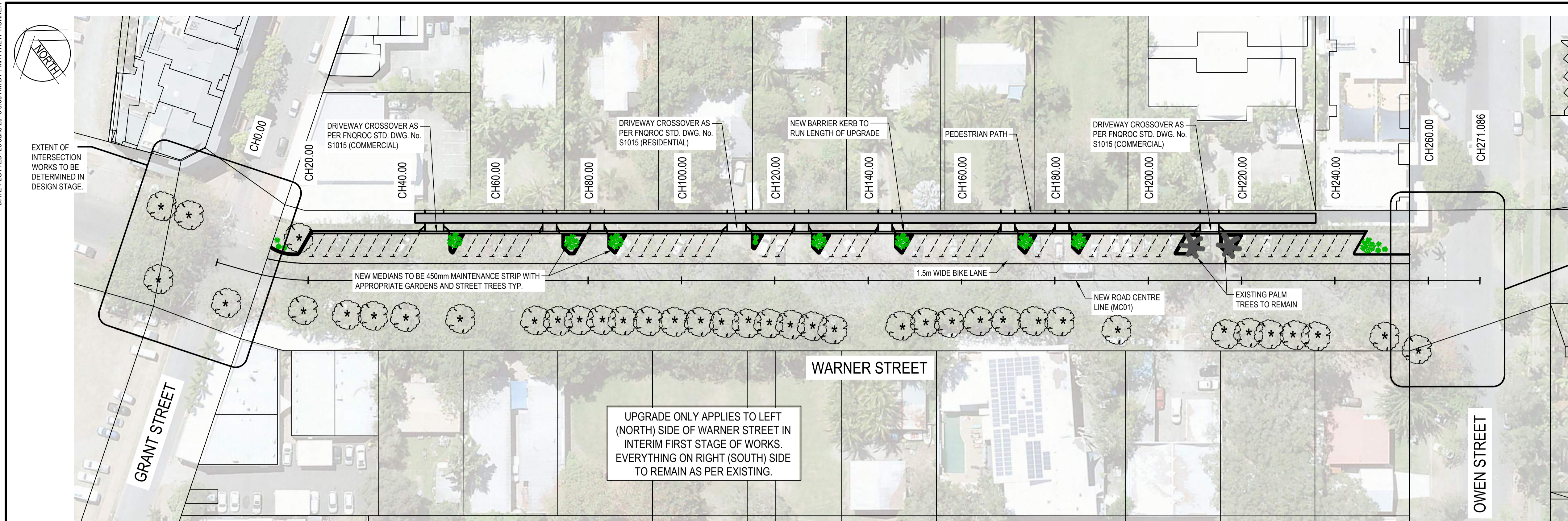
Option 1 allows for the maximum extent of vehicle amenities including parking, pavement rebuild and kerb rebuild. Once Stage 2 is finalised, pedestrians will also benefit from dual pathways on each side of Warner Street, free from ponding water and tree root emergence.

**Maintenance and Cost**

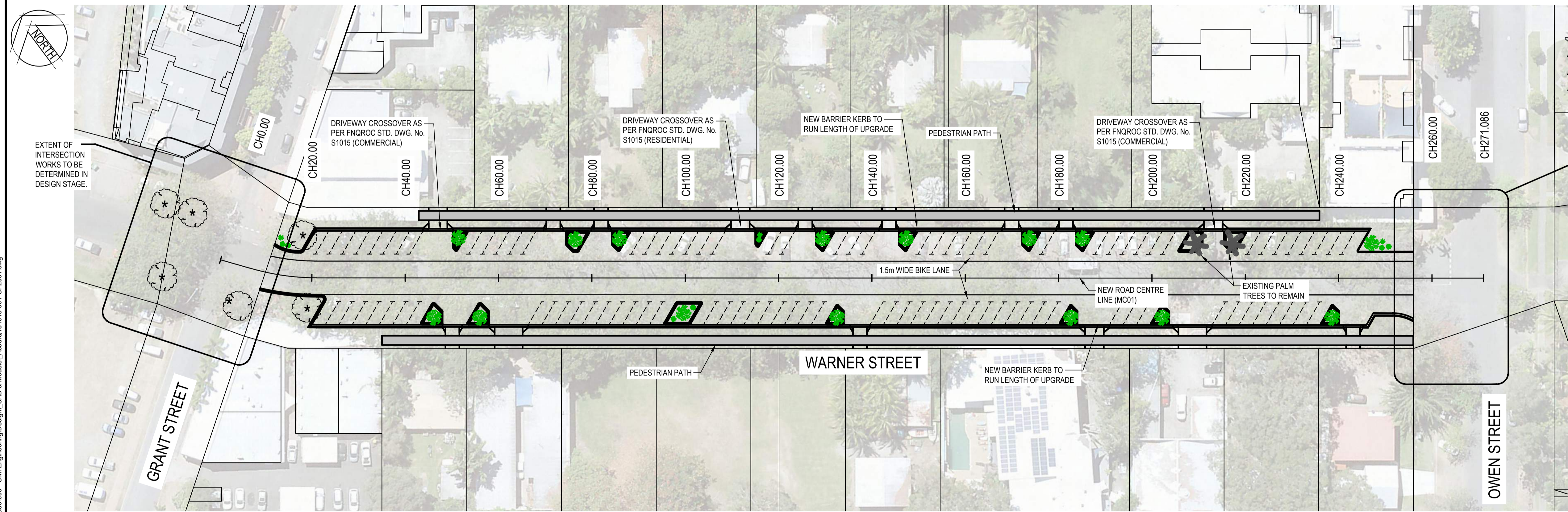
Option 2 will provide Council with the least amount of ongoing maintenance costs due to the removal of all (with exception of Grant Street intersection) existing street trees, replacement of existing damaged kerbs and verges and replanting of suitable species (replaced with FNQROC standard medians).

However, this option will result in the highest projected construction costs due to two stages of construction and intermediate design details to be executed between phases. Double site mobilisation and establishment costs and ongoing traffic control and associated requirements will see this option's order of cost the highest.





INTERIM FIRST STAGE OF WORKS PLAN  
SCALE 1:500





FINAL SECOND STAGE OF WORKS PLAN  
SCALE 1:500

EXTENT OF INTERSECTION WORKS TO BE DETERMINED IN DESIGN STAGE.

EXTENT OF INTERSECTION WORKS TO BE DETERMINED IN DESIGN STAGE.

