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Tauranga City Council

Mount Maunganui Landslide, Tauranga January 2026

Preliminary Geotechnical Appraisal Report – Mount Maunganui Beachside Holiday Park Landslide

16-03-2026



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Prepared for

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Executive Summary

This report presents a preliminary geotechnical assessment (PGAR) of the Mount Maunganui (Mauao) landslide that occurred on the southeastern flank of Mauao on 22 January 2026, following an extreme rainfall event that delivered approximately 300 mm of rain over a 48-hour period. WSP was engaged by Tauranga City Council to undertake this assessment, focusing on the harbour side of the Mount Maunganui Beachside Holiday Park, including the main landslide area, Pilot Bay boat ramp, and the southern extent of Adams Avenue. The findings support the development and implementation of a Trigger Action Response Plan (TARP) for public safety and landslide hazard management.

Mauao is a rhyolitic lava dome skirted by a thick succession of weathered volcaniclastic sediments, colluvium, and tephra deposits that are highly susceptible to slope instability. The lower eastern slopes are steep and show evidence of historic landsliding.

Three landslides (CG1–CG3) occurred within the site, with CG1 being the most significant. The main failure generated a scarp approximately 40 m wide and 20 m high, with debris travelling up to 125 m and depositing in excess of 10,000 m³ of material. The landslide caused extensive damage to campground facilities and impacted the Mount Hot Pools. Six lives were tragically lost in the event.

Short-to-medium term risk-reduction measures were implemented, including installation of debris barriers, removal of unstable boulders from the head scarp, and establishment of a Trigger Action Response Plan (TARP).

Further geotechnical investigations are recommended to facilitate the construction of a ground model, assess ongoing slope stability, and inform long-term risk management. Remediation of the site will depend on future land use, with a low-intervention approach likely to be appropriate should the area be retained as a reserve, alongside targeted protection measures for adjacent infrastructure such as the Pilot Bay boat ramp and Mount Hot Pools.

1. Introduction

This report provides a preliminary geotechnical assessment of the Mount Maunganui (Mauao) landslide that occurred on the southeastern flank of Mauao on the 22nd of January 2026.

WSP NZ Limited (WSP) have been engaged by Tauranga City Council (TCC) to undertake this work following numerous landslides that occurred on Mauao, including a landslide that occurred on the morning of 22 January 2026 which initiated on southeastern side of Mauao and tragically resulted in the death of 6 people at the Mount Maunganui Beachside Holiday Park.

The landslide followed an intense period of sustained heavy rainfall on the night of the 21st of January, that resulted in approximately 300mm of rainfall accumulating over a 48-hour period.

The purpose of this report is to document the preliminary findings for the harbour side of the Mount Maunganui Beachside Holiday Park (including the main landslide) based on a desktop study and site observations undertaken by WSP to support further geotechnical assessments. This document also supports the Trigger Action Response Plan (TARP) which was developed for the harbour side of the Holiday Park which includes the Pilot Bay boat ramp and southern half of Adams Avenue.

2. Site Description and Desktop Assessment

The site location, geology and findings of our desktop assessment are described below.

2.1 General

- The site comprises the harbour-side portion of the Mount Maunganui Beachside Holiday Park, extending from the Pilot Bay boat ramp to the Mount Hot Pools. It also includes the lower southeastern flank of Mauao, where the landslide scarp is located at approximately RL 30 m (NZVD). The Holiday Park itself lies at the base of the slope on relatively flat, terraced ground between RL 5 m and RL 3 m, immediately east of the scarp.
- A review of pre-event elevation data shows that the lower eastern flanks of Mauao dipped steeply at approximately 2H:1V to 2.25H:1V (about 24–27°). Several historic landslide scarps are present across these lower slopes, with some runout deposits extending into the site. The 2026 landslide occurred within a narrow triangular wedge of soil located between two of these relict slip scarps.
- The ground at the base of Mauao has likely been modified by historic earthworks to create level platforms for the campground sites close to the base of the slope.
- Observations of the current landform of the lower flanks of Mauao, historical imagery dating as far back as the early 1900's, as well as several geotechnical reports (Richards, 1999; Martin and

Brideau, 2014; Flynn, 2022) highlight multiple bowl-shaped depressions which indicate that landsliding on the lower flanks of Mauao has been an historically active process.

