GeoSolve Ref: 240480.03
3 December 2025

Otago Regional Council
70 Stafford Street (Phillip Laing House)
Dunedin 9016

Attention: Shay McDonald

Geotechnical Engineering Assessment Memo
Bendigo-Ophir Gold Project Fast-Track Application Assessment

In accordance with our Agreement by email correspondence dated 17 November 2025, we have undertaken an assessment of the proposed Bendigo-Ophir Gold Project Fast-Track Application, specifically the technical scope shown on Figure 1 below. Our investigation has comprised a site inspection undertaken on 25 November 2025 and review of the Substantial Application documents.

TECHNICAL REVIEWS – SCOPE

GEOSOLVE

Scope:

- Geotechnical stability – pits, underground mine, TSF, ELFs
- Natural hazards – landslides, earthquakes, flooding
- Whether the activities will exacerbate any existing natural hazards, or whether existing hazards will affect activities
- Any modelling in relation to the above
- Assessment of structures in rivers, in relation to natural hazards but also hydrological impacts.
- Erosion and sediment control

Please consider the conditions that are relevant to ORC, Central Otago District Council, and both councils jointly.

Figure 1: GeoSolve's technical review scope as provided by ORC

This letter covers geotechnical review of the application only.

Documents Reviewed

The following geotechnical documents have been reviewed as provided as part of the applicant's substantial application.

- B.20 Engineering Geology Limited - Site-Specific Seismic Hazard Study Report
- B.21 Engineering Geology Limited - Shepherds Tailings Storage Facility Technical Report
- B.22 Engineering Geology Limited - Site Geotechnical Factual Report
- B.23 Engineering Geology Limited - Shepherds Silt Pond Technical Report
- B.25 Engineering Geology Limited - Process Plant, Infrastructure and Admin Areas Geotechnical Report
- B.26 Engineering Geology Limited - Erosion and Sediment Control Report
- B.27 Engineering Geology Limited - Shepherds, Western and Srex Engineered Landforms, and Come In Time Pit Backfill Technical Report
- B.28 Peter O'Bryan & Associates - Geotechnical Assessment Open Pit and Underground Mining - Rise and Shine Deposit
- G.14 Erosion and Sediment Control Management Plan
- G.15 Engineered Landform Management Plan
- G.16 Tailings Management Plan
- G.17 Pond and Reservoir Management Plan

Pit Stability

Pit Details

We understand open pit mining is proposed from 4 pits; the 'Rise and Shine' (RAS), 'Come in Time' (CIT), 'Srex' (SRX) and 'Srex East' (SRE) pits. The RAS pit is the largest by some margin.

The pit stability of the RAS pit has been assessed in document B.28. The stability of the other pits does not appear to have been assessed at this stage.

We understand that backfilling is not proposed for the RAS and SRX pits; these are instead to remain as open pits with associated pit lakes in perpetuity. There will therefore remain an unstable zone around these pit margins on closure and bunding is proposed to prohibit public access. The extract below from Western Australia guidance illustrates this concept.

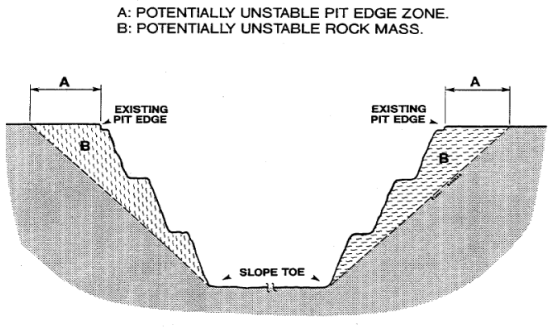

Figure 1
DEFINITION OF TERMS OF INSTABILITY

Figure 2: Unstable zone around abandoned mines (https://www.worksafe.wa.gov.au/system/files/documents/2025-02/MSH_G_SafetyBundWallsAroundAbandonedMines.pdf)

Review Comments

A comprehensive report has been provided on the stability of the RAS pit. The report has been prepared using existing data and acknowledges that additional investigations and analysis are required to fully assess the pit stability. We understand that it is proposed to update the stability assessment as excavation progresses based on observations of performance.

The report notes that pit stability will be influenced by defects within the rock, particularly the schist foliation and the various shear zones associated with known faulting. The Thomson Gorge Fault (TGF) in particular has been identified as being potentially problematic due to its low shear strength.

