Clarence City Council

Begonia Street Traffic Calming

October 2018

Executive summary

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1. Introduction

1.1 Background

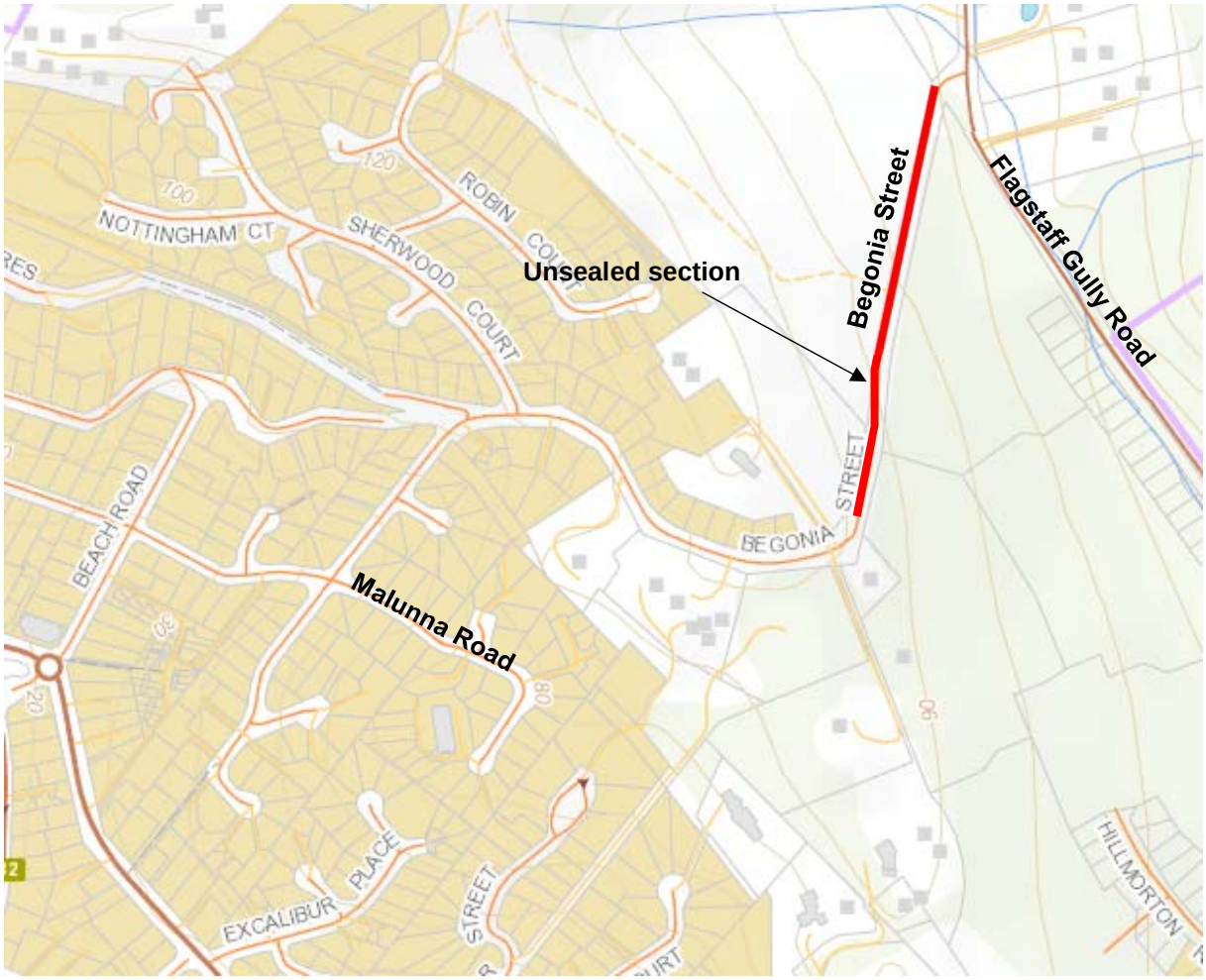
GHD was engaged by Clarence City Council to undertake a review of potential traffic calming measures which may be appropriate for Begonia Street in Lindisfarne.

Begonia Street connects Flagstaff Gully Road and Malunna Road. The northern end of Begonia Street (approximately 450 m) is unsealed. This section has remained unsealed in order to discourage through traffic in a residential area. Begonia Street is known to be used as a rat-run between Mornington and Lindisfarne, to avoid the Tasman Highway and East Derwent Highway. This also affects sections of Malunna Road and Beach Road, which connect Begonia Street to Gordons Hill Road and the East Derwent Highway. Local residents have a long history of requesting that Council protect the residential amenity of the area.

The unsealed section of Begonia Street creates a maintenance cost for Council, with grading undertaken every 6-8 weeks. Council also receives regular complaints from the public that the road should be sealed.

This report considers options for the management of Begonia Street. Recommendations regarding maintenance practices on gravel roads are provided. The feasibility of traffic calming measures on gravel roads is considered. Traffic calming measures which may be appropriate if the road is to be sealed are also considered.

Figure 1-1 Site location



Base map source: Land Tasmania 2012, TheList

1.2 Existing conditions

Begonia Street is classified as a minor collector road under Council's road hierarchy. It is a two-way, two-lane road. There is a load limit of 4 t on Begonia Street. The speed limit is 50 km/h.

