BEFORE THE HEARINGS PANEL
FOR THE PROPOSED TE TAI O POUTINI PLAN

UNDER	the Resource Management Act 1991
IN THE MATTER	of a submission in a Plan Change under clause 6 of Schedule 1 of the Act
BETWEEN	**SKYLINE ENTERPRISES LIMITED**
	Submitter

STATEMENT OF EVIDENCE OF PAUL FAULKNER

Dated: 9 September 2024

TODD & WALKER law
LAWYERS | NOTARY PUBLIC

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Statement of evidence of Paul Faulkner

Introduction

[1] My name is Paul Faulkner.

[2] I am the Principal Engineering Geologist for GeoSolve Limited (**GeoSolve**). I have 26 years of experience in my field and hold the qualifications of BSc (Geological Science) and MSc (Engineering Geology), from the University of Leeds in the United Kingdom. I am a fellow of the Geological Society, London, and a member of Engineering New Zealand.

[3] I currently work with Geosolve and have been based in the Queenstown region for approximately 18 years. I have worked for Tonkin & Taylor Limited and Geosolve during this period.

[4] Since 2006 I have worked on a wide variety of projects in the South Island of New Zealand with most of my work being in the Otago and Queenstown area. I have worked on many large commercial and residential developments, often in steep mountainous environments where natural hazards such as debris flow, land stability, liquefaction, and rock fall are key issues.

Code of conduct for expert witnesses

[5] I confirm I have read the Code of Conduct for expert witnesses contained in the Environment Court of New Zealand Practice Note 2023 and that I have complied with it when preparing my evidence. Other than when I state I am relying on the advice of another person, this evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

Scope of evidence

[6] I have been engaged by Skyline Enterprises Limited (**SEL**) to provide expert geotechnical evidence with respect to the Te Tai o Poutini

Plan (**TTPP**), being the proposed combined District Plan for Westland, Buller, and Grey District Councils.

[7] This evidence is prepared in advance of the hearing planned to be heard by the Commissioners on 8-9 October 2024 at 97 Cron Street, Franz Josef.

[8] I understand SEL propose to create a special purpose zone sufficient to accommodate an aerial cableway. The special purpose zone will commence at the existing Department of Conservation Car Park at Franz Josef Glacier, cross the Waiho River and head south east traversing the mountain slopes to a geographical feature named Crawford Knob. The total length of the proposed special purpose zone is approximately 5.7 km. The location of the proposed SEL and key geographical features are shown on Figure 1 below.

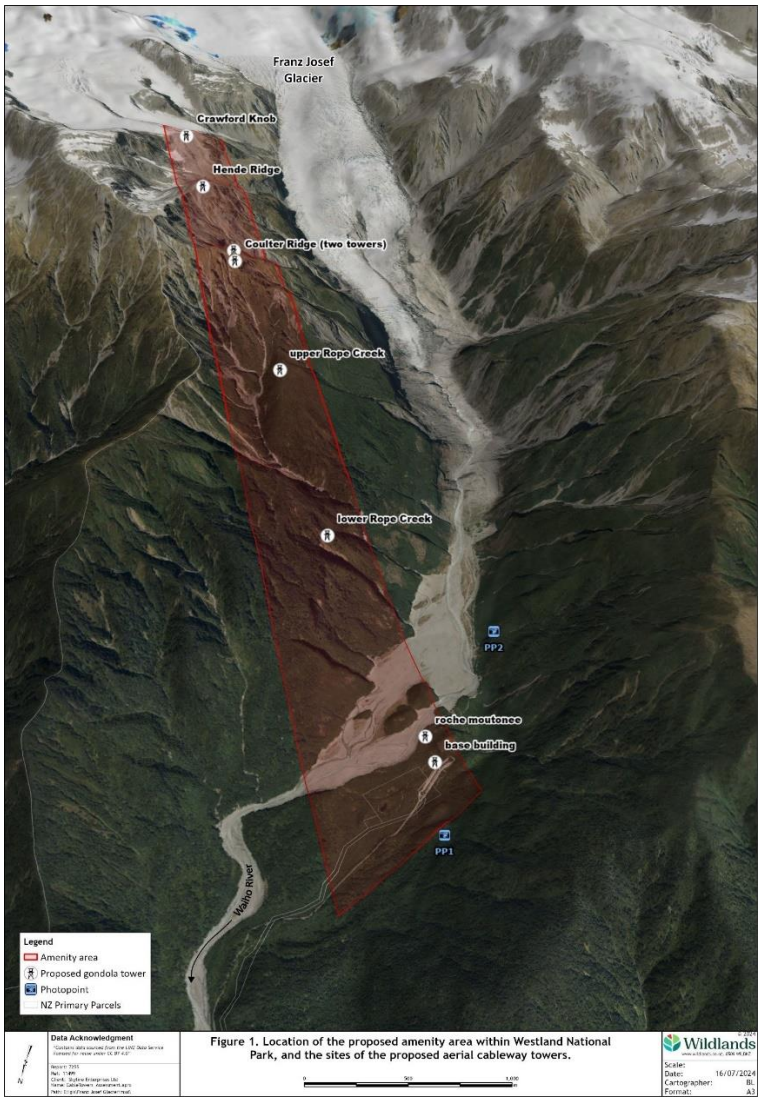

Figure 1. Location of the proposed amenity area within Westland National Park, and the sites of the proposed aerial cableway towers.