**LEGEND:**

- \* EXISTING TREE TO REMAIN
-  NEW STREET TREE
-  EXISTING ROSEWOOD TREE

XREFs: x:\DCDB\_DSC (Jan 2016) - x-IMAGE - x-CIVIL\_DESN  
CAD File: H:\2018\0184018 - Warner St. Port Douglas Upgrade\005 - Civil Engineering\Design\ CAD & Models\ Acad\184018-001-CI-2001.dwg

Rev.	Date	Description	Des.	Verif.	Appd.
01	04.04.2018	PRELIMINARY REVIEW	MJT	BNC	BNC

© Cardno Limited All Rights Reserved.  
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.



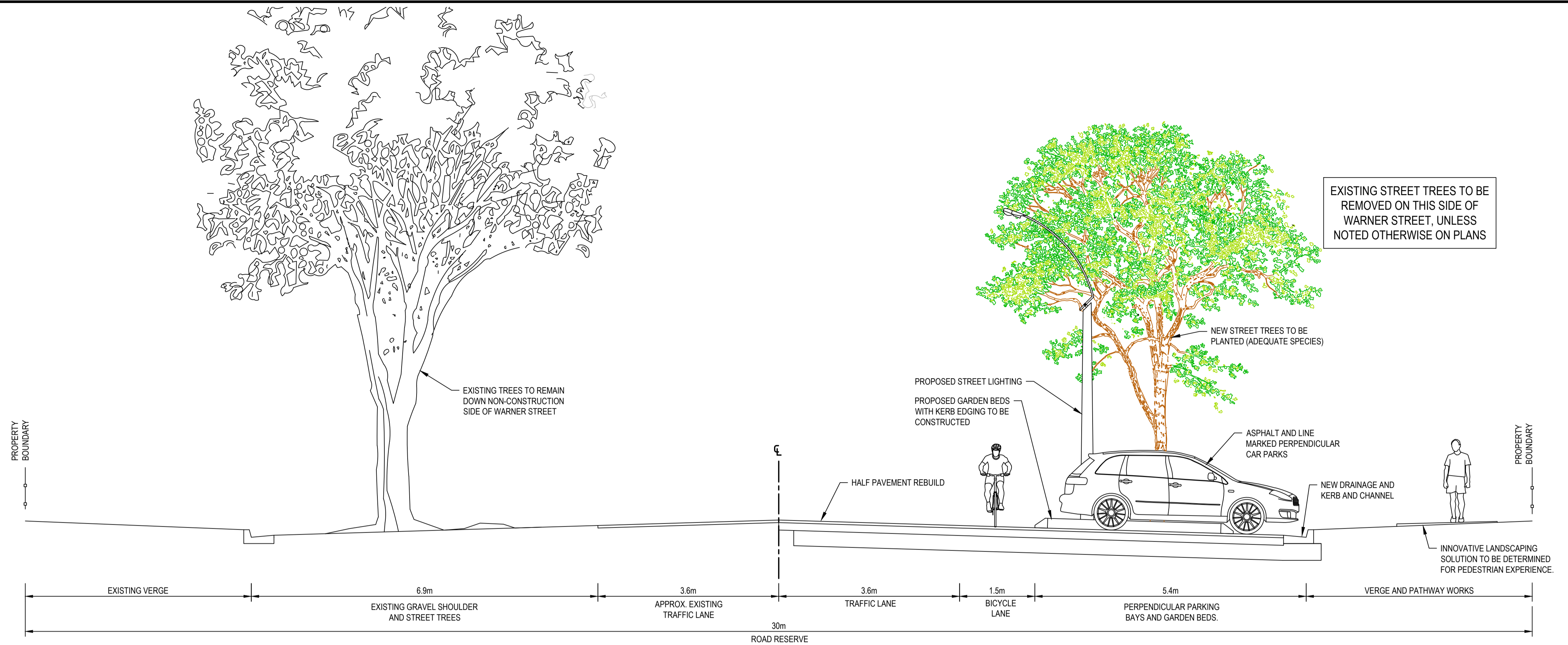
**Cardno**  
Shaping the Future

Cardno (QLD) Pty Ltd | ABN 57 051 074 992  
15 Scott Street, Parramatta Park  
Cairns QLD 4870  
Tel: 07 4034 0500 Fax: 07 4051 0133  
Web: www.cardno.com.au

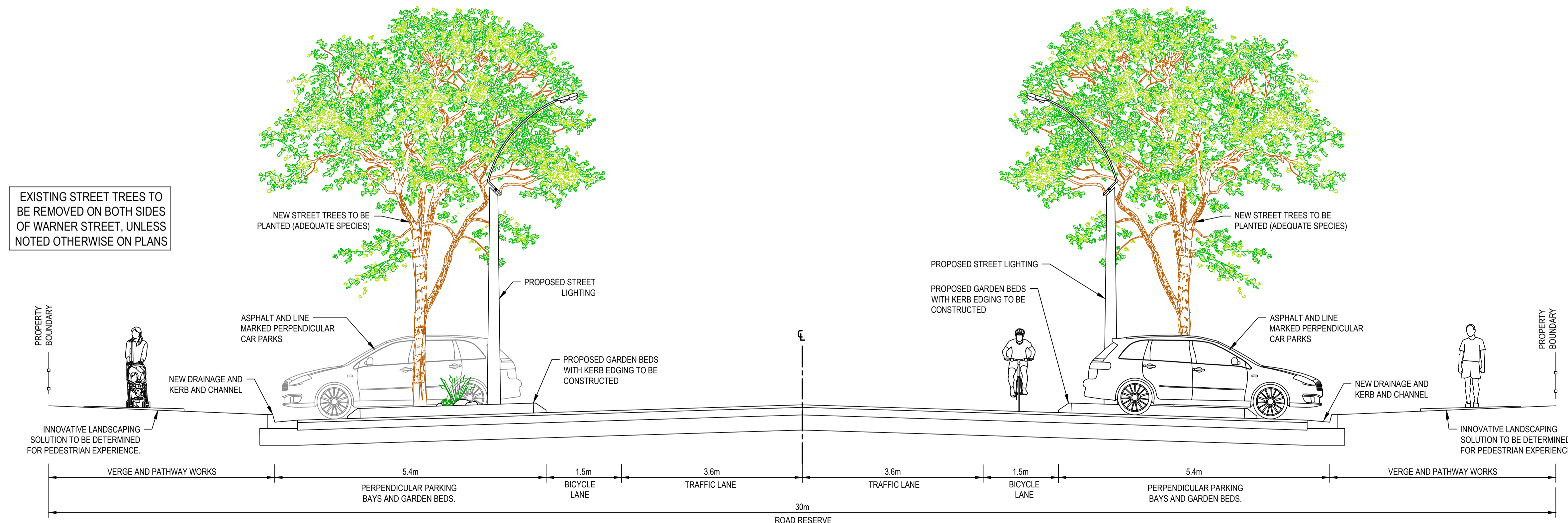
Drawn M. TICKNER	Date 08.03.2018	Client DOUGLAS SHIRE COUNCIL
Checked B. CLAYTON	Date 04.04.2018	Project WARNER STREET UPGRADE
Designed M. TICKNER	Date 04.04.2018	Site PORT DOUGLAS
Verified B. CLAYTON	Date 04.04.2018	Title OPTIONS ANALYSIS OPTION 1 - STAGED APPROACH SITE PLAN
Approved ####	Date ####	