The unsealed section of Begonia Street has a width of 6-7 m. This section is relatively straight and has a longitudinal grade of approximately 7.5%. The land adjacent to this section is currently undeveloped and there is no direct property access. There are no footpaths or street lighting in this section. Overhead power runs adjacent to the road on the western side. A small section of Begonia Street is sealed at the intersection with Flagstaff Gully Road.

Figure 1-2 Begonia Street, unsealed section



The sealed section of Begonia Street has tight horizontal curvature, which limits sight distance at property accesses. Four speed humps are provided through this section to reduce vehicle speeds. The southern section of Begonia Street on approach to Malunna Road is steep, with a grade of approximately 20%. A footpath is provided on one side of the road in the sealed section. Street lighting is also provided.

Begonia Street is not a bus route. Council has advised that the unsealed section of Begonia Street is not used by garbage trucks.

Figure 1-3 Begonia Street, sealed section



1.3 Traffic volumes

Traffic counts for Begonia Street were obtained from Council. MetroCount data was collected at 65 Begonia Street (just south of the gravel section) for one week in July 2016. This traffic count was taken after the completion of the upgrade to the East Derwent Highway / Tasman Highway interchange. It was considered that this upgrade may have reduced rat-running on Begonia Street.

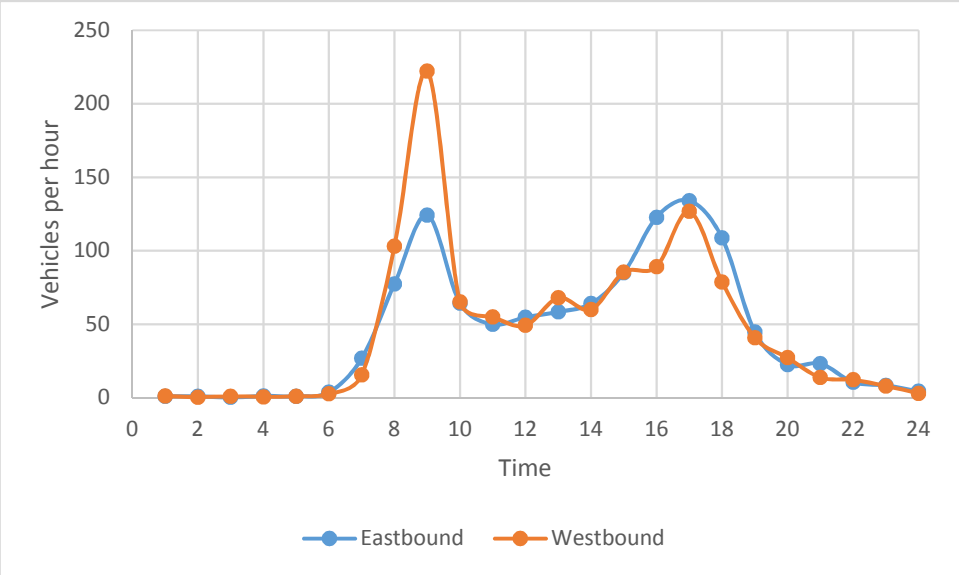
The traffic counts are summarised in Table 1-1. The average weekday daily traffic volume on Begonia Street is 2,220 vehicles. Peak hour volumes are 350 in the morning peak and 260 in the evening peak, with 3% heavy vehicles across the day.

A daily traffic profile is illustrated in Figure 1-4. There is a fairly even directional split across the majority of the day, with the exception of the morning peak, when a high volume of westbound traffic is evident. This is likely due to drivers avoiding congestion on the Tasman Highway during the morning peak hour.

Table 1-1 Begonia Street traffic volume data, 2016

	AM peak	PM peak	Total
Eastbound	124	134	1093
Westbound	222	127	1130
Total	346	261	2223

Figure 1-4 Begonia Street traffic volumes, daily profile



1.4 Crash history

Crash data was obtained from the Department of State Growth for Begonia Street, between Flagstaff Gully Road and Malunna Road, for the ten-year period between May 2008 and May 2018. There were a total of 18 crashes during this period, including eight crashes involving injury. The crash history is summarised in Table 1-2.

Seven crashes occurred on the unsealed section of Begonia Street. All of these were off-path crashes, involving a single vehicle.

Five crashes occurred at the intersection between Begonia Street and Flagstaff Gully Road. Three crashes involved vehicles from adjacent directions at the intersection. Two crashes were single vehicle, off-path crashes.

Six crashes occurred on the sealed section of Begonia Street, including two at intersections.

Table 1-2 Begonia Street crash history

	Total crashes	Injury crashes	Dominant crash types
Intersections			
Intersection of Begonia Street and Flagstaff Gully Road	5	1	Intersection (3), Off-path (2)
Intersection of Begonia Street and Malunna Road	1	-	Manoeuvring
Intersection of Begonia Street and Sherwood Court	1	-	Intersection
Mid-block			
Begonia Street- sealed	4	3	Manoeuvring (2), On-path (1), Off-path (1)
Begonia Street- unsealed	7	4	Off-path (7)
Total	18	8	

1.5 Future development

Council has approved a residential subdivision in the area between Begonia Street and Flagstaff Gully Road. The subdivision will have 120 lots. The original proposal included a connection onto Begonia Street, however this was not approved. The subdivision will be accessed from Flagstaff Gully Road. The subdivision is likely to increase traffic volumes on Begonia Street.