[9] SEL seek the inclusion of a new Special Purposes Zone referred to as the Franz Josef Amenities Area Zone (**FJAAZ** or **Special Purpose Zone**) into the TTPP. The purpose of the FJAAZ is to identify and set aside an area that can appropriately facilitate the development of an aerial cableway through a future Discretionary Activity consent process and supported by associated objective and policy framework. Consequential amendments are also proposed to other chapters of the TTPP to facilitate future development within the proposed FJAAZ. These proposed amendments are detailed in the evidence of Mr Sean Dent.

[10] I have undertaken a general review of the geotechnical and natural hazards present in the proposed cableway corridor, the results of which are outlined in my previous report, dated 6 November 2018 (Reference 160644). This report is attached to this brief as **Appendix A**.

[11] The aim of my 2018 assessment was to identify a cableway route through the zone that, where possible, avoids or reduces the risk from natural hazards. This exercise allowed a broad zone to be defined within which the most feasible route between the lower and upper stations is assessed to be present. Detailed modelling was not deemed necessary for this type of broad scale overview, which has relied on field inspections, Lidar survey and existing data.

[12] The philosophy behind the route choice, as outlined in the attached 2018 report at **Appendix A**, is summarised as follows:

(a) The base station is located adjacent to the existing car park. The location is immediately adjacent to competent bedrock exposures on the valley floor that provide some protection from the Waiho River, a stable foundation subgrade, and an opportunity to elevate the structure above overland flow activity from the mountainside to the west.

(b) Once across the Waiho River, the route aims to target elevated locations (e.g. ridgelines) that will enable tower construction to be above obvious hazards such as deep gullies, rock fall, debris flow and avalanche paths, and landslides.

(c) The upper station at Crawford Knob targets competent bedrock suitable for foundation bearing. The location is set-back from the western slopes of Thelma Peak which present a rock fall and avalanche risk.

(d) The overall route choice aims to be sufficiently upslope from the sub-vertical valley sides exposed by glacial retreat, which are considered to be at risk of failure due to loss of ice support.

[13] There is minor scope for route variation within the identified special purpose zone. The key geographical features of Sentinel and Teichelman Rock on the valley floor, the Coulter and Hende Ridgelines, and Crawford Knob will, however, dictate and restrict the route choice.

[14] No further work has been undertaken since issue of the attached.

[15] Further assessment will be required to quantify the natural hazards and geotechnical environment in sufficient detail to support the detailed design and associated resource consents. Further assessment is expected to include, as a minimum:

(a) Qualitative and quantitative assessment of the natural hazards including rock fall, debris flow, avalanche, landslide and flooding, and, if appropriate, risk to life assessments supported by relevant software modelling. Assessments will need to consider the local area around the structure locations and the wider mountain slopes.

(b) Review and design of appropriate hazard mitigation measures, if required.

(c) An understanding of the geotechnical nature of each station and tower location, e.g. rock quality and stability, an understanding of the rock mass, including defects, to support foundation and anchor designs. Drilling may be required to obtain sufficient geological data.

(d) The site is located in close proximity to the Alpine fault. An understanding of seismic design requirements and associated topographic amplification will be required.

[16] From a technical perspective I expect the final project feasibility and engineering requirements will require collaboration between the geotechnical and natural hazards engineer, structural engineer and cableway designer.

Conclusion

[17] My work to date has focused on determining the most feasible route from the existing Franz Josef carpark to Crawford Knob. The assessment has identified a preferred route which avoids or limits exposure to natural hazards, and targets areas where construction of the required infrastructure is considered to be achievable.

[18] Based on this likely indicative alignment, and the level of assessment completed to date, I see no impediments (in principle) to constructing and designing a future aerial cableway which could ensure that risks from natural hazards are less than minor or can be managed appropriately. Key geographic features have been identified which will dictate the chosen route.

[19] Further work will be required to support the final structure locations and is expected to comprise detailed assessment of the natural hazards associated mitigation measures, and the geotechnical nature of each structure location.

Dated: 9 September 2024

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Paul Faulkner

Appendix A - 2018 Report

GeoSolve Ref: 160644
6 November 2018

Skyline Enterprises Ltd

Attention: Grant Hensman

Preliminary Geological and Hazards Report
Franz Josef Glacier - Gondola

1.0 Introduction

This letter report has been completed for Skyline Enterprises for the proposed Franz Josef Glacier Gondola. This work has been completed in accordance with the terms and conditions outlined in Geosolve proposal 160644, dated 7 November 2016.

The aim of this report is to summarise the general geology and natural hazards associated with the proposed Gondola and provide context around the current route choice. Further detailed assessment will be required support future consent applications and specific engineering design.

2.0 Project Description

The proposed gondola site is located approximately 7km to the south of the Franz Josef Township, Westland, Figure 1.1, below shows the site location.

Figure 2.1. Site Location Plan

It is proposed to construct a gondola, which will start on the true left of the Waiho River Valley adjacent to the existing Department of Conservation (DOC) carpark. The route crosses to the true right of the valley in the first 1 km where it remains for the remainder of its length. The total gondola route length is approximately 5.5 km and the alignment is shown on Figure 1.1 above and the attached plan, Figure 1a.

