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Geotechnical Assessment Report to Support a Private Plan Change at 50 Pukekohe East Road & 47 Golding Road, Pukekohe

Rev B

18 September 2023

Job No. 210968



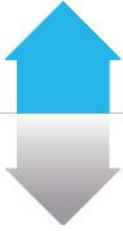
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**GEOTECHNICAL ASSESSMENT REPORT
TO SUPPORT A PRIVATE PLAN CHANGE
50 PUKEKOHE EAST ROAD & 47 GOLDING ROAD, PUKEKOHE**

Job Number:	210968
Name of Project:	50 Pukekohe East Road & 47 Golding Road, Pukekohe
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1.0 Introduction

Soil & Rock Consultants (S&RC) were engaged by Omac Ltd & Next Generation Properties Ltd to carry out a geotechnical desktop study and preliminary assessment report regarding a proposed private plan change for future residential development of 50 Pukekohe East Road & 47 Golding Road, Pukekohe .

The scope of this report has been defined as the following:

- Identify any potential natural hazards. From a geotechnical perspective these comprise erosion (including coastal erosion, bank erosion, and sheet erosion), falling debris (including soil, rock, snow, and ice), subsidence and slippage (as defined by Section 71 of the Building Act 2004 – but excludes inundation (flooding, overland flow, storm surge, tidal effects, and ponding)).
- Identify the general measures to manage natural hazards (defined above), including avoidance, adaption, or remediation.
- Identify key opportunities and constraints (geotechnical) relevant to development of the site.
- Provide a drawing showing the existing situation on the site, including, where relevant: any areas of the site that are subject to hazard (as defined above).

The primary purpose of this reporting is to identify the issues discussed above and provide associated remedial, mitigating, and design recommendations in order to determine the land suitability for future residential development, and support any applications in this regard. Detailed geotechnical assessment will be required following a plan change.

1.1 Limitations

This report has been prepared by Soil & Rock Consultants for the sole benefit of Omac Ltd & Next Generation Properties Ltd (the client) with respect to 50 Pukekohe East Road & 47 Golding Road, Pukekohe and the brief given to us. The data and/or opinions contained in this report may not be used in other contexts, for any other purpose or by any other party without our prior review and agreement. This report may only be read or transmitted in its entirety, including the appendices.

The recommendations given in this report are based on a walkover inspection of the site and desk-based study and intended for a broad scale planning exercise only. Inferences about the subsurface conditions on the site have been made but cannot be guaranteed. Localised variations in ground conditions from those described in this report are likely to exist across the site. Detailed geotechnical investigation works are recommended during the detailed design phase to confirm the inferences made herein, and to provide detailed design parameters.

2.0 Site Identification

The proposed plan change covers two properties ('the site'), comprising:

- 50 Pukekohe East Road, Pukekohe (Part Allot 15 PSH OF Pukekohe);
- 47 Golding Road, Pukekohe (Lot 1 DP 392968);

The properties cover a combined area of approximately of 27.2 hectares. Under the Auckland Unitary Plan, the entire site is zoned 'Future Urban Zone'.

A detailed walkover inspection of the site was carried out on 07 December 2021. The purpose of our walkover was to identify the presence of the following:

- Signs of past structures, possible earthworks and/or placement of non-engineered fill.
- Signs of natural hazards (erosion, falling debris, subsidence and slippage).
- Assess predominant landscape and landform.

Site Location, Topography & Geomorphology

The site is situated to the southeast of Pukekohe township and bound by Pukekohe East Street to the north and Golding Road to the west. The properties to the south and east of the site typically comprise undeveloped farmland (see Figure 1 - the location and orientation of Figures 2 to 5 are also shown on Figure 1).

The subject site comprises predominantly gently to moderately sloping farmland (see Figure 2), with one large shed located in the north-west corner and another near the south-western corner of the site.

Several gullies and overland flow paths (OLFPs) traverse the site, typically in an overall east-west orientation. The immediate banks of the gullies are moderately to steeply incised in places (up to 35°). The low-lying and flatter areas of the site (i.e. within the gully inverts) are significantly 'boggy' in certain areas, and a large pond is also present in the southwest portion of the site (see Figure 3).

Slope inclinations within the site are generally in the order of approximately 5° to 25° with isolated areas at steeper inclinations (banks of some gullies). During our walkover several minor scarps/erosion surfaces were observed at various locations around the site, on the moderately to steeply inclined slopes (see Figure 4). The observed scarps are related to minor localised erosion/instability within the surficial soils (which has likely been exacerbated by stock movement) rather than deep-seated instability.

Built Development

A large shed is present within the northwest corner of 50 Pukekohe East Road, and appears to be located on a filled building platform (see Figure 5). There is also evidence of a historical structures to northwest and the east of this shed which are likely areas for demolition debris and fill remnants.

To the south, one dwelling and a farm shed are located within No 47 Golding Road and is accessed via a gravel driveway that extends from Golding Road.

According to the Auckland Council GeoMaps website there are no existing public underground services within the site.

Vegetation

Vegetation across the site is typically sparse as the site predominantly comprises pasture. Shelterbelts of trees are present along some fence lines, and generally some larger trees are present in the areas around the base of the gullies/OLFPs that traverse the site.

