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PLANNING APPLICATION FORM

Section 57 & 58

OFFICE USE
ONLY

Application Number PA2025301
Assess No: A7379
PID No: 2514291

Applicant Name:	BRIDAL SCAM OLIVER			
Applicant Contact Name				
Postal Address:				
Contact Phone:	Home		Work	
Email Address:				

Planning Application Lodgement Checklist

The following documents have been submitted to support the consideration of this application:

1. A current copy of the property title text, folio plan and schedule of easements ☒
2. A completed application form including a detailed description of the proposal ☐
3. A complete plan set: ☐
 - a) Floor plans ☐
 - b) Elevations (from all orientations/sides and showing natural ground level and finished surface level) ☐
 - c) Site Plan showing: ☐
 - Orientation
 - All title boundaries
 - Location of buildings and structure (both existing and proposed)
 - Setbacks from all boundaries
 - Native vegetation to be removed
 - Onsite services, connections and drainage details (including sewer, water and stormwater)
 - Cut and/or Fill
 - Car parking and access details (including construction material of all trafficable areas)
 - Fence details
 - Contours
4. Other: ☐

*If submitting plans in over the counter please ensure they are A3.
All plans must be to scale.*

WEST TAMAR COUNCIL



Application Number: Application Number

APPLICANT DETAILS

Applicant Name: BRIAN OLIVER.

Note: Full name(s) of person(s) or company making the application and postal address for correspondence.

LAND DETAILS

Owner/Authority Name:
(as per certificate of title) BRIAN SONIA OLIVER & REBECCA LOUISE OLIVER

Location / Address: 166 FLINDERS ST BEAUTY POINT

Title Reference:

Zone(s):

Existing Development/Use:

Existing Developed Area:

Are any of the components in this Application seeking retrospective approval?
E.g. Use and/or development that has commenced without a Planning Permit.

YES ☐ NO ☐

(If yes please specify the relevant components):

DEVELOPMENT APPLICATION DETAILS

Proposed Use:

Residential: ☐ Visitor Accommodation: ☒ Commercial: ☐ Other: ☐

Description of Use:

SHORT STAY ACCOMMODATION

Development Type:

Building work: ☐ Demolition: ☐ Subdivision: ☐ Other: ☐

Description of development:

New or Additional Area:

Estimated construction cost of the proposed development:

Building Materials:

Wall Type: Colour:

Roof Type: Colour:

Application Number: Application Number

VISITOR ACCOMMODATION

☐ N/A

Gross Floor Area to be used per lot:	93 sqm	Number of Bedrooms to be used:	3
Number of Carparking Spaces:	3	Maximum Number of Visitors at a time:	6

SUBDIVISION

☐ N/ASubdivision creating additional lots ☐Boundary adjustment with no additional lots created ☐

Number of Lots (existing) :		Number of Lots (proposed) :	
Description:			
If applying for a subdivision which creates a new road(s), please supply three proposed names for the road(s), in order of preference:			
1.			
2.			
3.			

COMMERCIAL, INDUSTRIAL OR OTHER NON-RESIDENTIAL DEVELOPMENT/USE

☐ N/A

Hours of Operation:	Monday / Friday:		To	
	Saturday:		To	
	Sunday:		To	

Existing Car Parking:	
Proposed Car Parking:	

Number of Employees: (Existing)	
Number of Employees: (Proposed)	

Type of Machinery installed:	
Details of trade waste and method of disposal:	

Application Number: _____ Application Number _____

APPLICANT DECLARATION

Owner: As the owner of the land, I declare that the information contained in this application is a true and accurate representation of the proposal and I consent to this application being submitted and for Council Officers to conduct inspections as required for the proposal,

Owner Name
BRIAN JOHN OLIVER
Name (print)

Signed

22-9-2025
Date

Applicant: (if not the owner) As the applicant, I declare that I have notified the owner of my intention to make this application and that the information contained in this application is a true and accurate representation of the proposal,

Applicant Name
BRIAN JOHN OLIVER
Name (print)

Signed

22/9/2025
Date

Please Note: If the application involves Crown Land you will need to provide a letter of consent and this form signed by the Minister, or a delegated officer of the Crown with a copy of the delegation.

**Crown
Consent**
(if required)

Name (print)

Signed

Date

**Chief
Executive
Officer**
(if required)

Name (print)

Signed

Date

If the subject site is accessed via a right of way, the owner of the ROW must also be notified of the application.

Right of Way Owner:

As the applicant, I declare that I have notified the owner of the land encumbered by the Right Of Way, of my intent to lodge this application that will affect their land.

Name (print)

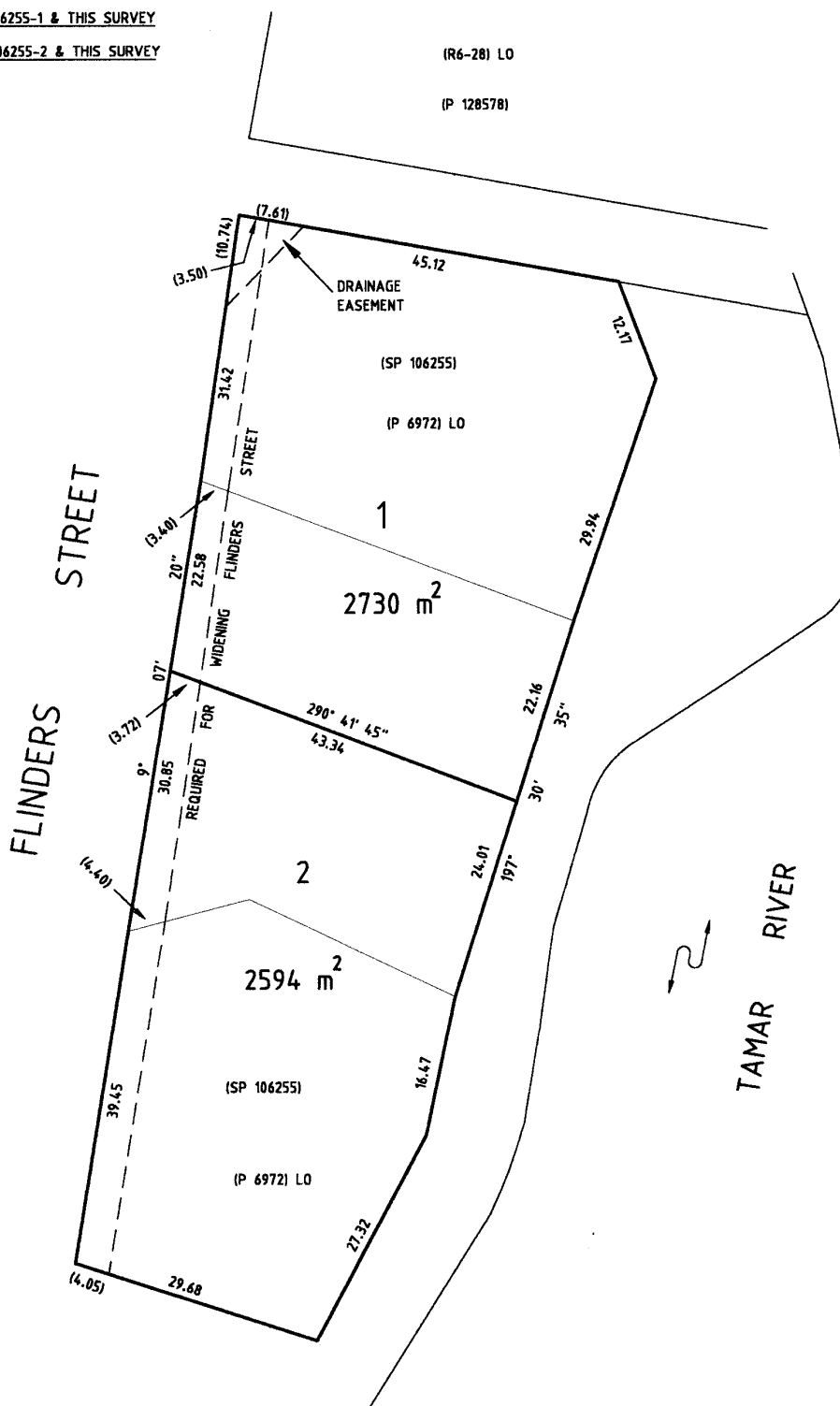
Signed

Date

OWNER: BRIAN JAMES SWAIN, SUSAN SWAIN, ROBERT MITCHELL TURNBULL & THE CROWN		PLAN OF SURVEY		REGISTERED NUMBER SP 140355
FOLIO REFERENCE: CT. 106255-1, CT. 106255-2 CT140355-1000 & 1001		BY SURVEYOR M.R. ROSE OF 2/3 WALDEN STREET, NEWSTEAD		APPROVED 22 JUL 2004 <i>Alice Kawa</i> Recorder of Titles
GRANTEE: WHOLE OF LOT 1 (1735m ²) AND LOT 2 (1599m ²) GRANTED TO THE CROWN WHOLE OF LOT 1000 (995m ²) & LOT 1001 (995m ²) - THE CROWN		LOCATION TOWN OF BEAUTY POINT		
MAPSHEET MUNICIPAL CODE No 129 (4844-42)		LAST UPI No 4109241 4109242	LAST PLAN : SP. 106255	ALL EXISTING SURVEY NUMBERS TO BE CROSS REFERENCED ON THIS PLAN

LOT 1 IS COMPILED FROM CT 106255-1 & THIS SURVEY

LOT 2 IS COMPILED FROM CT 106255-2 & THIS SURVEY







**LANDSLIDE RISK ASSESSMENT
PROPOSED CHANGE OF USE
166 FLINDERS STREET, BEAUTY POINT**

Prepared for: **Brian Oliver**

Date: 6 November 2025

Document Reference: TG25209/1 - 01report

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Appendices

Appendix A Review of Landslide Reports Beauty Point

Appendix B Selected Site Photographs

Appendix C Landslide Risk Terminology

Appendix D Risk to Life

Version	Date	Prepared by	Reviewed by	Distribution
Original	6 November 2025	David Gibbons	Dr Wayne Griffioen	Electronic

1 INTRODUCTION

1.1 Practitioner details

Lead/coordinating consultant name	Wayne Griffioen
Academic Qualification/s	BE (Hons) University of Western Australia PhD Civil Engineering, University of Western Australia
Relevant Experience	
Business name and address	Tasman Geotechnics
Contact phone number	03 6338 2398
Email address	wayne@tasmangeotechnics.com.au
Signature	
Date	6 November 2025

1.2 Methodology

This report has been prepared in accordance with the **Practice Note Guidelines for Landslide Risk Management 2007** and the **Tasmanian Planning Scheme – State Planning Provisions C15.0 Landslip Hazard Code**.

Note that the terms landslip and landslide are used interchangeably in this report and are entirely equivalent.

1.3 Planning Scheme

The Tasmanian Planning Scheme (the 'planning scheme') has been effective in the West Tamar municipality since 9 February 2022. The primary purpose of this report is to address the risks of landslip associated with a proposed change in Use per Code 15.0 (Landslip Hazard Code) of the State Planning Provisions of the planning scheme.

The site is entirely within a High Landslide Hazard Band, and a Proclaimed Landslip Zone A. It contains an existing dwelling and is zoned as General Residential.

The property owner wishes to use the site for Visitor Accommodation. Visitor Accommodation is a Permitted Use under C8.2 of the planning scheme. Because the site is in a High Landslide Hazard Band, there is no exemption from consideration of the Landslip Hazard Code for the change in use under C15.4.

The proposed Visitor Accommodation will utilize the existing dwelling. No new work is proposed. Clause C15.5.1 of the planning scheme addresses Use within a landslip hazard area.

The objectives are:

That uses, including critical, hazardous or vulnerable use, can achieve and maintain a tolerable risk from exposure to a landslip for the nature and intended duration of the use

There are no acceptable solutions. The performance criteria state that:

P1.1

A use, including a critical use, hazardous use, or vulnerable use, within a landslip hazard area achieve and maintain a tolerable risk from exposure to landslip, having regard to:

(a) the type, form and duration of the use; and

(b) a landslip hazard report that demonstrates that:

(i) any increase in the level of risk from landslip does not require any specific hazard reduction or protection measure; or

(ii) the use can achieve and maintain a tolerable risk for the intended life of the use.

P1.2

If landslip reduction or protection measures are required on land beyond the boundary of the site, the consent in writing of the owner of that land must be provided for that land to be managed in accordance with the landslip reduction or protection measures.

There are additional performance criteria (P2, P3 and P4) for critical, hazardous and vulnerable uses respectively, which do not apply to this proposal.

A landslide risk assessment is to address risk to property and risk to life.

Although tolerable levels of risk for property loss are rarely quoted in literature, using the qualitative risk to property criteria in AGS (2007d) a Moderate risk profile would be considered as a tolerable level of risk for existing development as well as existing landslides. AGS notes that Existing Landslides (as is the case here) will likely require remedial works and then consequently become a New Constructed Slope. This is not the case, and hence the categorization of Existing Development is a better fit for the site in this instance.