The proposed base station location will be directly adjacent to the existing visitor car-park at the head of the glacier access road and on the downstream side of Sentinel Rock, approximate RL 220 m. The alignment then crosses the lower-mid slopes of Annie Peak and then Mt Gunn and on the south western side of the peak Goatpath where it crosses the Coulter and Hende Ridges. The gondola terminates at the upper station on the immediate north western side of Crawford Knob, at approximate RL 1670 m.

Details of the development, e.g. individual stanchion locations and building details etc. are unknown at this stage of the project. Two key locations are however present mid route on the Hende and Coulter ridgelines. It is expected that to successfully negotiate across the southern side of Goathead peak that structures will be required in these 2 locations.

3.0 Works Completed

The following works have been completed for the purposes of this assessment:

- A review of Geological mapping;
- A review of high resolution aerial photography and site contours;
- Helicopter overflights of the area;
- Broad scale Geomorphological mapping of the route;
- Localised inspection and mapping of the Coulter, Hende; upslope and downslope stations, and;
- Review of hazard assessments regarding the Waiho River.

4.0 Route Choice

Different routes were considered prior to the current proposed alignment. The general philosophy behind the alignment is summarised as follows:

- The base station is located immediately adjacent to the existing car-park with available access;
- The base station is immediately adjacent to bedrock exposures on the valley floor, Sentinel Rock, and the adjacent Teichelman Rock. These features are considered to provide a level of protection from activity associated with the Waiho river, and, provide elevated locations for stanchions on the valley floor. The base station itself will also be elevated above the valley floor in this location.
- A localised debris flow risk is present from the hillsides approximately 400m to the south of the base station, Sentinel rock provides protection from this risk.
- Initially the alignment on the true right targets areas of ice smoothed bedrock, and then the route is elevated above debris and over land flow paths as it climbs towards Coulter Ridge.
- Utilising the Coulter and Hende ridges elevates the alignment above the unstable areas between these 2 ridgelines and, areas of instability along the base of the slopes associated with retreat of the glacier. Spanning between the 2 ridgelines avoids a wide area of rock fall, debris flows, avalanche and general instability between the 2 ridge locations.

- The deep gully with associated broad area of overland and active debris flows at approximate chainage 5000 m is spanned.
- The upper station is located on an elevated ice smoothed exposure of bedrock suitable for building foundations and is set back from steep or unstable slopes. Rock fall and avalanche risk from the western slopes of Thelma Peak are also directed away from this area.

5.0 Site Geology

General

The regional Geological map is summarised on Figure 1a, attached.

The base station is located close to rock exposures on the valley floor, identified as pelitic schist and minor psammitic Schist. Sedimentary deposits, comprising river gravel, sand and silt deposits, are present in the Waiho valley floor. Elevated areas of the alignment are present on pelitic and minor psammitic Schist, and, in the southern half, the Pudding Hill Formation, which comprises thinly bedded sandstone and mudstone flysh, is present.

Seismic

The site area is subject to very high seismic risk associated with rupture of the Alpine Fault. The Alpine Fault is located along the west coast of the South Island and is present approximately 4 km to the north of the proposed lower terminal, see Figure 1a, Appendix A.

There is a high probability (30%) that rupture of the Alpine Fault will occur in the next 50 years[1]. The mean interval between ruptures is understood to be in the order of 330 years, with the last rupture being in the year 1717.

Intense ground shaking is expected during an Alpine Fault rupture, with seismic amplification affects occurring for ridgelines and topographically elevated areas.

Geological mapping indicates other faults, noted as inactive, are present in the study area. These faults run roughly sub-parallel to the Alpine Fault and are shown on Figures 1a to 1d, attached.

Geomorphology

Several active processes are present in the site area which influence the geomorphology, including:

- Uplift of the Southern Alps, principally due to movement along the Alpine Fault;
- Glaciation, including recent retreat of the Franz Josef Glacier and loss of support for the valley sides;
- Slope instability including, land sliding, rock fall, and debris flow;
- Weathering, including high rainfall and freeze-thaw;
- River process including aggradation and avulsion on the valley floor and debris flow from side creeks.

[1] https://www.gns.cri.nz/Home/Learning/Science-Topics/Earthquakes/Major-Faults-in-New-Zealand/Alpine-Fault

Figures 1b, 1c and 1d, attached, show the main geomorphological observations relative to the key locations on the proposed alignment.

6.0 Avalanche

The risk of avalanche affecting the site has been preliminary assessed by reviewing the fall line and topography around key locations. Three key locations with the potential for significant snowfall are present in elevated areas of the proposed alignment, the mid stations at Coulter Ridge and Hende Ridge, and the top station.

The Coulter and Hende ridge locations are elevated above the surrounding topography with no large catchment or potential for accumulations of high snow volumes above them. Local slopes in the immediate vicinity of the infrastructure may result in a low volume accumulation of snow requiring some control, See Figures 6.1 and 6.2 below.