Status <b>PRELIMINARY</b>			
NOT TO BE USED FOR CONSTRUCTION PURPOSES			
DATUM AHD	DATE 04.04.2018	Scale 1:500	Size A1
Drawing Number Q184018-001-CI-2001			Revision 01





INTERM FIRST STAGE OF WORKS  
SCALE 1:50



FINAL SECOND STAGE OF WORKS  
SCALE 1:50

XREFs: x:DCDB\_DSC (Jan 2016), x:IMAGE: x:CVIL\_DESN  
CAD File: H:2018\0184018 - Warner St. Port Douglas Upgrade\005 - Civil Engineering\Design\CAD & Models\ Acad\184018-001-CI-2002.dwg

Rev.	Date	Description	Des.	Verif.	Appd.
01	04.04.2018	PRELIMINARY REVIEW	MJT	BNC	BNC

© Cardno Limited All Rights Reserved.  
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (QLD) Pty Ltd | ABN 57 051 074 992  
15 Scott Street, Parramatta Park  
Cairns QLD 4870  
Tel: 07 4034 0500 Fax: 07 4051 0133  
Web: www.cardno.com.au

Drawn M. TICKNER	Date 08.03.2018	Client DOUGLAS SHIRE COUNCIL
Checked B. CLAYTON	Date 04.04.2018	Project WARNER STREET UPGRADE PORT DOUGLAS
Designed M. TICKNER	Date 08.03.2018	Title OPTIONS ANALYSIS OPTION 1 - STAGED APPROACH TYPICAL SECTIONS
Verified B. CLAYTON	Date 04.04.2018	
Approved ####	####	

Status	<b>PRELIMINARY</b>		
NOT TO BE USED FOR CONSTRUCTION PURPOSES			
DATUM	DATE	Scale	Size
AHD	04.04.2018	1:500	A1
Drawing Number	Q184018-001-CI-2002		Revision
			01



# 5. UPGRADE OPTIONS

# OPTION 2

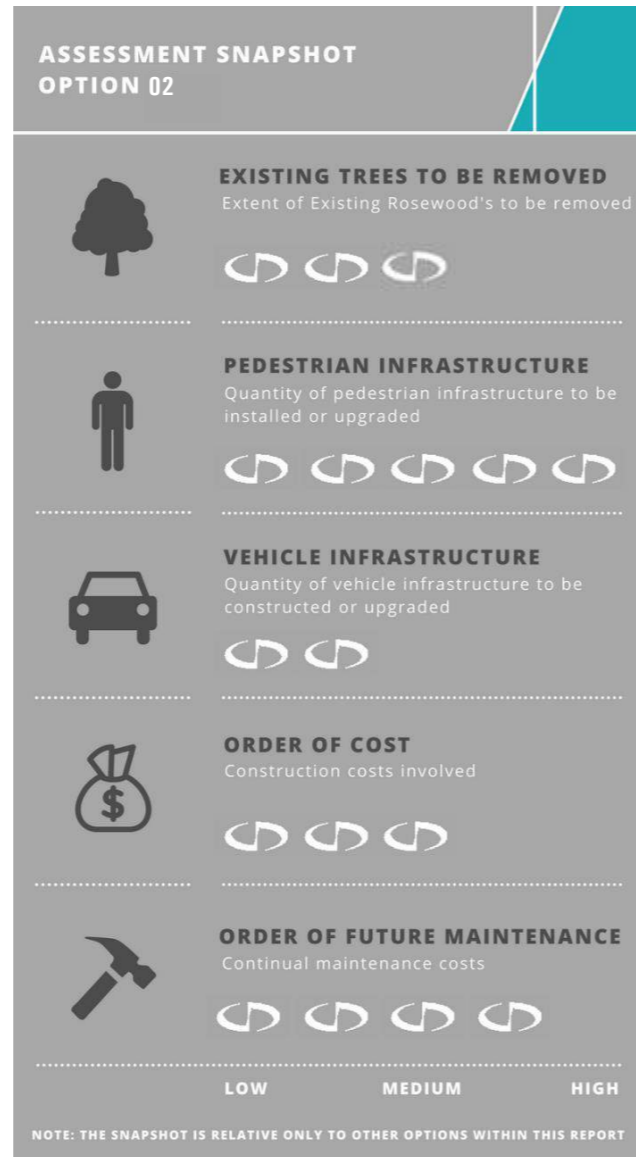
## DUAL LANE WITH PEDESTRIAN LANDSCAPED ZONE

**Option Summary**

Warner Street is currently heavily used by pedestrians both local and visitor. However, lack of suitable paths and adequate verges has resulted in pedestrians utilising the paved street. This increases the safety risk.

An option is identified to utilise half the existing road corridor as an extended verge and pedestrian walkway supplemented by active landscaping throughout. This walkway will be adequately lit to create an enhanced and safe walking experience for pedestrians.

The remaining half of the road corridor will remain dual carriageway with adequate parking facilities provided along the southern side of Warner Street.



**Stormwater**

Option 2 will require a unique approach to drainage and stormwater with a standard FNQROC drainage solution on the southern portion with kerbs, inverts and pits and a non-standard 'ecological approach' on the northern side, where a combination of natural swales and standard pits and culverts would keep the landscaped pedestrian zone free of water. Culverts would be required for access crossing. The resulting drainage standard may not satisfy the FNQROC design standard for a 10 year ARI event, the actual immunity level attained will depend on Council's planned extent for upgrading of external areas.

