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Gabrielle Wall  
Ministry of Education  
PO Box 2522  
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gabrielle.wall@education.govt.nz

Reference 246872-300441

Dear Gabrielle

### **Review of Appendix 8 - Redcliffs School: Rockfall Hazard Mitigation | Eliot Sinclair**

In line with our discussions please find below my review of the Eliot Sinclair geotechnical report as it relates to the Redcliffs School Board submission dated March 2016. Please note that this review was prepared in my role and function as the appointed Crown and Ministry of Education Ground Engineering Advisor. I note that I have discussed the submission from a technical perspective with the report author, Nick Harwood of Eliot Sinclair in March 2016 and in May 2016.

As part of my review I had access to the main geotechnical report, made available by Eliot Sinclair. I also viewed the information available on the Redcliffs School website hosted by their lawyers Duncan Cotterill. In my professional role I have focused my review on Appendix 8 which comprises the geotechnical report from Eliot Sinclair, dated 30 March 2016. My comments are provided as a Ground Engineering Professional and Chartered Professional Engineer.

I have reviewed the Eliot Sinclair report's scope of work, the sources the authors considered and the tools and methods used to derive their outcomes and conclusions.

In essence the report provides a shift in hazard management. Previous studies have focused on protection for a hazard, in particular cliff collapse and mass movement debris inundation affecting the school grounds. The current report provides hazard management by retreat, i.e. moving away from the hazard. In broad terms this involves being a sufficient distance away from the hazard to minimise or eliminate the potential to be affected by the hazard.

The report authors consider hazard mitigation is being primarily achieved by means of '*separation distance from the hazard (rockfall source)*', refer to Eliot Sinclair Report Section 9.3. With secondary risk reduction measure being a 2m high engineered gabion (stacked rock) bund.

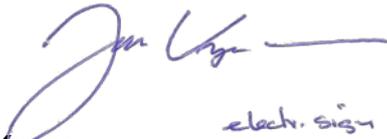
Based on my engineering judgement the Eliot Sinclair proposed mitigation measures are based on sound engineering principles. However, I note that the proposed retreat will reduce the school property by more than 1/3 of its current size. The retreat will also require relocation of several buildings and implementation of a long term maintenance and emergency management plan.

I note that an indicative maintenance regime has been provided by Eliot Sinclair. I broadly agree with the provided compliance monitoring.

In summary, I believe that Eliot Sinclair have considered appropriate engineering measures to derive a solution that reduces the risk to Redcliffs school users to a minimum. However, relocation of buildings and construction of an engineered bund will be required. Further to consider is the effective loss of more than one third of the school grounds.

I note that as part of this review I have solely focused on engineering aspects and have not considered any economic, societal or community impacts, disruptions or risks.

Yours faithfully

A handwritten signature in blue ink, appearing to read 'Jan Kupec', followed by a horizontal line. Below the signature, the words 'elect. sign' are written in a smaller, cursive script.

**Dr Jan Kupec**

*Technical Director – Ground Engineering | PhD MSc MIPENZ CPEng IntPE*