GeoSolve Ref: 240480.03 V3
19 March 2026

Otago Regional Council
Phillip Laing House
Dunedin 9016
Attention: Shay McDonald

Revised Surface Water & River Engineering Assessment Memo Bendigo-Ophir Gold Project Fast-Track Application Assessment

In accordance with our Agreement by email correspondence on 5 February 2026, we have undertaken an assessment of the responses to our original assessment of the proposed Bendigo-Ophir Gold Project Fast-Track Application.

Our original assessment was submitted to the ORC on 3 December 2025, and responses to it from Engineering Geology Limited (EGL), Mine Waste Management Limited (MWM) and Peter O'Bryan & Associates were received on 4 February 2026 (and 17 February for the 2nd EGL report). Those documents are referred to in this letter report, and the respective reference numbers are EGL ref: 9702 (30 Jan and 17 Feb 2026), MWM ref: J-NZ0488-003-L-Rev0 (30 Jan 2026) and Peter O'Bryan & Associates ref: 24053C (2 Feb 2026).

The scope of this revised response is taken to be the Request For Information (RFI) letter sent from ORC to Santana Minerals Limited / Matakanui Gold Limited (MGL) on 12 December 2025, which lists the questions that were being posed in terms of geotechnical engineering, river engineering and erosion & sediment control. That RFI letter is also listed as a reference to this letter report (and includes GeoSolve's previous responses).

The questions from the ORC RFI letter (dated 12 December 2025) are reproduced below, with the original question from ORC's RFI letter *in italics*, and the following information provided as a response:

- What matters are agreed
- What matters are not agreed
- Where there is uncertainty as to the predictions / effects, what the implications of this uncertainty are in terms of adverse effects and their management
- Whether the consent conditions set out in D.01 – D.04 are appropriate, based on the nature of the activities, the site, and the surrounding environment, and experience with similar sites / activities.
- Further discussion / requested information where applicable

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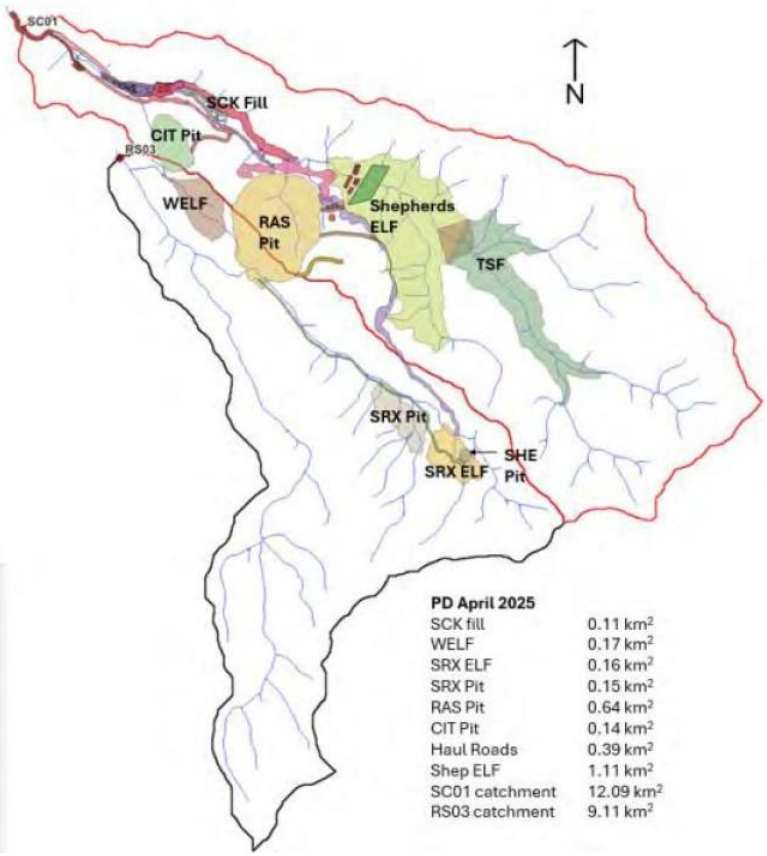

Figure 1: Site plan and proposed features as per EGL's response

Question 1 - Question 3

Questions 1, 2 and 3 from the RFI are considered in separate (geotechnically focused) letter.