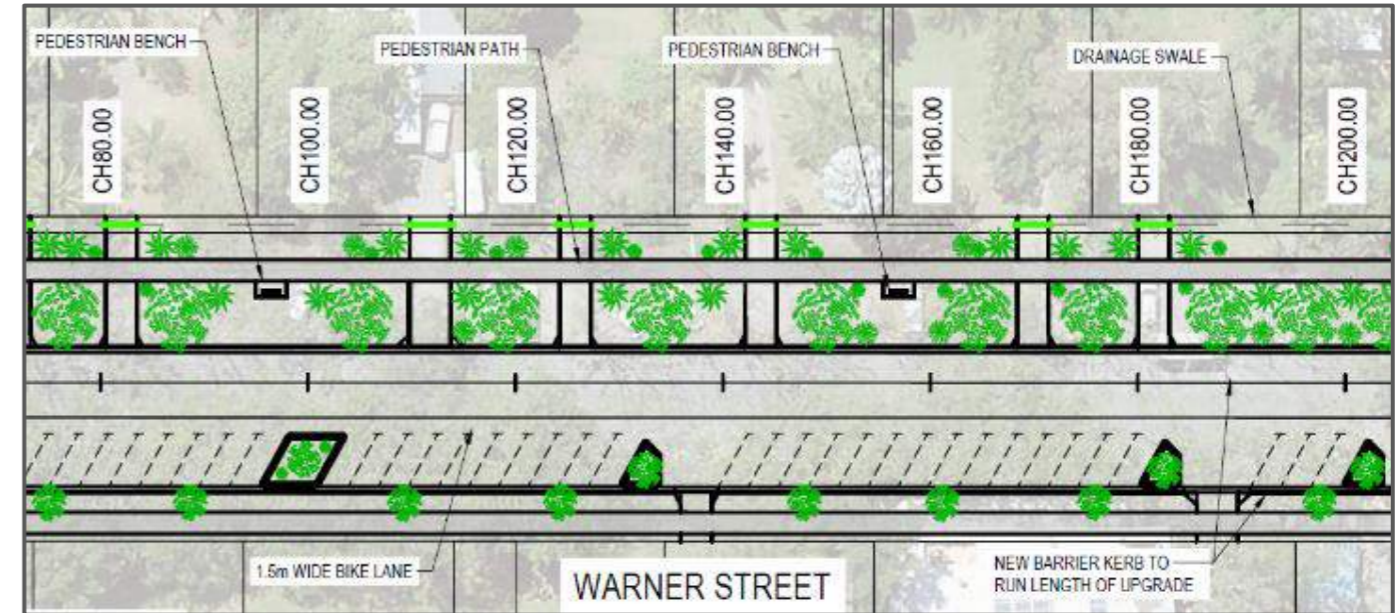


Figure 5-3: Snapshot from Drawing Q184018-001-CI-3001 refer to Page 17a & 17b for plans and sections

**Trees**

As per Option 1 the southern side will be removed and replanted with an appropriate species. The northern side of Warner Street will be utilized as a pedestrian only landscaped zone which will have an abundance of plants and trees creating a scenic thoroughfare for pedestrians. A selection of existing trees may be noted to remain if protected adequately but due to the nature of the trees this may not be to the benefit of the trees themselves. Approx. 42 new street trees will be introduced creating a localised canopy effect.

**Pedestrians and Vehicles**

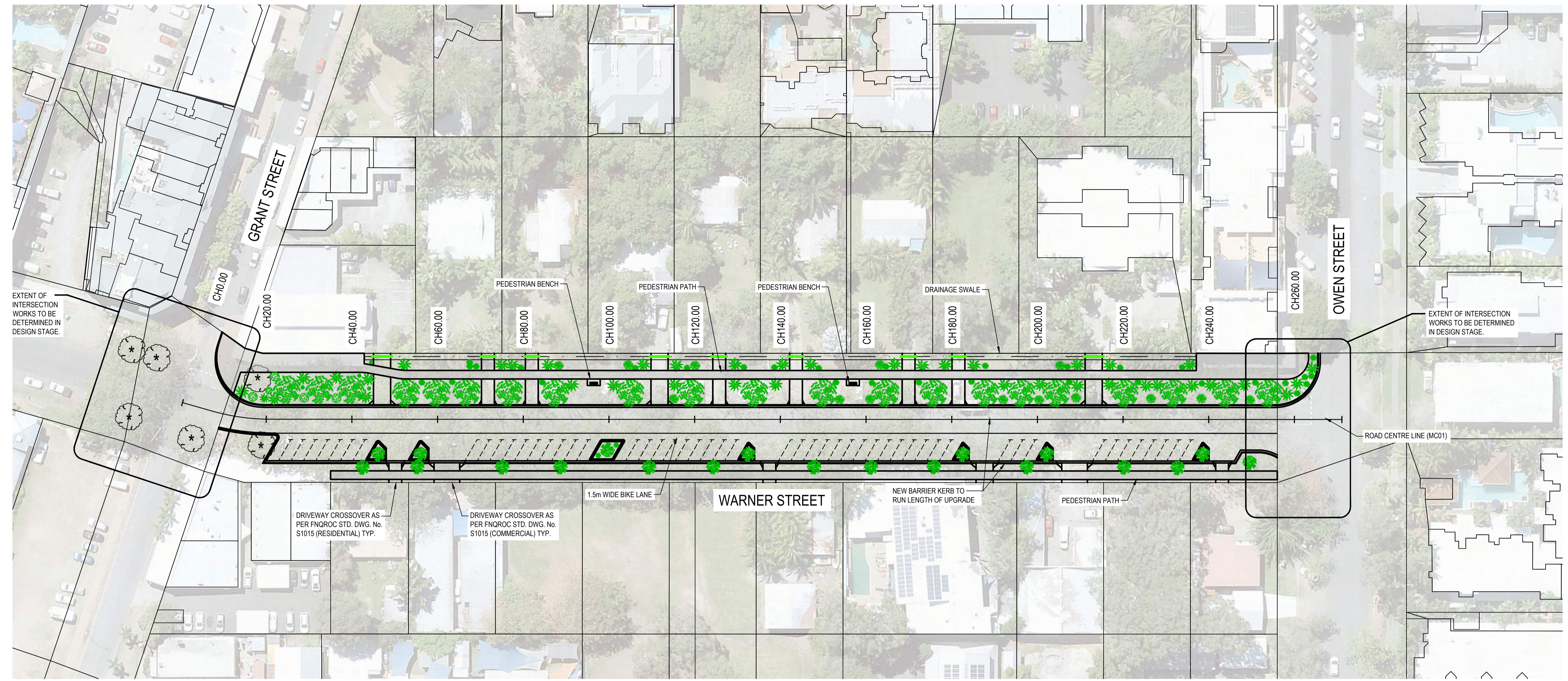
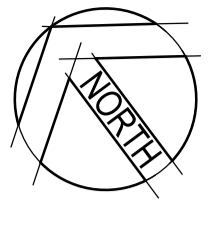
A single lane approach will provide pedestrians with a high level of amenity and safety, while maintaining its operational purpose as a commercial avenue. In that Warner Street's traffic flow is less than its counterpart, Macrossan Street, it is expected that Warner Street will only marginally suffer from the reduction in pavement (dual lane each way to single lane one way). It is noted however that No traffic studies or counts have yet been conducted on Warner Street; and a traffic impact assessment has not been undertaken.

