

TONKIN & TAYLOR LTD. ENVIRONMENTAL & ENGINEERING CONSULTANTS

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RC980009

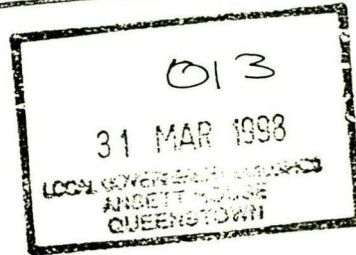


Dunedin Ph 021 341851  
Fax 03 4544989

Our Ref: 890005  
30 March 1998

Queenstown Lakes District Council  
Private Bag 50072  
QUEENSTOWN

Attention: Mr M J Gillooly



Dear Sir,

**RE: Proposed Subdivision Frankton Rd RM980009**

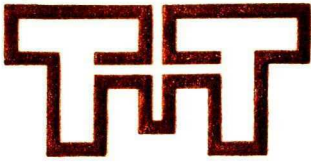
Please find enclosed 2 copies of our review on the above application, carried out in accordance with your instructions.

We trust this provides all information required at this stage, but please advise if any aspects require clarification.

Yours faithfully  
TONKIN & TAYLOR LTD

Graham Salt  
GEOTECHNICAL GROUP





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**QUEENSTOWN LAKES DISTRICT COUNCIL**

**PROPOSED SUBDIVISION, FRANKTON RD  
REF. RM980009**

**GEOTECHNICAL REVIEW**

Our Ref: 890005  
March 1998

Prepared for:

Queenstown Lakes District Council  
Private Bag 50072  
QUEENSTOWN

Distribution:

Queenstown Lakes District Council  
Tonkin & Taylor Ltd

2 copies  
1 copy



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**QUEENSTOWN LAKES DISTRICT COUNCIL**  
**PROPOSED SUBDIVISION, FRANKTON RD RM980009**  
**GEOTECHNICAL REVIEW**

**1.0 INTRODUCTION**

A subdivision is proposed at Frankton Rd, Queenstown (WJ & MM Grant, RM 980009). This report reviews geotechnical issues and the suitability of the site for residential development.

**2.0 BACKGROUND**

The site was originally classed as unsuitable for development in an earlier regional study by the Otago Catchment Board. Since then a more detailed appraisal has been carried out by Canterprise (D H Bell, August 1997: Geotechnical Evaluation, Marina Heights Extension - Frankton.)

**3.0 GEOLOGY**

The site is underlain by schist and capped with deposits of till, beach deposits, lake sediments and landslide debris.

**4.0 INVESTIGATIONS AND DOCUMENTATION**

4.1 General

Site investigation and geological mapping of the site itself are appropriately addressed in the Canterprise report. However, a principal issue is the location of a large schist debris landslide which crosses the north eastern boundary of Lots 8 and 9. Only a small portion of each lot is affected. Mapping of the full landslide is not included with documentation supplied.

4.2 Slope Stability Issues

The landslide deposits are reported to be derived from “a single movement event accompanying the latter stages of lake lowering or possibly following a major earthquake

.... There is no evidence for subsequent reactivation....” The report then refers to the slide as “marginally stable”, and again later its “existing marginal stability”, but concludes that that the “degree of weathering and air-photo studies indicate *present stability*.....”

The reading of these various terms (prior to our site inspection) left us with no convincing conclusion as to the stability for normal conditions. Stability under a future earthquake has not been addressed.

The common mode of failure of large schist slides in Otago is one of continuing gradual creep at rates of several millimetres per year (depending on relative rainfall), rather than “single movement” events. For this reason, and as there is no evidence to the contrary we would expect this slide to be classed as active.

As a result of our investigations comprising site inspection in March 1998, examination of stereoscopic aerial photographs, comparison with other schist derived slides with accurate survey monitoring, and discussions with colleagues (both internal and external to Tonkin & Taylor), we conclude that this is an active landslide, which will be creeping at variable rates - probably reaching about 30 mm/year.