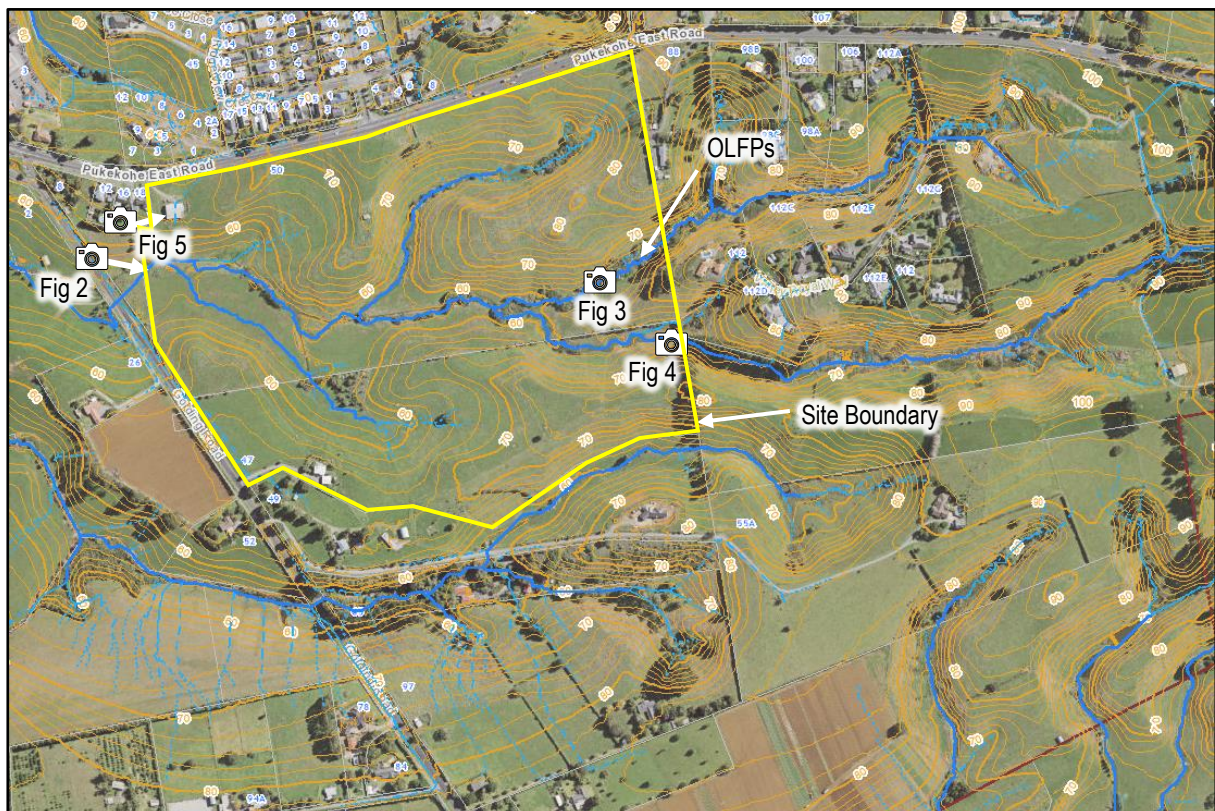


Figure 1: Aerial Image (Source: Auckland Council GeoMaps Website)



Figure 2: Drone Image of Site (Source: On-Site Photos)



Figure 3: Example of 'Boggy' Area (Source: On-Site Photos)

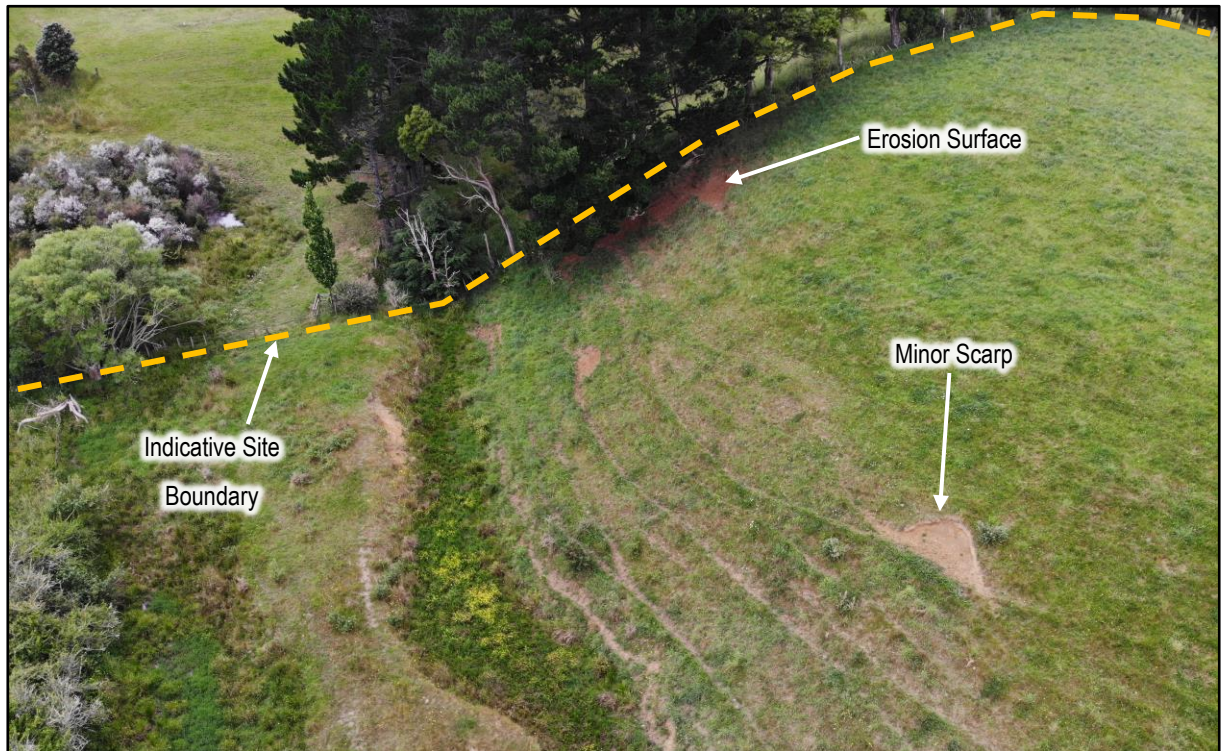


Figure 4: Example of Minor Scarps/Erosion (Source: On-Site Photos)