Pit monitoring using remote techniques is recommended.

The report does not specifically look at abandonment and provides no indications of potentially unstable zones around the pit margins on completion. This is not a significant issue as any recommendation at this stage would be preliminary and subject to a detailed assessment once additional investigations had been carried out and the performance of the batters of the pit had been assessed during excavation. One potential issue is noted below given the proximity of the pits to the site boundary.

For the mine operator, pit stability is critical to ensure the safety of the workforce and to prevent delays to mining.

However, it is important that any land outside the mine site is not destabilised by the mining operations as public access may be possible in these areas (i.e. the land bordering the southwest of the CIT pit and the RAS pit is public conservation land). Typically, a long-term factor of safety (FoS) of at least 1.5 under static loading conditions would be required within land accessible to the public and it appears from the stability analysis of the RAS pit when at full depth that this may not be achieved.

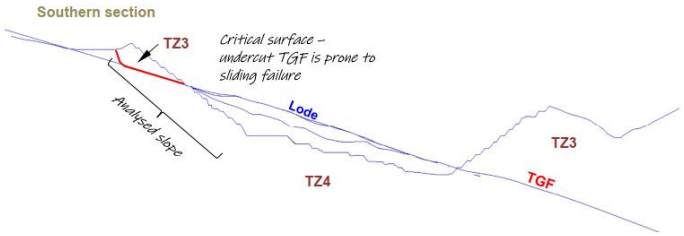

Figure 31 LE Analysis sections (May 2025 pit design, Phase 7 (ultimate pit)

SOUTHERN 222m high upper wall segment 39° segment overall angle	Dry	Static	1.35	TGF dips out of wall & is undercut
	Dry	Pseudo-static	1.07	0.13g disturbance
	Semi-saturated	Static	1.15	
	Semi-saturated	Pseudo-static	0.98	0.13g disturbance

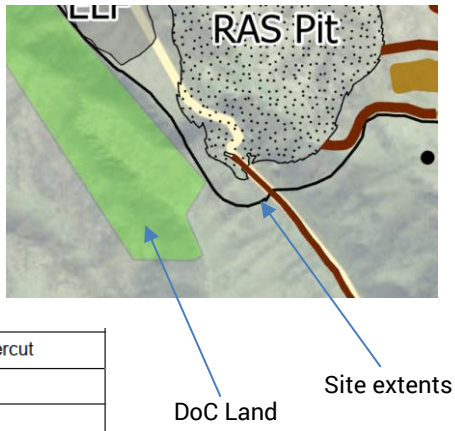

Figure 3: Stability Analysis Extract from B.28 Report (p46 & p47), Plan extract from C.02

Based on the basic section and the analysis results there is a risk that these typical target factors of safety are not achieved in public land, and as noted this analysis is preliminary. The section above would also suggest there is the potential for sliding along the TGF to extend beyond the site boundary, although likely not onto Department of Conservation (DoC) land.

The other issue is that as the RAS pit will not be backfilled, an exclusion zone around the pit will need to be established on abandonment as noted above to permanently restrict the public from approaching the pit edge. Typically, this involves the construction of a rock bund (generally 2 m high by 5 m wide) and this exclusion zone could encroach on DoC land, although buttressing of the pits walls could mitigate this issue on closure.

As noted above, the stability of the other pits does not appear to have been assessed and hence the risk to land outside the site has not been adequately addressed. If the additional investigations and assessment indicate that there are stability concerns, then as for the RAS pit these could likely be mitigated by buttressing.

Suggested Consent Conditions

The consent holder must ensure that the stability of ground outside the project site boundary is not adversely affected by the construction or operation of any of the deep mining pits.

1. A minimum FoS of 1.5 shall be maintained under static loading for all ground outside the site boundary, unless an alternative FoS is agreed in writing by the Consent Authority.
2. Prior to excavation, the consent holder shall provide a geotechnical stability assessment prepared by a suitably qualified and experienced practitioner. The assessment must:
    - Model potential failure surfaces and assess FoS for areas outside the site boundary.
    - Identify any mitigation measures or monitoring required to maintain compliance.
3. All stability assessments and monitoring reports shall be prepared by a suitably qualified chartered geotechnical or mining engineer.