In our opinion, the active slide requires a marginal strip for future downslope movement, so that any dwellings constructed have a distinct clearance from the slide. Our assessment of such a building restriction line (from our inspection and the information presently available) is shown on Figure 1. We appreciate that at the building consent stage, this boundary could be modified as a result of more detailed site specific investigations or monitoring.

Under seismic shaking, local acceleration of movement (particularly rockfall initiation) could be expected. However major catastrophic movement is not typical of this type of schist debris slide. We note the Canterbury recommendation for consideration of a rockfall protection fence for Lot 8. A detail for the fence has not been reviewed.

#### 4.3 Cut Slopes/Retention

Design of cut slopes and retention in most places will be governed by specific proposals for individual houses. The Canterbury report implies that these issues should be left to the building consent stage, and we concur.

#### 4.4 Foundation Design

Information provided indicates that there is a suitable building platform on each lot and with the exception of Lot 10, shallow foundations are expected to be adequate. Lot 10 is reportedly underlain by lake silts. Specific design of foundations (possibly piling solutions) may be necessary. We concur that such issues are best addressed at the building consent stage.

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## 5.0 RESOURCE CONSENT CONDITIONS

A number of recommendations have been made for works that will address geotechnical issues at this site. It appears that the applicant wishes to leave design of all such works to the building consent stage, and there are multiple references to “normal prudence” for these designs. Expectations for the latter may be varied.

For the Council to be “satisfied that the effects will be avoided, remedied or mitigated”, it would be reasonable to request detailed design drawings for those works which apply to the landslide area. In particular:

- (i) location plan and typical section details for the deep groundwater cutoff drain, including details of its path through other sections and outlet.
- (ii) location and design details for the rockfall protection fence

Construction of the works (or approved revisions) could then be made a condition of the resource consent in terms of Section 106(2).

An additional precaution, appropriate to areas where landslide activity is suspected, is that no piped services should cross the slide boundary, as creep movements or seismic shaking may cause pipe rupture and rapid acceleration of the slide when water is injected directly to the slip plane. (A factor in the Thredbo disaster). In this case, it is unlikely that services would come from the direction of the slide anyway.

## 6.0 RECOMMENDATIONS

The following recommendations are made:

1. Adopt a building restriction line. The subdivision is bordered and locally intruded by a large active landslide which will be creeping, probably at rate of about 30 mm/year. We suggest that the active slide requires a margin for future downslope movement, so that any dwellings constructed have a distinct clearance from the slide. Our assessment of such a building restriction line is shown on Figure 1. An advantage of such a restriction is that potential purchasers can be made aware of the adjoining hazard. At the building consent stage, this boundary may be modified as a result of more detailed site specific investigations or monitoring.
2. Request detailed design of landslide protection measures, as proposed by the developer and noted in Section 5 above, at the resource consent stage.
3. Allow deferment of the design of cuts, retention and foundations as these may be most effectively addressed at the building consent stage to meet the specific requirements of each individual lot owner.

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## 7.0 APPLICABILITY

This report has been prepared solely for the benefit of Queenstown Lakes District Council with respect to the particular brief given to us and data or opinions contained in it may not be used in any other context or for any other purposes without our prior review and agreement.