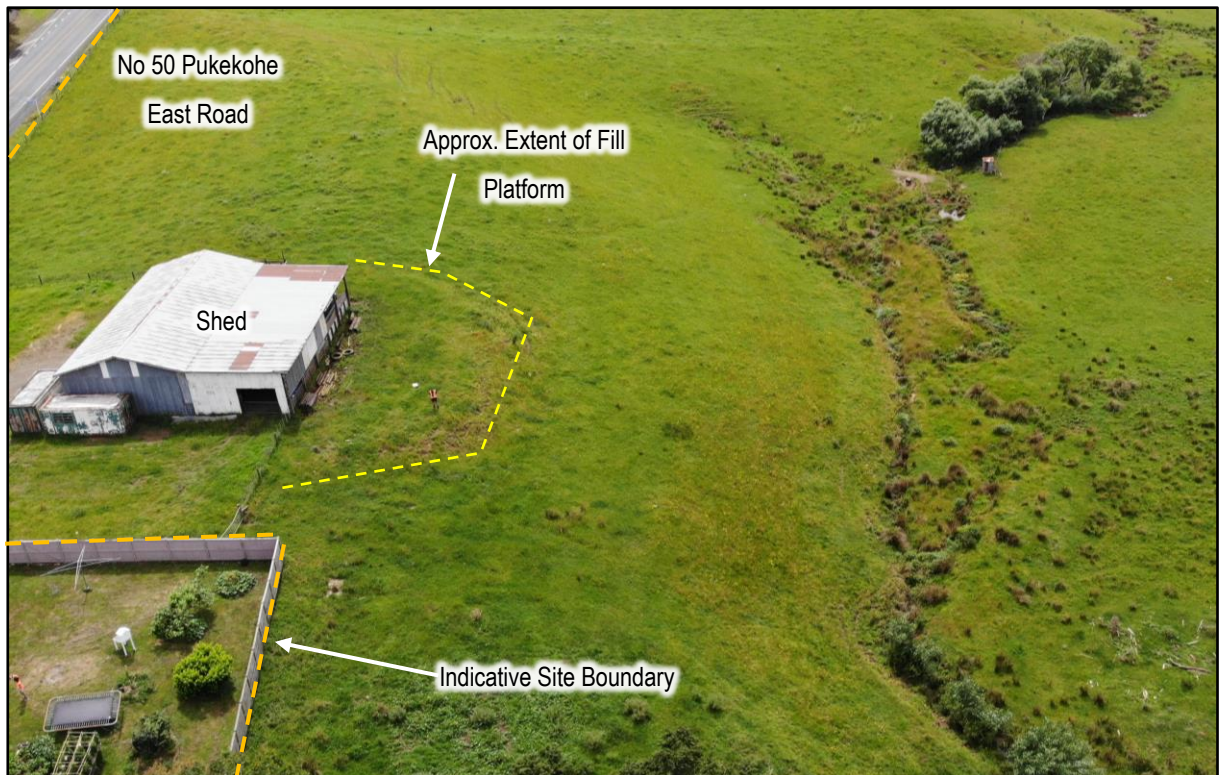


Figure 5: Apparent Fill Platform Below Shed (Source: On-Site Photos)

3.0 Desktop Study

3.1 Geology

According to the GNS New Zealand Geological Web Map 1:250,000, the site is underlain by 'Undifferentiated Kerikeri Volcanic Group Tuff of South Auckland Volcanic Field'. Basalt lava of the South Auckland Volcanic Field is shown to the northeast, southeast and west, and three 'pockets' of Holocene age (recent) alluvium are also shown within vicinity of the site (see Figure 6 below).

