

Mt Buller Mt Stirling Resort Management Board
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Project 79617.00
Date
R.001.Rev0
Initials

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Dear Sirs

Geotechnical Peer Review Mt Buller Sustainable Water Security - Off Stream Storage

1. Introduction

This report presents the findings of a peer review of the Geotechnical Risk Assessment prepared by GHD for the Mt Buller Sustainable Water Security - Off Stream Storage project. This review is an office based review of supplied information and did not include any site visits or assessment of self-sourced data.

In addition to the Geotechnical Risk Assessment, GHD's Options Assessment Summary and Concept Design Summary reports were provided. All documents were dated August 2016. At this time, DP has not been supplied with a copy of the geotechnical investigation report referred to in the supplied reports.

It is understood that the project is currently in a preliminary assessment phase and further design work will be undertaken in the future.

2. Project Description

The Mt Buller Sustainable Water Security - Off Stream Storage project proposes to construct a 100 ML storage reservoir within the Mt Buller ski area to provide a year round source of water for the resort village. The reservoir will comprise an HDPE lined pond formed within a shallow valley by cut and fill earthworks.

The ski area and resort sit astride a ridge descending eastwards from the summit of Mt Buller. The proposed works will be located on the north face of the ridge and to the west of the resort village.

3. Site Conditions

GHD had undertaken a number of boreholes in the project area and described the geological sequence as comprising Tertiary age basalt, overlying carbonaceous mudstone which in turn overlay colluvium. The basement rock beneath these deposits comprises Devonian age granite. Variable depths of weathering have occurred in each of the rock units, in places reducing them to residual soils.

GHD reported ground slope angles of between 8-13° in the vicinity of the main storage reservoir, with locally steeper ground (up to 23°) along the pipeline routes and near the Break Tank adjacent to the existing treatment plant.

Three landslide zones were identified around the project area, one north-west of the main storage area, a smaller zone to the north (downslope) of the storage area and a third along the pipeline route.

4. Risk Assessment

GHD have undertaken a qualitative risk assessment using the methods described in the AGS Guidelines for Landslide Risk Assessment, 2007. They note that the assessment is preliminary and will need to be reviewed further as detailed design is developed. The assessment has not covered risks associated with reservoir operation which will be addressed by the ANCOLD guidelines during detailed design. For three identified cases, a semi-quantitative risk assessment was carried out to determine the probability of risk to life. Recommended mitigation measures generally require further assessment at the detailed design stage, geotechnical inspections during construction and avoiding construction work in adverse weather.

The risk assessment report also includes a section on Acid Sulphate Soils. It notes that whilst published acid sulphate soil maps do not identify the site as being high risk, localised conditions may result in the presence of pyrite which may give rise to acid sulphate conditions.

5. Comments

Given the preliminary nature of the risk assessment and the concept stage design, the control measures and recommendations given in the GHD report are necessarily broad. It will be necessary to update the risk assessment during the detailed design process to ensure that all relevant risks are identified and the design addresses those risks.

The quantitative risk assessment has focused on risk to life, which given the location of the project is expected to be at tolerable levels. As the design is developed and further risk assessments are undertaken, it is recommended that "Damage to Property" is incorporated into any further quantitative risk assessment.

Whilst the risk assessment has identified numerous possible risks and associate control measures, we recommend further attention is given to the following risks during detailed design:

- **Southern Cut face of the reservoir.** Comments on Landslide Zone 3 suggest that the basalt-mudstone interface may be prone to translational sliding. The southern cut face of the reservoir will result in this interface daylighting, leading to the possibility of slips during or after construction. Further investigation of the orientation and material properties of this interface should be undertaken.
- **Uphill propagation of Landslide Zone 2.** Cross sections indicate that the area between Landslide Zone 2 and the toe of the reservoir wall comprises a thin layer of weathered granite. The hydrogeological section of the report also notes that responses of groundwater levels to rainfall events. Relatively rapid changes in groundwater levels are noted to be common in weathered granite and also contribute significantly to instability of such materials elsewhere. Consideration should be given to possible changes in hydrogeological conditions that could trigger further sliding and uphill propagation of the Landslide Zone 2 slips, which could potentially undermine the toe of the reservoir wall.
- **Cut Face Angles.** Whilst the nominal 2.5H:1V batter angles are discussed in the Concept Design Summary report and such a batter angle is often considered reasonable in normal circumstances, it should be noted that the natural slope angles in the identified landslide zones are flatter than this. Further investigation should be undertaken into the existing landslides to identify the mechanisms and confirm that the proposed face angles are appropriate.
- **Seepage.** A number of seepage points were noted in the reports. Care will be needed in the detailed design to ensure that flow paths are not restricted leading to build ups of groundwater which can have an adverse impact on slope stability. Whilst the report mentions the use of water stops to prevent the flow of groundwater along the pipe alignments, allowance will need to be made to discharge any water collected behind them.

With regard to the acid sulphate soil risk, we concur with GHD that the regional mapping may not identify all occurrences and that site specific testing should be undertaken.

Whilst the landslide risk assessment process is primarily focused on loss of life and damage to property, during our review of the available geotechnical documentation, risks to effective project delivery have also been identified. These include the risk of increasing site footprints arising from flatter batter angle requirements during detailed design as a result of further landslip investigation and the risk of site won materials proving unsuitable for re-use on site, for example hard rock material which cannot be broken down to a manageable size or weak and wet clays which cannot be moisture conditioned. Given there is likely to be a limited construction window for this project, an excavability trial is recommended during the detail design stage.

6. Limitations

Douglas Partners (DP) has prepared this report for the Mt Buller Sustainable Water Security - Off Stream Storage project at Mt Buller in accordance with DP's proposal MEL170202 dated 19 May 2017 and acceptance received from Alicia Burnett of ERM dated 22 May 2017. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of Mt Buller Mt Stirling Resort Management Board and their agents for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the

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This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

Please contact the undersigned if you have any questions on this matter.

Yours faithfully
Douglas Partners Pty Ltd



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Reviewed by



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