Question 4

Please provide the following information in relation to the proposed diversion of both Shepherds Creek and 'SREX tributaries':

a. Channel diversion / realignment path design details

b. Engineering drawings

c. Channel lengths, gradients and alignments

d. Proposed construction methodology

e. Erosion control or armouring details specific to the channel

f. Hydraulics / flood design calculations to support channel sizing

It is noted that the above information has already been provided for the proposed Rise and Shine Creek diversions.

On 17/02/26 EGL provided a draft combined response report for Questions 4 and 6 which '*contains details which address aspects of Questions 4 and 6*'. See Question 6 below for a combined assessment of that information. **This matter is not yet agreed**.

Question 5

In Report B.04, Kōmanawa state that, post-closure: Overall, surface water flows in both arms of the Shepherds and Bendigo catchments would increase. Please provide an assessment from a suitably qualified and experienced person of the predicted difference in flood magnitude between the current state and the post-closure state during an extreme event. This assessment should include an assessment of the impact of increased flows on flood hazards for receptors downstream of the development.

EGL have provided a comprehensive response to this question, the main point of which is that Kōmanawa's conclusions are based on the MWM report's Water and Load Balance model for closure, which is not suitable for assessing peak flood flows. EGL has undertaken a separate comparison of peak flood flows pre mine development and post closure, and provided details of that.

GeoSolve have assessed EGL's peak flood flows comparison, and it appears to be appropriate. The main predicted outcome is that peak flood flows will be attenuated by the various pit lakes and tailings storage facilities, reducing downstream risk. **This matter is agreed, however it is recommended that those assessing the potential ecological effects are made aware that peak flood flows will be reduced, as this may affect their assessment.**

It is noted that EGL's assessment states '*In closure, SRX Pit lake is proposed to spill clean water directly to the creek*'. **It is recommended that those assessing the potential ecological effects confirm that they consider that water to be sufficiently clean from an ecological standpoint** (GeoSolve understand e3 Scientific are undertaking that assessment on behalf of ORC and have contacted them to advise that)**. It also is recommended that an appropriate consent condition is included to ensure that inspection is undertaken during/after spilling of that pit lake water to ensure it is not laden with sediment or other contaminants**.

Question 6

Please provide an assessment from a suitably qualified and experienced person of the flood carrying capacity of the proposed Shepherds Creek diversion channel. Specifically, this assessment should include:

a. Whether this channel will be capable of conveying 100-year ARI (1% AEP) flood flows.

b. If the channel cannot accommodate the flows described in part (a) without overtopping, an assessment of the potential consequences of overtopping.

c. Clarification of whether the proposed channels will be left as-constructed following closure of the mine, and if this is case then an explanation as to how their ongoing performance will be assured.

As stated for Question 4 above, on 17/02/26 EGL provided a draft combined response report for Questions 4 and 6 which '*contains details which address aspects of Questions 4 and 6*'. GeoSolve's assessment of that draft report is summarised in the Table 1 below.

Table 1: Summary of Question 4 and Question 6 assessment

Question	Part	Answered?	Where	Notes
Q4	a. Path design details	**Partially**	§3.2–3.5 pp.3–6	Alignment narrative + concept figures but not full design set
	b. Engineering drawings	**Partially**	Fig. 8 p.12; layout p.15	Typical section + layout plan only; not full drawings
	c. Lengths / gradients / alignments	**Partially**	§5.2.1 p.10–11	Gradients given; no total length; alignments only descriptive
	d. Construction methodology	**Partially**	§3.5 p.6	Two construction approaches described conceptually
	e. Erosion / armouring	**Yes**	§3.2, §5.2 p.3, 10–11	Riprap sizing table + design principles
	f. Hydraulics / flood calcs	**Yes**	§5.1 p.9–10 + figs p.16–17	Model method + peak flows + curves
Q6	a. 100-yr flow capacity	**Partially**	§4.2.1 p.8; §5.1 p.9	Designed for 1% AEP; capacity vs overtopping not explicitly stated
	b. Overtopping consequences	**No**	—	Not assessed
	c. Post-closure performance	**Partially**	§3.1 p.2; §5.3 p.12	States channel remains + rehabilitation goals but limited assurance detail

Overall adequacy of response is considered to be that both Question 4 and Question 6 are partially answered, however there are omissions from both of the answers, particularly Question 6. Some of the critical omissions are:

- No overtopping risk assessment (e.g. back-scour and channel re-routing potential)
- No confirmation channel passes design flood in all locations without overtopping
- No detail on how potential aggradation with be mitigated to maintain flow capacity

- No closure performance assurance methodology

Other omissions include:

- Missing alignment geometry and lengths
- Construction sequencing not specified
- No hydraulic profile outputs
- No detailed design drawings

In summary, this draft report demonstrates concept feasibility and provides indicative design criteria and modelling, but does not fully answer the questions. The principles listed as being proposed in the draft Resource Consent Conditions (Schedule 2, 22) appear appropriate, however it is noted that the majority of them include wording 'as much as practicable/possible', and **it is recommended that an external party determines what that practical/possible level is, and the Consent Condition(s) are amended to ensure this**.

This matter is not yet agreed and further information is required as per the (non-exhaustive) table and bullet points above.

Question 7

Report B.04 states that an estimated period of 50-60 years will elapse prior to the RAS pit lake and underground workings would connect to the surface water system. Please provide an assessment from a suitably qualified and experienced person that addresses the following matters:

a. The margin of error in this 50-60-year estimate.

b. Whether this margin of error has been incorporated into any other assessments that have relied on this estimate, including but not limited to dam safety, contaminant transport, downstream ecological assessments, and monitoring and maintenance requirements across the mine site.

c. How any proposed underdrains have been taken into account in the time estimate.

d. If stream depletion effects are anticipated for 50-60 years post-closure, please explain the reasoning behind Kōmanawa's statement that surface water flows in both arms of Shepherds and Bendigo catchments would increase.

MWM's response to this question explains that this was an outdated estimate used by Kōmanawa, and have undertaken some sensitivity testing calculations to refine the estimate to 25-40 years. MWM consider this not to present a significant risk to pit wall stability. They also point out that the pit walls will be buttressed by the water pressure as it fills, improving stability. **This part of the matter is agreed**.

MWM also state '*Post-closure, creek flows are expected to increase as a result of (treated) seepage from MWFS being discharged to the receiving environment*'. **It is recommended that**

those assessing the potential ecological effects confirm that they consider that water to be sufficiently clean from an ecological standpoint (GeoSolve understand e3 Scientific are undertaking that assessment on behalf of ORC and have contacted them to advise that).

Question 8

The Shepherds Silt Pond has been assessed in Report B.23 as a low PIC dam. GeoSolve consider that this is incorrect, and that the correct classification of the Shepherds Silt Pond would be a medium PIC dam. Please provide an updated assessment that reflects the correct classification of this dam, including any changes to any design, construction, operation, maintenance, surveillance, or closure requirements.

EGL has responded to this point with the clarification that it is the incremental increase in Population At Risk (PAR) and Potential Loss of Life (PLL) that is being assessed, and referenced the NZ Dam Safety Guidelines in regard to the Potential Impact Classification (PIC) that they have prepared, and the Low PIC conclusion they have come to.

GeoSolve consider that EGL's Rainy Day dam breach assessment may show an incremental increase in PAR and PLL that coincides with a Low PIC (assuming that the processing plant can be taken to be empty of workers during heavy rainfall, and that the incremental damage increase is minimal, which are both to be confirmed), however the Sunny Day breach assessment appears to show a PAR of 200 being exposed to a flood hazard category of H6 (the highest category) with a 5 minute warning time (see Figure 2 below). It is unclear how the conclusion has been reached that the PLL is a less than 1% chance of someone passing away, however GeoSolve consider that it is likely that at least 1 person would pass away in such an event, given that H6 is defined as '*Unsafe for vehicles and people, all building types considered vulnerable to failure*'. This would mean that the PIC would be Medium or potentially even High, based on the increase in both PAR and PLL for the Sunny Day breach.