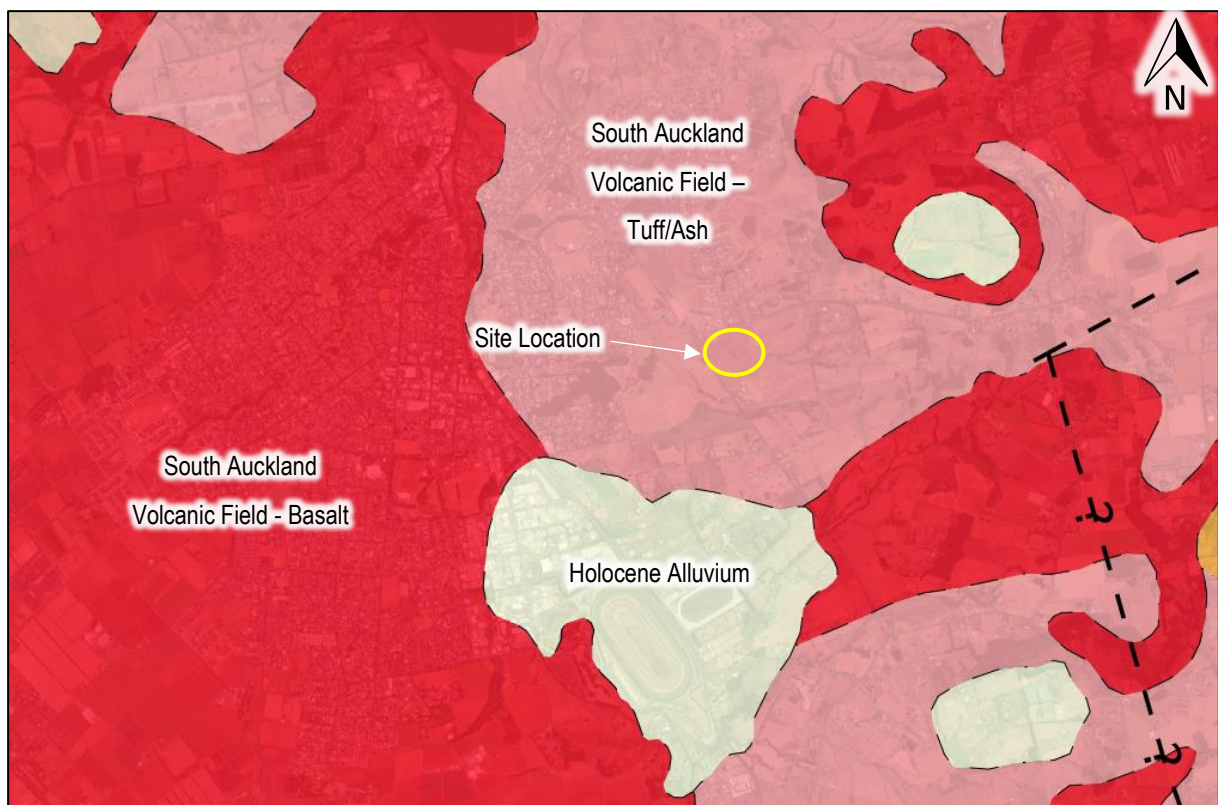


Figure 6: GNS Geological QMap (Source: GNS Science Ltd)

South Auckland Volcanic Field – Tuff/Ash

Tuff/ash deposits typically occur as thin graded beds of grey, mud to sand sized fragments of basalt and basanite fragments. This material will vary in thickness (usually thickest closer to the source of the eruption) and can be underlain by other volcanic deposits such as basalt rock, or by the 'country rock' (materials that pre-existed the eruption) such as Waitemata Group sediments or more-recent alluvial deposits.

No evidence of basalt or other geological units were observed at the ground surface during our walkover. As such we anticipate volcanic ash/tuff is likely to be encountered across the higher elevations of the site. The ash/tuff will likely provide a suitable founding stratum for shallow foundations (to be confirmed by

detailed geotechnical investigation). Alluvial soils were encountered in nearby boreholes above and below the volcanic deposits, as discussed in Section 3.2.2, and would be expected from the ground surface in the lower elevations of the site (bases of the gullies).

Puketoka Formation

Puketoka Formation soils are alluvial deposits generally comprising pumiceous soils include silts, clays, sands, and occasional gravels. Organic clays and peat deposits are common, and surficial volcanic ash deposits, typically less than 1m in thickness, may also be present (such as discussed in Section 3.2.2 below). They have been deposited for a longer geological timescale than recent/localised alluvium and are therefore generally more consolidated and of higher strength.

Recent (Holocene) Alluvium

Generally, recent alluvium is variable in terms of consistency and strength and typically found along stream channels, flood plains, or localised gully features. Holocene alluvium is generally highly compressive, weak, often saturated, and can contain high quantities of organic material.

Alluvial soils are often susceptible to consolidation (resulting in settlement) when subjected to foundation or fill loads, particularly where organic soils are present. Lower strength soils are common, particularly where saturated, and can be sensitive, often rapidly losing strength in response to disturbance by construction plant and/or exposure to the elements.

Though not mapped within the site, it is considered likely that recent alluvium will underlie the anticipated tuff/ash deposits, and be present in close proximity to watercourses, OLFP's and ponds.

Fill

Fill (likely non-engineered) can be expected in varying quantities across the site, generally around existing structures (such as that identified in Figure 5), historical structures and accessways. No large fill stockpiles were identified during the site walkover.

Groundwater

Minimal groundwater information was available for this assessment however in general, land adjacent to the gullies/OLFP's are shown on the Auckland Council GeoMaps website to be within 'flood sensitive areas'. The flood sensitive areas encompass a greater area adjacent to the gully/OLFP near the west boundary and 50 Pukekohe East Road. Groundwater levels are anticipated to be relatively shallow in these areas. High groundwater can create significant complications if deep excavations are proposed

(e.g. basement excavations, bulk earthworks). A detailed groundwater analysis and assessment is likely to be required for any proposed basement or bulk excavations in low-lying areas.

3.2 Nearby Geotechnical Investigations

3.2.1 Soil and Rock Consultants Database

Soil & Rock Consultants (S&RC) have completed a geotechnical desktop study to support a private plan change at 53 Birch Road, 2 & 19 Goldings Road and 212 East Street, Pukekohe (S&RC Ref: 21139). These properties are located to the west of the current site

S&RC have carried out a number of geotechnical investigations in the area. Reference has been made to the S&RC Project Database and the following project and report has been reviewed:

- *'Geotechnical Investigation Report, Proposed 19 Lot Residential Subdivision, 17 – 35 Anselmi Ridge Road, Pukekohe'*. Ref No. 14021, dated 11 June 2014.