Upon abandonment or closure of the mining pit, the consent holder must:

1. Designate an exclusion zone around the pit to prevent public access. The extent of the exclusion zone shall be determined based on residual stability risks and safety considerations and must be approved by the Consent Authority.
2. Construct and maintain physical barriers (e.g. bunds) and install appropriate signage to restrict entry and warn of hazards.

3. Ensure that these measures are designed and implemented to remain effective in perpetuity, including provisions for ongoing maintenance or transfer of responsibility to a suitable entity.
4. Submit an Exclusion Zone and Public Safety Management Plan to the Consent Authority for certification prior to site abandonment. The plan must detail:
    - Location and dimensions of the exclusion zone.
    - Type and specifications of barriers and signage.
    - Long-term maintenance arrangements.

Underground Mine Stability

Details

The assessment of underground mining primarily considered the development of the working from a mining perspective rather than looking at the potential external effects of this operation.

Review Comments

The main issue that needs consideration is mining-induced subsidence. We understand that this has not been assessed by the applicant due to key inputs required for the assessment being dependent on the mining techniques adopted, which are yet to be finalised.

The land that is potentially affected by subsidence is currently undeveloped and future development is unlikely given its location. The effects of any subsidence are therefore unlikely to be significant.

The panel could consider a consent condition requiring a full subsidence assessment report.

Tailings Storage

Tailings Structure Details

The Shepherds Tailings Storage Facility (TSF) will be an earth and rockfill dam about 108 metres high, with a crest at 690 metres above sea level. We understand that has been assigned a high Potential Impact Classification (PIC) under the New Zealand Dam Safety Guidelines[1]. The TSF will hold up to 22 to 25 million tonnes of tailings and will be buttressed by an engineered landform downstream to ensure long-term stability.

A technical report on the design of the tailings dam has been provided by Engineering Geology Limited (EGL). The report provides a detailed assessment of the dam design,

[1] New Zealand Society on Large Dams (2024). *New Zealand Dam Safety Guidelines 2024; Module 2. Consequence assessment and dam potential impact classification.*

including the derivation of soil parameters and groundwater conditions. The stability of the dam has been assessed under both static and seismic loading.

The design includes zoned construction for seepage control, a comprehensive drainage system, and measures to withstand extreme rainfall events and major earthquakes. At least one metre of freeboard above the maximum flood level will be maintained, and operational water levels will be kept well below the crest.

Safety management will include regular inspections, monitoring, and emergency planning. Compliance with building and dam safety regulations is mandatory, along with independent peer review given the dam is considered high PIC.

Geotechnical Review Comments

As noted above, the dam has been classified as high PIC which means that dam failure could cause catastrophic impacts on people, property, infrastructure, cultural sites, and the environment. In this case the main issues are potential fatalities, significant damage to the applicants site infrastructure and buildings, significant damage to New Zealand State Highway 8 (SH8) and other infrastructure and major environmental harm. Note that the PIC does not consider the probability of failure, only the consequences.

Given the size of the dam, it will require building consent and will also require an independent peer review by a qualified dam engineer.

The report provided by EGL for the dam design is a comprehensive document which covers all critical aspects of dam design including dam stability (under static and seismic loading), seepage and drainage, flood passage and assessment of potential failure modes.

Once the dam is operational, it will be subject to ongoing monitoring and annual inspections as required by dam safety legislation.

One key point is that the dam will be buttressed by one of the engineering landforms as shown on the section below. We understand this buttress will be constructed from waste rock from the mine pit and will be constructed concurrently with the dam. The designer has not accounted for the additional stability provided by the waste rock buttress in their design which is conservative.

There is a landslide risk within the impoundment area, which has not been addressed at this stage. This risk has been acknowledged and proposed to be fully addressed at the detailed design stage. It was noted during our site visit that the applicant has started the investigations of these landslides.

The buttress will result in a significant improvement in the dam stability, which in our view means that post-closure there is no credible risk of dam failure.