Table A4. Summary of Consequences for Sunny Day Breach Scenario

Items	Distance Downstream (km)	No. of Buildings Affected	Time of Arrival	Hazard Category (No. of Buildings)	Inundated Length (km)	PAR	Potential Loss of Life
Site Access Roads in Valley (AADT = 200)	0.0	-	<1 min	H6	3.2	0.67	0.0135
Process Plant	2.0	1	5 min	H6	-	200	0.0091
Administration Building	4.0	-	-	-	-	-	-
Thomson Gorge Road (AADT = 259)	5.5	-	-	-	-	-	-
Farmland	1.7	-	-	-	-	-	-
Buildings Downstream	6.5	5	-	-	-	-	-
Ardgour Road (AADT = 400)	7.0	-	-	-	-	-	-
SH8 Bridge (AADT = 1945)	10.5	-	-	-	-	-	-
Summary						201	**0** (0.0225)

Figure 2: Table A4 from EGL's Shepards Silt Pond report (document B.23, Appendix A, pdf page 58)

GeoSolve contacted EGL to discuss this point, and their response was:

The Shepherd Silt Pond presented in the Fast Track Application is Low PIC (Potential Impact Classification) based on the modelling in the report. It is possible for it to be a Medium or High PIC dam if the Process Plant arrangement was different in final design. This is because of the PAR at the Plant is notable. Shepherds Silt Pond presented is a large dam under the Building Act 2004. This means the proposed Shepherds Silt Pond requires a building consent and this will require that the PIC is assessed and the dam is designed to the appropriate standard to manage dam safety risk in design and construction using the New Zealand Dam Safety Guidelines. This will be administered by Environment Canterbury as the Building Consent Authority for dams for the region. Further together under the Building (Dam Safety) Regulations 2022 and Building Act 2004 the PIC is required to be certified and this is submitted to Otago Regional Council and reviewed every 5 years i.e. any changes to the PIC during operation and in closure will require the management of risk through a Dam Safety Assurance Program.

The outcome of this appears to be that it is currently unclear what the PIC for Shepards Silt Pond should be designated as, and it is dependent on the final levels of the area and Process Plant arrangement. **GeoSolve consider that based on the current information provided that the PIC should be Medium or High based on the increase in PAR, potential increase in PLL (detailed above), and potential increase in damage level (including to commercial or industrial facilities). Those issues should be considered for both the Sunny Day and Rainy Day breach scenarios once the Process Plant arrangement and final levels of the area are confirmed**.

Further information is requested on this point, which may not be available until a later date, and this matter is not yet agreed.

Question 9

GeoSolve recommend that sediment management features (such as sediment retention ponds) and other infrastructure that are to exist for the proposed operational life of the mine be designed to accommodate a 50-year ARI (2% AEP) storm event. Please explain whether there are any physical constraints on site that would prevent sediment devices and infrastructure being sized to this capacity. If such physical constraints exist, please assess the potential effects of sediment being discharged from sediment devices and entering streams, either directly or indirectly, including the expected frequency of this occurrence.

EGL has provided an engineering response to this question (see referenced report list at the end of this letter report), detailing their reasoning for the sizing of each feature, experience at other sites, and practical measures to balance the engineering requirements. Their proposed sizing for each feature is summarised in Figure 3 below. It is noted that this table does not capture all proposed sediment management features, but is a summary of the major ones and their proposed design.

It is noted that a response has not been provided to the second part of Q9 however: '[if the features cannot be sized to a 1:50 year storm event]… *please assess the potential effects of sediment being discharged from sediment devices and entering streams, either directly or indirectly, including the expected frequency of this occurrence*'. Given that the consequences

(and frequency) of the sediment management features being under capacity have not been assessed/provided, and could potentially result in back-scour and channel re-routing, it has not been determined whether a reduction in the requested design storm is appropriate.

Preliminarily, GeoSolve consider that a design storm of between 1:20 and 1:50 year return period (for all storm durations, and with allowance for climate change and appropriate freeboard) should be provided for in sediment management features, dependent on the consequences/frequency of them being under-capacity. The calculations used to size the features should also be provided for approval.

GeoSolve has contacted e3 Scientific with regard to assessment of those potential effects.