2.2 Site Geology

- Mauao is a ~232 m high rhyolitic lava dome, forming a dominant landscape feature in Tauranga. Mauao was formed by the outpouring of rhyolitic lava approximately 2.3 million years before present. The geology is described as Late Pleistocene-aged, Minden Rhyolite Subgroup (Whitianga Group) volcanics. The lower slopes of Mauao are overlain by successions of volcanoclastic sediments, colluvium and terrace deposits that are not described in published geologic maps (e.g. Briggs et al., 1996; Leonard et al., 2010).
- Site observations on the northern and southern sides of Mauao indicate coastal terrace deposits comprised of distal ashfall, presumably from Taupo and Coromandel Volcanic Zones with evidence of regionally extensive ashes such as Younger Ashes, Rotoehu Ash and Hamilton Ash. Hall (1994) reports that the Pahoia Tephra, positioned stratigraphically below these ashes, is exposed at Mauao's base. Weathered tephra deposits such as Pahoia Tephra are highly susceptible to slope failure, especially when the deposits are highly sensitive which is commonly associated with the clay mineral Halloysite (e.g. Kluger et al., 2017).

3. Site Observations

3.1 Event Summary and Description

Key points are documented below:

- The landslide occurred at approximately 9.30am of the morning of the 22nd of January 2026 with debris running out to the southeast of the failure zone and into the campground.
- Based on data available from Tauranga Airport rainfall gauge (Tauranga Aero AWS), a combined amount of 295.4 mm of rain fall, was recorded on the 21st and 22nd of January.
- Prior to the failure, significant groundwater seepages were noted at the base of Mauao emitting from the historically cut banks adjacent to the holiday park. Sediment laden water was also observed based on media photographs. The water resembled springs found in other places on the flanks of Mauao exiting directly from the slopes with significant flows noted, however with sediment suspended within the water.
- Media images show a small (up to 5 m high and 20 m wide) toe failure within a cut bank immediately prior to the main failure with large amounts of water and sediments flowing through the Holiday Park.
- Based on the aerial imagery, the landslide produced a scarp approximately 40 m wide and 20 m high, with the debris running out approximately 125 m from the top of the head scarp (see CG1 below, Figure 1). The landslide debris material comprised predominantly soils, with several metre-sized boulders, and produced an estimated 2 to 4 m thick deposit, with an estimated

volume of greater than 10,000 m³. Two smaller failures also occurred within the site, including a small translational slide to the north (CG2) and a small rotational slump to the south (CG3) of the main scarp area (CG1).

- The landslide destroyed the campground ablution block, with the frame and roof detached from its foundations and carried to the southeast along with campervans, caravans and tents. The debris also impacted the Mount Hot Pools, overtopping a masonry block wall and depositing debris across the western quadrant of the facility. Several pohutukawa trees on the margin of the landslide were damaged, and multiple trees, including a large pohutukawa tree, were carried with the debris.
- Post-failure, a large amount of water was seen seeping from the failure scarp from multiple areas with the water forming small streams flowing down onto the debris field. Sediment laden water flowed around the Hot Pools to the northeast and along Adams Avenue.
- Rescue and recovery efforts were initiated by Urban Search and Rescue NZ (USAR), NZ Police and Fire and Emergency New Zealand (FENZ) on 22 January which involved systematic excavation of the toe of the debris. As part of these works a large amount of debris (soil and rock; caravans, campervans and tents; and building material) was removed from site and taken to the Tauranga Airport. When recovery efforts were finished, an excavated batter (at 3H:1V) was cut into the landslide debris. The remainder of the excavated debris remains on site and has been formed into bunds with hydroseed mulch applied to their surface.
- WSP undertook site inspections over the wider Mauao area from the 23 January and continue to do so, through February and March 2026. Inspections were undertaken by WSP over the following weeks, which included site walkover assessments, landslide mapping, logging of soils, analysis of installed monitoring cameras, UAV drone surveys and soil sampling.

Further details are provided below.