This project was selected based on its proximity and relevance to the subject site. A brief summary of the project and the findings of the report is given below.

The 2014 geotechnical investigation was carried for nineteen proposed dwellings situated on the north side of Pukekohe East Road, adjacent to the site and shown by the geological maps to be within an area underlain by the same geology (as identified in Section 3.1).

Fieldwork comprised drilling of nineteen hand augerholes. In general, the soils encountered comprised surficial fill material overlying alluvial deposits (differing from the mapped geology of the area). The alluvium typically comprised firm to very stiff silt and silty clay, with minor clay and traces of fine sand and gravel lenses. No significant organic or highly compressible material was encountered within the alluvial deposits.

3.2.2 New Zealand Geotechnical Database

The New Zealand Geotechnical Database (NZGD) was reviewed for nearby ground investigation data to further understand the likely geology and assist with establishing appropriate geotechnical testing methods.

We have reviewed one machine drilled well borehole, two Test Pits (TP's) and a series of hand augerholes undertaken within and directly adjacent to the site. Logs of the ground investigations are included in Appendix A and the plan location of the ground investigations are shown in Figure 7.

A summary of the key geotechnical information provided by the investigation logs is presented below in Table 1.

Table 1 – Investigation Logs Summary

Hole ID's	Description	Comments
NZGD: HA_89698 Log Ref: H5 & H10	All four hand augerholes drilled to 3.0m below ground level (target depth). The ground profile typically comprised: 0.0m - 0.3m Topsoil 0.3m – 2.5/3.0m 'Basaltic Ash' and Puketoka Formation Soils 2.4m – 3.0m Weathered Tuff (encountered in A5, AH8 & A10)	Shear vane results generally between 75 – 125kPa (stiff to very stiff) Groundwater recorded at 0.1m in H5
NZGD: TP_67734 Log Ref: TP04 & TP05	Two Test Pits undertaken to 2.0m below ground level (target depth). Ground profile typically comprised: 0.0m - 0.3m Topsoil up to 0.3m – 2.0m Volcanic Ash (South Auckland Volcanic Field)	Shear vane results between 85 – 136kPa (stiff to very stiff) Water seepage at 1.8m in both TP's
NZGD: Other_82351 No Log Ref	Well Bore to 69.0m below ground level 0m – 2.5m Brown volcanic clays 2.5m - 19.0m Volcanic ash 19.0m – 24.0m Green/grey silts, pumice 24.0m – 27.0m Pumice silts 27.0m – 33.0m Green silts 33.0m – 38.0m Organic silts and clays 38.0m – 50.0m Volcanic ash 50.0m – 53.0m Firm Basalt 53.0m – 68.0m Firm honeycomb basalt with ash layers 68.0m – 69.0m Green sticky clays	No strength testing, description not in accordance with NZGS guidelines 'Water Depth' recorded at 18.2m

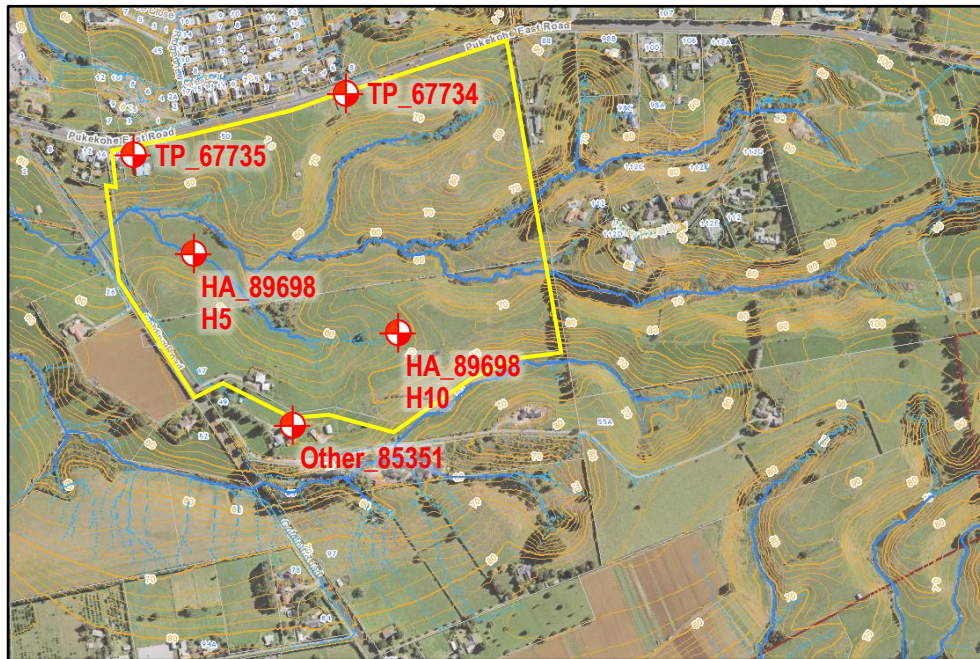


Figure 7: Layout plan of reviewed investigations (Source: NZGD Website)

In summary, the ground profile across the site appears to comprise surficial topsoil, followed by Puketoka Formation alluvial deposits and Volcanic Ash (Tuff) deposits of the South Auckland Volcanic Field, underlain by basalt rock and ash layers at depth. The basalt rock appears to be underlain by further alluvial deposits. This is a typical geologic ground profile for this area.