**Maintenance and Cost**

With Landscaped zones featuring gardens and plants, Option 2's order of maintenance costs will be higher than Options 1 and 3. However ongoing maintenance costs will be significantly reduced from the current situation due to planting of adequate species use and drainage upgrades.

The order of cost for Option 2 will be heavily dependent on the level of finish and streetscape chosen. Utilising innovative landscaping solutions and drainage design will mean that Warner Street can become an iconic street within Port Douglas.





**SINGLE LANE PLAN**  
SCALE 1:500

LEGEND:	
	EXISTING TREE TO REMAIN
	NEW LANDSCAPE PLANTING
	EXISTING ROSEWOOD TREE
	CULVERT
	SWALE

XREFs: x:\DCDB\_DSC (Jan 2016) - x-IMAGE - x-CIVIL\_DESN  
CAD File: H:\2018\CI-3001-184018 - Warner St - Port Douglas Upgrade\005 - Civil Engineering\Design\ CAD & Models\ Acad\184018-001-CI-3001.dwg

Rev.	Date	Description	Des.	Verif.	Appd.
01	04.04.2018	PRELIMINARY REVIEW	MJT	BNC	BNC

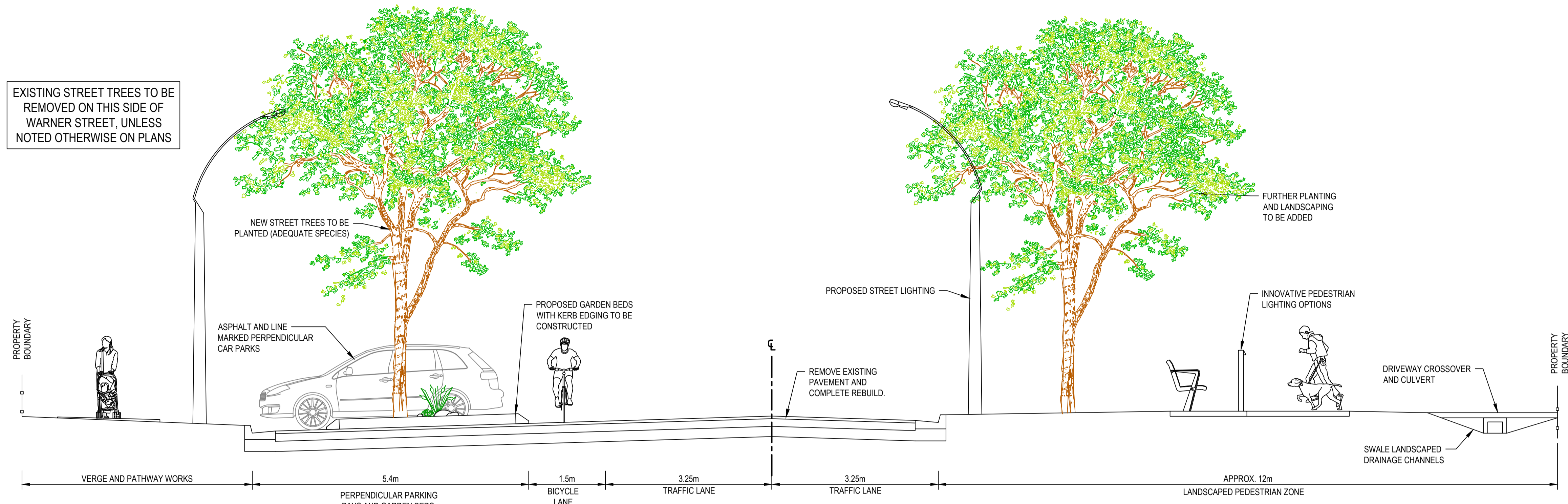
© Cardno Limited All Rights Reserved.  
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (QLD) Pty Ltd | ABN 57 051 074 992  
15 Scott Street, Parramatta Park  
Cairns QLD 4870  
Tel: 07 4034 0500 Fax: 07 4051 0133  
Web: www.cardno.com.au

Drawn	M. TICKNER	Date	08.03.2018	Client	DOUGLAS SHIRE COUNCIL
Checked	B. CLAYTON	Date	04.04.2018	Project	WARNER STREET UPGRADE PORT DOUGLAS
Designed	M. TICKNER	Date	08.03.2018	Title	OPTIONS ANALYSIS OPTION 2 - DUAL LANE & PEDESTRIAN LANDSCAPED ZONE SITE PLAN
Verified	B. CLAYTON	Date	04.04.2018		
Approved	####				

Status	<b>PRELIMINARY</b> NOT TO BE USED FOR CONSTRUCTION PURPOSES						
DATUM	AHD	DATE	04.04.2018	Scale	1:500	Size	A1
Drawing Number	Q184018-001-CI-3001			Revision	01		





DUAL LANE & PEDESTRIAN LANDSCAPE ZONE TYPICAL SECTION  
SCALE 1:50

Rev.	Date	Description	Des.	Verif.	Appd.
01	04.04.2018	PRELIMINARY REVIEW	MJT	BNC	BNC

© Cardno Limited All Rights Reserved.  
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

**Cardno**  
Shaping the Future

Cardno (QLD) Pty Ltd | ABN 57 051 074 992  
15 Scott Street, Parramatta Park  
Cairns QLD 4870  
Tel: 07 4034 0500 Fax: 07 4051 0133  
Web: www.cardno.com.au

Drawn M. TICKNER	Date 08.03.2018	Client DOUGLAS SHIRE COUNCIL
Checked B. CLAYTON	Date 04.04.2018	Project WARNER STREET UPGRADE PORT DOUGLAS
Designed M. TICKNER	Date 08.03.2018	Title OPTIONS ANALYSIS OPTION 2 - DUAL LANE & PEDESTRIAN LANDSCAPED ZONE TYPICAL SECTIONS
Verified B. CLAYTON	Date 04.04.2018	
Approved ###	Date ###	

Status <b>PRELIMINARY</b> NOT TO BE USED FOR CONSTRUCTION PURPOSES			
DATUM AHD	DATE 04.04.2018	Scale 1:500	Size A1
Drawing Number Q184018-001-CI-3002			Revision 01