1.6 Previous proposals

In 2012, Council considered making the unsealed section Begonia Street one-way eastbound, to improve safety and amenity on Begonia Street, Malunna Road and Beach Road. The proposal was advertised and the public was given the opportunity to comment on the proposal.

A total of 149 submissions were received. The majority of submissions (84%) were against the change. The concerns raised included:

- Safety of access - Tasman Highway/East Derwent Highway
- Difficulty in towing large trailers, caravans and boats up the steep section of Begonia Street
- Safety of the steep section of Begonia Street in wet and/or icy conditions
- Reduced access for emergency services
- Increased travel distances and time
- The separation of the Flagstaff Gully portion of the Lindisfarne suburb from the rest of the suburb
- Egress from area in case of bushfire
- Increase in traffic on Gordons Hill Road

Council decided against proceeding with the proposal.

2. Maintenance of gravel roads

2.1 General

Unsealed roads require frequent maintenance grading which is necessary to maintain the condition of the surface, due to the surface being susceptible to weather damage and traffic-induced wearing. The maintenance of unsealed roads usually includes grading, and resheeting.

2.1.1 Grading

Periodic grading of unsealed roads is undertaken to provide a good running surface and to form crossfall to allow water to run off. Water ponding on unsealed roads leads to deterioration of the surface and to the formation of potholes. It is desirable to provide a crossfall of 4% to 6% to ensure good water shedding occurs.

Council have indicated that they undertake maintenance grading on Begonia Street approximately every 6 to 8 weeks.

2.1.2 Resheeting

Gravel loss and subsequent replacement by resheeting is the most significant factor affecting the life cycle operating costs of an unsealed road pavement (Austroads 2009).

The loss of the wearing course material occurs because of traffic abrasion and loss of fine binding material, degradation due to weathering, climatic conditions, grading maintenance, and pavement material selection.

Council have indicated that Begonia Street was last resheeted in May 2016 with an average thickness of material of 75mm-100mm.

2.2 Increasing surface performance

Measures which may be considered to improve the surface performance of the unsealed section of Begonia Street include compaction, reshaping and stabilisation.

2.2.1 Compaction

The performance of the unsealed surface can be significantly improved by compacting the surface after grading. In addition to normal compaction, it is quite common to slurry the surface, which brings fine material to the surface which assists in retaining the aggregate fractions in place through cohesion. However, care needs to be taken when slurrying not to produce a highly slippery surface.

2.2.2 Reshaping

Reshaping of the road surface involves scarification of the surface and remixing of the aggregate base, which can yield a proper blending of fines and aggregates, and the restoration of an appropriate crowned road surface.

2.2.3 Stabilisation

Stabilisation of unsealed road wearing surfaces is generally limited to granular stabilisation (mixing of granular material). However, modified stabilisation (particularly lime and chemical binders) may be used to enhance surface wear characteristics, slow down the rate of deterioration, and reduce the number of grading interventions and resheeting applications.

Chemical Binders

Chemical stabilisation binders act as surface stabilisers providing stability to otherwise unstable surface materials. The primary function of chemical stabilisation is to bind the fine fractions such that they hold the aggregate fractions in place for a longer period of time. This is enhanced by the binder providing bonding and waterproofing of the fines to maintain the dry strength of the fine material.

The benefits of chemical stabilisation of unsealed wearing courses are:

- prevention of particles becoming airborne
- resistance to traffic wear
- resistance to ageing
- environmental compatibility
- easily applied with common road maintenance equipment
- workable and responsive to maintenance
- cost competitive

The consideration of proprietary chemical binders is generally based on the determination of their suitability to the parent material.

In addition to laboratory mix design considerations, the selection of a particular binder needs to be considered in terms of the quantity of stabilisation binder required, the cost of the binder (including transport to site and on-site handling), any additional plant required, OH&S issues, and chemical residues left in water tankers.

3. Traffic calming measures

3.1 Unsealed roads

Traffic calming treatments are generally not suitable for unsealed/gravel roads for safety and maintenance reasons. The unsealed road surface has an effect on reducing vehicle speeds, and this, coupled with speed limit signage are generally the only measures suitable for traffic calming. Additional treatments such as road/speed humps, slow points, and horizontal deflections can all have a detrimental effect on both safety and physical road condition.

3.1.1 Safety

Unsealed road surfaces have lower friction coefficients than sealed surfaces. The surface condition of unsealed roads can also change quickly, unlike sealed pavements, due to traffic and environmental conditions such as rain.

Due to these surface factors, any unnecessary change in horizontal direction or speed (i.e. braking), like a traffic calming device, can affect the safety of the road user, and may lead to an increase in crash occurrences.

3.1.2 Maintenance

An increase in braking frequency or horizontal movement on an unsealed surface will most likely lead to surface deterioration. Surface defects such as corrugations form at locations of braking, acceleration and gearing changes, and alignment changes such as ‘left to right’ movements are susceptible to potholing.

As a majority of traffic calming measures involve a slowing of speed at a specific feature, any additional traffic calming treatment will most likely increase maintenance costs.