AGS (2007c) suggests the tolerable loss of life individual risk should be 10^{-5} /annum for new constructed slopes, new development, or existing landslide, and 10^{-4} /annum for existing slopes or existing development.

For the proposed works, the following tolerable levels of risk are adopted;

- Risk to property: Moderate,
- Risk to life: 10^{-4} /annum.

2 BACKGROUND INFORMATION

2.1 Regional Setting

The site is situated adjacent to the foreshore, in the mid-northern part of Beauty Point. Early settlement at Beauty Point centered on the relatively steep east facing slopes adjacent to the river, which forms one edge of a broadly wedge-shaped plateau which tapers to the north.

The top of the plateau is about 60m above sea level. On the eastern side of the plateau, the ground falls steeply toward the Tamar River at about 25° near the crest, flattening to a midslope bench at about 30m to 40m above sea level with slopes of about 7° to 10°. East of Flinders Street the slope typically steepens again to the river foreshore.

Older and recent landslides have occurred along the east facing slopes, from the plateau crest to the foreshore.

2.2 Geology

The Mineral Resources Tasmania (MRT) Digital Geological Atlas, 1:25,000 Series, Bell Bay sheet, shows the surface geology of the site to be mapped as Cenozoic aged sediments, described as “*dominantly non-marine sequences of gravel, sand, silt, clay and regolith*”.

There are known discrepancies in the published mapping in the Beauty Point area, carried over from one mile to the inch mapping conducted by Gee in the late 1960s/early 1970s. In particular, the mapping shows a laterally continuous exposure of Cenozoic aged basalt to the west of the site, whereas the actual exposure is much less. In many cases the more recent 1:25,000 scale Deviot Landslide Map Series Simplified Geology sheet is preferred. In this instance the two map sheets agree for the surficial geology at the site itself (Cenozoic aged deposits), although they differ in other areas. An extract of the Deviot Landslide Map Series Simplified Geology sheet is presented in Figure 1.

2.3 Landslide Inventory

There are several large (regional scale) landslides of unknown activity state at Beauty Point, with the largest being ID 1021 which covers a significant proportion of the Beauty Point foreshore and adjacent slopes, including at the site. Landslide 1021 is the largest landslide zone in Beauty Point and is mapped as extending from the crest of the plateau downslope to the foreshore and about 275m offshore into the Tamar River, with the furthest offshore extent corresponding to the locally deepest part of the river channel. How the underwater extent was determined is unknown to us. Landslide 1021 is about 1300m long, north to south.

Unknown activity state means that the landslide has not been observed to have been active in modern times (i.e., since European colonization). Nevertheless, the landslide can be recognized as a feature in the landscape. Land which has failed previously may, under some circumstances, be more prone to future landsliding than land which has never previously failed.

Wholly contained within the boundary of the regional scale Landslide 1021 are four recent or active landslides:

- ID 1025 and 1028, the Beauty Point North Landslides,
- ID 1027, the Beauty Point Central Landslide, and
- ID 1029, the Beauty Point South Landslide.

A classification of Recent or Active means that the landslides have been observed to be active in modern times.

The MRT Landslide Inventory Map shows that Landslide 1025 covers most of the site, including the existing dwelling. Landslide 1028 slightly encroaches onto the south-eastern corner of the site. The most easterly part of the site is not mapped within Landslides 1025 or 1028 but is still within Landslide 1021.

Landslides 1025 and 1028 have been active within the past century, and Landslide 1028 has resulted in damage to residential property. In particular, Landslide 1028 caused catastrophic damage to a (former) house at 175 Flinders Street, just west of the site.

Known landslides from the MRT database along with the declared Landslip A and B areas are shown in Figure 2.

2.4 Landslide Susceptibility Mapping

The Bell Bay Landslide Susceptibility Map published by MRT shows a potential source area for landslide (re)activation over most of the site, with a potential runout zone in the eastern part of the site.

An extract of the MRT Slide Susceptibility map is presented in Figure 3.

2.5 Previous Reports

A history of landsliding at Beauty Point drawn from various sources but principally newspaper reporting from the early 1900s and Department of Mines/MRT reports from the second half of the 20th century is presented in Appendix A.

Almost all the discussion is of the recent or active landsliding, constrained generally within the boundaries of regional scale landslide ID 1021.

In summary, recent landslides are known to have occurred:

- Circa 1910, north of the Beauty Point Hotel (possibly at the Beauty Point Central Landslide/Crozier Street)
- Circa 1910, at an unknown location (Lockwood's property)
- Circa 1910, at the Beauty Point South Landslide
- Circa 1958, at the Beauty Point Central Landslide
- Circa 1958, at the Beauty Point North Landslide (i.e., at the site)
- In 1969, at the Beauty Point South Landslide

Several areas are reported to have been stabilized with piling: along Flinders Street in multiple discrete locations (including at the Beauty Point North Landslide) and adjacent to a former tramway below Flinders Street.

All the damage reports in the MRT database are on the lower slopes and generally clustered around the recently active landslides, except for a single point at 116 Oxford Street, reported by Benn (1971). This is of interest because it is in the head scarp area of the regional scale Landslide 1021, which could conceivably indicate movement at the regional scale. However, the report notes that:

The house is situated on the crown of an old slide and is approximately 25 ft from the scarp. The slope of the ground ranges from 2-3° where the house is located to 25-30° on the scarp in front of the house. The soil consists of silt and clay with minor sand and gravel. The concrete foundations of the house have cracked in a few places and a separation of up to 1 cm horizontally in one crack indicates movement towards the scarp face. No other indications of movement were observed, but after heavy rainfalls some erosion is occurring on the steep slope in front of the house. The erosion should be prevented as much as possible, and consequently trees and grass should not be removed from the scarp or the area between the house and the scarp.

The damage is described as 'insignificant' and nothing in the report points to movement of the regional scale landslide.

The various newspaper reports and older MRT reports do not specifically identify causes for landslide events. Nevertheless, there appears to be a temporal association with rainfall, and vegetation clearing, excavations for road or tramway construction, and wetting of the soils from a leaking water pipe have all been suggested as contributing factors to the occurrence or re-occurrence of movement on the recently active landslides.

Jennings (1963a) referred to the regional scale landslide features he had observed:

From a study of the area it is clear that the small slips are simply small unstable wedges along the front of an old major slide extending from south of Beauty Point to Inspection Head.

Stevenson (1975) drew similar conclusions:

The Beauty Point landslip occurred in clay and sand with intercalated basalt in an escarpment about 60 m high. Its age is unknown and probably prehistoric, but secondary effects have continued intermittently since at least 1900.

The destruction of property in Beauty Point has resulted from a secondary activity in the form of slow earthflows moving down from the heaved foot of the primary slip.

In summary, the regional scale landsliding at Beauty Point is an older landscape feature which has been variably described as 'old' and 'prehistoric' and which we tentatively identify as early to

mid-Holocene, whereas the recent or active landslides are smaller, localized and discrete failures in specific locations along the toe of the regional scale landslide, active in the 20th century.

2.6 Landslide Time Scales

As described above, there are two 'classes' of landslides mapped at Beauty Point: relatively large (regional scale) landslides of unknown activity state, and smaller landslides which are:

- a. Wholly contained within the larger, older landslides, and
- b. Recently active, having caused damage to residential property and other infrastructure in modern history, in some cases on more than one occasion.

These two classes of landslide have been active on separate timescales and therefore have differing implied probabilities of (re)activation.

Most landslides in Tasmania are undated, i.e., no attempt has been made to ascribe an age to landslides which have not been observed to be active during the modern era (i.e., since European settlement). Per the Department of Premier and Cabinet (2013):

The date of first time failure and the activity state is poorly known across most of the landslide records. Landslide events that have been directly observed and recorded since European settlement are classified as Recent or Active. However, for most of the landslides in the landscape their age is uncertain and they have not been directly dated using established geological dating methods, which is beyond our resources. These landslides are classified as Activity Unknown.

The only research we are aware of which ascribed dates to a Tasmanian landslide was by McIntosh and Barrows (2011), which used terrestrial cosmogenic nuclide ('TCN', aka surface exposure) dating methods on large dolerite boulders exposed in a slope deposit on the Nicholas Range.

Pánek (2019) conducted a review on >1200 previously dated large Quaternary aged landslides from across the globe, and observed that:

As inferred from landslides dated to the Late Glacial and Holocene, glacial-interglacial transitions are the major intervals of enhanced landsliding, but the length of this interval varies between distinct types of landscapes. Mass movements in non-glaciated temperate mountain ranges, arid and tropical regions, and coastal areas intensified soon after the onset of the Holocene alongside the warming and wetting of the climate... Although the incidence of landslides was ubiquitous throughout the Holocene, the mid- to late-Holocene transition (~5–4 ka) was especially favourable for the origin of landslides across distinct types of landscapes, indicating a strengthened role of mass movements during the culmination phases of interglacial climate optima.

Apart from the study by McIntosh and Barrows, there were no dated landslides from southern Australia included in the Pánek database. Pánek noted a strong temporal bias towards more recent landslides in the dataset, which he attributed to the removal of older landslides by erosion.

Clague (2015) confirms that glacial action (in particular) tends to destroy evidence of landslides:

In arid environments that were not glaciated in the Pleistocene, landslides with remnant surface expression may date back millions of years. In contrast, in areas that were covered by alpine glaciers and continental ice sheets during the Pleistocene Epoch, most paleolandslides are Holocene in age (<11,600 years old).

The last glacial maximum was 21 +/- 3ka, but in Tasmania only the Central Plateau and West Coast ranges were glaciated (Barrows et al., 2002). Therefore, landscape features in the Tamar Valley could not have been eroded by glacial activity in the most recent glaciation. Hence, the oldest landslides in the Tamar Valley could conceivably be older.

Nevertheless, it is reasonable to assume that a realistic minimum age for the oldest Tamar Valley landslides is c. 6000 – 11,650 years, being temporally associated with the early Holocene sea level rise (EHSLR) as alluded to by Pánek.

The EHSLR was a rapid c. 60m global sea level rise, driven by increasing atmospheric temperatures and ice sheet decay. Smith et al. (2011) noted that:

There is a striking coincidence in the timing of the EHSLR and a number of significant geological and climate events

Lambeck and Nakada (1990) studied the Australian coast and noted that:

The observations indicate that present sea-level was reached at about 6000 years ago and that since then level has remained constant to within a few metres.

This puts the 'culmination phase' of Pánek to be c. 6000-years before present (BP).

Rising sea levels by themselves may not necessarily cause landsliding. Pánek (2019) notes that the interrelationship between climatic factors and landsliding is complex, and the same climatic variations may lead to increased or decreased landslide activity in different regions and with different landslide types. Smith et al. (2011) report a temporal correlation between submarine sliding and rising sea levels, with suggestions of causative mechanisms. For terrestrial landslides, the causative mechanisms for the temporal correlation between rising sea level and landsliding may be more related to changes in precipitation and groundwater pore pressures rather than due to rising sea levels *per se*. Ezzy and Mazengarb (2007) suggest coastal erosion as a contributing factor:

During interglacial periods (such as the present Holocene) when sea levels are high, there is a contrasting effect on landscape evolution and mass wasting processes according to conventional geomorphology theory. Based on global sea level curves the Tamar Valley was inundated by the sea reaching a maximum at approximately 6000 years BP to form a ria-type estuary. The rise in sea level would have been accompanied by coastal erosion and the removal of toe support, leading to an increase in slope instability.

Given that the sea level peaked at about 6000 years ago and has remained relatively constant since, this may represent an absolute minimum age for the regional scale landslides at Beauty Point. However, we do not exclude the possibility that the landsliding commenced earlier (such as the early Holocene) and continued in the period leading to up the sea level reaching the current levels.

We note that glacio-isostatic rebound is considered a contributing factor to Holocene landslides in other parts of the world (e.g., Smith et al., 2011) but in Tasmania the implied uplift during the last 120kyr is 14 – 16m, much less than the EHSLR (Corbett, 2014).

Without actual dating, the age of the regional scale landsliding at Beauty Point remains unknown. Based on the available evidence, we consider that it is likely in the age range of >21 to 6kyr, and most probably ~11 to 6kyr. We note that it may be possible to undertake TCN dating on rafted blocks of Cenozoic aged basalt which are found on the lower slopes at Beauty Point and elsewhere in the Tamar Valley (such as at Deviot), but such work is outside the scope of this report.

Clague (2015) notes that:

Assessments of landslide risk are based on reliable frequency-magnitude (F-M) curves, which are plots of the size of landslides against their average return period. On an F-M curve, smaller events with shorter average return periods are commonly anchored with historical data, but larger, more rare events are based on paleolandslide data. When performing such risk assessments, different types of landslides with different possible causes and triggers must be treated separately.

At Beauty Point, all the recently active landslides are relatively small features, wholly contained within the broader regional scale landslide masses. Hence, these are localised failures of previously disturbed ground, and not (re)activations of the regional slides. These are known to have been active in the last century, and in some cases on multiple occasions. Therefore, the regional scale events appear to be correlated with a 6000 – 10,000+ year timescale and were accompanied by a dramatic shift in global climate, whereas the small-scale events are correlated with a 50 – 100-year timescale, under generally similar climate conditions to the present.