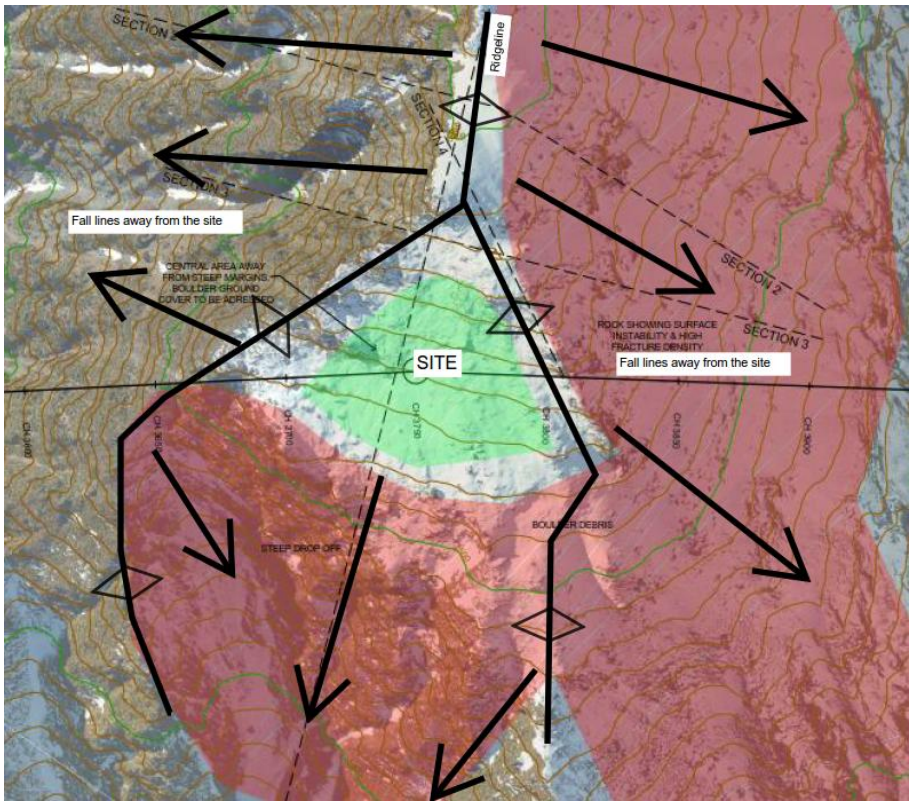


Figure 6.1. Coulter Ridge, site location relative to adjacent topography.

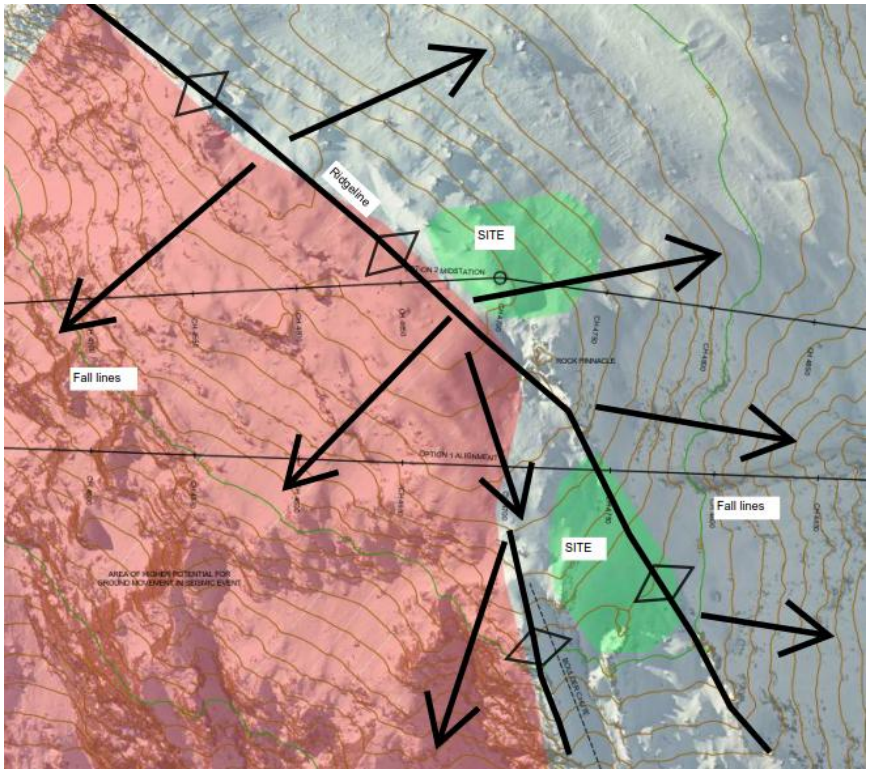


Figure 6.2. Hende Ridge, site location relative to adjacent topography.