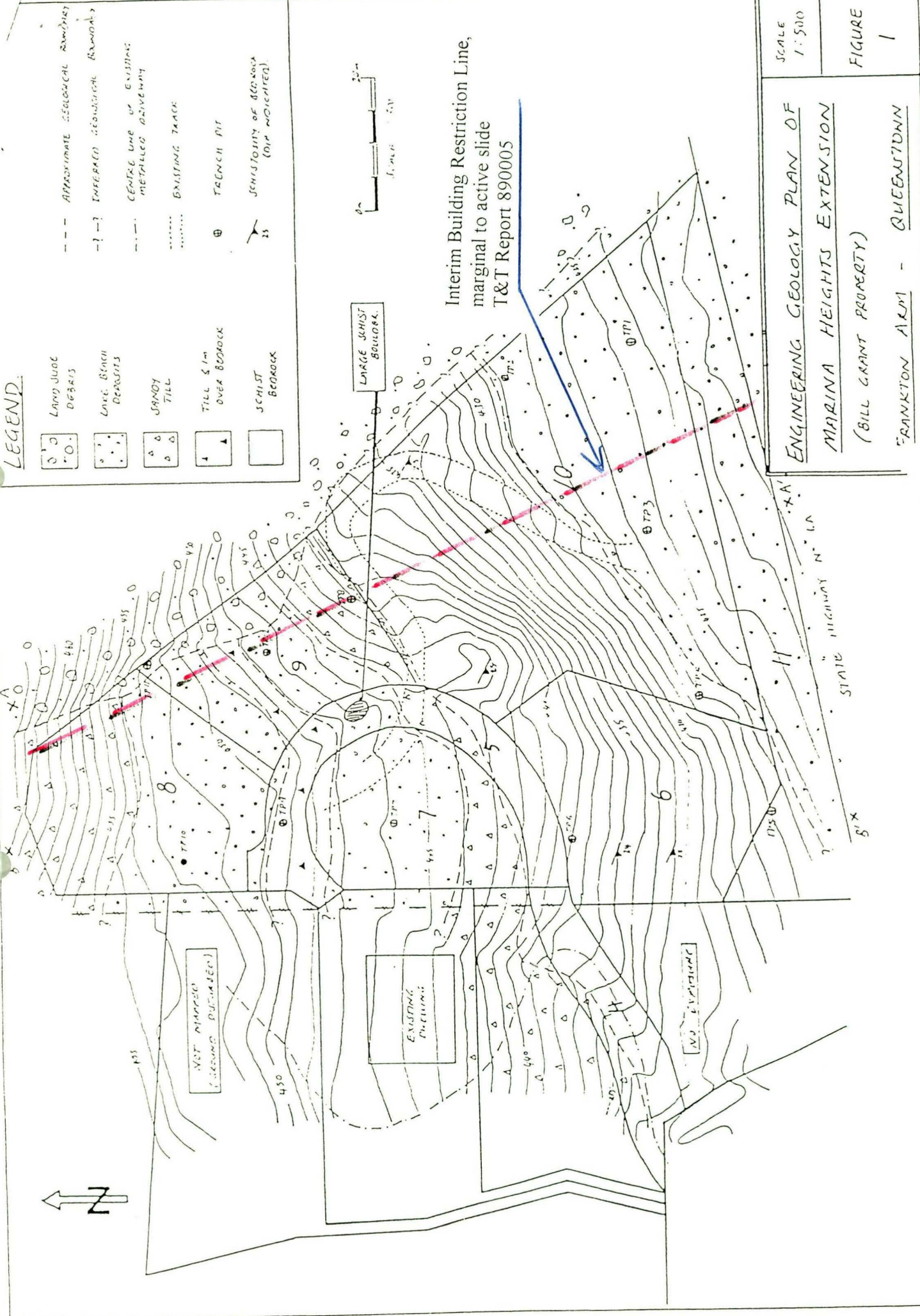
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**LEGEND**

- ○ LAND QUOTE DEBRIS
- ● LATE SILICEOUS DEPOSITS
- △ △ SANDY TILL
- ▲ ▲ TILL & IM OVER BEDROCK
- SCHIST BEDROCK
- - - - - APPROXIMATE GEOLOGICAL BOUNDARY
- ? - ? INFERRED GEOLOGICAL BOUNDARY
- · - · - CENTRE LINE OF EXISTING METALLED DRIVEWAY
- ⋯⋯⋯ EXISTING TRACE
- ⊕ TRENCH PIT
- ⚡ SCHISTOSITY OF BEDROCK (DIP INDICATED)



Interim Building Restriction Line,  
marginal to active slide  
T&T Report 890005

LARGE SCHIST BOULDER

NOT MAPPED (SEEING DISTANCE)

EXISTING BUILDING

NO EXISTING

ENGINEERING GEOLOGY PLAN OF  
MARINA HEIGHTS EXTENSION  
(BILL GRANT PROPERTY)  
FRANKTON ARM - QUEENSTOWN

SCALE  
1:500

FIGURE  
1