2.7 Proposal

It is proposed to change the use of the existing property from Residential (owner-occupied or long-term tenancy) to Visitor Accommodation. No physical work is proposed.

The house has already exceeded its minimum assumed design life of 50 years (see following section) but given that the house appears to be well maintained and in good condition, the duration of the proposed Use is indefinite. For assessment purposes, we will take the design life to be 100 years from the earliest known date where the house was constructed (1969, see following section). This extends to 2069, or about 44 years from the present.

3 SITE CONDITIONS

Selected site photographs are presented in Appendix B. The site layout is shown in Figure 4.

The c. 2728m² site is located between Flinders Street and contains an existing house. The site has an overall fall of about 8° towards the east but can be broken into several zones by slope. About 15m west of the house is an embankment rising towards Flinders Street. This has a typical fall of about 14°. Around the house itself, the typical slope is about 8°. To the east and south of the house, the typical slope is about 5°.

The site is separated from the river foreshore by a parcel of land managed by NRE Tasmania. The foreshore lot varies in width from about 10m to about 30m. Therefore, the site has no direct foreshore exposure. The slope within the foreshore lot is relatively gentle, apart from at the ~3m high foreshore scarp.

The beach has a gravelly (lag) surface, and the erosional foreshore scarp is generally protected with revetment. The revetment is somewhat patchy, with areas of natural soil exposed at various locations. In one spot, a lack of revetment has led to undercutting of tree roots. The natural soils are talus, with gravel to cobble sizes clasts generally in a fine-grained matrix; these soils would generally be classified as (Gravelly) CLAY. At one point, near the high tide line, the talus appears to overlie weathered in-situ rock, possibly sandstone.

The site contains an existing house and outbuildings. A page about the site retrieved from realestate.com.au on 30 October 2025 indicates the house was constructed in 1990, however we do not believe this is correct. Examination of historic aerial photographs shows that there was a house on the site, at approximately the location of the present house, in 1946 (the earliest available image). A higher resolution image from 1969 shows the house at that time to be in the same location and with the same configuration (roof layout) as the present house. Therefore, the house has been present since *at least* 1969. The MRT landslide damage record database has an entry for the house at the site, but without a classification of the severity of the damage, or a record of the date. In our opinion, the most likely scenario is that the (original) house may have been damaged in the 1958 landslide which caused catastrophic damage to the house at 175 Flinders Street (directly opposite the site), and could potentially have been demolished and reconstructed, or repaired afterwards. In either case, we infer that this most likely occurred between 1958 and 1969, and the house has been in the current location and configuration since then (notwithstanding any later renovations or internal alterations).

There are several outbuildings on the site. There is a garden shed to the south-east of the house. To the south, there is a single garage with attached carport, and another garden shed just east of the garage. There is an approximately 10m x 12m asphalt sealed hardstand between the house and garage, and an asphalt sealed driveway. Whilst the driveway has been present since at least 1969, it was only sealed c. 2014. The garage/carport structure was either constructed or reconstructed at a similar time.

The house and outbuildings all appear to be in good condition. The asphalt sealed driveway and hardstand surfaces are in good condition, apart from some minor cracking of the asphalt within the carport. The eastern side of the hardstand is about 1m above the natural ground level and is retained with concrete blocks and timber. Whilst the retention is clearly not engineered, it appears to be sufficient for purposes (considering the low height), and wheel stop beams prevent parking close to the retained edge.

Upslope of the house, there is a ~1m high post and whaler type retaining wall, made from concrete beams and posts. The wall is leaning downslope with a maximum deviation from vertical of 10 – 12°. There are a tree and other vegetation in a garden bed directly above the wall. The wall is at least 10m upslope of the closest structure (a garden shed) and, despite the lean, does not appear to be in danger of collapse.

There is an outdoor area north of the house which is up to about 1m above natural ground level, which is retained with a concrete post-and-whaler wall like the wall west of the house. The wall appears to be in good condition.

Surrounding the house the site is generally vegetated with grass (lawn), with scattered trees, particularly near the southern boundary. The trees do not exhibit bent trunks or leans which may be associated with landslide movement. There is a groundwater spring in the south-western corner of the site, at the base of the embankment below Flinders Street. There is a poorly defined drainage path across the lawn at the rear of the carport, where the groundwater seepage flows towards the east, and the surface soils are moist in this area. There is also an area of moist surface soil near the south-eastern corner of the hardstand, without an apparent source. There are occasional basalt cobbles or boulders in the soil in the southern part of the site.

The surface of Flinders Street appears to be in good condition. There is a power pole west of the house, which has been reinforced on two sides and has a slight downhill lean. There is a surface drain downslope of Flinders Street which captures runoff from the road. This flows north, and underneath the driveway in a culvert before continuing in an open drain north of the site and eventually discharging onto the foreshore.

There is no cracking in the soil, or distress to structures other than as described above. It is not apparent from a surface inspection that the site had previously been affected by landslide (~67 years ago), and there are no indications of recent instability. Nevertheless, the moderate slopes, talus soils and groundwater spring are all indications that slope stability must be considered now and if any works are proposed in the future.

4 LANDSLIDE RISK ASSESSMENT

4.1 General

Risk assessment and management principles applied to slopes can be interpreted as answering the following questions:

- What might happen? (HAZARD IDENTIFICATION).
- How likely is it? (LIKELIHOOD).
- What damage or injury might result? (CONSEQUENCE).
- How important is it? (RISK EVALUATION).
- What can be done about it? (RISK TREATMENT).

The risk is a combination of the likelihood and the consequences for the hazard in question. Thus, both likelihood and consequences are considered when evaluating a risk and deciding whether treatment is required.

The qualitative likelihood, consequence and risk terms used in this report for risk to property are presented in Appendix C and are based on the Landslide Risk Management Guidelines, published by Australian Geomechanics Society (AGS, 2007). The risk terms are defined by a matrix that brings together different combinations of likelihood and consequence. Risk matrices help to communicate the results of risk assessment, rank risks, set priorities and develop transparent approaches to decision making.

4.2 Geotechnical Model

A geotechnical model is a representation of the subsurface conditions, including soil and rock masses, used in engineering and construction projects. It helps engineers understand the properties and behaviors of the ground to design safe and effective structures. Key components of a geotechnical model include the types and characteristics of rocks and soils, and the distribution and movement of groundwater.

The availability of information from which to derive a geotechnical model often changes over time, and hence a geotechnical model may evolve as new information becomes available. Some

aspects of a geotechnical model are interpretative, particularly when data is limited (often in the early stages of a project).

With that in mind, the geotechnical model for the site is as follows:

The MRT mapping shows that the site is on a mapped (regional scale) landslide, implying that the surficial soils should be generally expected to be slope colluvium or talus, unless it has locally been removed by a later erosive process, or a local area is within a zone of depletion rather than accumulation. Being on the lower slopes, we would generally expect to see accumulation rather than depletion on the site.

Sloan (Sloane, 1985) describes the talus at Beauty Point as a combination of clay, sandy clay and basalt boulders, with gravel and sand lenses and up to about 9m thick. This generally appears to be consistent with our observations at the site and on the foreshore, and we assume that the talus generally extends at least to the shoreline.

The groundwater springing through the talus (at the embankment below Flinders Street) is a phenomenon that is known to occur elsewhere in Beauty Point and may be associated with landsliding.

The site slopes are moderate to gentle, and there are no indications of recent instability. Nevertheless, the site is known to have been affected by landsliding in the past (c. 1958), with an adjacent house being catastrophically damaged. That lot (at 175 Flinders Street) remains vacant. There is no reported attribution for the 1958 landslide, and the road (Flinders Street) was apparently stabilized by piling. There is no surface expression of the piles evident now.

The house has been in its present location for at least 56 years and appears to be in good condition.

4.3 Potential Hazards

Based on the site observations, subsurface data and available information discussed in the sections above, the following landslide hazards are identified for the site:

Movement of regional scale landslide (ID 1021). The landslide complex consists of a large area of previously failed material, with discrete internal areas of recent or active movement. MRT have argued that the likelihood of movement on any part of the regional scale landslides at Beauty Point should be the same as for the recent or active landslides. We disagree and consider it should be at least one order of magnitude less likely. On this basis, the likelihood of movement on Landslide 1021 is assessed as Possible.

Movement of Recent or Active landslides (e.g. ID 1025). Landslide 1025 affected the site in 1958, and we infer that it damaged the house at that time. Therefore, the likelihood of movement on Landslide 1025 is assessed as Likely (implied indicative recurrence interval of 100 years).

The consequence of the last movement of landslide 1025 on the property is unknown, but 'some' damage is inferred to have occurred.

It should be noted that the proposed change in use will have no effect on the likelihood of the landslide hazards.

4.4 Risk to Property

The following table summarizes the risk to property of landslide events in relation to the proposed change in use as described above.

Table 2. Landslide risk profiles

Scenario	Likelihood	Consequence	Risk Profile
Movement of regional landslide 1021	Possible	Medium: structure at risk may be moderately damaged	Moderate
Movement of landslide 1025	Likely	Minor: structure at risk is near toe of landslide, which will have low velocity, and impact will be from part of landslide mass only	Moderate

The assessment shows that there is a Moderate level of risk of property damage.

4.5 Risk to Life

The calculation of risk to life requires a quantitative assessment. Here, we have used an event tree approach to assess the risk to life for the person most at risk, a visitor staying in the accommodation. We note that whilst landslides at Beauty Point have resulted in damage to houses and roads, including catastrophic damage to about 15 houses, these are typically slow-moving features of relatively small displacement, and no loss of life associated with landsliding has occurred in this region, and no injuries from landslide related causes have been recorded.

An event tree showing a possible sequence of events is presented in Appendix D for the landslide hazards identified in Section 4.3. The risk assessment shows that the estimated Risk to Life is 1.3×10^{-5} , lower than the adopted tolerable risk. This assumes occupancy 5 days per week, which may be an overestimate of the actual achieved occupancy across an average year.

4.6 Risk Evaluation

The tolerable levels of risk for the proposal were outlined in Section 1.3. In terms of Risk to Property, this assessment shows that proposal presents a Moderate level of risk and hence the risk is tolerable. In terms of Risk to Life, this assessment shows that the risk to life is also tolerable.

In terms of the specific performance criteria listed in Section 1.3 it is our assessment that the proposed new Use (C15.5.1) can achieve and maintain a tolerable risk from exposure to landslide having regard to the type, form, scale and duration of the Use (P1.1).

There is no increase in the level or risk from landslide that requires any specific hazard reduction or protection measures, and the Use can achieve and maintain a tolerable risk for the intended life of the Use (P1.1).

P1.2, P2, P3 and P4 do not apply.

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Important information about your report

These notes are provided to help you understand the limitations of your report.

Project Scope

Your report has been developed on the basis of your unique project specific requirements as understood by Tasman Geotechnics at the time, and applies only to the site investigated. Tasman Geotechnics should be consulted if there are subsequent changes to the proposed project, to assess how the changes impact on the report's recommendations.

Subsurface Conditions

Subsurface conditions are created by natural processes and the activity of man.

A site assessment identifies subsurface conditions at discrete locations. Actual conditions at other locations may differ from those inferred to exist, because no professional, no matter how qualified, can reveal what is hidden by earth, rock and time.

Nothing can be done to change the conditions that exist, but steps can be taken to reduce the impact of unexpected conditions. For this reason, the services of Tasman Geotechnics should be retained throughout the project, to identify variable conditions, conduct additional investigation or tests if required and recommend solutions to problems encountered on site.

Advice and Recommendations

Your report contains advice or recommendations which are based on observations, measurements, calculations and professional interpretation, all of which have a level of uncertainty attached.

The recommendations are based on the assumption that subsurface conditions encountered at the discrete locations are indicative of an area. This can not be substantiated until implementation of the project has commenced. Tasman Geotechnics is familiar with the background information and should be consulted to assess whether or not the report's recommendations are valid, or whether changes should be considered.

The report as a whole presents the findings of the site assessment, and the report should not be copied in part or altered in any way.