3.3 Review of Council Property Files

Property File requests were lodged with Auckland Council and files were available for both properties.

A thorough review of the available property files was carried out. The majority of documents contained within the property files related to Resource Consents and Building Consents/Permits, though no geotechnically pertinent information was encountered.

3.4 Historical Aerial Photographs

Historical aerial photographs were obtained from a variety of sources (see Table 2) from 1942 through to 2021. The aerial photographs were examined from a geotechnical perspective and relevant features are discussed in Table 2, and the photographs are attached in Appendix B.

Table 2 – Geotechnical Review of Historical Photographs

Year	Source	Location and Geotechnical Features
1942	Retrolens	<p>The site and surrounding areas are predominantly being used for pastoral purpose. The current landform generally represents that observed during the November 2021 site walkover, with no major digressions of streams, overland flow paths and ponds (though some ponds are not present). Vegetation is sparse, with bush/shrubs generally confined to overland flow paths and ponds.</p> <p>A large building is located within northern boundary of 50 East Pukekohe Road. The remainder of the site contains several small sheds.</p>
1961	Retrolens	<p>No significant changes to the landform have been identified and the surrounding area remains predominantly as pasture.</p> <p>There appears to be a small horticultural operation in the northern section of 50 Pukekohe East Road.</p>
1975	Retrolens	<p>An access road has been constructed near the southern boundary, orientated east-west. No other significant changes to the landform have been identified.</p> <p>The large shed and another structure (inferred dwelling) have been constructed in the northwest corner of 50 Pukekohe East Road. The fill platform to the south of this shed is evident.</p>
1988	Retrolens	<p>No significant changes to the landform have been identified and the surrounding area remains predominantly as pasture.</p> <p>No additional built construction is evident.</p>
2003-2004	Auckland Council	<p>The access road identified in the 1975 photography has been decommissioned. No other significant changes to the landform have been identified. Areas to the east and southwest have been residentially developed.</p> <p>No additional built construction is evident.</p>
2010-2011	Auckland Council	<p>The 'wetland' area around the gullies near the eastern boundary (where it enters the site) encompasses a larger area and is densely vegetated. No other significant changes to the landform have been identified. The subdivision to the north (referred to in Section 3.2.1 of this report) has begun development. The remaining land surrounding the site appears similar the most recent aerial photography (2021).</p> <p>A dwelling has been constructed at 47 Golding Road as well as the access road leading to the property</p>
2017	Auckland Council	<p>No significant changes to the landform have been identified and the surrounding area remains largely unchanged.</p> <p>No additional built construction is evident.</p>

Year	Source	Location and Geotechnical Features
2021	Google Earth Pro	No significant changes to the landform have been identified and the surrounding area remains largely unchanged. No additional built construction is evident.

4.0 Natural Hazards

Based on the desktop study and walkover inspection, we consider that the site area is not currently affected (and is unlikely to be affected in the future) by any of the following natural hazards:

- Coastal erosion – the site is not situated in a coastal environment.
- Naturally falling debris (soil, rock, snow, and ice) – no cliffs or high banks with the potential for soil or rock falls are present. The likelihood of falling snow and ice is considered negligible.

We consider that the site has the potential to be affected by the following natural hazards:

- Subsidence.
- Bank erosion.
- Sheet erosion.
- Slippage.

The areas considered to have the potential to be affected by these hazards are identified in the Site Identification Plan, Drawing No. 210968/1, attached in Appendix C. The hazards and risks to the site are described in more detail below.

Subsidence

Areas where subsidence could be a potential hazard are limited to parts of the site where unconsolidated alluvial deposits (anticipated around the drainage gully and at depth) or non-engineered fill (anticipated where current structures are present and where historical structures have been identified) may be present. Subsidence may occur within such areas if the surface loading was increased by development activities such as construction of heavy structures, or placement of significant thicknesses of fill material. In particular, the natural soils within low-lying areas that are permanently saturated may be susceptible to this.

Bank Erosion

Evidence of bank erosion along the drainage gully margins and on moderately sloping areas have been noted during our site walkover. Bank erosion is an on-going natural process, however it has the potential to be exacerbated by increased flow rates as a result of increased impermeable area post-development.

Sheet Erosion

Sheet erosion is defined as that caused by raindrop impact and transport of material downslope by water flowing overland as a sheet rather than in overland flow channels. The site is not currently at significant risk of sheet erosion, however the risk may increase temporarily during development earthworks as large areas of subgrade are exposed by stripping of vegetation and topsoil.

Slippage

Evidence of relic slip scarps from small scale slope failures were noted on the slopes around the gully banks and on ground which is moderately to steeply sloping. Smaller scale slippage on the gully banks can be treated as synonymous with bank erosion. Slips within the moderately to steeply sloping ground were likely triggered by saturation of the soils following prolonged heavy rainfall, but may also be related areas of non-engineered fill.

5.0 Measures to Manage Natural Hazards

The following are suggested measures that may be utilised to manage the natural hazards identified above as being potentially 'at risk'. It should be noted that these options are preliminary only, and that the final mitigation methods would be designed based on detailed geotechnical investigation and analysis.

Subsidence

Unconsolidated alluvial deposits are generally restricted to gullies, overland flow paths and low-lying areas. As described above, such soils are subject to consolidation when additional loads are applied at the ground surface, resulting in subsidence (often referred to as settlement). Common practice to avoid this is to remove any weak, organic or compressible material during pre-development earthworks, install drainage, and replace with engineered fill.