It is not recommended that further traffic calming measures are installed on the unsealed section of Begonia Street, unless the road is sealed.

3.2 Sealed roads

If the northern section of Begonia Street is sealed, this road may become more attractive to through traffic, resulting in increased traffic volumes. Traffic calming measures which may be suitable if the road is to be sealed have been considered. The objectives of traffic calming measures are to discourage through traffic, reduce vehicle speeds and reduce crashes.

Options for traffic calming measures on Begonia Street (if sealed) include vertical deflection devices, horizontal deflection devices and diversion devices.

3.2.1 Vertical deflection devices

Vertical deflection devices are physical devices which create a vertical change in the path of travel. They generally result in reduced vehicle speeds as drivers attempt to avoid discomfort when travelling over the device. Vertical deflection devices which may be considered in this location include road humps, road cushions and flat-top humps.

Road humps are typically 70 to 120 mm high with a total length of 3 to 4 m (Austroads 2016). Road humps can result in a reduction in vehicle speeds, a reduction in road crashes and a reduction in through traffic. General advantages and disadvantages of road humps are summarised in Table 3-1.

Table 3-1 General advantages and disadvantages of road humps

Advantages	Disadvantages
• a significant reduction in vehicle speeds in the vicinity of the device • a significant reduction in road crashes • relatively low cost to install and maintain • they discourage through traffic • when used in a series they regulate speeds over the entire length of the street • they can be designed to limit discomfort to cyclists	• traffic noise level may increase just before and after the device due to braking, acceleration and the vertical displacement of vehicles • they may divert traffic to nearby streets without local area traffic management measures • they are uncomfortable for vehicle passengers and cyclists • they may adversely affect access for buses, commercial vehicles and emergency vehicles • they can impact on passenger comfort when used on bus routes.

Source: Austroads 2016, Guide to Traffic Management Part 8: Local Area Traffic Management

Road cushions are an alternative to road humps. They occupy only part of the roadway, compared to road humps which occupy the whole width. Road cushions are designed to be more sympathetic to cyclists, buses and commercial vehicles. Road cushions are generally 70 to 80 mm high, 3.0 m long, with a width of 1.6 – 1.9 m (Austroads 2016).

A flat-top road hump, or raised table, has a raised surface that is flat, rather than curved as for a typical road hump. Flat-top humps are typically 57-100 mm high, with a 2- 6 m long raised platform (Austroads 2016).

The effectiveness of vertical deflection devices are compared in Table 3-2.

Table 3-2 Effectiveness of vertical deflection devices

Treatment type	Change in 85th percentile speeds		Casualty crash reduction factor, scheme-wide
	At-treatment	Scheme-wide	
Road humps	-45%	-21%	71%
Road cushions	-27%	-	60%
Flat-top humps / raised tables	-24%	-	71%

Source: Austroads 2009, Impact of LATM Treatments on Speed and Safety

Road humps are considered to be the most appropriate form of vertical deflection device for the northern section of Begonia Street. This would maintain consistency with the southern section of Begonia Street which has four existing road humps.

As shown in Table 3-2, road humps have been shown to be the more effective in reducing vehicle speeds than road cushions and flat-top humps. Road humps have been shown to reduce the 85th percentile speed by 45% at the road hump and by 21% at the midpoint between devices.

Begonia Street is not a bus route, and the northern section is not used by garbage trucks. It is not considered necessary to provide a device which is more sympathetic for buses and commercial vehicles.

Austroads (2016) advises that the spacing of road humps should not be less than 80 m and generally not more than 120 to 150 m. The existing road humps on Begonia Street are spaced at approximately 85 – 100 m.

If road humps are selected, it is recommended that four road humps are installed on the northern section of Begonia Street, approximately 85 m apart. This treatment would be consistent with the existing road humps on Begonia Street. A concept sketch of this option is provided in Appendix A.

It is important that road humps are located so they are clearly visible to approaching drivers. Street lighting would need to be installed to ensure the speed humps are illuminated at night.

3.2.2 Horizontal deflection devices

Horizontal deflection devices are physical features which alter the horizontal path of a vehicle. The deflection may result in a reduction in traffic volume, speed and conflicts. Horizontal deflection devices include lane narrowing, slow points and centre blister islands.

Lane narrowing involves reducing the trafficable carriageway width to reduce vehicle speeds. The existing carriageway width in the unsealed section of Begonia Street is already relatively narrow, at 6-7 m. Narrowing the lane width in this location is not expected to have a significant impact on traffic speeds or volumes.

A slow point is a series of kerb extensions which narrow and/or angle the roadway. Slow points can be either one or two lanes. Two-lane slow points are usually less effective in controlling speeds and providing adequate visual obstruction. (Austroads 2016)

General advantages and disadvantages of slow points are summarised in Table 3-3.

Table 3-3 General advantages and disadvantages of slow points

• a reduction in vehicle speeds in the vicinity of the device and when used in a series, speeds are reduced over the length of the street • a significant reduction in road crashes • they may provide pedestrians with a shorter distance to cross the street • they discourage through traffic • they impose minimal inconvenience on local residents • they can provide a landscaping opportunity.	• they may restrict emergency vehicles and buses • possible increase in traffic noise • they will require the removal of on-street parking • with one-lane devices, confrontations between opposing drivers may occur when arriving simultaneously and it may be unclear who should give way • they can be hazardous for cyclists if they are not catered for in the design • landscaping needs to be maintained so as not to reduce visibility.