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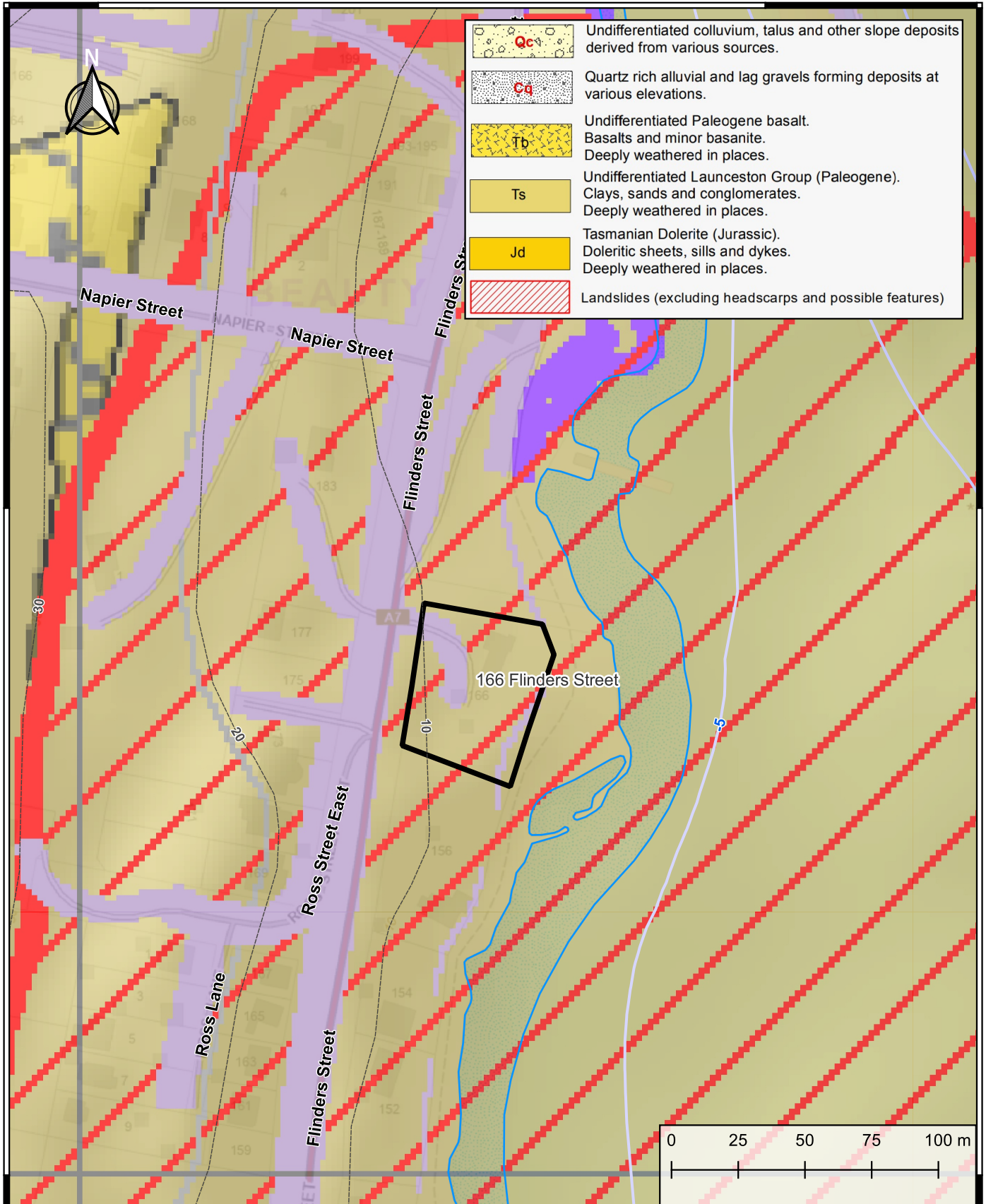
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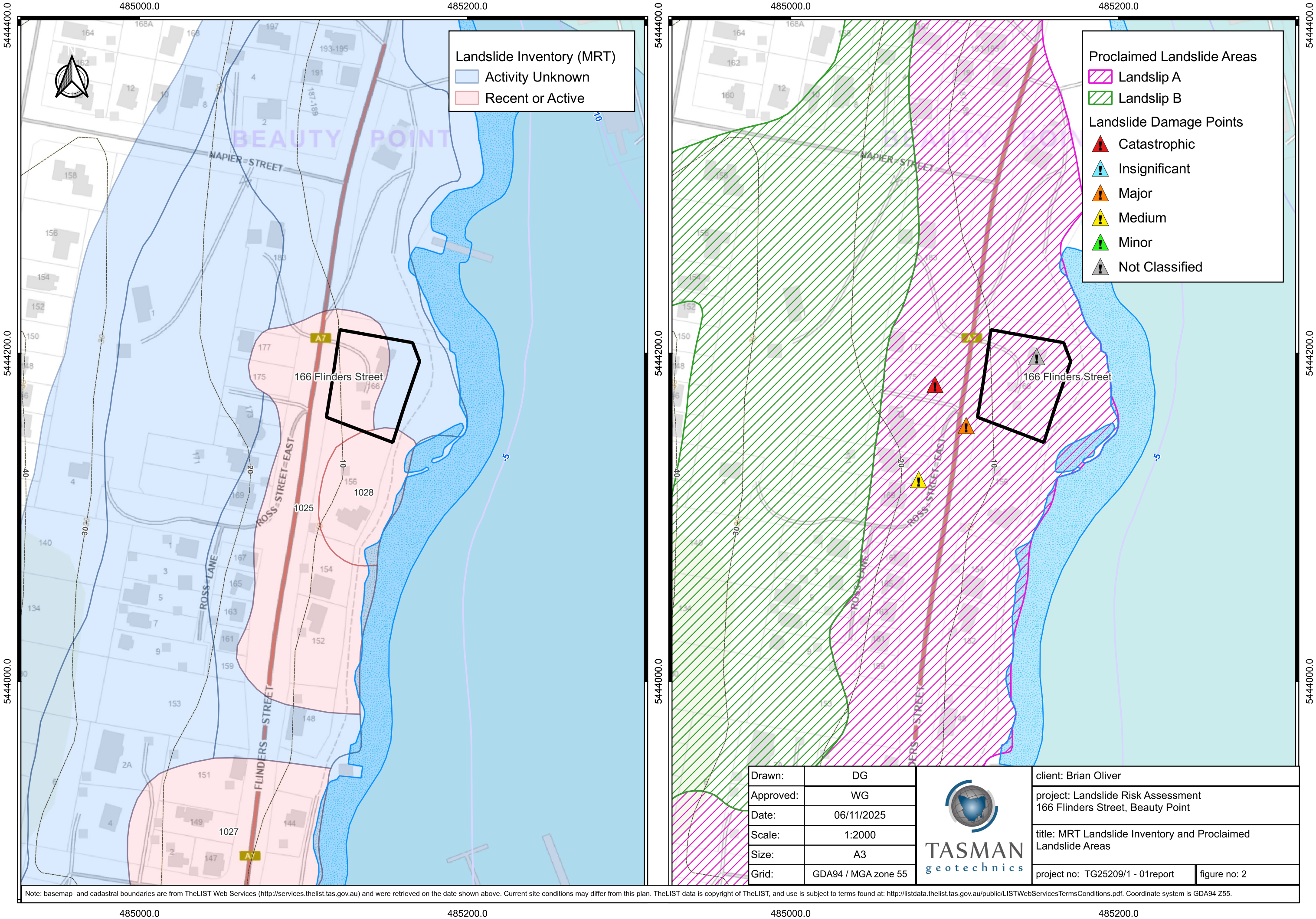


client: Brian Oliver
project: Landslide Risk Assessment 166 Flinders Street, Beauty Point
title: Extract of MRT Deviot Simplified Geology Map
project no: TG25209/1 - 01report
figure no: 1

Note: basemap airphoto and cadastral boundaries are from TheLIST Web Services (<http://services.thelist.tas.gov.au>) and were retrieved on the date shown above. Current site conditions may differ from this plan. TheLIST data is copyright of TheLIST, and use is subject to terms found at: <http://listdata.thelist.tas.gov.au/public/LISTWebServicesTermsConditions.pdf>.

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Grid:	GDA94 / MGA zone 55



client: Brian Oliver

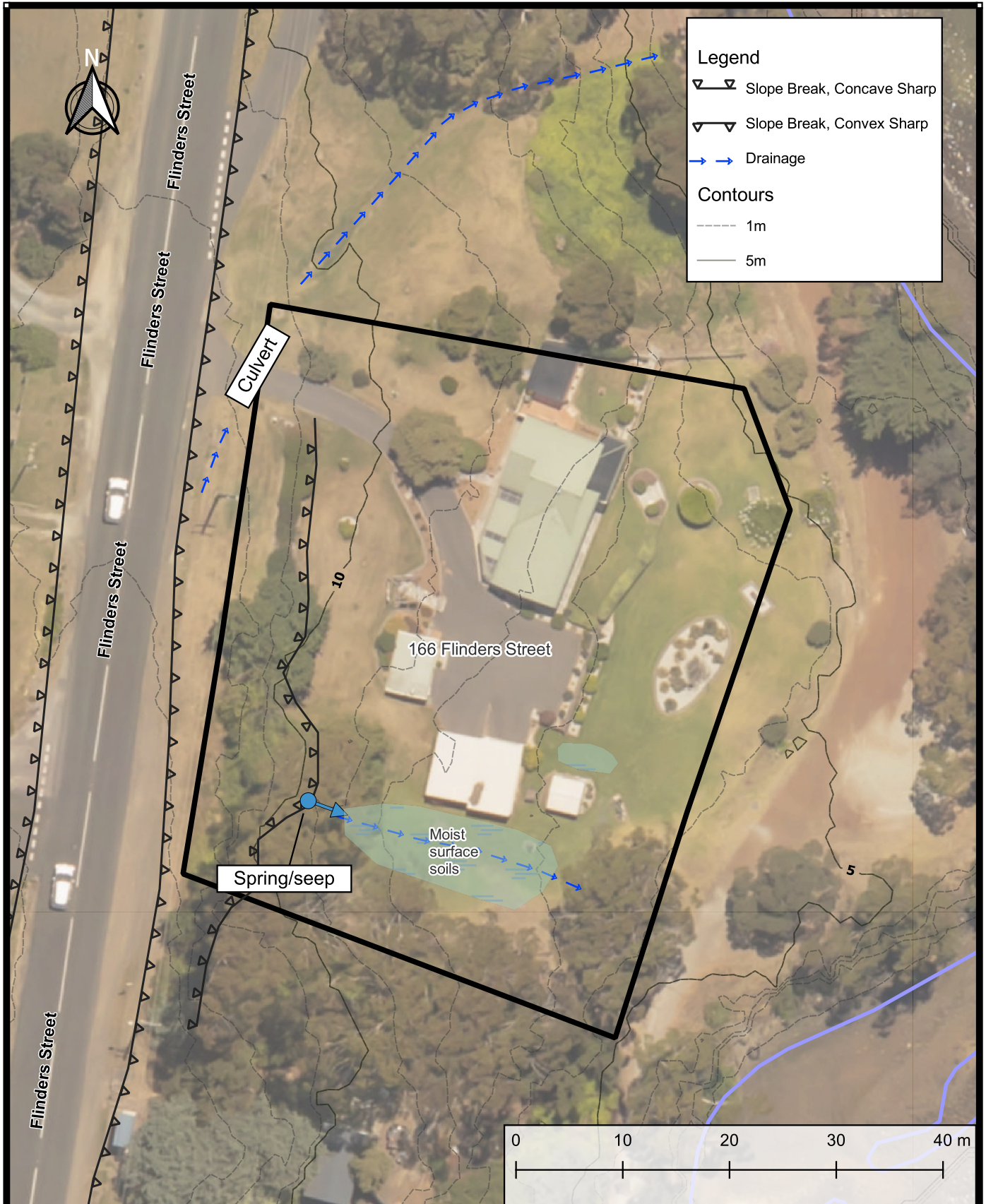
project: Landslide Risk Assessment
166 Flinders Street, Beauty Point

title: Extract of MRT Deep Seated Landslide
Susceptibility Mapping

project no: TG25209/1 - 01report

figure no: 3

Note: basemap airphoto and cadastral boundaries are from TheLIST Web Services (<http://services.thelist.tas.gov.au>) and were retrieved on the date shown above. Current site conditions may differ from this plan. TheLIST data is copyright of TheLIST, and use is subject to terms found at: <http://listdata.thelist.tas.gov.au/public/LISTWebServicesTermsConditions.pdf>.



Drawn:	DG	 TASMAN geotechnics	client: Brian Oliver	
Approved:	WG		project: Landslide Risk Assessment 166 Flinders Street, Beauty Point	
Date:	31/10/2025		title: Site Layout	
Scale:	1:500		project no: TG25209/1 - 01report	
Size:	A4			
Grid:	GDA94 / MGA zone 55		figure no: 4	

Note: basemap airphoto and cadastral boundaries are from TheLIST Web Services (<http://services.thelist.tas.gov.au>) and were retrieved on the date shown above. Current site conditions may differ from this plan. TheLIST data is copyright of TheLIST, and use is subject to terms found at: <http://listdata.thelist.tas.gov.au/public/LISTWebServicesTermsConditions.pdf>.

Appendix A

Review of Landslide Reports Beauty Point

Landslide Occurrence and Reporting at Beauty Point

West Tamar District

The first European settlement in northern Tasmania occurred in 1804 with the establishment of the Port Dalrymple settlement at George Town. No written pre-colonial records of landsliding exist, although landslides were presumably a feature of the landscape.

The earliest records of landsliding in the West Tamar generally were made by Friend (Lt. Friend, 1848), who described the '*great interest*' that had been created by the '*numerous landslips on the banks of the River Tamar*'. There is no specific mention of Beauty Point, but references are made to landsliding at what is assumed to be Grindelwald (*Pleasant Hills*) and Legana (*Freshwater Point*). Friend reports:

The first appearance of these moves—at least, that which first attracted my attention—was in the year 1833, on a farm at Pleasant Hills...

Since that time, as improvements have advanced, the landslips have multiplied, and in some recent cases the extent of the mischief has been most serious. The soil on the west bank of the Tamar, which has been and is most liable to these accidents, is composed of decomposed trap rock, resting on yellow clay...