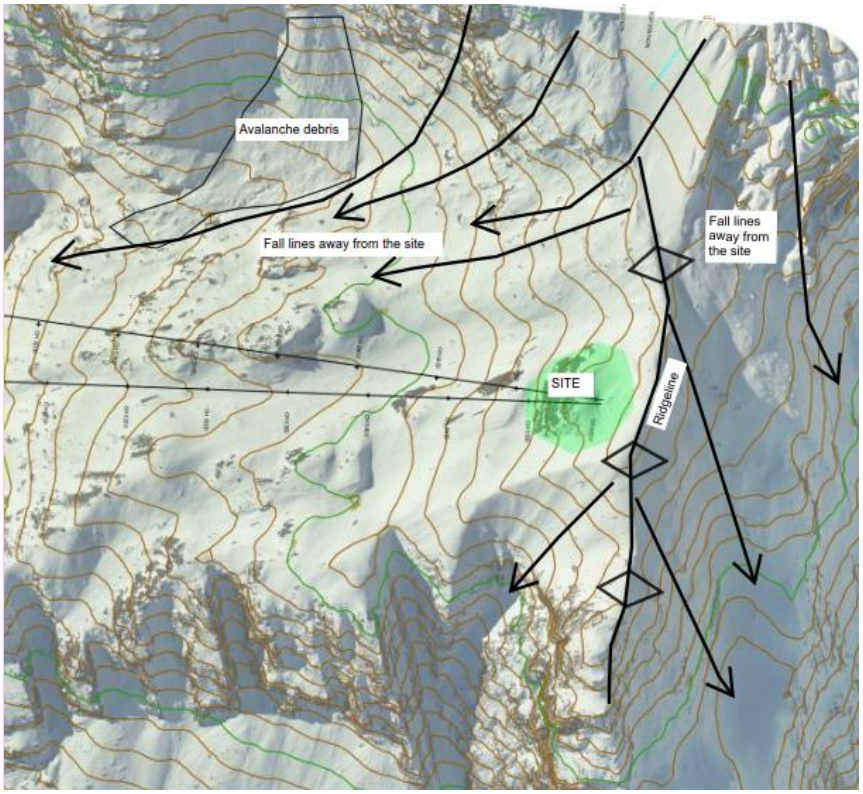


Figure 6.3. Top Station, site location relative to adjacent topography.

Figure 6.3 above shows the lidar data in the area around the top station and Crawford knob. Crawford knob protrudes from the valley side as a 'spur' which provides a locally elevated position. The western slopes of Thelma Peak are present a short distance to the east and fall steeply towards the alignment, however do not fall directly towards the proposed top station location. Site contours indicated debris from this slope is directed in a north-north westerly direction and away from the top station. Avalanche debris observed during the site inspection, and aerial photography, indicates this directional trend. On the south eastern and western side of Crawford knob the ground falls steeply away from the station site. Local slopes in the immediate vicinity of the infrastructure may result in a low volume accumulation of snow requiring some control during the winter months.

Based on the above assessment the alignment is considered favourable with respect to avalanche risk in the first instance. Refining of the risks in the immediate surrounding area of the infrastructure will be required to determine if local control measures e.g. snow barriers or other control measures are required.

7.0 Waiho River

Prior to construction of the current DOC carpark an assessment[2] of the upper Waiho River for the then carpark location, 400 m upstream from the proposed lower station, was undertaken. The assessment reviewed the short to medium term impacts of aggradation and degradation of the valley floor, and the impact of glacial advance/retreat. The assessment noted a lack of data with respect to the valley floor, river levels etc and the recommendations therein are considered by the author to be precautionary in nature.

The study concluded the upper Waiho can be considered to behave as an alluvial fan with relatively even aggradation occurring over the long term. However, evidence indicates the valley floor can be modified rapidly in response to flood events with aggradation and incision occurring over short timeframes. Sentinel Rock and surrounding outcrops are considered to be a significant obstacle to flood waters resulting in the deposition of materials and the resultant risks of avulsion and erosion being higher as a result upstream of these features. Recommendations for the relocation of the kiosk and car-park to a higher terrace on the upstream side of Sentinel Rock were provided.

The carpark was eventually moved further downstream than the recommended location and constructed on the downstream side of Sentinel rock. The carpark and proposed lower station, are therefore downstream and removed from the more active area of aggradation, avulsion and erosion occurring upstream of Sentinel rock. Sentinel Rock itself provides a robust natural barrier to river activity and adjoins an elevated terrace above current river levels. Possible options to increase the elevation of infrastructure further by utilising the lower slope of Sentinel Rock itself are also provided.

[2] Franz Josef Glacier access road – security of road end facilities, T R Davies, 1998, Published by the Department of Conservation.

Based on this preliminary assessment the proposed lower station location is expected to be in a suitable location with respect to Waiho activity, pending further assessment to refine building levels and layout, and local protection works associated with minor creeks on the valley side.

It is likely that the glacier access road, particularly the first 2 km from State Highway 6, is at a greater risk than the proposed lower station location. This section of road is present directly on the edge of the active Waiho river bed and erosion protection works are required to maintain its operation. It is feasible that future erosion/washout of the road could occur, which could indirectly affect the operation of the Gondola.

8.0 Further Work

This letter is intended as a summary of the current route choice with respect to geology and hazards. Further detailed assessment will be required for future consent stages of the project. The local hazard environment will need to be accommodated for in the final design and layout of the final infrastructure locations.

Close collaboration will be required between the lift designer, structural engineer and geotechnical engineer to ensure each stanchion location is suitably located and designed to accommodate the site-specific conditions.

The seismic performance of the Coulter and Hende ridgelines, will be a key component and is likely to require anchoring of structures and stabilisation of local exposures and earthworks.

9.0 Applicability

This report has been prepared for the benefit of Skyline Enterprises Ltd with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement.