# 5. UPGRADE OPTIONS

# OPTION 3

## CENTRE PARKING FULL RECONSTRUCTION TO FNQROC STANDARD

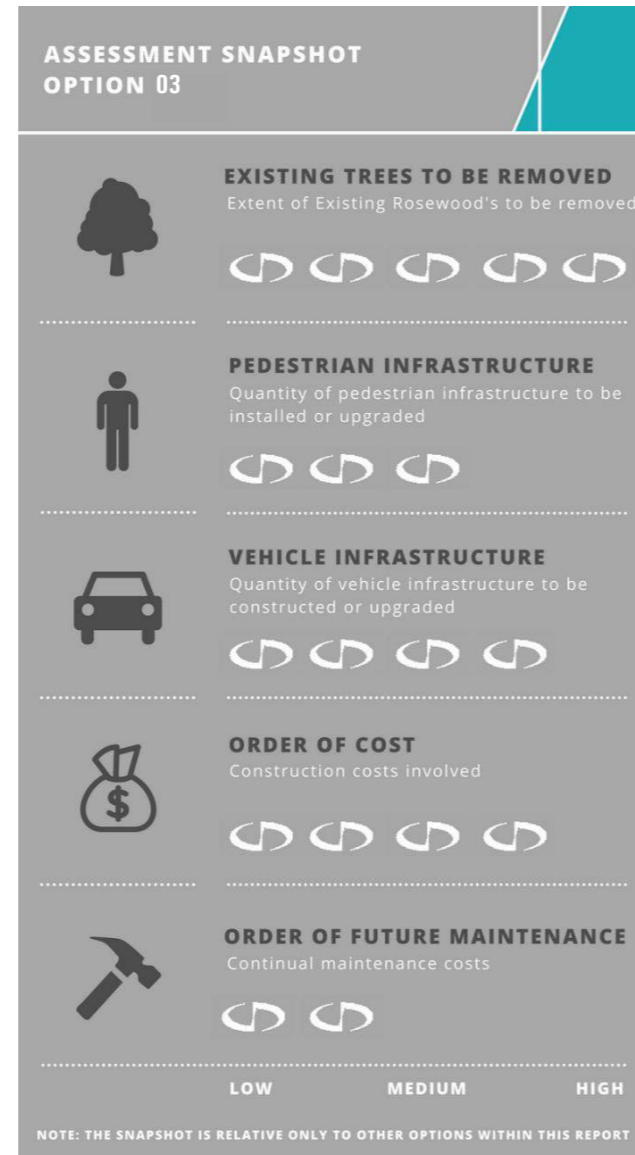
**Option Summary**

Warner Street does not currently comply with the local standards and particularly the FNQROC manual. An option to remove all existing vegetation and infrastructure from the street and replace with an FNQROC standard design has been proposed.

By utilising centre parking the verges are unencumbered and will be able to cope with reasonably sized street trees and pathways as seen elsewhere in Port Douglas.

This option would seek to bring Warner Street up to standard with relevant authority Standards, improve drainage and update the visual streetscape and practical amenity.

This option allows for one period of construction and therefore only one period of disruption to local businesses and the community.



**Stormwater**

Option 3 will bring Warner Street up to FNQROC standard to the greatest extent practicable.

New pits, pipes and driveway crossovers will see Warner Street draining adequately in minor rain events with significant reduction in ponding and blockages.

All drainage infrastructure will be to FNQROC standards subject to Council's budget and decisions regarding external and downstream drainage. As per Option 1 and 2, drainage may not satisfy the mandatory FNQROC design standard of a 10 year ARI event as a result.

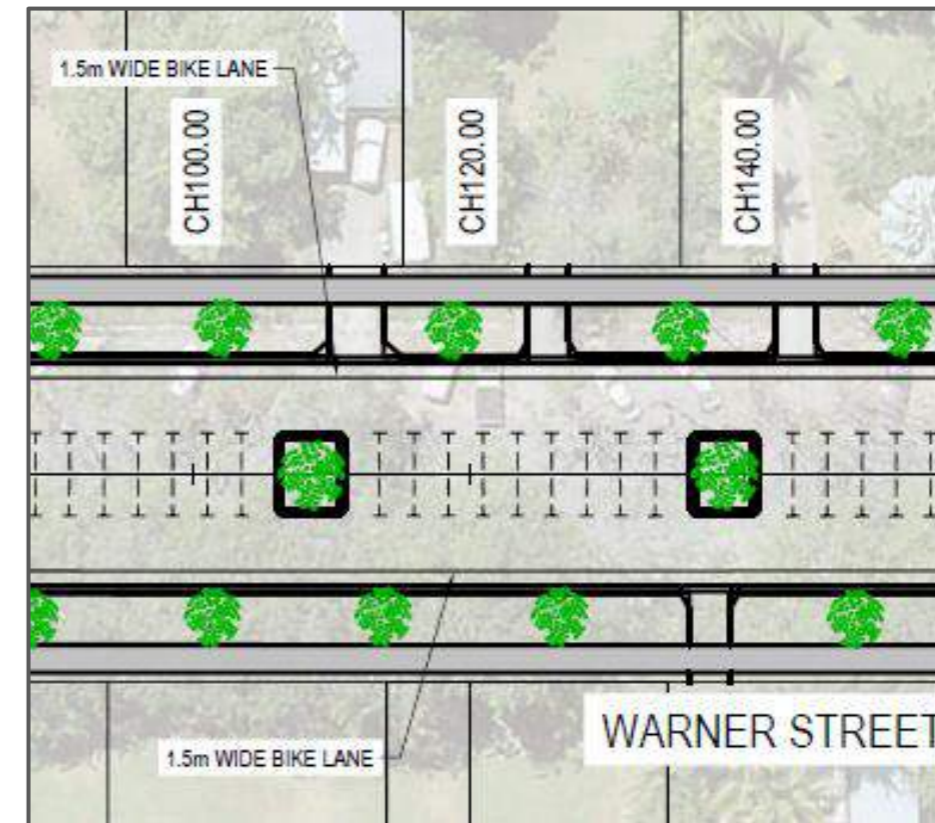


Figure 5-4: Snapshot from Drawing Q184018-001-CI-4001 refer to Page 18a and 18b for plans and sections

**Trees**

Option 3 provides the "cleanest" option as far as design and construction is concerned, in that, removing all existing trees, vegetation and infrastructure and beginning with a clean slate. Option 3 will see approximately 60 trees removed with a possible 6 trees on Grant St. intersection retained. All existing garden beds and planting will be removed and replaced with appropriate planting and street tree species as discussed in the Landscape and Vegetation section of this report. Approx. 41 new street trees will be introduced creating a localised canopy effect.

