

TECHNICAL MEMORANDUM



To	[REDACTED]	From	[REDACTED]
Project	Beleura Creek Path, Mornington	Date	9 March 2022
Subject	Geotechnical Inspection of Beleura Creek Path	Ref No.	V220152Letter01.1

Further to our meeting on site at the Beleura Cliff Path in Mornington, we would like to summarise the findings of our site inspection.

This email does not provide a formal risk assessment of the site, especially for the medium to longer term, but rather discusses the likely short term implications for the site.

At your request in an email dated 31 January 2022, an experienced geotechnical engineer from Cardno now Stantec attended site on 15 February 2022.

The Beleura Cliff Path is a walking track that runs from Caraar Creek Lane in the north-east along the cliffs in a south-westerly direction and eventually ends up at Mills Beach in the south-west.

It is understood that while the path runs through a combination of Council, DELWP and private lands in the past the maintenance of the path has fallen on Council.

The figure below shows the approximate alignment of the path.



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Along the path there are a number of areas where there is minor evidence of gradual movement of the cliffs which is shown in the form of cracking of the paths and occasional arcuate depressions.

However, for a majority of the length of the path any movement of the path appears to be occurring slowly and it is not considered that there is an imminent risk to the public from a failure of the path or the surrounding cliffs.

Further discussion on these areas is provided at the end of this email.

While a majority of the path was considered to be a low risk to the public, there was one section to the rear of 25-27 Kalimna Drive which is of particular concern.

The location is shown in the following figure.



The area lies on a bend in the path where the path follows the cliff into a small gully. In this area the cliff is very steep and there are areas where there is minimal vegetation and the underlying residual soils and weathered granite rock are exposed.

In recent times collapses of the cliffs have occurred at two locations resulting in debris from the cliffs falling onto the path. These locations are shown as yellow lines on the figure above.

Photographs of the two sites are provided below. The first image is the northern cliff and the second image is the southern cliff.

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While the overall cliff is likely to be relatively stable and have a tolerable risk due to the presence of weathered granite at shallow depth, weathering of the upper soil profile has resulted in collapses of the upper cliff.

These collapses in combination with heavy vegetation above the cliff have resulted in overhangs where significantly large bodies of soil are only being supported by the root structure of the vegetation.

It is considered likely that further collapses of these upper soils will occur in the relatively short term. As can be seen from the photographs, fencing has been installed to capture spoil falling from the cliff.

In the immediate future such fencing may provide some protection to the public from incidental small failures. However, as the fencing is not an engineer designed retention system any large failures are unlikely to be restrained by the existing fences.

As such it is considered that the risk to the public from a larger collapse of the upper cliff is not tolerable and a rehabilitation solution is required to reduce the immediate risk.

In order to reduce the risk it is recommended that the vegetation within 2m of the crest of the slope be removed. Any overhangs should then be removed and the upper 1m of cliff flattened back to a maximum slope of 1V:2H.

Provided that the works can be undertaken within the next few weeks then it is acceptable for the path to remain open. However, if the works cannot be undertaken in the next few weeks it is recommended that the path be closed until the works occur.

Of course, it will be necessary for the path to be closed during the works as collapses could impact on the path during the works.

An appropriate work safety method will need to be developed by the contractor to ensure they adopt methods that reduce the risk to workers and the public while the works occur.

Once these works have been undertaken the short term risk should be reduced to a tolerable level. However, there is potential that the medium and longer term risk will still not be tolerable.

This is because ongoing weathering of the cliff may result in further erosion of the cliff and new overhangs developing over time eventually leading to new collapses.

This is the nature of cliffs and an engineered solution would be required to reduce the longer term risk.

A formal risk assessment of the medium to long term risk leading to geotechnical recommendations for the need for rehabilitation of this area is recommended.

In addition to the above issue, it was observed that the path slightly down slope from the above area is showing signs of instability as shown in the following figure.



In this area there is significant cracking of the path as well as an arcuate depression potentially indicating the early signs of a failure of the cliff face below the path.

The hand rail was also in a loose condition.

While the immediate risk in this area is borderline tolerable there is potential for a failure to occur in the short to medium term. It is recommended that a series of monitoring points be installed to identify the rate of any movement that may be occurring.

In addition, it is recommended that the cracks be repaired and any drains be cleaned out to minimise the potential for water building up in this area.

It recommended that a formal risk assessment of the medium to long term risk be conducted for this area. Considering its proximity to the previous area discussed it is likely that any longer term solution would incorporate works for both sections of the cliff.

For the remainder of the cliff it was generally identified that the short term risk is likely to be tolerable. However, there is evidence of ground movement at a number of locations in the form of cracking of the path and minor slumps of debris from the cliffs above the path.

In order to appropriately assess the longer term risk it is recommended that a number of activities are undertaken as follows:

- A survey of the path be undertaken and any cracks identified
- All existing cracks along the path should then be repaired and a record taken of the date the repairs were undertaken

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- A regular walk over of the path should then be undertaken (say 6 monthly intervals) looking for signs of movement. New cracks should be measured and widening of existing cracks noted.
- Regular survey points should be installed and these should also be measured on say a 6 monthly basis. It is understood that there are markers on the posts along the walkway but these are not acceptable as survey points due to their location at the top of the post.
- Should significant movement be identified in the walkover or survey then a geotechnical engineer should be engaged to assess
- It is also recommended that a more detailed risk assessment be conducted.

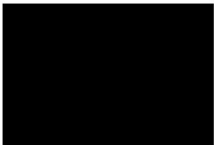
Cardno now Stantec would be pleased to provide fee proposals for any of the above mentioned risk assessments on request.

Good cliffside practices are also recommended for maintenance of the slope. While it is important to establish good vegetation to increase stability and reduce erosion care needs to be taken not to introduce excessive water onto the site. A network of irrigation pipes were observed across the site.

While such pipes used in moderation can help with plant growth, excessive use can introduce too much moisture resulting in further instability. Furthermore, leaking pipes can introduce water in an uncontrolled measure into the slope. It is therefore not recommended for irrigation pipes to be installed on the site.

We trust this meets with your requirements.

Yours sincerely,



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