Yours faithfully,

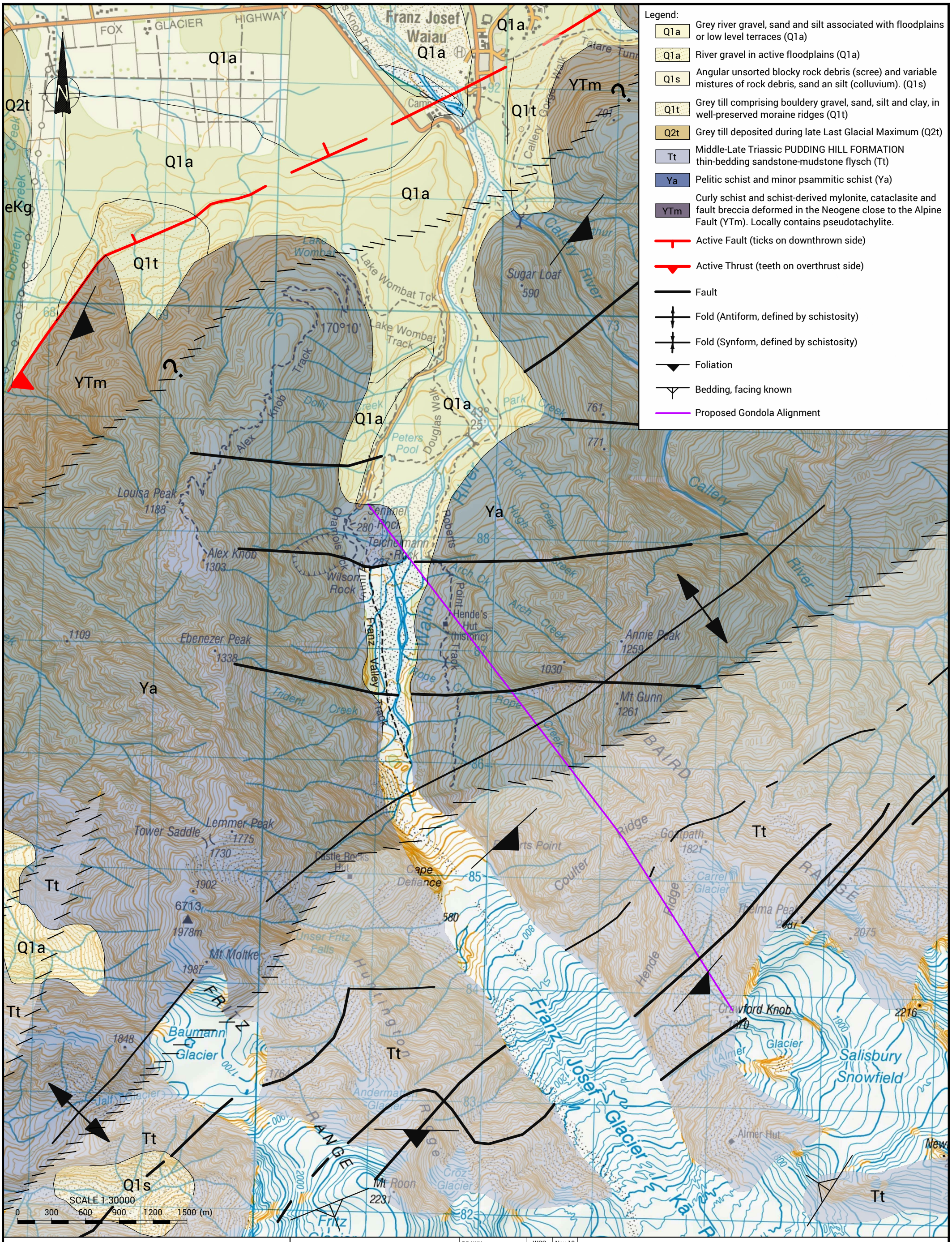
Paul Faulkner

Senior Engineering Geologist

Attachments:

Figure 1a, Site Geology

Figure 1b, 1c and 1d. Geomorphology Plans



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PROJECT No: 160644		

Skyline Enterprises Limited

Franz Josef Gondola

Preliminary Geological Assessment

Site Geology

FIG No: Figure 1

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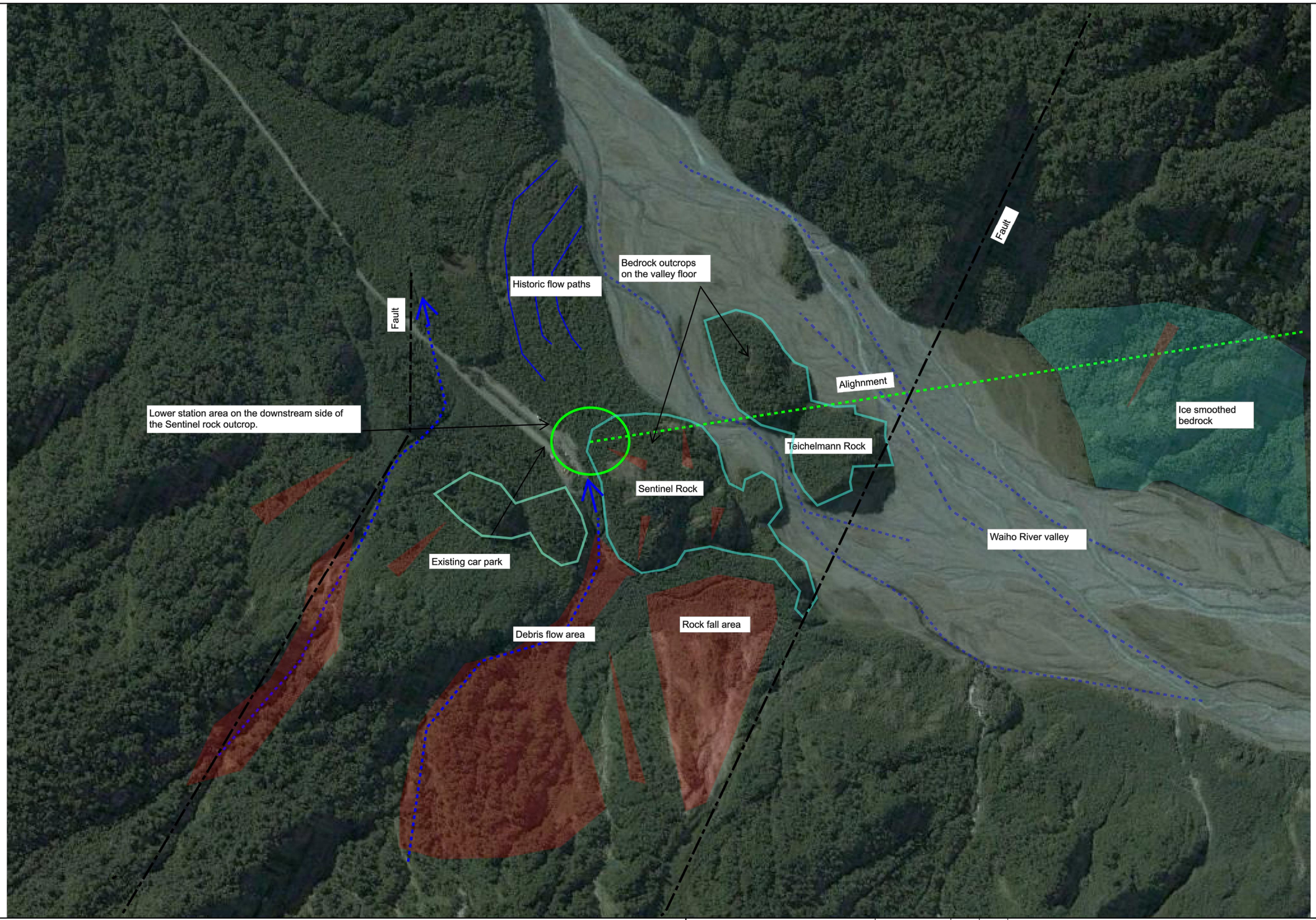

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Preliminary Geological Assessment

Lower Station Area. Chainage 0 - 1250m

FIG No: Figure 1b

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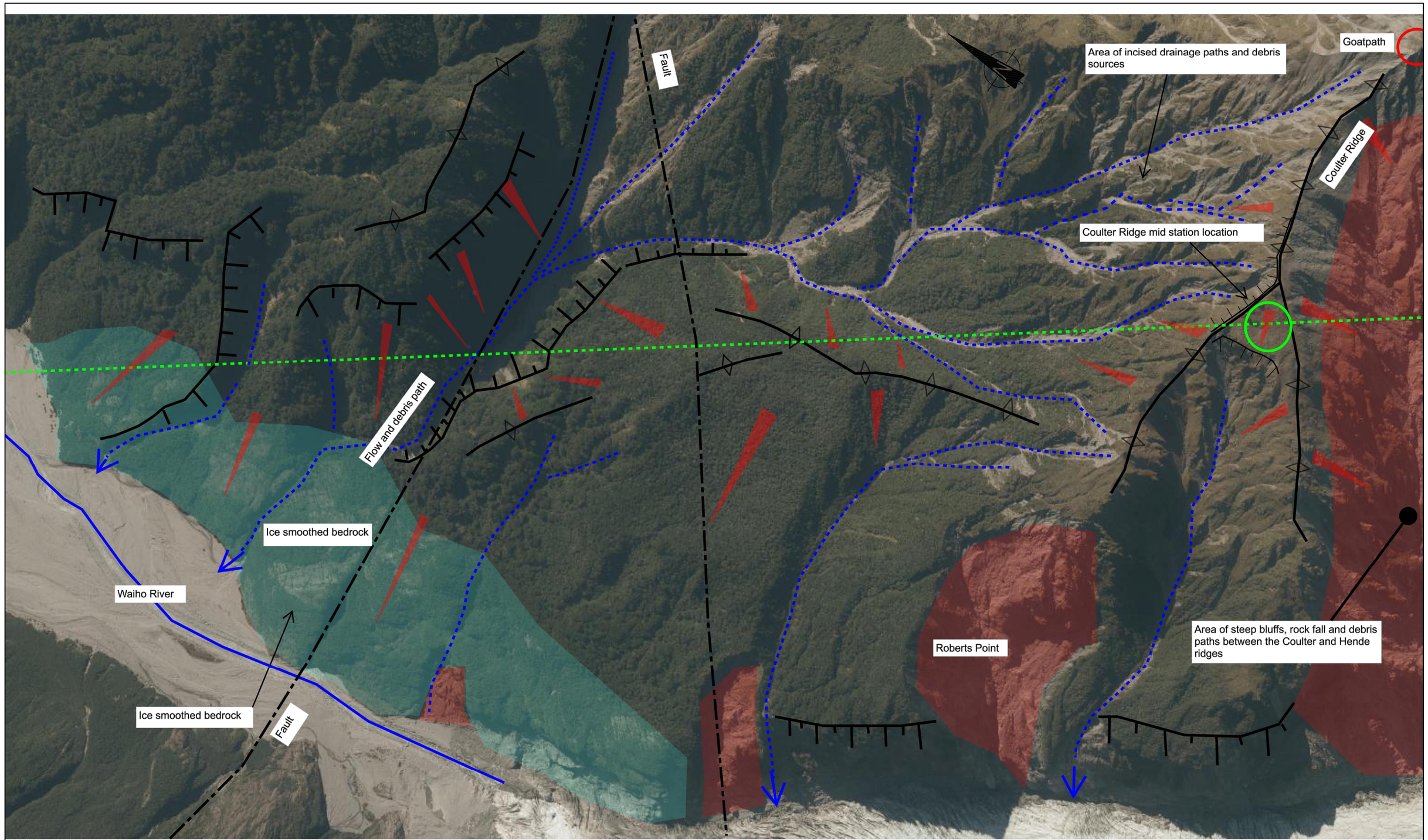