The 'improvements' refer to the clearing and cultivation of land, primarily for agricultural purposes. Friend also noted that the West Tamar district was more prone to landsliding than the East Tamar:

It is remarkable that the eastern bank of the Tamar has not suffered, except in very few slight instances, from this destructive agent.

Beauty Point Landslides circa. 1906 -1910

The date of establishment of the settlement of Beauty Point is unknown. However, by the 1870s (Burch, 2012) there were wharves, a blast furnace and railway at the northern end of modern-day Beauty Point in an area known as 'Port Lempriere'.

In or around 1906, at least one landslide occurred at Beauty Point. A brief timeline has been established from contemporary newspaper reports. The date of landslide initiation has not been identified, but by October of 1906 the landslide was described as 'continuing' and had therefore commenced prior to that time. Heavy rainfall occurred in the winter of 1906. Sporadic landslide movement continued for at least several years, and piles were installed by both the Tasmanian Gold Mining Company Ltd (operator of the Beaconsfield gold mine) and the state government.

June 1906. (Daily Telegraph, 1906) *BEACONSFIELD, Monday. — Heavy rain has been falling all day. The road from Launceston to Beaconsfield is under water for a depth of 2ft in places. Also the Beaconsfield to Beauty Point road. Two houses near Blythe's Creek are in danger of being flooded out.*

October 1906. (Daily Telegraph, 1906). *As a result of the landslip at Beauty Point continuing, Mr J. A. Jensen has now decided that it will be necessary to remove his splendid residence to a more secure position, and estimates the cost of doing so at £100. Large fissures have now opened in the ground near the beach, a short distance north of the Beauty Point Hotel, which so far has not been affected.*

Note: the original Beauty Point Hotel burnt down in the 1990s, but the current hotel is understood to be in the approximate location of the original. If accurately reported, fissures on the beach north of the hotel may relate to Landslide 1027 (the 'Beauty Point Central Landslide'), or to a feature not recognized in the modern era.

November 1906. (Examiner, 1906). *Mr. Geo. Simmons. Chief Inspector of Roads in the north, accompanied by Mr. Freeland, the chairman of the West Tamar Road Trust, Messrs. Brown, Kerrison, and Beston, visited the landslip at Beauty Point to-day. It was proposed to put large drains through Mr. Jensen's orchard, and it was decided to invite the Minister of Lands to visit the scene,*

as the work is much greater than anticipated. The road has sunk about 8ft., and shifted towards the river for 27ft.

January 1907. (Daily Telegraph, 1907). *The work undertaken with a view to preventing a recurrence, of the unfortunate landslide, extending from the centre of Mr J. A. Jensen's orchard to the water's edge, is still being vigorously prosecuted, and, from the amount of labor and material that are being put into the contracts, it is evident that the job will be a very costly one. On the beach below the tramline the piling is quite an imposing undertaking, whilst the attempt being made by Mr Jensen to hold up the top half of his land, on which his residence stands, also exhibits the serious nature of the disturbance.*

Note: the piling referred to appears to be related to the Tasmanian Gold Mining Company tramway. The tramway was built by J. W. Wyett and was reported to have been extended to Beauty Point in 1886 (Beck, 2017) and taken over by the mining company in 1903. The tramway was closed in 1915 following closure of the mine in 1914.

October 1907. (Daily Telegraph, 1907) *The Minister for Lands (Mr Hean) has decided to send at once two experts to report on the Beauty Point landslide, which has moved another 14ft this winter towards the river, and has caused the public road to be dangerous to traffic.*

February 1908: (Tasmanian News, 1908). *The landslide at Beauty Point has again commenced to move, this time south of, and only 50ft from Jensen's homestead.*

March 1908: (Daily Telegraph, 1908). *The Minister of Lands (Mr Hean) and the Treasurer (Mr Urquhart) yesterday made an inspection of the extensive landslide at Beauty Point. Mr Hean said last night that Ministers had decided it was absolutely necessary the Government should do something in the way of protecting the main road from further shifting of the land, and they proposed to ask the Cabinet to agree to a sum of money being spent for the purpose of driving piles on the upper side of the main road. This, remarked Mr Hean, would protect the road, and also be of assistance to the Tasmania Company's tramway, which runs from the mine to the Beauty Point jetty. The soil for about 12ft to 15ft deep rested on blue pug, thus causing slips to take place. If the piles were driven a considerable distance into the pug, this would relieve the weight at the back, and therefore protect the road from further slips.*

August 1908: (Daily Telegraph, 1908). *Mr G. Simmons, the Northern Inspector of Roads) returned to Launceston last night from an inspection of repairing work being carried on at the landslide at Beauty Point. Mr Simmons says that about forty piles have been driven, some being in 25ft. The driving is exceedingly hard, the piles taking from 135 to 195 blows from the 25cwt monkey to get them into position. He was unable to say if the experiment would have the effect of stopping the slip, but he considers it is well worth the trial that is being given.*

Note: a 'cwt' is a hundredweight, which in British terms is 112 pounds (or 8 stones). 25cwt is therefore equivalent to 1270kg.

July 1910: (Daily Telegraph, 1910). *A. Jensen, M.H.R., who has just arrived from Melbourne, states that the foundation of his recently-erected eleven-roomed house at 'Pomona,' Beauty Point, has left the main building, and is gradually moving down the hill. The last landslide is about 90ft, and is due to the very excessive rain. Regret is expressed for Mr Jensen, who is calling tenders to remove the building to another site. The portion piled by the Government has not moved in the least.*

October 1910: (The Mercury, 1910). *Another landslide, several acres in extent caused by the excessive wet weather, is reported from Beauty Point. The slip is on Mr. Lockwood's property, and the house and yard been shifted some distance. There was a creep recently on Mr. J. A. Jensen's property, and his residence is being pulled down, in readiness for removal to firmer ground.*

March 1920: (Daily Telegraph, 1920). *Overseer Mr Peter Brown, jun., has been engaged for some time with a gang of men putting pipe and cobble drains through and across the land slip to the north of the wharf, and at present is building a strong stone wall along the beach to hold the toe of the slip. As no movement has been noticed in the slip for the past two years, it is hoped that with the improvements just being carried out that there will be no further trouble. The Council is arranging to have work started to improve the road where the big slip took place some years ago near Mr J. A. Jensen's orchard. The whole road for about five chains slipped down hill about 20ft or 30ft,' and it is intended to rebuild and straighten same, which will be a great improvement when finished.*

April 1921: (Daily Telegraph, 1921). *A start has been made at last to remake the road across the strip by Mr Jensen's orchard. It will be remembered that some years ago the whole of the side of the hill for several chains long, and about two or three hundred yards back, slipped towards the river, carrying the main road and the Tasmania tram some distance out of its place. Piles were driven by the T.G.M. Co. along the beach and the Government spent £600 in driving piles on the top side of the road to stop the huge mass from going any further. As there has been no movement for the last two years the Council have decided to reconstruct the road and Mr Albert Hinds, the Council's overseer has the work well in hand.*

Jensen's former house (known as 'Pomona') is understood to be at what is now 77 Flinders Street, which is just west of the modern Beauty Point South Landslide. The TasMap sheet for Beauty Point labels 77 Flinders Street as 'Pomona', and there are extensive orchards surrounding 77 Flinders Street in an aerial photo from 1946. We note the orchard was reported to have been established in 1903, several years prior to the 1906 landslide event.

The tramway is understood to have terminated at the Beauty Point Wharf, not at the Inspection Head Wharf. Therefore, if a landslide disrupted the tramway, it must have been south of the Beauty Point Wharf. This, along with the effects on 'Pomona', suggest the main landslide that was subject of the above articles, was ID 1029 (the 'Beauty Point South Landslide'). By the same logic, the piles installed by the government were on the upslope side of what is now Flinders Street, presumably in the vicinity of landslide 1029.

Mr. Lockwood is understood to be George Lockwood, a boat-builder and fisherman. The location of his property, reported to have been affected by landslide in 1910, is presently unknown but this appears to have been a separate landslide, and not the Beauty Point South Landslide.

Landslides circa. 1950s–1970s

The next reports on landsliding at Beauty Point appear several decades later, in the first of eighteen reports prepared by staff from the former Tasmanian Department of Mines, now known as Mineral Resources Tasmania (MRT).

The earliest reporting is by Blake (Blake, 1961). The report identifies two active landslides; both located between the Beauty Point Wharf and the Inspection Head Wharf. Based on the plan in the report, the landslides are ID 1027 (the 'Beauty Point Central Landslide' or 'Crozier Street Landslide') and ID 1025 (the 'Beauty Point North Landslide'). Blake does not mention landslides south of the Beauty Point Wharf. The purpose of the report was to determine the '*cause and prevention*' of landslips affecting the '*West Tamar Highway*' at Beauty Point. The relevant section of roadway is now known as Flinders Street. The commencement date of landsliding is not recorded, but a record of damage to a house (formerly located at 175 Flinders Street) is recorded as before 26 August 1958. Therefore, we assume that Blake's investigation of 1961 followed landsliding commencing in the late 1950s.

The report describes a '*swamp*' formed by accumulation of landslide debris creating a dam and retaining water '*percolating from the plateau surface*'. Drainage works were recommended. Blake mentions that the slips had '*extensively damaged the road surface over lengths of 100 yards and 80 yards respectively*'.

Following the work by Blake, three separate investigations were carried out in 1963, all by Jennings. The first was in April of that year (Jennings, 1963a). Jennings reported:

For sometime a Department of Mines diamond drill has been engaged on drilling a small landslip in the vicinity of Beauty Point on behalf of the Public Works Department. The slip is a small failure in Tertiary clay and sand extending from just above the West Tamar Highway down to the foreshore. The slip has caused a subsidence of some three feet of the highway over a distance of about 200 feet. The tension zone above the road is well defined and occurs immediately in front of an asbestos dwelling owned by F. G. White. So far no structural damage to this house has occurred. There is an equally well defined zone of heave around the toe of the slip along the foreshore.

The drilling indicates that the slip is a rotational shear failure of the clay beds along the top of a saturated bed of porous sand. Remedial action is being taken by the Public Works Department.

From a study of the area it is clear that the small slips are simply small unstable wedges along the front of an old major slide extending from south of Beauty Point to Inspection Head.

This infers that although remedial measures may be taken to correct these small landslides, the whole area traversed by the West Tamar Highway, between Beauty Point and Inspection Head, is inherently unstable.

There is no plan in the report, but there are various drill logs from the Public Works Department logged by Jennings in 1962 with the boreholes generally located near the intersection of Crozier Street and Flinders Street. A Department of Public Works plan from 1960 shows F.G. White's house to be at what is now 147 Flinders Street. Therefore, the landslide referred to by Jennings is the Beauty Point Central Landslide (also known as the Crozier Street Landslide).

A more thorough report was prepared later in the same year by Jennings (Jennings, 1963b) following inspections on the 12th and 13th of June 1963. As well as the landslides north of the Beauty Point Wharf, Jennings identified a feature corresponding to landslide ID 1029 (the 'Beauty Point South Landslide') to the south. The report discusses the contributing factors to the landslides and provides recommendations for remedial actions:

Factors leading to movements of this kind are the presence of relatively weak sediments such as plastic or waterlogged clay and silt, steep slopes, poor drainage and interference with natural conditions by buildings and earthworks. It is quite clear that movements due to soil creep, earth flows and landslips have taken place in the vicinity of Beauty Point. It should also be noted that all these movements grade into one another. Thus material which is gradually moving downslope by soil creep may quite suddenly form a destructive earth flow if the environmental conditions are changed.

The geological history of the Beauty Point district indicates that even before settlement the stability of the area was delicately balanced. The inevitable result of settlement has been the disruption of drainage and a profound disturbance of the equilibrium due to the additional loading by houses and street construction. To avoid further aggravation of this problem it is therefore necessary to endeavour to remove the additional loading and to provide efficient drainage over the affected area.

Jennings (1963b) created a plan showing an area in which he recommended building restrictions be imposed, and provided a list of recommended actions, many of which relate to drainage and sewage works.

Jennings inspected a single residential lot off Bagot Street later that same year (Jennings, 1963c). A precise location for the lot is not given, but by inference it is likely to have been within the area that Jennings had previously identified as requiring building restrictions. The report ultimately made no findings in relation to the individual lot but did re-emphasize some of the earlier conclusions regarding inherent instability in the district.

The following year, Jennings (Jennings, 1964) provided a brief report regarding a proposal to extend the Inspection Head Wharf. Jennings expresses concerns about the possibility of affecting the stability of 'a major ancient landslip which appears to occupy most of the area between the Beauty Point and Inspection Head Wharves'. The concern related to the potential for dredging of the (offshore) toe of the landslide promoting further instability. Jennings also advised against the excavation of material near the West Tamar Highway north of Inspection Head (as a source of fill) due to the potential for the excavation to cause instability.