Source: Austroads 2016, Guide to Traffic Management Part 8: Local Area Traffic Management

Austroads (2016) recommends that slow points are only provided where the resulting traffic volume is not more than 1,000 vehicles per day, otherwise congestion or crash risk may increase. Existing traffic volumes on Begonia Street are greater than 2,000 vehicles per day. In addition, traffic volumes are expected to increase following the development of a subdivision on Flagstaff Gully Road. Therefore a slow point could create an increased crash risk in this location.

A centre blister island is a concrete island in the median of the road that narrows the lanes and diverts the angle of traffic flow into and out of the device. The island should be a minimum of 2 m wide and 3 m long. (Austroads 2017).

Advantages and disadvantages of centre blister islands are summarised in Table 3-4.

Table 3-4 Advantages and disadvantages of centre blister islands

• they reduce vehicle speeds • they prevent drivers from overtaking others • they can provide a refuge for pedestrians and cyclists crossing the street • their flexibility in design allows buses and commercial traffic to be accommodated • they may visually enhance the street through landscaping and reduce the 'gun barrel' effect on long straight roads.	• they prohibit or limit access and movement from driveways • they reduce on-street parking adjacent to the islands • they may create a squeeze point for cyclists if not appropriately catered for in the design • they may require kerb and footpath realignment in narrow streets • they are not particularly effective at reducing through traffic • they are relatively expensive to install and maintain.

Source: Austroads 2017, Guide to Traffic Management Part 8: Local Area Traffic Management

It is noted that blister islands are not particularly effective at reducing through traffic, which is a key objective for traffic calming on Begonia Street. Road widening would also be required to provide a centre blister island, making this option more costly. Centre blister islands are not considered appropriate for this location.

The effectiveness horizontal deflection devices are compared in Table 3-5. One-lane slow points are the most effective in reducing vehicle speeds and crashes. It is noted that one-lane slow points are less effective in reducing vehicle speeds and crashes than road humps.

Table 3-5 Effectiveness of horizontal deflection devices

Treatment type	Change in 85th percentile speeds		Casualty crash reduction factor, scheme-wide
	At-treatment	Scheme-wide	
Kerb extensions / lane narrowing	-7%	-	-
Slow points – two-lane	-27%	-	51%
Slow points- one-lane	-34%	-32%	61%
Centre blisters	-24%	-	-

As the existing road is narrow, a two-lane slow point or centre blister treatment could not be provided without road widening. A one-lane slow point is considered the most appropriate horizontal deflection device for Begonia Street.

If a horizontal deflection device is selected, it is recommended that two one-lane slow points are installed on the northern section of Begonia Street. A concept sketch of this option is provided in Appendix A.

It is important that the slow points are located so they are clearly visible to approaching drivers. Street lighting would need to be installed to ensure the slow points are illuminated at night.

A vertical deflection device could be installed in conjunction with the slow point to further reduce speeds and discourage through traffic. The concept sketch of this option includes a road hump in the middle of each of the slow points.

3.2.3 Diversion devices

Diversion devices are used to redirect traffic, typically through the use of physical obstructions in the roadway supplemented by regulatory signs. These measures obstruct specific vehicle movements to discourage through traffic. Diversion devices include a full road closure or a half road closure.

An option to improve amenity on Begonia Street, Malunna Road and Beach Road is to close the unsealed section of Begonia Street to all traffic. This would eliminate through traffic on Begonia Street, resulting in a substantial decrease in traffic volumes (in the order of 2,000 vehicles per day in this section). A space for vehicles to turn around would need to be provided.

A full road closure would reduce accessibility for local residents. As there are limited alternatives to Begonia Street, a full closure would result in substantial increases in travel distances and times for some traffic. A full closure would limit access to the proposed subdivision off Flagstaff Gully Road. It would also restrict access for emergency vehicles, although an emergency vehicle only access could be created. A full closure is unlikely to be supported by the community.

Half road closures restrict entry or exit to local areas by kerb arrangement and regulatory control to one direction only. An alternative to a full closure would be to make the unsealed section of Begonia Street one-way. This would still have a substantial impact on through traffic, with traffic volumes likely to reduce by approximately 1,000 vehicles per day on this section of Begonia Street.

As detailed in Section 1.3, there is a fairly even directional split of traffic across the majority of the day, with the exception of the morning peak, when a higher volume of westbound traffic is evident. Consequently the impact on traffic volumes of either a one-way eastbound or one-way westbound scenario would be similar.

A one-way eastbound scenario would require a simpler modification to the road. Modifying the Flagstaff Gully Road / Begonia Street intersection to restrict entries to Begonia Street would make the unsealed section of Begonia Street one-way eastbound. Alternatively, to make Begonia Street one-way westbound, a turning facility would be required on Begonia Street adjacent to the closure. It is recommended that a one-way eastbound scenario would be more suitable. A concept sketch of the one-way eastbound scenario is provided in Appendix A.

A half road closure would restrict access for local residents, but to a lesser extent than a full road closure. A half road closure would increase travel distances and travel times in one direction. With a half road closure, there is risk that the restrictions will be violated, creating a safety hazard.

