



GEOTECHNICAL OPINION – COLLABORATIVE APPROACH

3/613 POINT NEPEAN ROAD
MCCRAE

REPORT NO: 122573/A

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1. INTRODUCTION

Further to our previous report reference 122573, dated 13 October 2023, we would confirm receipt of your instructions in correspondence 20 June 2024, we provide the following additional review for the purposes of leading to a collaborative approach, mindful that our brief is solely in connection with 3, 613 Point Nepean Road, McCrae, and how it is impacted by the landslip from the adjoining property.

In addition, we confirm having received further reports as follows:

- PSM Report: PSM5226-002L, dated 3 November 2023 and appendices.
- PSM Report: PSM5226-002L Rev1, dated 11 June 2024 (Risk Assessment) and appendices.
- PSM Report: PSM5226-006R Rev0, dated 11 June 2024 Expert Opinion Report – Landslide Assessment and appendices.
- PSM Report: PSM53226-005R, dated 11 June 2024, Expert Opinion Report – Rectification and appendices.
- Harwood Andrews Letter, Reference BRBLMH 22402127, dated 18 July 2024.

It is relevant to capture briefly the critical elements of these reports as I understand them.

1.1 PSM Report Reference PSM5226-002L and Report PSM5226-002L Rev1

These reports deal with the risk to life and property of the three (3) properties (P1, P2 and P3) of which P3 is of interest to me.

The PSM reports offer some history to the potential reason for the slide noting that a series of trees were removed from property P1 between April 2021 and September 2021, and a summary of rainfall events that will obviously be a triggering factor in a landslide of this type in this area. The Rev1 puts greater emphasis on damaged water pipes and irrigation.

The reports outline the geotechnical model of the slide, the topography and the geology, all of which is factual and not a matter for dispute.

PSM note that groundwater monitoring has not been conducted on the site, with no installed piezometers.

The landslide risk assessment, as it relates to property P3, is slightly ambiguous with the illustration of potential further failures and existing failures provided in inset 11 (Landslide Hazards). The revised report has a different inset (No 10) with different failure types and the volume of material in each hazard is varied and it is not really apparent how or why these were varied.

Of particular relevance in relation to the risk assessment for property P3 is the volume of material that may likely be associated with both the existing slide and any further slide, as this directly impacts the design of a debris flow barrier.

In Section 4.2 (002L) the inference is that the existing slide is a translational slide of volume 20m³. Inset 11, however, indicates a significantly greater slide, volume coming from Hazard 1A at the top of the escarpment of 50m³ to 200m³ in addition to Hazard 2A of 20m³ and provides an assessment of the measured debris rich angle, which extends across Penny Lane (6 metres) and 3 metres into property P3.

In the revised report Hazard 1A is decreased to 50m³ and Hazard 2A to 10m³, which results in a slightly lower intrusion into property P2 and P3, as I understand the sections.

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A risk assessment is then carried out in accordance with AGS Guidelines, with the results of this assessment indicating the risk to life for Hazard 1A as a probability of 2.4×10^{-4} and is considered unacceptable. Again, this risk assessment is revised in the Rev1 report.

As an overall view, this author considers the risk assessment as somewhat conservative and the change in assumptions confusing, but is in agreement that the risk to life is considered unacceptable to property P3 and that the decision to vacate property P3 as a consequence of the landslide was wise.

1.2 PSM Report, Expert Opinion – Landslide Assessment PSM5226-006R Rev0 and Appendices

This report provides greater detail as to the causation and as a general comment more emphasis on drainage and irrigation, and the conceptual hydrogeological processes. Consistent with my brief I present no opinion on this report.

1.3 PSM Report, Expert Opinion Report – Rectification PSM53226-005R and Appendices

In this report PSM is asked to consider reports provided by the relevant parties providing advice, being Stantec Australia, Civiltest Pty Ltd, REXICOM Consulting Engineers and A.S.JAMES on behalf of the Willigenburgs.

Without going into the details in the report, Section 8 provides three (3) options that may be suitable for the rectification of the site, and these are summarised in Table2, together with PSM opinions.

Option 1 is the debris flow fence, earthworks, drainage and revegetation. This is presented by PSM not as a temporary measure, as was envisaged in our previous advice, but as a permanent option for the solution. PSM rightfully point out that the landslide risk is likely to be reduced to tolerable levels for property P2 and P3, but is unlikely to reduce the risk for the property (garden areas) of P1. The effectiveness of the revegetation effort is pointed out is also likely to control the design life. Herein, costs aside (dealt with later) the purpose of the debris fence is presented in the PSM report as a permanent fixture and the undersigned can understand why it is not preferred, in that it will do little to actually reinstate the land integrity in property P1.