In January 1969, Jennings (Jennings, 1969) revisited Beauty Point at the behest of the Beaconsfield Council who had constructed a drainage scheme in response to his recommendations of 1963 (Jennings, 1963b). There were two areas specifically earmarked for subdivision which the council wanted reappraised. 'Pedders' subdivision 'east of Orford [sic] Street' was considered unsuitable for development ('no building be permitted on this subdivision'). The other subdivision was along the 'eastern side of Orford [sic] Street to the north of Crozier Street', and some but not all the lots were considered suitable for development.

Although we will come to it later, it is worth noting at this point that the 'main' modern landslide reactivation at Beauty Point (of landslide ID 1029) is reported to have occurred in or around November 1969. The Beauty Point Landslip Act (Tasmania, 1970) took effect (commenced) from 11th January 1971. The Act was 'An Act to make provision for the acquisition and clearance of certain lands in the town of Beauty Point and in the parish of Wells in which earth movements have occurred, and for purposes incidental thereto'. Nevertheless, there are no publicly available reports

on landsliding at Beauty Point from 1970, although it was clearly a very relevant topic; the reporting comes several years later.

In 1971, Elmer (Elmer, 1971) examined a property at 116 Oxford Street for a proposed extension of an existing house. The report concluded that the proposed extension would not materially increase the risk of landslides, but that risk was nonetheless present. The report does not mention the landsliding which recently occurred at Beauty Point.

In 1972, Stevenson (Stevenson, 1972) provides the first post-incident review of the recent landsliding events. The report is illuminating and most of it is reproduced below:

Properties numbered 78 to 90 Flinders Street were examined on 10 November, 1969. Other properties on both sides of Flinders Street are affected to a lesser extent.

The slope of the ground is of the order of 12°–14° and is convex. The houses are built on the flatter upper portion and the gardens fall steeply to the sea-shore road. The area has previously been affected by slips, so that the surface before the present movements was not a simple one.

The deformation of the ground is characteristic of Tamar Valley slips. The upper end of the slip is at about the level of Flinders Street and is somewhat ill-defined. It may be indicated by the small crack which has been repaired along the centreline of the road, but otherwise the road is little affected. The flatter part of the slope occupied by the road and footpaths has acted as a temporary barrier to movement although it should be noted that uphill from the road the property at 83 Flinders Street, which is on a steeper slope has moved in a slip which appears to be independent of that affecting the houses on the lower side of the road.

Note: we surmise from the earlier reporting that piles had been installed along a section of the upslope side of Flinders Street about 60 years earlier. This piling may have protected Flinders Street in this later reactivation, which Stevenson describes as 'little affected'.

Further down the slope from Flinders Street, it is apparent that deformation has been principally a stretching of the ground in a direction tangential to or a little steeper than the slope. This has affected the houses by opening gaps in the lower corners of rooms and is most obvious in concrete paths laid directly down the slope. Cracks in the soil are no longer obvious but the concrete shows that the elongation is 5% to 10% of the ground under the houses.

In the steep back gardens of the houses in the centre of the slip area (numbers 80 to 86) tensional deformation gives way to predominantly vertical movement as the tangential movement passes into an area of steeper slopes. The slope is here 'stepped' in slices up to 60 cm high but generally about 30 cm. The stepping is caused when the tangential movement causes the surface soil to slide over the convex slope into a steeper region where it is less supported, and therefore drops under its own weight. A feature which is common in Tamar Valley slips but is otherwise rare in that occasional slices are squeezed upward. Surface runoff and sullage water readily collects between the slices and if not drained can maintain and even re-start movement. Water was present in some places where the slip was examined.

Further down the slope the mode of deformation changes again, and becomes a very steep bulge which at its lower limit either overturns the turf completely or breaks the surface following the plastic clay inside to flow stiffly down slope, around and between the trees and fence posts. Any originally upright object such as a tree or post is tilted downhill, and the whole mode of movement of the toe of the slip is demonstrated very clearly by the remains of flights of concrete or stone steps. It is noteworthy that the deeper rooted objects such as large trees are but little disturbed by the clay movement, while surface objects such as posts or slabs are tilted or overturned. At no point has the slip reached the shore road, and the road itself has not been involved in any way, except that water from the slip has flowed on to it and still maintains permanent pools in hollows.

The slip shows few of the characteristics of a classic rotational slip and appears to be a form of slip and has been described as a slow earth flow. Features are present that make the Tamar Valley type slip distinctly different from any that have been described elsewhere. It appears, but remains to be proved, that the material in movement does not extend to any great depth and that it moves as a blanket over a surface which is more or less parallel to the original surface of the ground. This would explain why tangential tension predominates in the upper part of the slip for the blanket of material stretches under its own weight. The toe end piles up as it encounters friction at the foot of the slope. The clays are very absorbent and little liquid water is available to flow from the mass except near the toe where it may be squeezed out by compression. Mud springs are sometimes seen but are not present in the Beauty Point slip.

Tasman Geotechnics

Reference: TG25209/1 - 01report

In summary, the Beauty Point landslide of this report appears to be of a shallow blanket slide type, and has been caused by the access of surface water partly due to unsound drainage methods and partly to abundant natural rainfall.

In 1974, Leaman (Leaman, 1974) conducted a pilot seismic survey at selected locations in Beauty Point to determine if the seismic method could be used to give a clearer picture of the total geological environment. Whilst the author suggested that the reported results may be of value, it appears that no further broader scale investigation was undertaken. Nevertheless, the technique was applied to several later local investigations.

In 1975, Turner (Turner, 1975) examined landslides at Craighurn (Hillwood) and Beauty Point. Turner describes the deeper Cenozoic stratigraphy from outcrops and drilling that was occurring at the time:

Exposures of sediments of the lower unit comprise silty and sandy clay. Exposures are mainly on the shore and are best in the area south of the Port Dalrymple Yacht Club. The sediments are brown, yellow and light grey in colour and the colours are commonly mottled. The fabric of the materials is disrupted. Some subsurface information was procured by diamond drilling in 1962–1963. The deposits intersected were all clay-rich but a substantial proportion (?25–30%) show relict fine to medium sand grade texture. Relict grains of labile minerals are clearly evident in some sand together with quartz and mica grains.

A good example of a coarse-grained, poorly-sorted sand in which a large (?70–80%), original labile constituent has been pseudomorphed by clay occurs between 15 and 17 m in Hole 6, where a few thin horizons containing granules or pebbles of quartz were intersected. Fine white mica is common in both sand and clay.

Both fossils and mica flakes are orientated such that a strong planar fissility exists. This must define the bedding orientation which in all holes lies approximately perpendicular to the axis of the drill. As the holes were vertical the bedding in the areas drilled is approximately horizontal.

Turner discusses the landslides:

Morphological features in the main slip zone south of the Beauty Point jetty [N.B. Landslide 1029] comprise fractures along the top of the slope which show little displacement, and one structure near 485 144 mE, 5 443 139 mN which shows a similar trend in development to the structures at Craighurn. Its upslope portion is at the top of the relatively steep slope and consists of an arcuate system of fractures on which there is downslope-side down displacement, while the downslope portion consists of a clay flow. The clay flow has its origin in a cutting beside the road which runs along the base of the slope and when active (during the winter) causes obstruction of the road and is therefore periodically removed.

It is suspected that the entire failure in the main zone at Beauty Point was triggered by artificial modification of the slope. Apart from clearing of vegetation and construction of buildings, two other important artificial factors have affected the slope.

In 1886 a tramway was constructed along the middle slope to provide access to the Beauty Point jetty. The cutting would have removed the lateral restraining load from the uphill side thus probably inducing failure of the type currently associated with the road cutting. The absence of any remnants of the cutting is presumed to be a result of this failure. Also in the early days a wooden water pipe was laid from the springs near 484 965 mE, 5 442 863 mN to the jetty. Numerous maintenance problems were encountered with the pipe and leakages would have given rise to water content on the slope in excess of normal.

Note: the springs described above are at 8 Augustus Street (near 485071mE 5443096mN in GDA94 coordinates; the coordinates above are in AGD66 given the report dates from 1975). Old infrastructure, including water tanks and a valve are still present at this location.

Turner also remarks:

The second area of recent landslide activity at Beauty Point is near the intersection of Crozier and Flinders streets. This has been artificially stabilised by deep piling and no worthwhile observations were made at the location.

Although we have no other records of this piling, it is apparent from Turner that the Beauty Point Central Landslide (or 'Crozier Street Landslide') was stabilized by piling, presumably between 1963 and 1975.

In 1975, Stevenson (Stevenson, 1975) discussed landslide conditions in the broader district, with some mentions of the conditions at Beauty Point, noting that:

The Department of Mines has been required to advise on landslips at various times but in 1971 was given general instructions to examine the whole problem in the Tamar Valley.

A common factor is the presence of high plasticity clay soils:

The clay mass of the slide is universal. The clay may be very stiff, almost dry and light red brown as at Lawrence Vale, grey, buff, or almost white but is remarkable for its high plasticity. Consistencies reminiscent of toothpaste are commonly seen in clays in the toes of slips, although the main mass of the slide may consist of quite dry and firm blocks.

In the context of Beauty Point, Stevenson summarises the original ('ancient') landslide:

The Beauty Point landslide occurred in clay and sand with intercalated basalt in an escarpment about 60 m high. Its age is unknown and probably prehistoric. but secondary effects have continued intermittently since at least 1900.

The basalt is the Upper Olivine Basalt of Sutherland who indicates that it lies 25-30 m above the Lower Olivine Basalt in the succession and is about 5 m thick, but is severely displaced at Beauty Point by landslide movements.

These movements formed a crown about 1200 m long parallel to the coast and about 200 m from it. Such a wide crown in relation to its downslope length is possibly the result of the coalescence of several slips. The mode of movement appears to have been Rotational Slump and the back tilt which has caused the ponding mentioned by Jennings and is still seen would indicate a rotational nature.

And the 'secondary activity':

The destruction of property in Beauty Point has resulted from a secondary activity in the form of slow earthflows moving down from the heaved foot of the primary slip.

In this context, both the c. 1906-1910, c. 1960 and late 1960s to early 1970s events are considered 'secondary activities'.

In 1983, (Sloane, 1983) conducted seismic and morphological surveys at Robert Street for a proposed subdivision. Excavations for a sewer line had exposed some basalt material which raised the possibility that a basalt 'shelf' may extend under the site, which would have implications for slope stability at the site. The hypothesis was not proven, with Sloane concluding that:

In summary, there is no new information on which a reassessment of the stability classification can be made.

In 1985, (Sloane, 1985) produced a report on landslide zoning and provided a summary of the conditions as they were understood at that time. Twenty-two boreholes were drilled at Beauty Point in 1976 by the Department of Mines, but no specific report regarding the drilling is available. Nevertheless, we assume that the information gathered from the 1976 drilling program helped inform the 1985 report.

Sloane describes the geology:

The plateau region is underlain by a thick sequence of Tertiary lacustrine sediments and basalt. Upper sand, gravel and clayey sand extend to depths of up to 10 m from the plateau surface. These in turn overlie up to 20 m of basalt, virtually un-jointed and massive, with low vesicularity. The basalt is variable in thickness and the upper and lower boundaries undulate. Below the basalt is a thick sequence of organic-rich clay and sandy clay with sand units, extending well below sea level. Abundant plant leaf and stem fragments and mica along bedding surfaces are characteristic of these sediments.

Auger and diamond drilling has determined that the mid-slope bench and the steep foreshore slopes are underlain by up to nine metres of high-plasticity clay, silty and sandy clay with gravel lenses. The gravel lenses frequently contain groundwater. Jennings suggested that these deposits are Quaternary in age. The slope mantle is undoubtedly colluvial, possibly Quaternary in age.

The upper escarpment slopes are mantled by gravel and sandy-gravel slope wash derived from the plateau surface sediments. Diamond drilling also determined that the escarpment basalt did

not appear to supply the seepages at the foot of the escarpment, whereas elsewhere in Tasmania Tertiary basalts are reliable aquifers.

The groundwater from the plateau region is considered to originate in the sand and gravel overlying the basalt as the surface sediments exhibit a high infiltration capacity. The seepage origin at the top of the basalt in the escarpment is masked by the sand and gravel slope-mantle and seepages first appear at the concave break of slope at the foot of the escarpment, where the clayey colluvial sediments of the mid-slope bench may inhibit further infiltration.

And the history of landsliding:

Early reports of landslides at Beauty Point exist around the turn of the century when a large landslide either occurred or re-activated on the steep foreshore slopes. The headscarp extended back to the harbourmaster's house which was subsequently cut into three parts and dragged by bullock teams to its present location. The first oblique aerial photograph, taken by a light aircraft in 1934, showed that an arcuate grove of pine trees had been planted on this main landslide area and wooden piling had been driven in along the toe region. As the area developed during the 1940s and 1950s the trees were felled and houses built.

Note: an aerial photograph from 1946 shows an arcuate grove of trees immediately west of Flinders Street adjacent to No. 77 ('Pomona'). The type of tree cannot be determined from the aerial image. However, there are several pine trees in this area today. We have seen no other reports of the harbourmaster's house being relocated, nor do we know where the harbourmaster's is (or was).