A half road closure would restrict access for emergency vehicles, unless they disregard controls (emergency vehicles are empowered to travel against the traffic flow when necessary).

It is noted that making Begonia Street one-way has been considered in the past and there was objection to the proposal from the community.

4. Recommendations

Management options for the currently unsealed section of Begonia Street in Lindisfarne have been considered. If the road is to remain unsealed, additional traffic calming treatments are not recommended as they may lead to safety issues and increase maintenance requirements and costs. From a long-term and economical maintenance perspective, it is recommended that the existing maintenance techniques be reviewed to ensure proper compaction of the surface after grading is being achieved, and that stabilisation of the wearing course is considered.

If the road is to be sealed, it is recommended that either road humps or single lane slow points are installed, or this section is made one-way eastbound.

Road humps are likely to reduce vehicle speeds and crash risk, providing some improvement to safety and amenity. However, road humps are unlikely to have a substantial impact on reducing through traffic on Begonia Street. Despite existing traffic calming measures, including speed humps and keeping the northern section unsealed, Begonia Street is known to be used by through traffic, to avoid the Tasman Highway and the East Derwent Highway. There are limited alternatives to this route, which makes Begonia Street attractive to rat-running, particularly at peak times when congestion is experienced on the highway. The proposed subdivision off Flagstaff Gully Road is likely to further increase traffic volumes on Begonia Street.

If road humps are selected, it is recommended that four road humps are installed on the northern section of Begonia Street, approximately 85 m apart. A concept sketch of this option is provided in Appendix A. Road humps should be located where they are clearly visible to approaching drivers and street lighting should be installed.

Similar to road humps, slow points will reduce vehicle speeds but are unlikely to have a substantial impact on reducing through traffic. If slow points are selected, it is recommended that two one-lane slow points are installed. A concept sketch of this option is provided in Appendix A. Street lighting would need to be installed to ensure the slow points are illuminated at night. Slow points could be installed in conjunction with a vertical deflection device. The concept sketch of this option includes a road hump in the middle of each of the slow points.

To have a substantial impact on reducing through traffic, it is considered that a half road closure would be the most appropriate option. If this option is selected, it is recommended that modifications are made to the intersection between Flagstaff Gully Road and Begonia Street to prohibit entries to Begonia Street. This would make the northern section of Begonia Street one-way eastbound. This would have a substantial impact on through traffic, with traffic volumes likely to reduce by approximately 1,000 vehicles per day in this section.

Making this section one-way would restrict access for local residents. There is also a risk that restrictions will be violated, creating a safety risk. Access would also be restricted for emergency vehicles, unless they disregard controls. It is noted that making Begonia Street one-way has been considered in the past and there was objection to the proposal from the community.

A concept sketch of this option is provided in Appendix A. This option includes physical modifications to the intersection to restrict access and regulatory signs to advise the banned movements.

5. Cost estimate

A high level cost estimate, based on unit rates plus contingency, has been prepared for the three recommended options, as summarised in the following tables. The cost estimates include the cost of sealing the road. The construction cost of the one-way eastbound option is estimated to be $217,000, compared to $362,000 for the road humps and $379,000 for the slow points.

Table 5-1 Cost estimate, road humps

Option - Road Humps				
	Quantity	Unit	Rate	Total
Site establishment & demobilisation	1	Item	5000	$5,000
Remove existing gravel wearing coarse	3000	m^2	5	$15,000
Pavement repair (digouts)	1	Item	10000	$10,000
Base material Class 1 (100mm thick)	3000	m^2	20	$60,000
Seal (Asphalt incl. waterproofing seal)	3000	m^2	40	$120,000
Road Hump	4	No.	1600	$6,400
Linemarking	1200	m	3	$3,600
Relocate existing sign	1	No.	500	$500
New Lighting	4	No.	10000	$40,000
Cleanout existing table drain	1	Item	2000	$2,000
Traffic management	1	Item	16000	$16,000
Sub-Total				$278,500
Contingency			30%	$83,550
TOTAL (Construction Cost)				**$362,050**

Table 5-2 Cost estimate, one-way eastbound

Option - One-Way (Eastbound)				
	Quantity	Unit	Rate	Total
Site establishment & demobilisation	1	Item	5000	$5,000
Remove existing gravel wearing coarse	2000	m^2	5	$10,000
Pavement repair (digouts)	1	Item	5000	$5,000
Base material Class 1 (100mm thick)	2000	m^2	20	$40,000
Seal (Asphalt incl. waterproofing seal)	2000	m^2	40	$80,000
New guide posts	13	No.	30	$390
Remove existing guide posts	13	No.	10	$130
Linemarking	800	m	3	$2,400
New sign	1	No.	750	$750
Cleanout existing table drain	1	Item	2000	$2,000
Landscaping	1	Item	5000	$5,000
Traffic management	1	Item	16000	$16,000
Sub-Total				$166,670
Contingency			30%	$50,001
TOTAL (Construction Cost)				**$216,671**