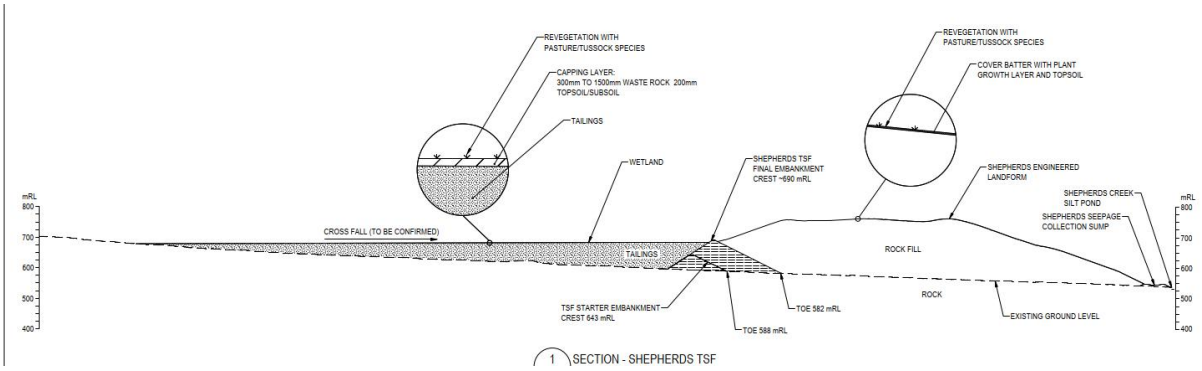

Figure 4: Cross Section Through TSF on Closure

Overall, we are satisfied that the geotechnical risks associated with the construction of the TSF have been adequately addressed by the applicant. The key points that support this conclusion are:

- A comprehensive report has been prepared by an experienced dam engineer, who we understand will prepare the detailed design of the dam. There are significant details already provided for the dam including a suite of drawings that are close to detailed design standards.
- The final design will be subject to a detailed peer review by a second experienced dam engineer.
- The dam will require a Dam Safety Assurance Program (DSAP), and compliance to the DSAP will be certified annually by a recognised dam engineer.
- During construction and implementation, the dam will be subject to regular monitoring and inspection as required by New Zealand legislation.
- The dam will be buttressed by a significant quantity of rockfill, which means that on closure of the mine there is no credible failure mechanism for the dam.

We have not considered any environmental aspects of the dam design such as leachate treatment as they are outside the scope of our engagement. We understand these are to be considered by other experts.

Silt Pond

Silt Pond Details

The silt pond is an engineered dam intended to capture sediment-laden runoff from the Shepherd Engineered Landform (ELF) and provide backup process water storage.

It is classified as a Low Potential Impact structure under New Zealand Dam Safety Guidelines and has a maximum height of about 16 metres above the natural ground level, although we understand its effective height will be around 5 m as backfilling of the downstream valley is proposed.

The pond has been designed to provide sediment control for up to 1:10 annual exceedance probability (AEP) storm events from the ELF with a spillway provided to pass 1:1,000 AEP events.

Review Comments

We provide comments on the PIC of the dam in our River Engineering report.

As above the report prepared is comprehensive and we have no concerns around the stability of the dam.

Overall, we are satisfied that the geotechnical risks associated with the construction of the dam have been adequately addressed by the applicant.

The only concern we have is around the 1:10 AEP storm that the pond is designed for. This is discussed further below – see Erosion and Sediment Control and in our River Engineering report.

Engineered Landforms

Details

EGL have provided details the following details regarding the engineered landforms proposed as part of the mine development:

> Unmineralised waste rock generated by mining of the Bendigo-Ophir Gold Project (BOGP) open pits and a small amount of material from the development of an underground mine will be stored in Engineered Landforms (ELFs). The ELF's will be designed, constructed, operated and rehabilitated to provide safe long-term storage of waste rock generated by mining activity during BOGP operation.
>
> Four ELFs are proposed:
>
> - Shepherds ELF (85Mm^3 capacity);
> - Come in Time Pit Backfill (3.9Mm^3 capacity);
> - Western ELF (5.2 Mm^3 capacity); and
> - Srex ELF (4.2Mm^3 capacity).

EGL have provided an assessment of the stability of each of the ELFs and provide recommendations for construction and consenting of each of these earth structures.

Review Comments

All rock stacks are proposed to be constructed at batters of 3:1 (horizontal to vertical) using waste rock, a product that has relatively high shear strength parameters.

Analysis has been carried out by EGL for the Shepherd ELF only as that is considered to be the worst case from a stability perspective. We agree that this will be the worst case.

EGL have provided some recommended consent conditions, including one requiring all ELFs to be designed by a chartered engineer. They also recommend various conditions related to construction, monitoring and completion of the ELFs, which all seem reasonable.