At some time during the late 1950s two large landslides occurred further to the north, again located on the steep foreshore slopes. The Crozier Street landslide, and another named Whites slip, both affected homes adjacent to the main road which traversed the slopes. Mr White's house was pulled back from the headscarp of one of the landslides, while a somewhat rotated and deformed house on the toe region still stands today. Blake reported on the activity of these landslides but no mention was made of the main landslide to the south. Rows of wooden piles were driven into each landslide adjacent to the main road and swampy depressions on the mid-slope bench were drained. A drainage adit was driven into the base of the Crozier Street failure but it was located too far below the landslide mass to be effective.

We note that the Crozier Street Landslide is the Beauty Point Central Landslide, which is also where White's house was located. Blake referred to this, and the Beauty Point North Landslide. We believe that Sloan mistakenly refers to the Beauty Point North Landslide as 'White's slip'. Interestingly, Sloan indicates that both landslides were piled, which is the first mention of piling at the Beauty Point North Landslide.

Remarkably (considering the significance of the event) Sloane provides the only summary of the overall extent of the damage in the 1969 landslide event:

The main landslide at Beauty Point reactivated in November 1969, resulting in the destruction of ten houses, with a final total of fifteen houses eventually destroyed or rendered uninhabitable. The government compensated homeowners under the Beauty Point Landslip Act 1970 and also declared the Beauty Point Landslip Act 1971 which prohibited building in the area suggested by Jennings.

Sloane summarizes the conditions of the recently active landslides:

In summary, the active landslides are of the semi-rotational earth flow type. Active soil-creep is evident at various locations. The instability is associated with up to nine metres of clayey colluvial or talus deposits, containing gravel aquifers. These slope deposits mantle the mid-slope bench and steep foreshore slopes. Gravel aquifers exist in the colluvial mantle. These aquifers are laterally and vertically variable in their occurrence and prediction of their location is difficult.

Sloane goes on to describe how areas are categorized as either Landslip A or Landslip B zones, based on morphological considerations and slope 'complexity'.

In 1987, Sloane (Sloane, 1987) conducted a geotechnical investigation into a proposed subdivision between Flinders and Robert Streets in an area partially classified as Landslip 'B'. The investigation concluded that the area classified as Landslip 'B' remained unsuitable for development, whereas the remainder of the lot was suitable.

In 1989, Matthews (Matthews, 1989) undertook a drilling program to determine if areas of groundwater seepage in Beauty Point were attributable to a sand mining operation run by

Stornoway Hewitt just west of Beauty Point. The results were inconclusive, and it was proposed to conduct further monitoring.

In 1992, Weldon (Weldon, 1992) undertook a ground vibration study in the '*Beauty Point landslide area*' to '*assess whether trucks carrying wheat from the port across the landslide were significantly contributing to further movement in the area*'.

Whilst ground vibrations were detected, the investigation report concluded that:

Provided the condition of the road is maintained in an excellent state ... and the speed limits are observed, it is considered that vibrations from the cartage of wheat are within acceptable limits. It is probable that the higher vibrations recorded could be detectable by occupants of housing adjacent the roadway. As the vibrations are only occasional, it is considered they are unlikely to have a deleterious effect on the active landslide area.

In 1993, Benn (Benn, 1993) reported on survey results based on road nails installed in Flinders Street at landslide ID 1029 (Beauty Point South Landslide). The report presented factual data only, which showed a maximum cumulative displacement of -97mm for road nail 122m, and a maximum height variation of +9/-17mm in the period from 1991 to 1993.

In 2011, Stevenson (Stevenson, 2011) summarized the work on landslides undertaken statewide by the Department of Mines/MRT, which included some review of the earlier work at Beauty Point.

MRT is no longer involved in routine geotechnical investigations and therefore no later reports are available.

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Appendix B

Selected Site Photographs

Flinders Street frontage: 166 Flinders Street



Date & Time	16 Oct 2025 11:51
Coordinates	No coordinates
Description	Power pole
Comments	Reinforced on two sides, slight downhill lean

Flinders Street frontage: 166 Flinders Street



Date & Time	16 Oct 2025 11:52
Coordinates	No coordinates
Description	Surface water drain and culvert under driveway
Comments	None

Flinders Street frontage : 166 Flinders Street



Date & Time	16 Oct 2025 11:55
Coordinates	485086mE, 5444269mN
Description	Culvert and stormwater lid
Comments	Drain overgrown, moist in base

North of property : 166 Flinders Street



Date & Time	16 Oct 2025 11:56
Coordinates	485087mE, 5444263mN
Description	Surface drain continues
Comments	None

North East of site: 166 Flinders Street



Date & Time	16 Oct 2025 11:58
Coordinates	485186mE, 5444404mN
Description	Surface drain discharges to culvert under foreshore track
Comments	None

Foreshore: 166 Flinders Street



Date & Time	16 Oct 2025 11:59
Coordinates	485145mE, 5444403mN
Description	Culvert discharge
Comments	None

Foreshore: 166 Flinders Street



Date & Time	16 Oct 2025 12:00
Coordinates	No coordinates
Description	Basalt gravel lag, cobble to boulder sized and revetment
Comments	None

Foreshore : 166 Flinders Street



Date & Time	16 Oct 2025 12:05
Coordinates	485239mE, 5444390mN
Description	Apparently in-situ weathered rock with clay seams
Comments	None

Foreshore : 166 Flinders Street



Date & Time	16 Oct 2025 12:06
Coordinates	485181mE, 5444202mN
Description	Probable talus overlying gravels, overlying weathered rock
Comments	None

Foreshore : 166 Flinders Street



Date & Time	16 Oct 2025 12:08
Coordinates	485185mE, 5444185mN
Description	Probable talus overlying weathered rock
Comments	None

Foreshore : 166 Flinders Street



Date & Time	16 Oct 2025 12:09
Coordinates	No coordinates
Description	Undercutting tree roots and fallen trees where revetment is absent/collapsed
Comments	None

Foreshore : 166 Flinders Street



Date & Time	16 Oct 2025 12:11
Coordinates	485223mE, 5444390mN
Description	Clayey talus with gravel to cobble size angular/sub-angular material
Comments	None

Foreshore : 166 Flinders Street



Date & Time	16 Oct 2025 12:15
Coordinates	485168mE, 5444155mN
Description	Poorly sorted material
Comments	None

Foreshore : 166 Flinders Street



Date & Time	16 Oct 2025 12:17
Coordinates	485186mE, 5444153mN
Description	Soft clayey deposits
Comments	None

Eastern side on foreshore track: 166 Flinders Street



Date & Time	16 Oct 2025 12:19
Coordinates	No coordinates
Description	View from foreshore lot (NRE) towards house
Comments	None

East of house: 166 Flinders Street



Date & Time	16 Oct 2025 12:19
Coordinates	485164mE, 5444160mN
Description	Sewerage pit
Comments	Near site boundary

South of house: 166 Flinders Street



Date & Time	16 Oct 2025 12:21
Coordinates	485032mE, 5444141mN
Description	Boulders in lawn, south of house
Comments	Talus

Southern boundary: 166 Flinders Street



Date & Time	16 Oct 2025 12:22
Coordinates	No coordinates
Description	No consistent lean or trunk bends diagnostic of landslide
Comments	None

South West of house : 166 Flinders Street



Date & Time	16 Oct 2025 12:24
Coordinates	485124mE, 5444177mN
Description	Groundwater seepage/spring
Comments	None

Tree next to spring: 166 Flinders Street



Date & Time	16 Oct 2025 12:25
Coordinates	No coordinates
Description	Trunk Hollow, northern bifurcation leaning northwest(?)
Comments	Near spring

South of house: 166 Flinders Street



Date & Time	16 Oct 2025 12:27
Coordinates	No coordinates
Description	Minor drain, presume for spring
Comments	Carport/shed to left of frame

West of house: 166 Flinders Street



Date & Time	16 Oct 2025 12:29
Coordinates	No coordinates
Description	Retaining wall above house, leaning downslope. Concrete post and whalers.
Comments	10-12 degrees off vertical

North Eastern corner: 166 Flinders Street



Date & Time	16 Oct 2025 12:34
Coordinates	485247mE, 5444366mN
Description	Retaining wall
Comments	Slight lean downhill, not much

North Eastern side of house: 166 Flinders Street



Date & Time	16 Oct 2025 12:35
Coordinates	485154mE, 5444208mN
Description	None
Comments	None

Yard East of house: 166 Flinders Street



Date & Time	16 Oct 2025 12:35
Coordinates	No coordinates
Description	Lawn below house
Comments	None

Yard south east of house: 166 Flinders Street



Date & Time	16 Oct 2025 12:36
Coordinates	No coordinates
Description	Lawn below hardstand
Comments	None

South east of house: 166 Flinders Street



Date & Time	16 Oct 2025 12:37
Coordinates	No coordinates
Description	Retaining for parking hardstand
Comments	Not professionally constructed, about 1m high

Southern side of house: 166 Flinders Street



Date & Time	16 Oct 2025 12:39
Coordinates	No coordinates
Description	All in good order
Comments	None

Western side of house: 166 Flinders Street



Date & Time	16 Oct 2025 12:39
Coordinates	No coordinates
Description	In good order
Comments	None

Southern side of house: 166 Flinders Street



Date & Time	16 Oct 2025 12:40
Coordinates	485013mE, 5444229mN
Description	Carport and outbuildings
Comments	In good order

Western side of house: 166 Flinders Street



Date & Time	16 Oct 2025 12:42
Coordinates	No coordinates
Description	In good order
Comments	None

Western side of house: 166 Flinders Street



Date & Time	16 Oct 2025 12:42
Coordinates	No coordinates
Description	Driveway in good order
Comments	None

North-western corner of house: 166 Flinders Street



Date & Time	16 Oct 2025 12:43
Coordinates	No coordinates
Description	Northern site boundary
Comments	None

Southern side of house: 166 Flinders Street



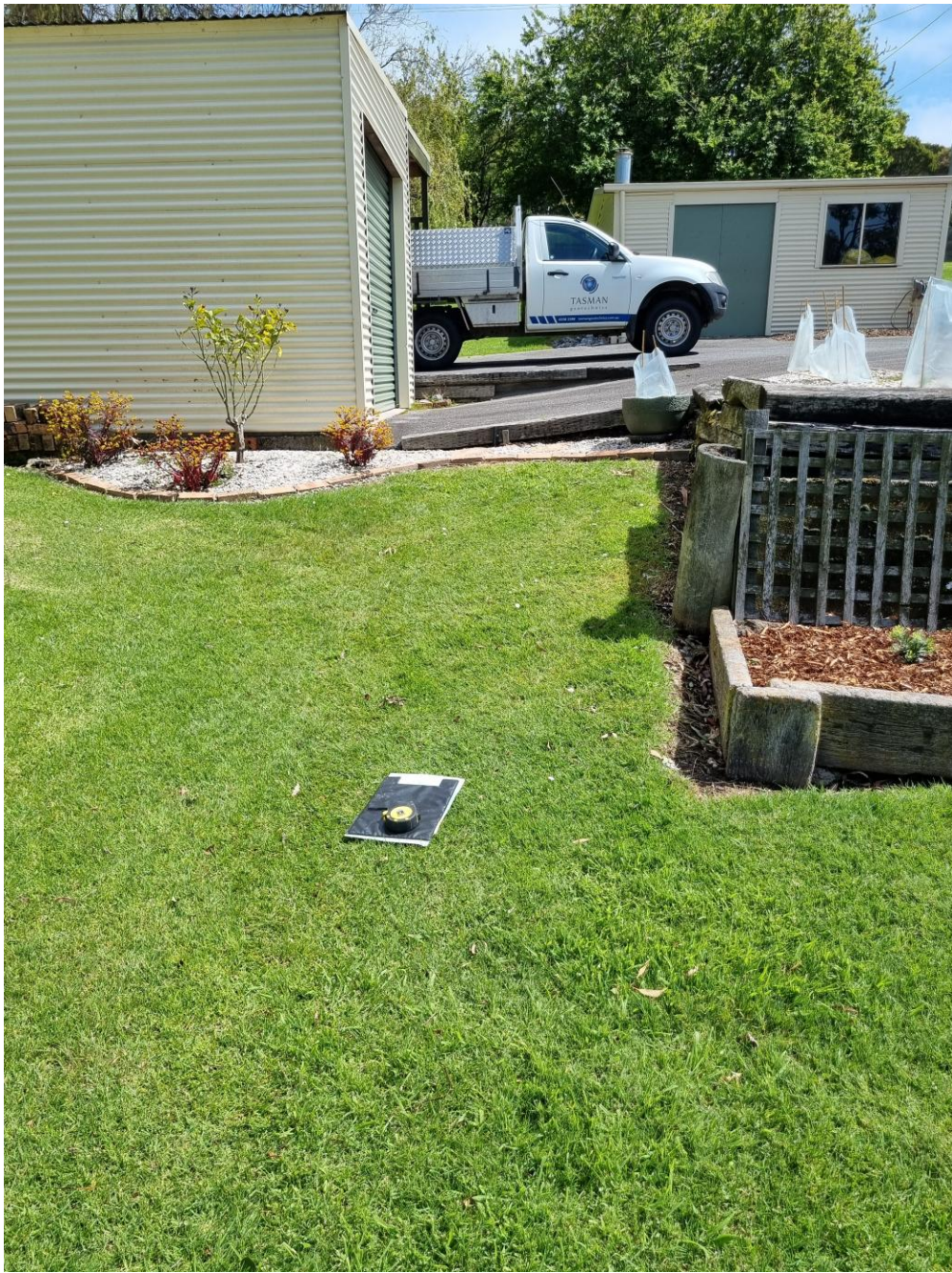
Date & Time	16 Oct 2025 12:44
Coordinates	No coordinates
Description	Pit for driveway runoff
Comments	None

Eastern side of house: 166 Flinders Street



Date & Time	16 Oct 2025 12:46
Coordinates	485108mE, 5444330mN
Description	Lawns, all in good order
Comments	None

South east of house : 166 Flinders Street



Date & Time	16 Oct 2025 12:49
Coordinates	No coordinates
Description	Surface soils moist to wet near clipboard
Comments	Source uncertain

Carport: 166 Flinders Street



Date & Time	16 Oct 2025 12:50
Coordinates	No coordinates
Description	Minor cracking in asphalt
Comments	In carport

Appendix C

Landslide Risk Terminology

Terminology for use in Assessing Risk to Property

These notes are provided to help you understand concepts and terms used in Landslide Risk Assessment and are based on the “Practice Note Guidelines for Landslide Risk Management 2007” published in *Australian Geomechanics* Vol 42, No 1, 2007.