3.2 Landslide Observations

Three landslides occurred within the Harbour Side of the Holiday Park and are described below and in Table 1, with photographs provided in Figures 2 to 4.

1. CG1 – Primary landslide – the largest and the focus of this assessment.
2. CG2 – A small translational earth slide 20 m upslope and north of the main slip – and possibly connected.
3. CG3 – A small earth slump to the south of the site.

CG = campground – refer to landslide inventory and severity map from WSP Inspection Report ‘Mauao Base Track Inspection’ Ref. 2-TA008.00 for a full list of documented failures on Mauao.



Figure 1. Site plan showing location of landslides that occurred on 22 January 2026 within the Harbour Side of the Holiday Park. Adapted from LINZ and USAR aerial imagery (dated 30 Jan 2026).

Table 1. Description of landslides within the harbour side section of the holiday park campground. Landslide classifications after Cruden and Varnes (1996).

ID	Description	Dimensions	Runout Distance	Other Comments
CG1	Observation of the scarp indicate a deep-seated rotational failure approx. 8m thick. The scarp is concave which suggests an initial rotational slump failure, however observations and examination of video footage suggest the debris moved as a translational mass to the east with little rotation. Debris material is comprised of a thick succession of soils containing weathered tephra, sediments, colluvium, midden layers, organic soils and interspersed rockfall boulders. The debris has a fine-grained tephra surface at its base with limited deformation of the soil layers within. The failure initiated between two relict slip scarps (“Bull Nose”) and incorporated the thin triangular wedge of soil between them.	Failure Zone: 20 m elevation change in head scarp 40 m wide, 45 m long Area of ~1650 m ² Debris Zone: 60 m wide, 80 m long Area of ~4100 m ²	125 m horizontal distance from head scarp to debris toe. Water and slurry runoff extends up to 50 m from the debris and follows a drainage path around the Hot Pools and along Adams Avenue.	Slumping of very saturated toe/cut face (evident in public sourced media) observed prior to main failure. 150 mm PE water main was exposed and severed with an unknown contribution to failure mechanics and timeline. Multiple examples of water flowing/seepage from the exposed scarp face suggests significant sub-surface flow prior to and during failure.
CG2	A shallow, translational earth slide that has occurred upslope 20 m north of the main slip CG1. Excavated soils comprise weathered tephra and organic soils. Occurs within a historically defined failure zone.	Failure Zone: ~1 m tall head scarp 6 m wide, 4 m long Area of ~25 m ² Debris Zone: 5 m wide, 10 m long Area of ~55 m ²	15 m horizontal distance from head scarp to debris toe. Water and slurry runoff extends up to 15 m.	Several tomos are present below the base of the topsoil that extend an indeterminate distance back into the slope, suggesting significant subsurface flow.



CG3	A small rotational earth slump within a cut-bank at the toe of the southern end of the campground. The head scarp has intersected the old walking track. Multiple small, slumped blocks have rotated downslope. Occurs within a historically defined failure zone.	Failure Zone: ~20 m wide 5 m tall scarp Area of ~70 m ² Debris Zone: ~ 20 m wide Area of ~100 m ²	10 m horizontal distance from head scarp to debris toe. Water and slurry runoff extends up to 10 m.	Occurring within cutbank at base of Mauao. Reoccurring failure that occurred before October 2025. Tension cracks present along walking path and slumping of slope were documented in 2023.
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Figure 2. Aerial UAV photograph of the main slip CG1 looking south.



Figure 3. Aerial UAV photograph of CG2 looking north. Main slip in lower left of image.



Figure 4. Photograph of CG3 slump looking southwest.

3.3 Exposed Soil Characterisation

A characterisation of the soils exposed within the excavated batters produced during the recovery earthworks is provided below. It is assumed that these soils represent the upper 3 to 5 m of the slope profile at the landslide site. Distinct soil layers are identifiable and are mostly undisturbed; suggesting that the debris slid as mostly undeformed blocks. The blocks do, however, show some deformity associated with their transport such as dipping and rotation (typically backwards towards the slip), and sliding over the top of each other. These factors, and the angled slope batter, make determining the exact soil succession and thicknesses difficult to determine.