**Pedestrians and Vehicles**

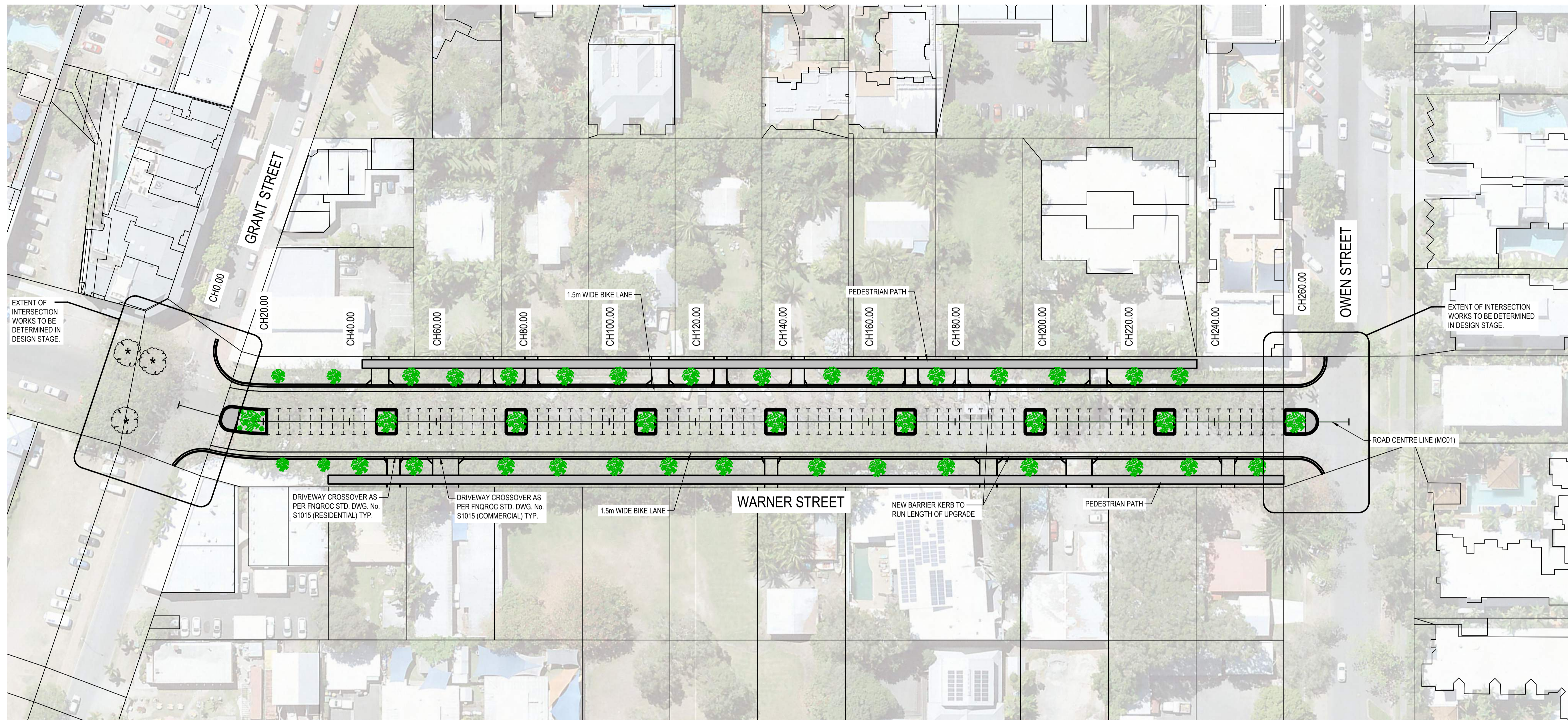
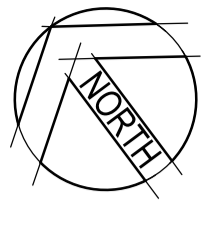
This option will bring Warner Street up to standard in terms of pedestrian and vehicle use. The standard approach to pavement, medians and parking has been used throughout Cairns and Port Douglas (Macrossan Street) and works well from a pedestrian and vehicle movement perspective. Single lanes each side with verges planted out with appropriate street trees and pathways for pedestrians will facilitate a clean, green modern streetscape.

**Maintenance and Cost**

As per Option 2, which results in a similar design, the maintenance aspect of this option is standard in nature. All trees and planting will be low maintenance species and planted to FNQROC standards in terms of garden beds and median construction.



The order of cost for this option results in it being the second most expensive upfront cost due to the large amount of new infrastructure required. However long term maintenance costs will be significantly reduced.





**CENTRE PARKING PLAN**  
SCALE 1:500

**LEGEND:**

- \* EXISTING TREE TO REMAIN
-  NEW LANDSCAPE PLANTING
-  EXISTING ROSEWOOD TREE

XREFS: x:\DCDB\_DSC (Jan 2016) - x-IMAGE - x-CIVIL\_DESN  
CAD File: H:\2018\0184018 - Warner St. Port Douglas Upgrade\005 - Civil Engineering\Design\ CAD & Models\ Acad\Q184018-001-CI-4001.dwg

Rev.	Date	Description	Des.	Verif.	Appd.
01	04.04.2018	PRELIMINARY ISSUE	MJT	BNC	BNC

© Cardno Limited All Rights Reserved.  
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.



