

Bluff Road Treatment Options

TO	Mercury Bay Community Board
FROM	Sam Edlin - Roading Engineer
DATE	30 April 2015
SUBJECT	Bluff Road Treatment Options

1 Purpose of Report

To seek a feedback from the Mercury Bay Community Board, regarding the preferred treatment option for the section of Bluff Road closed prior to Christmas 2014. This section of Bluff Road was closed due to safety concerns associated with rock fall risks.

2 Background

Safety concerns were raised in November 2014 regarding an overhanging bluff on Bluff Road, approximately 350m east of Matarangi and an initial geotechnical site inspection confirmed that this section of road should be closed to protect the public from a high risk of rock fall. On 8 December 2014 this 500m section of Bluff Road (between Matarangi and Suckers Rock) was closed pending a more detailed geotechnical site investigation report which would enable Council to make an informed decision regarding the most appropriate treatment for this site and the future use of Bluff Road.

A location plan and site photographs are included (refer attachment A) for more information.

The more detailed geotechnical site investigation completed by Opus in March 2015 including the site investigation, assessment and treatment options (available as a separate file in dropbox) is summarised below.

The most recent estimate of the annual average daily traffic (vehicles only) for this site is 113 vehicles per day, with a peak summer daily traffic estimated to be in the order of 200 vehicles per day. No count or estimate has been completed for pedestrian and cyclist use.

Site Assessment

The scope of Opus' site investigation included the following works:

- a) Topographic survey
- b) Engineering geological mapping of rock exposures across the shoreline, plus Scala testing at selected locations where sand shoreline deposits are present in order to provide an indication of depth to the underlying rock.
- c) Sub-contracted a specialist rope access firm to provide safe access for an Opus Engineering Geologist to survey / map the bluff face, assess the joints and investigate the scrub above the bluff overhang for tension cracks of potential release joints.

Geotechnical Assessment

Following is summary of the geotechnical assessment:

The nature of rock slope stability is such that it is very difficult to determine when or if rock failures will happen. This is because stability is governed by a whole range of considerations that include joint orientation, spacing, persistence, roughness, infill, joint wall strength and groundwater pressures.

The threat of rock falls occurring increases during and after heavy rainfall and periods of freeze/thaw in addition to during earthquakes. In addition, the presence of trees on the cliff face will also increase the risk of rock falls. The root zones can penetrate joints and prise them further open as the tree grows. Conversely, should the trees die or be removed then there is a risk of forming open conduits for water seepages into the joints as the roots decay.

Opus geotechnical staff assessed the joint data using specialist software in order to determine the modes of rock slope instability that may be possible and assessed planar, wedge and toppling type failures modes for various parts of the bluff site with the following findings:

For the east facing bluff section (which includes the bluff overhang) planar and wedge type failure modes may be possible.

For the north-west facing bluff section toppling, planar and wedge type failure modes may be possible.

Remedial Options

The following remedial options are considered in Opus' detailed report and summarised below:

Option 1: Blast overhanging rock and install rock fall mesh.

- Blast away the overhanging part of the bluff, to provide an 85° rock slope over approx. 20m road length.
- Once the cut slope has been formed, install rock fall mesh netting. This mesh will be held to the rock face by bolts drilled at the top of the bluff, sides and base.
- This rock fall mesh is a passive type system designed to help keep any blocks that may come loose close to the rock face to come to rest at the side of the road. It is not designed to be an active system retaining blocks to the slope and stopping rock falls altogether.
- Blasted rock volume is estimated at approx. 355m³ and 325m² of surface area covered by mesh netting.

Option 2: Blast overhanging rock and install rock fall mesh over approx. twice surface area.

- Same as option 1 above with additional mesh installed to the sides of the blasted part of the bluff.
- Blasted rock volume remains the same, 355m³ but the area of mesh netting increases to 650m².

Option 3: Blast overhanging rock with rock bolting and structural mesh.

- Same as option 1 above, but using 'active' rock bolting and structural mesh to achieve a higher safety factor.

Option 4: Re-align road.