The following soil profile was obtained from an approx. 2.5 m high slope batter exposure (at 3H:1V angle) near the centre axis of the landslide debris and 80 m from the head scarp. See Figure 1 above for location of slope profile, Figure 5 below for a photograph of the batter, and Figure 6 for the slope profile with an annotated soil profile.

The soils are dominated by weathered airfall tephra similar to those found elsewhere in the Tauranga region interspersed with hillslope deposits such as colluvium or rockfalls. The basal unit of the debris comprises very fine light-grey rhyolitic tephra.

Table 2. Characterisation of exposed soils within landslide debris from top to bottom of profile.

Unit	Unit Thickness (approx.)	Description	Residual Moisture
Topsoil and Midden / Shells	0.5 m	Dark brown SILT containing abundant intact bivalve seashells such as Pipi.	Moist
Orange-Brown Tephra	0.45 m	Brownish orange SILT with minor clay, minor fine to coarse sand and minor angular gravel and cobble-sized angular clasts. Moderately plastic when wet.	Moist to wet
Colluvium / Landslide Deposit	0.25 m	Yellowish orange-grey cobbly fine to coarse gravel within a sand and silt matrix. Poorly sorted with angular to rounded clasts comprised of fresh and weathered rhyolitic/dacitic lava. Matrix is moderately plastic when wet.	Mosit to wet.
Orange-Brown Tephra	0.5 m	Brownish orange SILT with minor clay and minor fine to coarse sand. Trace gravel and cobble-sized clasts. Moderately plastic when wet. Grades into bright orange with pockets of brown mottles throughout with gravels and cobbles absent. Appears as nearly solely silt and clay ash. Highly plastic.	Mosit to wet
Colluvium / Landslide Deposit	0.4 m	Light brownish grey cobbly fine to coarse gravel within a sand, silt and clay matrix. Poorly sorted	Wet

		with angular to rounded clasts comprised of fresh and weathered rhyolitic/dacitic lava. Matrix is moderately plastic when wet.	
Orange-Brown Fine Tephra	0.3 m	Orangish light brown clayey SILT. Moderately to highly plastic when wet. Hard and brittle when dry. Contains a 10 cm band of cream-light grey CLAY with minor to some silt. Highly plastic when wet.	Wet
Light Grey Fine Tephra / Sediment <i>(Possibly Pahoia Tephra)</i>	0.2 m in this location.	Light grey-cream CLAY with minor to some silt. Highly plastic when wet. Hard and brittle when dry. Dark brown-black limonite staining nodules throughout. Possibly Pahoia Tephra. Forms the basal layer of the landslide debris in most locations. True, insitu thickness is unknown, but occurs up to 0.5 m thick at the base of debris.	Wet



Figure 5. Photograph showing the batter slope excavated through the landslide debris during recovery efforts which provides an insight into the soil units within the failure. The main slip scarp can be seen in the upper background of the image.