It will be effective for property P3 in the long term, but not in the short term, and design for such a debris flow fence will need to be based on the full volumes outlined above in the PSM report for a permanent solution.

It should be emphasised for the purposes of allowing the owners of property P3 to occupy their residence that a substantial long term solution in terms of the debris flow fence is not what is likely to be required, but more a short term risk lowering fence, lowering the risk to life as acceptable.

Option 2 is the terraced retaining walls as outlined in the Civiltest report. The comment is made that the cement treated crushed rock is not required, which is reasonable, but more to the point is the comment that the constructability of the system is very difficult and access will lead to increased costs and time of project.

This is particularly relevant when considering property P3 and that property will remain unprotected for the full time and duration of the works until such time as all retaining walls are constructed and presumably until such time as all recommended vegetation is established, and there is a sign off for this approach. It is for this reason that the debris flow fence was discussed by ourselves in our previous correspondence.

Option 3. PSM discuss a soil nailing and netting slope reinforcement system, which has the advantages of much easier construction access and minimises excavation required, and probably some savings in the construction time.

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It's effectiveness, however, does allow for revegetation through the netting and the option is likely to inhibit access across the slope without addition structures, ie boardwalks or stairs. Some other provisions are also provided by PSM for this approach.

It should be said that also this approach will be relatively time consuming, and there is no protection to property P3 during the construction process, which like option 2 has its risks, due to plant and equipment on the slope.

PSM indicate they have a recommendation to prefer option 3 over option 1 and 2.

The reasons given for not preferring option 1 are valid in the long term, but not in the short term, and as mentioned above it is unlikely to control the landslide or risk to P1, but what is not mentioned is that it in fact creates a greater risk for property P3 during the construction phase.

PSM do not recommend option 2, preferring option 3, and I agree with this when considering the options for property P1, but the same risks, ie those during construction and overrun in the short term are not mitigated for property P3.

I have not examined in detail the preliminary design of the proposed rectification solution, in that it is not within brief and is a matter for property P1.

In Section 9.4 and following instruction 3.3.3.2 the assumption that the ideal location for the debris flow fence will be constructed on the boundary between Penny Lane and property P1.

I believe this also misinterprets the intent of the debris flow fence as not being a solution and means of property P3 being occupied sooner, but more as a rectification works for the landslide on property P1.

The fence should be constructed on or just within the boundary between Penny Lane and property P3 for three very valid reasons.

1. It will provide construction access for the rectification works, whatever they are, ie option 2 or option 3, to be constructed on property P1.
2. It will provide significantly reduced construction risk, which indeed has not been included in any of the risks during the construction works on the escarpment for the reinstatement of property P1.
This opinion is also in line with the comment that some of the issues raised against the debris flow fence can be managed by moving this fence to the boundary of Penny Lane and properties P2 and P3, and it would be the intention that the debris flow fence would become effectively redundant following completion of either of option 2 or option 3.
3. The further away from the slide the debris flow fence is the less the velocity of the material and the volume of material, and therefore the proportions of the fence.

I can only assume that the high cost for the debris flow fence in the Harwood Andrews letter is related to its position.

1.4 Harwood Andrews Letter, Reference BRBLMH 22402127

Harwood Andrews make the point that the construction of a debris flow barrier to remove the risk to life to property P3 still leaves the issues as to the most appropriate method of rectification for property P1. I am surprised by the RIX Asset Management installation costs and would like to see and be satisfied about the actual volume that these have been designed to resist, and where they have assumed the barrier to be.

I suspect the costs for the debris flow barrier are on the basis of a debris flow barrier being designed for the full volume of material that might likely occur over the next, say, 100 years, rather than the next 12 months.

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That should not be the design criteria for the purpose of the debris flow barrier in enabling the Willigenburgs access to their property in as short a time as possible.

On this basis, I am of the view there needs to be more emphasis on the design and costing of a debris flow barrier that represents something suitable in the short term, ie say one year rather than 50 years or 100 years.

It was for this purpose that I have undertaken, initially, to discuss with Geobruigg the most appropriate debris flow barrier for volumes of the order of 20-50m³ rather than larger volumes.

I have been on a short leave and have been unable to make any substantial progress with this discussion, but have been requested to provide some comment on the correspondence to date.

Should any point remain in doubt please do not hesitate to contact this office.

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