Provided such works are designed and carried out in accordance with good engineering practice, designed to recommendations based on specific geotechnical investigation, then the risk of subsidence in such areas will be managed.

If the earthworks process described above cannot be carried for an area of potential subsidence, then other management methods can be applied. These may include measures such as supporting any permanent structures on piles or raft type foundation systems specifically designed to limit the effect of subsidence or differential settlement.

Bank Erosion & Slippage

As described in Section 4.0 above, bank erosion and slippage is an on-going natural process, however it has the potential to be exacerbated by increased flow rates as a result of increased impermeable area post-development.

Often the best method to manage this natural hazard is to isolate any development from the areas considered to be at risk. This is generally achieved by setbacks of any permanent structures (buildings, roads, retaining walls, etc) from gullies, historical overland flow paths, ponds and wetlands.

Where this cannot be achieved, suitable erosion protection should be installed to mitigate small scale bank erosion and slippage. This may comprise measures such as rip-rap (also gabion rock), placement of geotextiles (e.g. Enkamat by Maccaferri or similar), or construction of gabion basket walls.

In order to manage the risk of slippage on other parts of the site, a detailed geotechnical investigation should be carried out, and any recommendations stemming from this should be observed during all detailed design works.

Sheet Erosion

Sheet erosion is only likely to create a risk to this site during development, when large areas of soil are exposed by stripping of vegetation and topsoil. Auckland Council's GD05 document provides guidelines for the control of erosion during earthworks. Provided these guidelines are followed, it is considered that the risk of sheet erosion at this site will be managed.

6.0 Predominant Landscape and Landform Character

The predominant landscape and landform character of the site, as described below, are identified on the Site Identification Plan, Drawing No. 210968/1, attached in Appendix C.

As described in Sections 3.1 and 3.3, the natural soils underlying the site are shown to comprise Puketoka formation alluvial deposits and tuff/ash deposits of the South Auckland Volcanic Group. Surface evidence of fill material has only been identified around the large shed in the northwest corner of 50 Pukekohe East Road, but local deposits of fill are highly likely within areas of existing and historical structures (though no evidence was seen during the site walkover). It is likely that gullies, overland flow paths, ponds and wetlands contain Holocene age, poorly consolidated alluvial deposits (gully alluvium).

Council records do not contain any documentation regarding fill placed on-site.

The site mostly comprises sloping ground, approximately 40-50% of which has been categorised as gently sloping with inclinations less than 14° (<1V:4H). There are two areas where the ground is near level, those being the area around the western end of the 'main' gully where it exits the site and a portion of the land surrounding the existing dwelling at 47 Golding Road (see Appendix C). The remainder of the site consists of ground sloping at moderate inclinations ($15^\circ - 25^\circ$) and the immediate banks of the gullies are moderately to steeply incised in places (up to 35°).

As described in Section 2.0, and discussed throughout the report, there is one 'main' gully system which exits the site to the northwest. This gully diverges into three smaller gullies within the site to east, and those gullies continue through adjacent land (except for the northern-most gully head). Another gully system is located within the southern portion of the site and exits to the southwest. This gully diverges into two within the site and both gully heads originate within the site.

Springs and localised seepages could be present on the gully slopes and within low-lying areas.

7.0 Geotechnical Opportunities and Constraints

We consider that the site is likely to provide the following opportunities and constraints to development from a geotechnical perspective.

Opportunities

- The majority of the site area is likely to be underlain by shallow Puketoka Formation alluvial deposits and volcanic Ash/Tuff deposits. Such soils are generally suitable for the support of single or multi-storey residential structures provided earthworks design is based on-site specific geotechnical investigation works. There may be some localised 'soft' areas outside of the gullies associated with soils of the Puketoka Formation, however we do not anticipate these to be numerous.
 - It is likely that the natural soils present on site (with the exception of weak, organic or compressible gully alluvium, and potential isolated areas of Puketoka Formations soils) will be suitable for re-use as engineered fill, should large scale earthworks be required prior to development.
 - No signs of large-scale instability were identified across the site during our walkover inspection and desktop study. Accordingly, the site is unlikely to be constrained by significant slope stability considerations.
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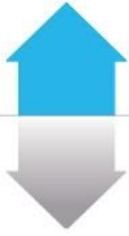
Constraints

- Non-Engineered fill material. A detailed geotechnical investigation will assist in determining the depth and extent of non-engineered fill with the site, though we believe non-engineered fill areas are limited to areas of present and historical structures, and we do not expect depths of non-engineered fill materials to be significant.
- Subsidence (Settlement). Weak, organic or compressible alluvial deposits are likely to be encountered within the gullies, historical overland flow paths (though no major tributaries have been identified outside of the current gullies and overland flow paths) and in low-lying parts of the site. Such material, if used for the support of permanent structures, would likely allow settlement (subsidence) above tolerable limits. Accordingly, where confined to the gully and overland flow paths, such material would require removal and replacement with engineered fill. Subsurface drainage is generally recommended below fill in gully areas. Where more extensive areas of compressible soils may be present, the risk of settlement may require mitigation in the form of specific development design carried out in accordance with recommendations based on specific geotechnical investigation.
- Bank Erosion and Slippage. Signs of bank erosion and localised slippage have been identified on the site. Often the best method to manage this natural hazard is to isolate any development from the areas considered to be at risk. This is generally achieved by setbacks of any permanent structures (buildings, roads, retaining walls, etc) from the identified areas at risk. The risk of instability would be determined with detailed geotechnical investigation and analysis. It is likely that conventional subdivision earthworks would mitigate some of the risk and may reduce setback distances.