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Preliminary Geological Assessment

Lower Slopes and Coulter Ridge

FIG No: Figure 1c

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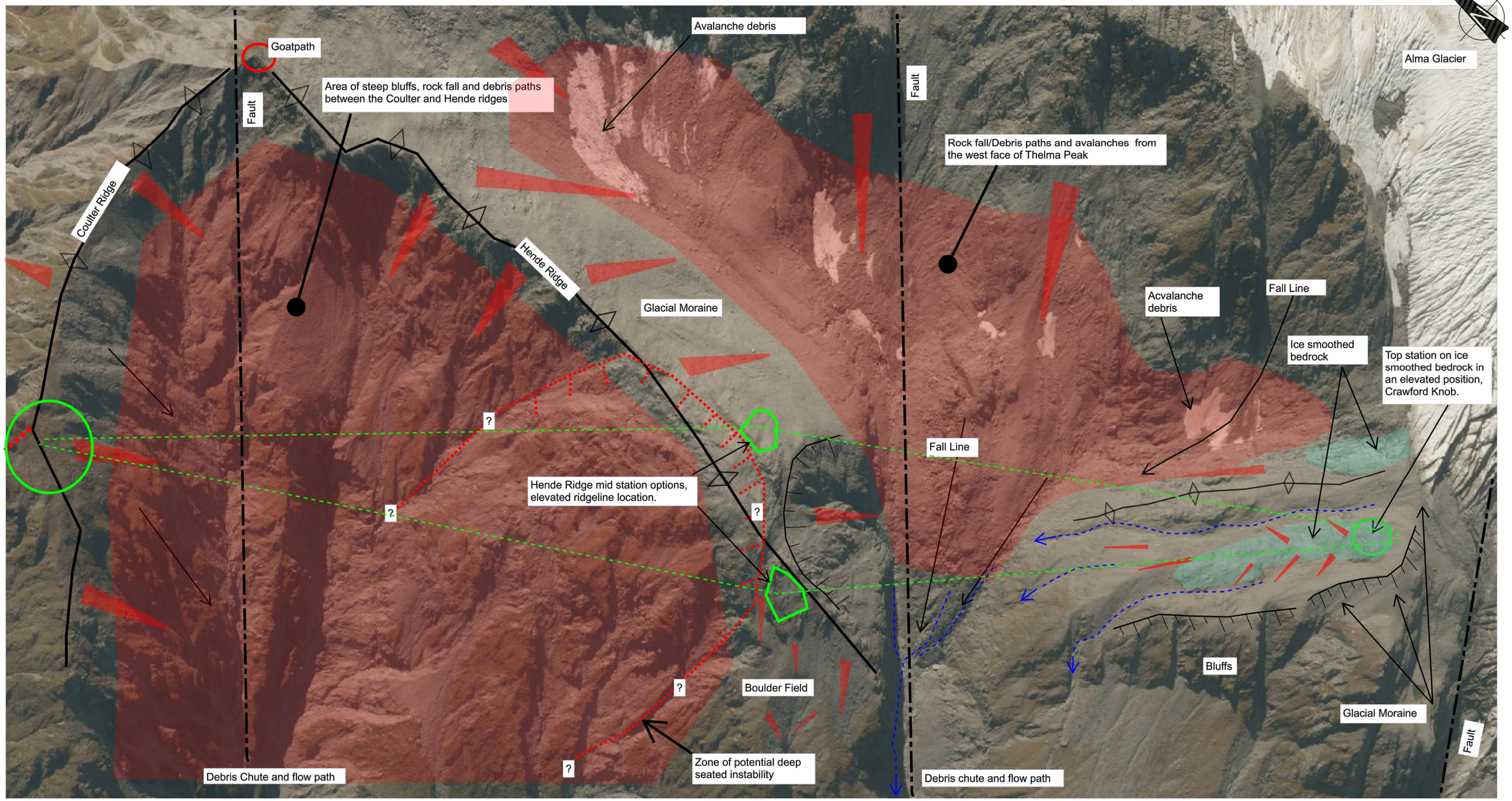

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Preliminary Geological Assessment

Hende Ridge and Top Station Area

FIG No: Figure 1d

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