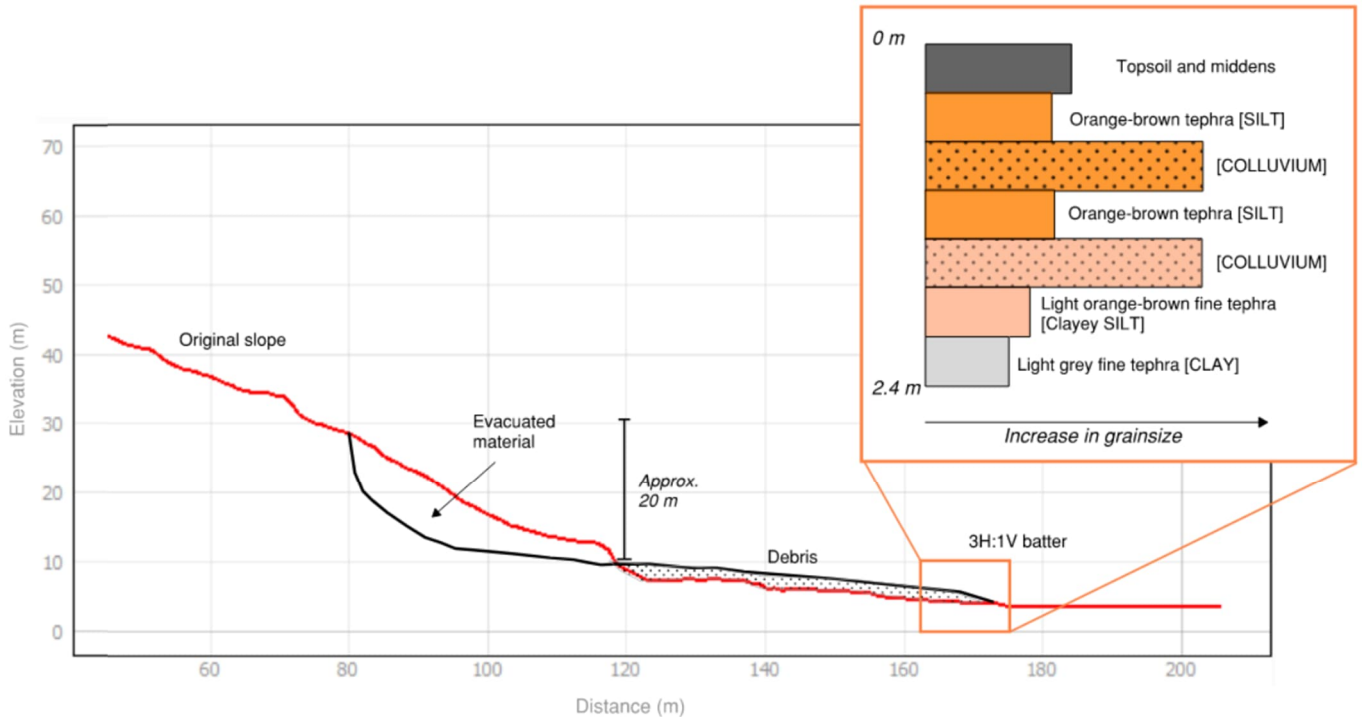


Figure 6. Slope profile showing landslide failure zone of CG1. Simplified soil profile obtained from cut batter shown in top right inset.

4. Assessed Failure Mechanism

It must be noted that this is a preliminary assessment of the failure mechanism based on initial observations without any intrusive investigations and therefore the assessment of the failure mechanism may change once further information comes to hand. At this stage the following factors are considered to have contributed to the Mount Maunganui landslide (CG1):

- Prior to the heavy rain event, the previous slope was generally dry and in an unsaturated state, with the sudden and heavy rainfall causing a reduction in suction and loss of apparent cohesion within the upper soil profile.
- Heavy rainfall resulted in raised groundwater levels and reduced shear strength of the soils. It is assumed that water from rainfall is stored and transported within fracture networks within the rhyolite rock further upslope, with hydraulic head building up and eventually driving flow through the subsurface soil profile. As the failure occurred after peak rainfall, there was a delayed response, and pore pressures would have likely increased progressively until failure. Strong seepage flows observed immediately after the landslide are evidence that high porewater pressures were occurring at depth and were released upon exposure of the slip surface.

- The site is located within a zone of historic failures with permanent springs and seeps that daylight nearby. Springs/seepages continued to flow at various locations within the main failure surface (CG1) and within the smaller translational slide to the north (CG2) for up to a week following the failure with pooling of water in the debris immediately below the scarp also noted. The landslide debris is interpreted to have been transported along a fine-grained rhyolitic tephra layer, possibly the Pahoia Tephra as this was observed at the base of the landslide deposit (see Figure 6 above. This will need to be confirmed with borehole investigations and laboratory testing in vicinity of the failure scarp to determine the spatial extent of these deposits.
- A 150 mm PE water main ran along the rear of the campground area at the toe of the failed slope and was seen ruptured following the large mass movement that occurred. However, it is not known if the pipe failed prior to, or during the landslide, and therefore it is difficult to determine whether it was a significant contributing factor to the failure.