Table 5-3 Cost estimate, slow points

Option - Slow Point				
	Quantity	Unit	Rate	Total
Site establishment & demobilisation	1	Item	5000	$5,000
Remove existing gravel wearing coarse	3000	m^2	5	$15,000
Pavement repair (digouts)	1	Item	10000	$10,000
Base material Class 1 (100mm thick)	2860	m^2	20	$57,200
Seal (Asphalt incl. waterproofing seal)	2860	m^2	40	$114,400
Road Hump	2	No.	1600	$3,200
Traffic Island	150	m^2	300	$45,000
Linemarking	1200	m	3	$3,600
Relocate existing sign	1	No.	500	$500
New Lighting	2	No.	10000	$20,000
Cleanout existing table drain	1	Item	2000	$2,000
Traffic management	1	Item	16000	$16,000
Sub-Total				$291,900
Contingency			30%	$87,570
TOTAL (Construction Cost)				**$379,470**

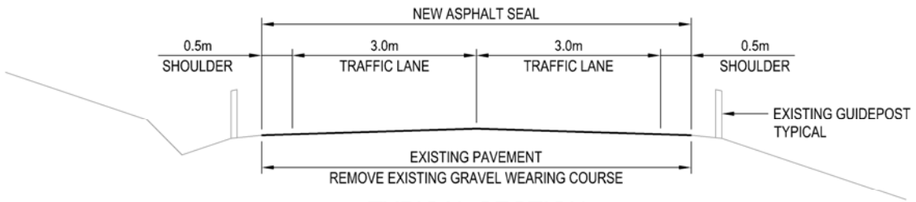
6. References

- Land Tasmania, 2012, TheList. https://www.thelist.tas.gov.au (accessed 2 July 2018)
- Austroads, 2016, *Guide to Traffic Management Part 8 Local Area Traffic Management*, 2nd edn, Austroads, Sydney
- Austroads, 2009, *Guide to Pavement Technology Part 6 Unsealed Pavements,* Austroads, Sydney
- Austroads, 2009, *Impact of LATM Treatments on Speed and Safety,* Austroads, Sydney

Appendices

Appendix A – Concept sketches





TYPICAL SECTION

SCALE 1:100

LEGEND

EXTENT OF NEW SEAL

PRELIMINARY

No	Revision	Note: * indicates signatures on original issue of drawing or last revision of drawing	Drawn	Job Manager	Project Director	Date

0 1 2 3m
SCALE 1:100 AT ORIGINAL SIZE

0 15 30 45m
SCALE 1:1500 AT ORIGINAL SIZE

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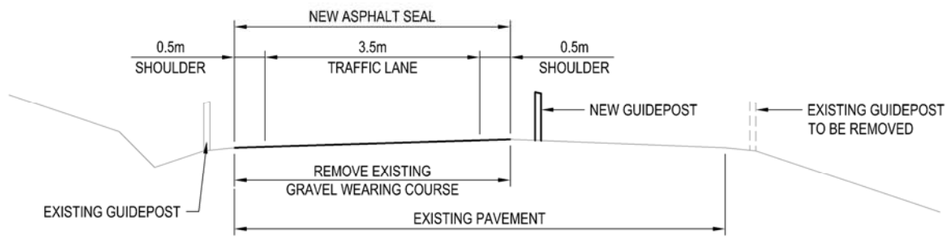
Drawn C.MONTY		Designer C.MONTY	
Drafting Check		Design Check	
Approved (Project Director)			
Date			
Scale AS SHOWN	This Drawing must not be used for Construction unless signed as Approved		

Client CITY OF CLARENCE
Project BEGONIA STREET TRAFFIC CALMING
Title OPTION - ROAD HUMPS

Original Size A3
Drawing No: 32-18906-SK001
Rev:

Plot Date: 6 July 2018 - 3:29 PM
Plotted By: Chris Monty
Cad File No: G:\32\18906\CADD\Drawings\32-18906-SK001.dwg





TYPICAL SECTION

SCALE 1:100

LEGEND

EXTENT OF NEW SEAL

PRELIMINARY

No	Revision	Note: * indicates signatures on original issue of drawing or last revision of drawing	Drawn	Job Manager	Project Director	Date

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SCALE 1:100 AT ORIGINAL SIZE