TABLE 1: SUMMARY OF DESIGN CRITERIA FOR PERMANENT EROSION AND SEDIMENT CONTROL MANAGEMENT FEATURES DURING OPERATION

Feature	Channel capacity or sediment retention capacity design AEP and duration	Comment
North Diversion Channel past TSF	1 in 10-year 24 hour storm	This is a practical balance between diversion and the size of the required cut.
North Diversion Channel past ELF	1 in 10-year 24 hour storm	This is a practical balance between diversion and the size of the required cut. Note that flood detention capacity on the TSF in closure will allow this channel to repurpose to pass 1 in 100 year flows in closure.
Shepherds Silt Pond	1 in 20-year storm all durations	EGL acknowledges that a higher performance level than 1 in 10-year event would be appropriate below Shepherds ELF and area between RAS Pit as this is the main disturbed area during mine operations. We consider 1 in 50-year event to be unnecessarily high based on experience at other sites. We propose 1 in 20-year to be a practical compromise. We propose ORC and Geosolve consider what we have discussed.
Shepherd Creek Valley Infill Diversion	1 in 100-year storm all durations)	This is a typical design level for permanent channel design
Shepherd Creek Valley Infill Diversion – Dirty water diversion	1 in 20-year storm all durations	The slopes above the valley infill and on the valley infill will contain haul roads. We propose the same design level as the Shepherds Silt Pond as they are both protecting clean water in Shepherds Creek.

Figure 3: Table 1 from EGL's Response to ORC RFIs document, pdf page 9-10

This matter is not yet agreed and further information is requested regarding the consequences (and frequency) of the sediment management features being under capacity, including details on how overtopping back-scour and channel re-routing will be avoided. Once that information is provided, discussion and agreement on the required storm design event for the sediment management feature sizing can be undertaken.

ORC Query

With regard to the ORC request '*GeoSolve's updated review should clearly indicate whether the consent conditions set out in D.01 – D.04 are appropriate, based on the nature of the activities, the site, and the surrounding environment, and experience with similar sites / activities*'.

GeoSolve have undertaken an overview assessment of the proposed conditions, and have summarised some of those relevant to surface water and river engineering in Table 2 below.

Table 2: Surface water and river engineering Resource Consent Conditions from CODC and ORC (from D.01 - D.04)

Condition / Requirement	Topic	Project Phase(s)	Source
Culvert ≥5% AEP storm	Hydraulic design	Design; Construction; Operation	D02
Minimise disturbance during culvert construction	Construction method	Construction	D02
Notify council before culvert install	Regulatory	Pre-construction	D02
Stream diversion minimum widths	Channel geometry	Design; Construction	D04
Diversion length ≈ original	Hydraulic equivalence	Design	D04
Mimic natural hydrology	Flow regime	Design; Operation	D04
Include riffles/pools/meanders	Habitat engineering	Design; Construction	D04

Implement FEMMP	Ecological management	All phases	D04
Diversion maps + monitoring	Documentation	Design; Construction; Operation	D04
Annual ecology report	Monitoring	Operation; Closure	D04
Implement Water Management Plan	Water systems	All phases	D04
Monthly surface water monitoring	Compliance	Operation	D04
Continuous monitoring instrumentation	Instrumentation	Operation	D04
Meet water quality limits	Performance	Operation; Closure	D04
Flow measurement ±5% accuracy	Calibration	Design; Operation	D04
Divert clean runoff	Erosion control	Construction; Operation	D04
Treat sediment runoff	Sediment control	Construction; Operation	D04
Install sediment controls before earthworks	Sequencing	Construction	D04
No flooding upstream/downstream	Hydraulic constraint	Design; Construction; Operation	D04
Prevent debris entering waterways	Construction practice	Construction	D04
TSF diversion sized for 1:10yr flood	Hydraulic design	Design; Operation	D04

Subsurface drainage under ELFs	Seepage control	Design; Construction; Operation	D04
ELF runoff to ponds/pits	Drainage	Design; Construction; Operation	D04
Divert upslope runoff	Flow interception	Design; Construction	D04
Dam registry with parameters	Asset management	Design; Operation; Closure	D04
Assess Large Dam classification	Safety	Design	D04
Large dams comply with national rules	Regulatory	Design; Operation; Closure	D04
TSF underdrainage before discharge	Sequencing	Construction; Operation	D04
Capture seepage	Containment	Operation; Closure	D04
Restore freeboard after rain	Dam safety	Operation	D04
Annual water monitoring report	Auditing	Operation; Closure	D04

In general the conditions appear relevant, however they heavily rely on the assumption that detailed plans to be produced in the future will be able to comply with external guidelines or standards. For example many conditions say: '*must comply with certified management plan*', or rely on professional judgment being applied appropriately. This has already been found to be somewhat problematic for some design work, such as the sediment control/diversion channel measures being proposed by the applicant's engineering representative to be reduced below the requested size as a '*practical balance between diversion and the size of the required cut*'.