5. Risk Assessment

5.1 Emergency Response and TARP

Following the emergency response phase, WSP recommended that the southern half of Adams Avenue was closed off until appropriate controls were in place to manage the risk to the public from further mass movements from the landslide failure susceptibility zone (lower Mauao flanks). WSP issued the following recommended controls:

- Installation of a container barrier within the site next to Adams Avenue to control minor rockfall or debris from the slip area.
- Removal of a large boulder on the northern side of the slip scarp. This boulder was removed by rope access technicians on 5 February 2026.
- A Trigger Action Response Plan (TARP) for Adams Avenue which was tied to site inspections, a live monitoring system, rainfall and earthquake monitoring. An approach was taken whereby a TARP Road Closure Zone was implemented for Adams Avenue within a projected 1V:5H runout zone from the landslide susceptibility area.

Refer to the Harbour Side TARP dated 27 February 2026. Version 2a for further details.

5.2 Pilot Bay Boat Ramp

The Pilot Bay boat ramp has been closed off as part of the current exclusion zone which includes the Mount Maunganui Beachside Holiday, Mount Hot Pools and Mount Surf Lifesaving Club. The boat ramp is located within the 1V:4H runout zone projected from the landslide susceptibility area. Based on our assessment we anticipate risks to the public using the boat ramp can be managed utilising the existing TARP developed for Adams Avenue with some minor modifications.

Further Work

5.3 Proposed Geotechnical Investigations

We recommend undertaking geotechnical investigations to develop a detailed ground model that characterises the subsurface conditions and supports back-analysis of the landslide. This information is required to assess the ongoing stability of the area and to better understand the groundwater regime and geotechnical factors that contributed to the failure.

The recommended investigation and laboratory testing programme includes:

- **Three machine-drilled boreholes** to depths of up to 40 m, positioned near the crest of the landslide and within the campground area below the scarp.
- **Laboratory testing** of representative samples from both the landslide debris and boreholes, including Atterberg limits, particle size distribution, and triaxial shear testing.
- **Topographic and drone-based photogrammetry surveys** to accurately map the landslide morphology and surrounding terrain.
- **Installation of piezometers** to monitor groundwater levels, seasonal fluctuations, and pore-pressure responses over time.

5.4 High-Level Remediation Strategy

Remediation of the slip area will ultimately depend on decisions regarding the future use of the site, which are yet to be determined. Depending on the preferred end use, a range of approaches may be appropriate. For example, if the area is retained in a largely natural state, options could include leaving the slip 'as-is' with hydroseeding and/or stabilising vegetation on the scarp. If existing or future structures remain within potential runout zones, such as the Hot Pools complex or other facilities, additional mitigation measures such as engineered debris or deflection bunds, supported by remote sensing instrumentation and appropriate TARP's may be required to ensure safe operation.

To support decision-making on future land use and to assess whether life-safety risks can be appropriately mitigated, we recommend undertaking a Quantitative Landslide Risk Assessment (QLRA) for both pre- and post-mitigation scenarios.

6. Limitations statement

This report ('Report') has been prepared by WSP New Zealand Limited ('WSP') exclusively for Tauranga City Council ('Client') in accordance with the Instrument and Emergency Support Services Agreement, dated 4th February 2026 ('Agreement').



This Report has been prepared expressly for the purpose of providing a preliminary assessment of the Mount Maunganui Beachside Holiday Park landslide, following the 22-23 January 2026 extreme rainfall event ('Permitted Purpose'). WSP accepts no liability whatsoever for the use of the Report, in whole or in part, for any purpose other than the Permitted Purpose. Unless expressly stated otherwise, this Report has been prepared without regard to any special interest of any party other than the Client. WSP accepts no liability whatsoever for any use of this Report, in whole or in part, by any party other than the Client. Unless WSP agrees otherwise in writing, any use or any reliance on this Report by a third party is at its sole risk without recourse to WSP. Third parties must make their own enquiries and obtain independent advice in relation to any matter dealt with or any conclusion expressed in this Report.

The data reported and conclusions drawn by WSP in this Report are based solely on information made available to WSP at the time of preparing the Report. The passage of time; unexpected variations in ground conditions; manifestations of latent conditions; or the impact of future events (including (without limitation) changes in policy, legislation, guidelines, scientific knowledge; and changes in interpretation of policy by statutory authorities); may require further investigation or subsequent re-evaluation of the conclusions.

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