Overall, we are satisfied that there are no significant issues with the geotechnical stability of the ELFs that have not been considered by the applicant and provided the recommended consent conditions are applied, the risk of instability should be minimal.

Erosion and Sediment Control

The erosion and sediment control report is at a relatively high level and notes that specific Erosion and Sediment Control Plans (ESCPs) will be prepared for each work area.

This requirement is defined in:

7. ICEA (2018), *Best Practice Erosion and Sediment Control*. International Erosion Control Association (Australasia), Picton NSW. www.austieca.com.au

This document provides the following design criteria, which the applicant proposes is adopted for the design and sizing of all sediment control measures.

Table A1 – Drainage design standard for temporary drainage works

Drainage structure	Anticipated design life		
	< 12 months	12–24 months	> 24 months
Temporary drainage structures [1] Queensland, Northern Territory, and northern Western Australia	1 in 2 year	1 in 5 year	1 in 10 year
Temporary drainage structures [1] New South Wales, Victoria, Tasmania, South Australia and southern Western Australia	1 in 5 year	1 in 10 year	1 in 10 year
Temporary drainage structures (e.g. Catch Drain, Flow Diversion Bank) located immediately up-slope of an occupied property that would be adversely affected by the failure or overtopping of the structure. [1], [2]	1 in 10 year	1 in 10 year	1 in 10 year
Temporary culvert crossing	Minimum 1 in 1 year hydraulic capacity wherever reasonable and practicable.		

Notes: [1] Design capacity excludes minimum 150 mm freeboard.
[2] Design flow rate based on up-slope drainage structures operating in accordance with their design capacity excluding freeboard, i.e. any constructed freeboard is assumed to have been washed away or otherwise deactivated.

In larger events, the sediment control measures will become overwhelmed (in a controlled manner) and there is a risk of sediment entering watercourses.

For the silt dam proposed above, in the event of storms greater than 1:10 AEP, the pond will overflow, the spillway will activate, and potentially sediment-contaminated water will enter

the creek directly. Over the 14-year operational life of the mine currently proposed, there is high probability (around 80%) that the spillway will become operational and discharge into the creek will occur.

Over 14 years there is a greater than 10% probability that a 1:100 AEP event will occur.

The above criteria are specifically for “building and construction sites” within Australia and therefore may not be appropriate for a “permanent” site within Central Otago where overflow will directly enter watercourses.

The applicant should be asked to provide information on how much silt will likely enter the watercourses once the criteria used to size the control measures is exceeded, how often these discharges are likely to occur during the working life of the mine and provide information on the potential effects on water quality.

Erosion and sediment control measures may need to be designed to cater for more onerous events than the applicant is proposing. Our River Engineering report provides some further comment on this aspect.

Site Hazards

Seismicity

EGL have provided a site-specific seismic hazard assessment for the site and provide recommendations around seismic loading to be used for design of the various infrastructure proposed.

The assessment uses the 2022 National Seismic Hazard model and appears to be in line with current good practice.

Landslides

There are a number of landslides within the site boundaries. These were clearly visible during the site visit and have been identified by EGL as part of their factual reporting.

These landslides are generally quite ancient and are unlikely to have undergone any recent movement. Landslides are common in schist terrain due to the foliation present within that rock type which leads to highly anisotropic behaviour, with significantly lower strengths being observed within the schist parallel to the foliation. These landslides are typically triggered when the toes of slope are subject to erosion.

The main risk associated with the mine development would be if any of the proposed pits were to further undermine the toe of one of these landslides, which could trigger movement.