If these Conditions are to be applied as proposed then **GeoSolve recommend that it is clarified that guidelines and standards are applied strictly to future design work that the Conditions reference, and that any decisions made based on engineering judgment are verified by an external source** (see the Question 6 response as an example of this).

- In Schedule One of D.02 (pdf page 5), **it is recommended that Condition 3 is amended to**:

  'The culvert in the Rise and Shine Creek must be located in general accordance with the plan in Attachment 1 to this consent and be constructed and operated to convey the runoff resulting from at least a 5% Annual Exceedance Probability (AEP) design storm for all storm durations.'

- In the Freshwater Ecology Management and Monitoring Plan section of D.04 (pdf page 7), **it is recommended that Condition 22 is amended to include a specific approval of the detailed design of the channel prior to its construction, including inspections to confirm construction and performance as per the approved detailed design**. See the Question 9 response for more information if required.

- In the Geotechnical Management Plans section of D.04 (pdf page 11), **it is recommended that Condition 31 is amended to reflect the answer to Question 9 in this letter report**, and that **a condition is added (if not already included) to reflect the sizing, design, external review and construction inspection requirements of all significant diversion and sediment control features**, such as those listed in Figure 3 of this letter report (and including those relevant to the SRX Pits and Clearwater Creek catchment). Final channel design and drawings should include Manning's n values, channel lining specifications, erosion protection (rock sizing, shear stress limits), bank stability criteria and freeboard requirements.

- It is noted that in the Geotechnical Management Plans section of D.04 (pdf page 11), Condition 30 is another example of the use of '*as much as practical*', which the consent holder may use as justification to avoid undertaking that task. **It is recommended that in general ORC consider specifying that the 'as much as practical' level is defined by an external party, or removing that part of the wording from the Conditions as and where appropriate**.

- **Long term erosion performance of engineered landforms does not appear to be detailed, and it is recommended that a Condition is included to address that. Current Conditions require 'stable landforms' but do not specify items such as: maximum allowable erosion rates, gully/rill erosion thresholds, surface armouring requirements, or post closure storm event design standards**. These should be addressed in future ESCMP documents to allow for appropriate sediment retention device sizing based on catchment hydrology, peak flow calculations, channel/culvert sizing and erosion protection for cutoff drains. Hydrological/hydraulic modelling is likely to be required for that assessment.

- The following points are repeated from GeoSolve's previous response, and **it is recommended that appropriate Conditions are added (or amended if already partially addressed) to reflect them**:

  - The RAS diversion channel design by Engineering Geology Limited (document B.24) appears appropriate, however it is considered that Option 2 is preferable, being the larger diversion channel without a bund. Of the two

variants of Option 2, it is considered that a rip-rap lined channel is preferable to a concrete-lined channel.

- Overall the channel sizing appears appropriate, however it is noted that Engineering Geology Limited have stated 'a smaller channel with higher flows is likely to be achievable following detailed design'. Due to the relatively conservative hydrological calculations appearing to balance out the relatively un-conservative hydraulic calculations, GeoSolve recommended that a smaller channel is not implemented at detailed design.
- It is considered that selecting Option 2 (with rip-rap) will reduce the post-closure monitoring and maintenance requirements, however it is still recommended that details regarding proposed monitoring and maintenance after closure of the mine are provided, to ensure that the flowpaths remain in the appropriate locations to avoid contaminant transport.

- In general, **it is recommended that all surface water and river engineering monitoring and maintenance Conditions have an external party regularly involved in their inspections, during construction, operation and closure works**. Given that reporting from the applicant states '*controls will be monitored and revised if discharge water quality is not suitable*', it is considered important that external involvement is ensured.

Other recommended additions to the proposed Conditions are detailed in bold in the responses to the various questions in this letter report.

March 2026 Update

After the first version of this letter report was submitted to ORC in February 2026, ORC assessed it and summarised it to EGL (on behalf of MGL) as:

> *River engineering*
> *The only matters that remain somewhat unresolved are:*
>
> - *an assessment of the likelihood and consequences of overtopping the Shepherds diversion channel;*
> - *an assessment of the frequency and consequences of spilling events from the sediment retention devises.*
>
> *The concern with both is the risk of back-scour and channel re-routing. Could EGL please provide the above two assessments? I don't anticipate them being lengthy.*
>
> *I am reasonably happy that the other minor points raised by Neil in his report are manageable by consent conditions, either those already proposed or modified versions which I would discuss in council's s53 comments.*

EGL then contacted GeoSolve to clarify the information required to satisfy those unresolved matters (a summary email from GeoSolve to ORC is attached to this letter report). EGL then provided a response to the river engineering matters described above, which is also attached, and ORC asked GeoSolve to revise this letter report based on EGL's further response. This is provided below.