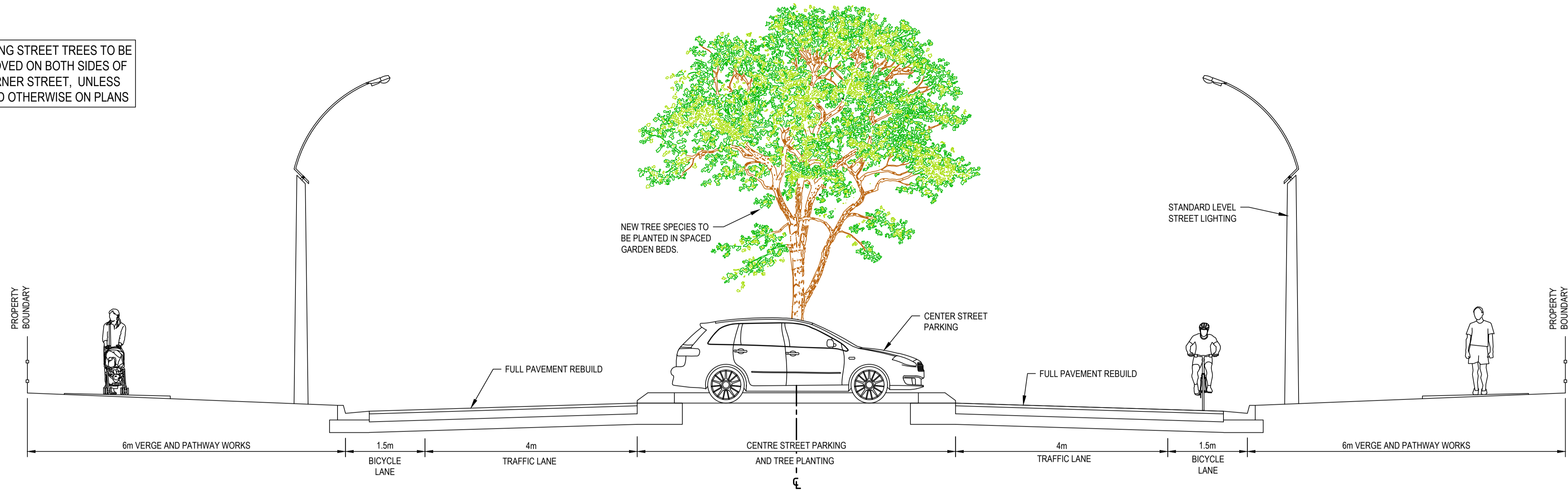
Cardno (QLD) Pty Ltd | ABN 57 051 074 992  
15 Scott Street, Parramatta Park  
Cairns QLD 4870  
Tel: 07 4034 0500 Fax: 07 4051 0133  
Web: www.cardno.com.au

Drawn M. TICKNER	Date 08.03.2018	Client DOUGLAS SHIRE COUNCIL
Checked B. CLAYTON	Date 04.04.2018	Project WARNER STREET UPGRADE
Designed M. TICKNER	Date 08.03.2018	Location PORT DOUGLAS
Verified B. CLAYTON	Date 04.04.2018	Title OPTIONS ANALYSIS OPTION 3 - CENTRE PARKING SITE PLAN
Approved ####	####	####

Status <b>PRELIMINARY</b>			
NOT TO BE USED FOR CONSTRUCTION PURPOSES			
DATUM AHD	DATE 04.04.2018	Scale 1:500	Size A1
Drawing Number Q184018-001-CI-4001			Revision 01



EXISTING STREET TREES TO BE REMOVED ON BOTH SIDES OF WARNER STREET, UNLESS NOTED OTHERWISE ON PLANS



**CENTRE PARKING TYPICAL SECTION**  
SCALE 1:50

Rev.	Date	Description	Des.	Verif.	Appd.
01	04.04.2018	PRELIMINARY REVIEW	MJT	BNC	BNC

© Cardno Limited All Rights Reserved.  
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (QLD) Pty Ltd | ABN 57 051 074 992  
15 Scott Street, Parramatta Park  
Cairns QLD 4870  
Tel: 07 4034 0500 Fax: 07 4051 0133  
Web: www.cardno.com.au

Drawn	M. TICKNER	Date	08.03.2018	Client	DOUGLAS SHIRE COUNCIL
Checked	B. CLAYTON	Date	04.04.2018	Project	WARNER STREET UPGRADE PORT DOUGLAS
Designed	M. TICKNER	Date	08.03.2018	Title	OPTIONS ANALYSIS OPTION 3 - CENTRE PARKING TYPICAL SECTIONS
Verified	B. CLAYTON	Date	04.04.2018		
Approved	###				

Status				<b>PRELIMINARY</b>	
NOT TO BE USED FOR CONSTRUCTION PURPOSES					
DATUM	DATE	Scale	Size		
AHD	04.04.2018	1:500	A1		
Drawing Number				Revision	
Q184018-001-CI-4002				01	



## 6. CONCLUSION



Cardno has prepared an Options Analysis Report for Douglas Shire Council in relation to the proposed Warner Street upgrade. The subject site is located in Port Douglas, North Queensland to the South of the town's main thoroughfare, Macrossan Street. The subject street is connected by Grant Street in the West and Owen Street in the East and extends west towards the Marina and Wharf Street

This report has detailed the following:

- > The site characteristics, objectives, and possible outcomes of upgrading Warner Street.
- > Provides a review of the current condition of all associated drainage infrastructure within the street and nearby properties.
- > The possible community outcomes, pedestrian and vehicle movement intentions, site environmental impacts, stormwater and flooding concerns and upgrade approaches and the landscaping results that could be achieved.
- > Provides three (3) upgrade options for Council's consideration.

## CONTACT INFORMATION

**Cardno (Old) Pty Ltd**

ABN 57 051 074 992

15 Scott Street

Parramatta Park

Cairns QLD 4870

Australia

[www.cardno.com](http://www.cardno.com)

Phone +61 7 4034 0500

Fax +61 7 4051 0133

## DOCUMENT REVISION

Version	Effective Date	Description of Revision	Prepared by	Reviewed by
01	04.04.2018	Preliminary Review	M. Tickner*	B. Clayton
02	26.06.2018	Final Issue	M. Tickner*	D. Hammersley/ U. Musso
03	16.08.2018	Final Amendments	M. Tickner*	M. Tickner





#### Global Head Office

Level 11, North Tower  
Green Square  
515 St Paul's Terrace  
Fortitude Valley  
QLD 4006 Australia  
  
Locked Bag 4006  
Fortitude Valley QLD 4006  
  
Phone + 617 3369 9822  
Fax + 617 3369 9722  
  
cardno@cardno.com  
[www.cardno.com](http://www.cardno.com)

#### Northern Australia Offices

##### Darwin

Level 6  
93 Mitchell Street  
Darwin NT 0800  
  
GPO Box 1162  
Darwin NT 0800

Phone: +61 8 8942 8242  
Fax: +61 8 8942 8211

##### Cairns

15 Scott Street  
Parramatta Park  
QLD 4870  
  
PO BOX 1169  
Cairns QLD 4870

Phone: +61 7 4034 0500  
Fax: +61 7 4051 0133



Follow us on  
[www.linkedin.com/company/cardno](http://www.linkedin.com/company/cardno)



Follow us on  
[www.twitter.com/cardno](http://www.twitter.com/cardno)



Join us on  
[www.facebook.com/CardnoGlobal](http://www.facebook.com/CardnoGlobal)



Watch us on  
[www.cardno.com/youtube](http://www.cardno.com/youtube)

## OFFICE LOCATIONS