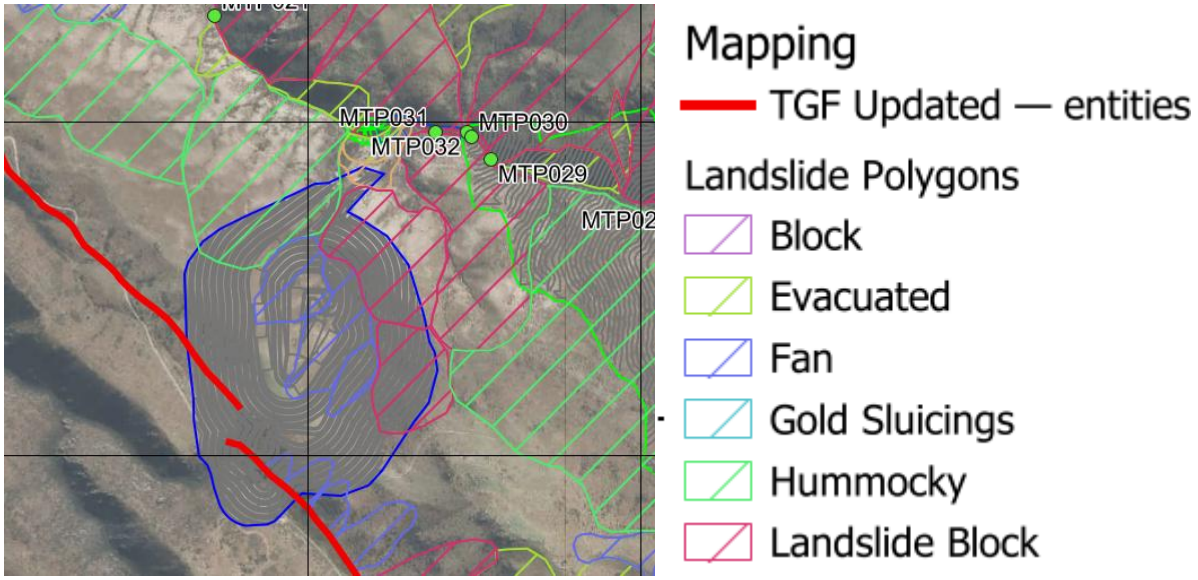

Figure 5 – Landslides that Coincide with the RAS Pit

As can be seen in Figure 5, there are two mapped landslides that coincide with the RAS pit. These mapped slides were not immediately apparent on site due to the viewing angle, but given the topography are likely to be trending in a northerly direction. It appears that a significant portion of these landslides will be excavated out as part of the mining and therefore the presence of the slides is something that will need to be considered during the initial excavation works by the applicant. As the slides are entirely within the mining site, there will be no external effects.

The portal for the underground mining will be constructed at the toe of an ancient schist landslide. The excavation of the portal has the potential to reduce the stability of the landslide, although this may be offset by placement of the spoil within the valley, hence the overall impact may be neutral. As part of the detailed design of the portal this issue should be considered.

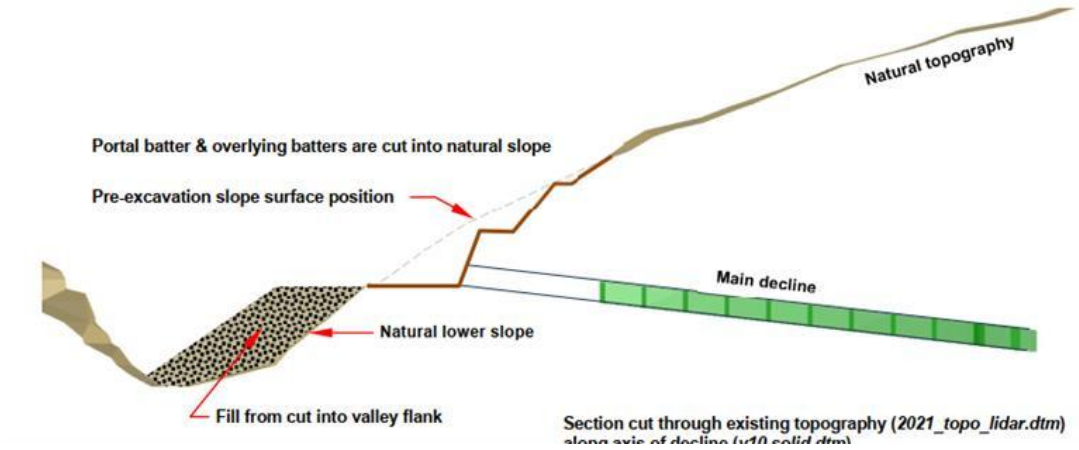

Figure 6: Extract from B.28 showing portal cross section

The applicant will need to consider these landslides as part of their detailed design of the various elements affected.

Applicability

This report has been prepared for the sole use of our client, Otago Regional Council, with respect to the particular brief and on the terms and conditions agreed with our client. It may not be used or relied on (in whole or part) by anyone else, or for any other purpose or in any other contexts, without our prior review and written agreement.

Yours faithfully,

Colin Macdiarmid
Principal Geotechnical Engineer (CPEng)
GeoSolve Limited