0 15 30 45m
SCALE 1:1500 AT ORIGINAL SIZE

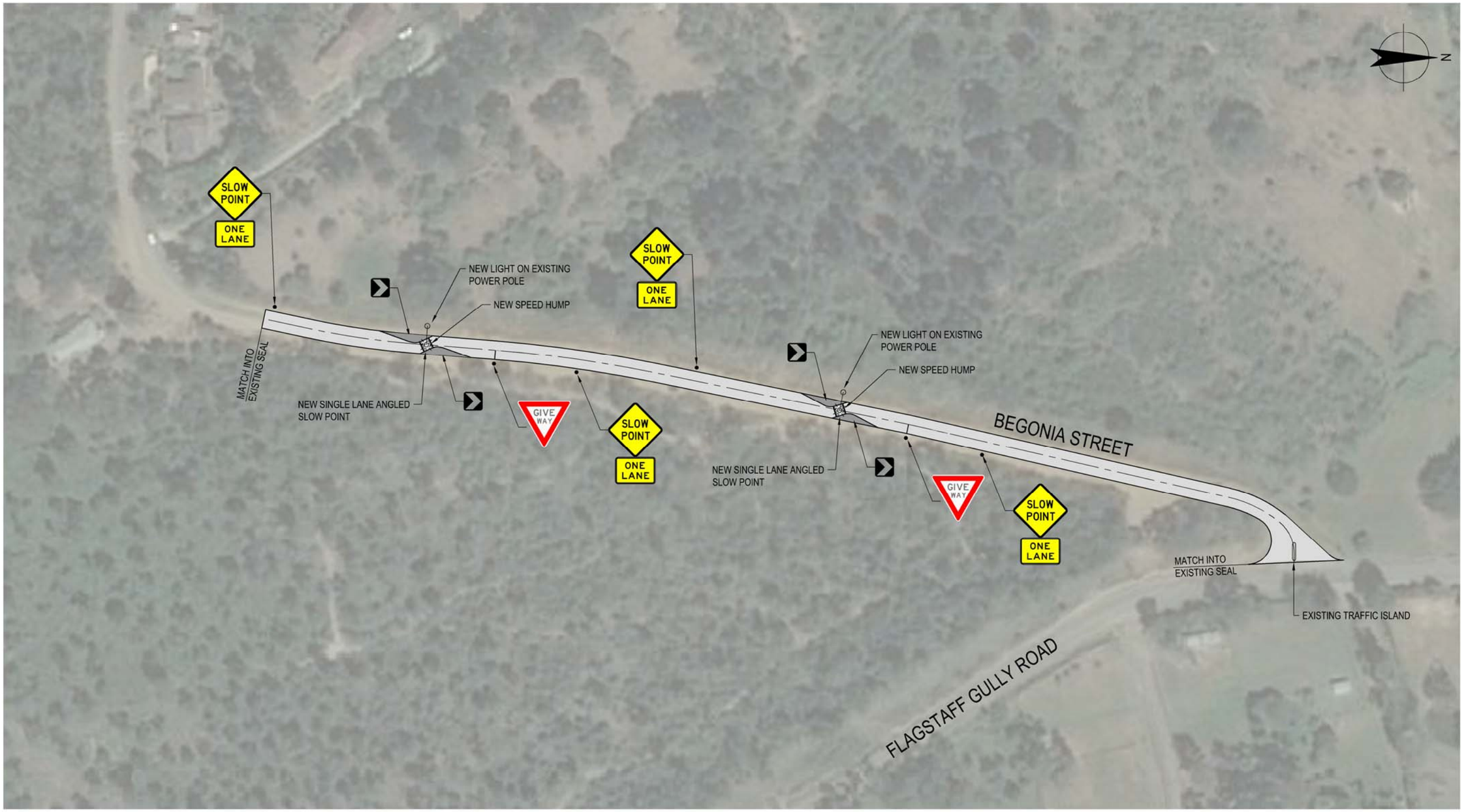
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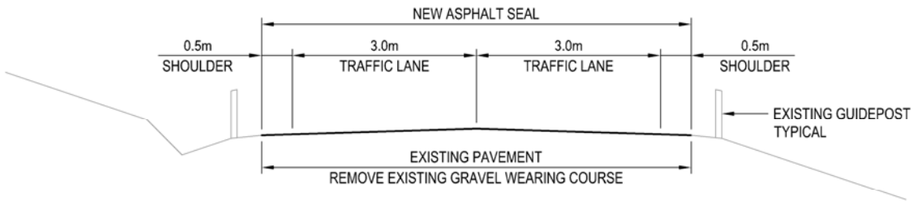
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Drawn C.MONTY	Designer C.MONTY	Client	CITY OF CLARENCE
Drafting Check	Design Check	Project	BEGONIA STREET TRAFFIC CALMING
Approved (Project Director)		Title	OPTION - ONE-WAY (EASTBOUND)
Date			
Scale AS SHOWN	This Drawing must not be used for Construction unless signed as Approved	Original Size A3	Drawing No: 32-18906-SK002 Rev:

Plot Date: 6 July 2018 - 3:36 PM Plotted By: Chris Monty Cad File No: G:\32\18906\CADD\Drawings\32-18906-SK002.dwg





TYPICAL SECTION

SCALE 1:100

LEGEND

EXTENT OF NEW SEAL

PRELIMINARY

No	Revision	Note: * indicates signatures on original issue of drawing or last revision of drawing	Drawn	Job Manager	Project Director	Date

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SCALE 1:100 AT ORIGINAL SIZE

0 15 30 45m
SCALE 1:1500 AT ORIGINAL SIZE

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Drawn C.MONTY		Designer C.MONTY	
Drafting Check		Design Check	
Approved (Project Director)			
Date			
Scale AS SHOWN	This Drawing must not be used for Construction unless signed as Approved	Original Size A3	Drawing No: 32-18906-SK003 Rev:

Client CITY OF CLARENCE
Project BEGONIA STREET TRAFFIC CALMING
Title OPTION - SLOW POINT

Plot Date: 19 October 2018 - 9:46 AM Plotted By: Chris Monty Cad File No: G:\32\18906\CADD\Drawings\32-18906-SK003.dwg

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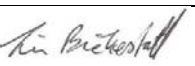
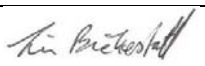
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3218906-78661/https://projects.ghd.com/oc/Tasmania/begoniastreettraffic/Delivery/Documents/Begonia Street Traffic Calming.docx

Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	K Easther, C Monty	T Bickerstaff		T Bickerstaff		19/10/2018

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