The EGL response intro/summary reads as:

> *In this response, EGL recommend a detailed assessment and design of the channel be undertaken prior to construction. This shall include assessment of overtopping and potential for back-scour and channel re-routing and the mitigations. Below EGL outlines:*
>
> *1. Summary of the potential for back-scour and channel re-routing for the proposed site.*
>
> *2. The key considerations required in a detailed assessment of channel design, overtopping, back-scour and channel re-routing.*
>
> *3. A proposed resource consent condition to enable ORC to review and approve the detailed engineering design for the Shepherds Creek Realignment prior to construction.*

The summary of the potential for back-scour and channel re-routing (Point 1.) references that the Northern Diversion Channel is to be cut into rock, while the Shepards Creek Realignment is to be constructed with rockfill. **It is agreed that cutting a channel into rock would mitigate the potential for the channel to back-scour and re-route as a result of overtopping**. Construction of a channel in rockfill would also mitigate the potential for the channel to back-scour and re-route, however **rockfill is generally highly permeable and has the potential for seepage from the channel to daylight downslope, which may cause scour/erosion/slope instability issues. Preventing that would need to be addressed in the**

detailed design, construction and monitoring & maintenance of the channel. There is mention that the (post-operations) Shepards Creek Realignment will be rehabilitated with a creek bed substrate and planting/vegetation prior to its operation, however it is unclear what the allowance is for the (during operations) Shepards Creek Diversion channel.

It is noted however that no assessment has been provided of the anticipated frequency and consequences of overtopping events e.g. with regard to scour and sediment transport of potentially loose soil on the batter below the proposed channel. Instead it has been stated that:

> *EGL recommend a detailed assessment and design of the channel be undertaken prior to construction, for the Northern Diversion Channel and Shepherds Creek Realignment. EGL recommend this includes:*
>
> *o Channel design capacity;*
>
> *o Armouring of the channel;*
>
> *o Detailing of inflow locations from gullies upstream;*
>
> *o Seepage controls to maintain base flows in the channel;*
>
> *o Overtopping potential, risks and mitigations, including;*
>
> > *Review of frequency of spilling events above channel design;*
> >
> > *Review of at-risk locations where flows can be impeded in channel (i.e. from slips);*
> >
> > *Identification of at-risk locations of re-routing (such as introduced localise steps in the channel)*
> >
> > *Potential alternative flow routes by-passing the channel*
> >
> > *Protection measures for alternative flows routes (rockfill, armouring and vegetation)*

Although those recommendations (Point 2.) appear appropriate, timing-wise EGL are proposing that the frequency and consequences of spilling events from the sediment retention devices is assessed at a later stage, rather than answering it now. **That information was requested in order to justify the 10 year ARI design storm for the diversion works during operation. As it has not yet been provided, GeoSolve still consider that the Northern Diversion Channel (and all other diversion channels that are to exist during operation of the mine) should be designed for at least a 1 in 20 year ARI storm of any duration**.

Establishing grass via hydroseeding on areas downslope of the proposed diversion channel immediately following (or prior to) its construction is recommended, partially due to the potential for landslips for block the channel. **If this or other appropriate scour mitigation measures are not achievable due to operational constrictions then it is recommended that a 50 year ARI return period storm is used in the design of the channels.**

The proposed post-closure flows across the capped TSF surface to the Northern Diversion Channel are described by EGL as '*water flows in the natural gullies onto the capped TSF surface to the Northern Diversion Channel on the north side of Shepherds ELF. Surface flows across the capped tailings surface will be at a very low gradient and low depth channels will be protected from erosion with rockfill*'.

It is considered that the natural gullies may be disturbed by the proposed mining activities, and that the transition of their flow onto the capped TSF surface will have erosive potential due to the velocity of the incoming flow, even if it is landing on a low gradient surface.