Likelihood Terms

The qualitative likelihood terms have been related to a nominal design life of 50 years. The assessment of likelihood involves judgment based on the knowledge and experience of the assessor. Different assessors may make different judgments.

Approximate Annual Probability	Implied indicative Recurrence Interval	Description	Descriptor	Level
10^{-1}	10 years	The event is expected to occur over the design life	Almost Certain	A
10^{-2}	100 years	The event will probably occur under adverse conditions over the design life	Likely	B
10^{-3}	1000 years	The event could occur under adverse conditions over the design life	Possible	C
10^{-4}	10,000 years	The event might occur under very adverse conditions over the design life	Unlikely	D
10^{-5}	100,000 years	The event is conceivable but only under exceptional circumstances over the design life	Rare	E
10^{-6}	1,000,000 years	The event is inconceivable or fanciful for the design life	Barely Credible	F

Qualitative Measures of Consequence to Property

Indicative Cost of Damage	Description	Descriptor	Level
200%	Structure(s) completely destroyed and/or large scale damage requiring major engineering works for stabilisation. Could cause at least one adjacent property major consequential damage.	Catastrophic	1
60%	Extensive damage to most of structure, and/or extending beyond site boundaries requiring significant stabilisation works. Could cause at least one adjacent property medium consequential damage	Major	2
20%	Moderate damage to some of structure, and/or significant part of site requiring large stabilisation works. Could cause at least one adjacent property minor consequential damage.	Medium	3
5%	Limited damage to part of structure, and/or part of site requiring some reinstatement stabilisation works	Minor	4
0.5%	Little damage.	Insignificant	5

The assessment of consequences involves judgment based on the knowledge and experience of the assessor. The relative consequence terms are value judgments related to how the potential consequences may be perceived by those affected by the risk. Explicit descriptions of potential consequences will help the stakeholders understand the consequences and arrive at their judgment.

Qualitative Risk Analysis Matrix – Risk to Property

Likelihood		Consequences to Property				
	Approximate annual probability	1: Catastrophic	2: Major	3: Medium	4: Minor	5: Insignificant
A: Almost Certain	10 ⁻¹	VH	VH	VH	H	L
B: Likely	10 ⁻²	VH	VH	H	M	L
C: Possible	10 ⁻³	VH	H	M	M	VL
D: Unlikely	10 ⁻⁴	H	M	L	L	VL
E: Rare	10 ⁻⁵	M	L	L	VL	VL
F: Barely credible	10 ⁻⁶	L	VL	VL	VL	VL

NOTES:

1. The risk associated with Insignificant consequences, however likely, is defined as Low or Very Low
2. The main purpose of a risk matrix is to help rank risks and set priorities and help the decision making process.

Response to Risk

In general, it is the responsibility of the client and/or regulatory and/or others who may be affected to decide whether to accept or treat the risk. The risk assessor and/or other advisers may assist by making risk comparisons, discussing treatment options, explaining the risk management process, advising how others have reacted to risk in similar situations and making recommendations. Attitudes to risk vary widely and risk evaluation often involves considering more than just property damage (eg environmental effects, public reaction, business confidence etc).

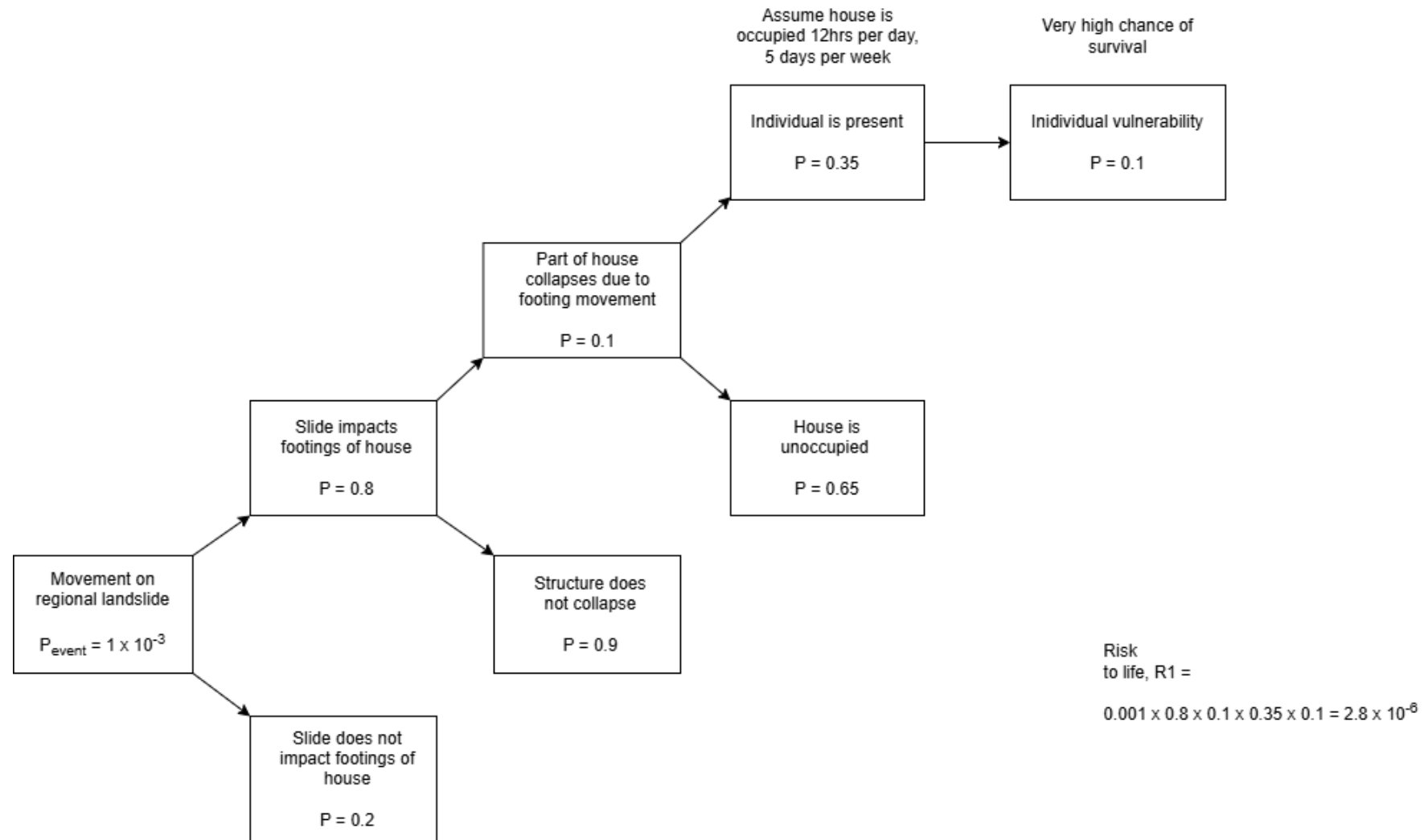
The following is a guide to typical responses to assessed risk.

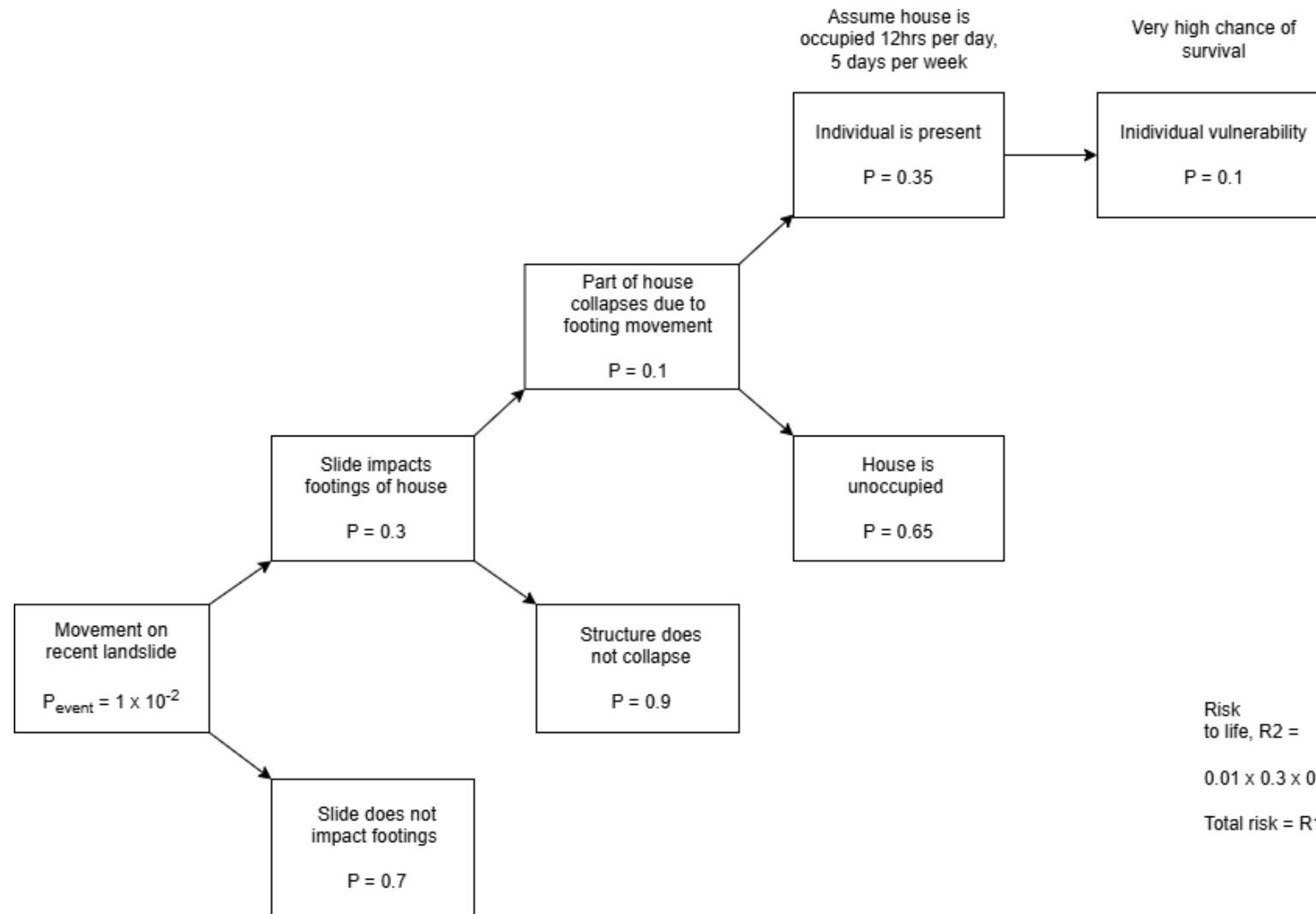
Risk Level		Example Implications
VH	Very High	Unacceptable without treatment. Extensive detailed investigation and research, planning and implementation of treatment options essential to reduce risk to Low; may be too expensive and not practical. Work likely to cost more than the value of the property.
H	High	Unacceptable without treatment. Detailed investigation, planning and implementation of treatment options required to reduce risk to Low. Work would cost a substantial sum in relation to the value of the property.
M	Moderate	May be tolerated in certain circumstances (subject to regulator's approval) but requires investigation, planning and implementation of treatment options to reduce the risk to Low. Treatment options to reduce to Low risk should be implemented as soon as practicable.
L	Low	Usually accepted by regulators. Where treatment has been required to reduce the risk to this level, ongoing maintenance is required.
VL	Very Low	Acceptable. Manage by normal slope maintenance procedures

Appendix D

Risk to Life

Event Tree – Risk to Life





Risk
to life, R2 =

$$0.01 \times 0.3 \times 0.1 \times 0.35 \times 0.1 = 1.0 \times 10^{-5}$$

$$\text{Total risk} = R1 + R2 = 1.3 \times 10^{-5}$$