- Construction of a new road across the bay (including a rip rap protection on the seaward facing side) to avoid the section of road with rock overhang.
- Estimated quantities are: structural fill – 3500m³; and rip rap – 1500m³

Option 5: Close road to vehicles, install box culvert 'tunnel'.

- Install a 'box culvert' type tunnel on road below the rock overhang to enable safe pedestrian and cyclist use only.
- Structure would be 'closed, with no coastal views and may require artificial lighting

Option 6: Close road.

- Full closure of this hazardous section of Bluff Road to all transport modes (including

vehicles, cyclists and pedestrians).

3 Issue

Staff require feedback from the Mercury Bay Community Board in order to provide this information to the Infrastructure Committee who will then inform Council's direction regarding the preferred future use of this section of Bluff Road.

4 Discussion

Community Views and Preferences

Infrastructure staff and an Opus representative met with the Mayor, Mercury Bay Community Board Chair and Area Manager on-site on 17 March 2015 to discuss possible remedial options and receive a Community perspective on future road use. Feedback from this meeting was that this section of Bluff Road needs to be re-opened, but the preference was for walking and cycling access only. However the cost of re-opening the road to pedestrians and cyclists is expected to be similar to that of opening to both vehicles and active transport modes.

Legislative Requirements

In terms of s319 Local Government Act, Council has discretion over whether roads are maintained and if they are to be maintained, the level of service to be provided.

Budget Implications and Risk Assessment

No specific budget has been provided for within Council's draft 2015-25 Long Term Plan to complete any of the remedial options being considered for this site, however the type of work proposed could be prioritised and funded within Council's 'minor safety improvement' budget and can be subsidised by NZTA (up to a project cost of \$300,000 and at \$46%) as a minor improvement project.

Reprioritisation of minor improvement work programmes will result in either this or other key road improvement projects being deferred, therefore consideration should be given to increasing the roading improvement budget (by the preferred option value) if Council wishes to complete this and other key projects in 2015/16.

The table below provides comparative remedial option risks and costs.

Option	Number of high threats	Number of moderate threats	Weighted Score	Relative Cost Estimate
Situation elsewhere on Bluff Rd	3	3	15	N/A
Option 1 - Blasting and mesh	1	4	12	\$330,000
Option 2 - Blasting and mesh over twice area	1	4	12	\$380,000
Option 3 - Blasting, bolting and structural mesh	1	2	7	\$510,000

Option	Number of high threats	Number of moderate threats	Weighted Score	Relative Cost Estimate
Option 4 - Re-align road	1	2	9	\$650,000
Option 5 - Close road to vehicles, place pedestrian culvert tunnel	1	3	10	\$250,000

The estimated rough order construction cost for each remedial option includes all rockwork, detailed design (preparing construction drawings and works specification), resource consenting construction of beach front retaining structures and guardrail on the seaward road edge.

The lower the risk assessment score, the better the level of protection. However, cost invariably increases as well. The risk assessment scores indicate, as expected that remedial work options 1 to 5 have a score that is lower than that for the situation elsewhere on Bluff Road.

Blasting is required on options 1 to 3 in order to remove the big rocks which the mesh would not prevent falling on the road.

Staff recommend that Option 1 is the preferred option as it will reduce the safety risk (to a level lower than other areas of Bluff Road) and provide the lowest cost option for vehicle, cyclist and pedestrian access between Matarangi, Rings Beach and Kuaotunu.

Resource consent would be required from Waikato Regional Council for all options other than option 5.

The next step is for feedback from the Community Board to go to the Infrastructure Committee to recommend to Council on the preferred treatment option for Bluff Road.

5 Suggested Resolution(s)

That the Mercury Bay Community Board:

1. Receives the 'Bluff Road Treatment Options' report, dated 7 April 2015.
2. Provides feedback to the Infrastructure Committee on the preferred treatment option for Bluff Road

References-Tabled/Agenda Attachments

Attachment A Bluff Road Treatment Options Supporting Information

Attachment A
Attachment A - Bluff Road Treatment Options Supporting Information