This means the TSF cap would become part of the drainage network. TSF caps are generally not designed for receiving channelised flow, and are typically designed for diffuse runoff or very shallow drainage pathways. They are not normally designed to convey catchment flows from external gullies, and once water concentrates it can form rills, gullies or erosion channels. **The interaction of the natural gullies and artificial landforms are likely to require ongoing monitoring and maintenance/remediation works post-closure**.

With regard to the proposed Consent Condition (Point 3.), this is suggested/drafted by EGL to be:

> *<u>Proposed Condition - Detailed Assessment and Design of Permanent Creek Realignments</u>*
>
> *Prior to the commencement of any construction works associated with permanent creek realignments, the Consent Holder must submit a Detailed Design for the realignments to the Otago Regional Council (ORC) for approval.*
>
> *The Detailed Design must be prepared by a suitably qualified and experienced professional and must include the following:*
>
> *o Hydraulic channel design, including design flows, channel capacity, and freeboard.*
>
> *o Assessment of back-scour and channel re-routing risks from overtopping.*
>
> *o Channel and bank protection design, including sizing, location, and extent of any rock armouring, vegetation, or structural protection.*
>
> *o Channel geomorphological assessment, demonstrating long-term channel stability to avoid unintended channel re-routing or avulsion.*
>
> *o Design of ecological enhancement elements.*
>
> *o Detailed Design Documentation including Design Report, Design drawings, Specification, Construction Monitoring Schedule. Drawings to include plan view, long-sections, and cross-sections at sufficient intervals to illustrate channel form, gradients, and structural elements.*
>
> *ORC must, within 20 working days of receiving the Detailed Design Documentation:*
>
> *Provide written approval; or*

Provide written requests for further information or amendments.

If ORC has not provided written approval or requested amendments within 20 working days of receipt of the Detailed Design Documentation, the package shall be deemed to be accepted and the Consent Holder may proceed with construction in accordance with the submitted design.

All permanent creek realignment works must be constructed in accordance with the approved (or deemed accepted) Detailed Design Documentation. On completion a Construction Completion Report documenting the as-built channel and protection measures and any variations shall be completed and reviewed by a suitably qualified and experienced professional and submitted to ORC.

Most aspects of the proposed Condition appear appropriate, however it is recommended that the items in **bold text** in this March 2026 Update section are included. Those include:

- That the Condition is updated to be for both temporary and permanent diversions/realignments.
- That the Condition is updated to require EGL's bullet pointed recommendations for channel design to be included in the detailed design, those shown *in italics* on page 15 of this letter report, and page 3 and 4 of EGL's report (attached to this letter report as Appendix B, under the heading Detailed channel design including overtopping).
- That the Detailed Design Documentation is to also include information on proposed channel lining and how that will prevent seepage from daylighting downslope and causing scour/erosion/land stability issues.
- That temporary diversions are to be designed from at least 1 in 20 year ARI storms (of any duration), and that permanent diversions are to be designed for 1 in 100 year ARI storms (of any duration, with allowance for climate change). If grass hydroseeding or other appropriate scour mitigation cannot be established downslope of the temporary proposed diversion channels they are to be designed for a 1 in 50 year ARI storm.
- That a comprehensive monitoring and maintenance/remediation plan is included as a part of the submitted documentation, including allowance for regular inspection by ORC, and for post-closure remedial works if required as a result of ongoing scour or erosion from redirected flowpaths.
- GeoSolve recommend that ORC satisfy themselves that they consider the paragraph wording regarding delivery timing and deemed acceptance of Detailed Design Documentation/Construction Completion Report etc of the proposed condition to be appropriate.

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.

Report prepared by:

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Report reviewed by:

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Documents referred to in this letter report include:

ORC RFI Letter (RMFT25.007), 12/12/25, including GeoSolve reports appended [26 pages]
EGL 'Response to ORC RFIs' (9702), 30/01/26 [12 pages]
MWM 'Otago Regional Council Clarifications' (J-NZ0488-003-L-Rev0), 30/01/26 [20 pages]
Peter O'Bryan & Associates 'Response to Technical Review' (24053C), 2/2/26 [44 pages]
EGL 'Shepherds Valley Creek Realignment', (9702), 17/02/26 [17 pages]
GeoSolve to ORC email summarising direct communication with EGL [4 pages]
EGL Second Response to ORC Comments [5 pages]