As an approximate guide, we have indicated on the Site Identification Plan a setback of 15m from gullies, overland flow paths and wetland, and 10m from ponds. Where appropriate setbacks cannot be achieved near low-lying areas, suitable erosion protection should be installed. Near areas at risk of instability, site specific geotechnical investigation, stability analysis and earthworks design will be required.

It is our opinion that the site is generally geotechnically suitable for development however we recommend geotechnical considerations addressed in this report be investigated and/or assessed as part of a proposal-specific geotechnical investigation with regard to future residential development of the site. A detailed assessment of total and differential settlement may be required should a geotechnical investigation encounter organic or soft material within the subject site. It is recommended that an assessment of liquefaction potential is carried out as part of a specific geotechnical investigation.

End of Report Text – Appendices Follow



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Appendix A

NZGD Investigation Logs

Geotechnical

Environmental

Stormwater

Hydrogeology

HAND AUGER LOG		SHEET 1 OF 1		BOREHOLE NO. H5							
PROJECT: FRANKLIN DISTRICT COUNCIL GROWTH STRATEGY PUKEKOHE SOUTH		CO-ORDINATES		E		N					
		GROUND LEVEL		DATUM							
PROJECT NO. 61417		Date Drilled		10.06.10		Logged by J. Jones					
						Checked					
DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC LOG	SAMPLE TYPE	UNDRAINED STRENGTH	SHEAR (kPa)	WATER CONTENT (%)			WATER CONTENT (%)	TESTING AND COMMENTS	
				Vane readings corrected as per BS 1377		W _p	W _f	W _l			
				X Shear Vane ○ Residual Shear Vane		X ———●————— I					
				50	100	150	200	20	40	60	80
0.0	[TOPSOIL] SILT, brown, friable	[Symbol]									
0.1	CLAY, silty, orange/light brown, slightly plastic, stiff, moist [BASALTIC ASH]	[Symbol]									
0.5	CLAY, silty, light grey streaked orange, moderately plastic, stiff to very stiff, wet [TAURANGA GROUP]	[Symbol]			x						
1.0	becomes very sandy (very fine grained)	[Symbol]			x						
1.5	becomes blue/grey	[Symbol]			x						
2.0		[Symbol]			x						
2.5	SAND (very fine grained), clayey, dark grey/purple, slightly plastic, loose to medium dense, wet [LITHIC TUFF]	[Symbol]			x						
3.0	EOB @ 3.0 m TARGET DEPTH	[Symbol]			x						
3.5											
4.0											
4.5											
5.0											
5.5											
6.0											
6.5											
7.0											

REMARKS: Groundwater encountered @ 0.1 m on 10.06.10

Fraser Thomas

- CONSULTING ENGINEERS
- RESOURCE MANAGERS
- ENVIRONMENTAL CONSULTANTS
- SURVEYORS & PLANNERS

HAND AUGER LOG		SHEET 1 OF 1		BOREHOLE NO. H10					
PROJECT. FRANKLIN DISTRICT COUNCIL GROWTH STRATEGY PUKEKOHE SOUTH PROJECT NO. 61417		CO-ORDINATES		E		N			
		GROUND LEVEL		DATUM					
		Date Drilled		10.06.10		Logged by J. Jones			
						Checked			
DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC LOG	SAMPLE TYPE	UNDRAINED STRENGTH (kPa) Vane readings corrected as per BS 1377 X Shear Vane O Residual Shear Vane	SHEAR (kPa)	WATER CONTENT (%) W _p W _f W _l X —●— I			TESTING AND COMMENTS
				-50 -100 -150 -200		-20 -40 -60 -80			
0.0	[TOPSOIL] SILT, brown, friable	~							
0.5	SILT, clayey orange/light brown, slightly plastic, stiff, moist [BASALTIC ASH]	/ / / /		x					
1.0	CLAY, silty, light grey streaked orange, moderately plastic, stiff to very stiff, wet [TAURANGA GROUP]	+ + + +		x					
1.5		+ + + +		x					
2.0	becomes light grey/green, moderately to highly plastic	+ + + +		x					
2.5		+ + + +		x					
3.0	SAND (very fine grained), clayey, dark grey/purple, slightly plastic, loose to medium dense, wet [LITHIC TUFF]		x					
3.0	EOB @ 3.0 m TARGET DEPTH			x					
3.5									
4.0									
4.5									
5.0									
5.5									
6.0									
6.5									
7.0									

REMARKS: Groundwater encountered @ 0.5 m on 12.07.10



Fraser Thomas
 • CONSULTING ENGINEERS
 • RESOURCE MANAGERS
 • ENVIRONMENTAL CONSULTANTS
 • SURVEYORS & PLANNERS



TEST PIT LOG TP04

URS New Zealand Limited
13-15 College Hill, Auckland

Phone: (09) 355 1300
Fax: (09) 355 1333

Project No.:
42070678

Project Reference:
Pukekohe No.1 and Buckland Watermains

Drilling Contractor: **HEBS**

Excavation Method: **1 TON EXCAVATOR**
 Logged By: **J. Power**
 Checked By: **E. Ross**
 Date Started: **11-7-11**
 Date Finished: **11-7-11**

Relative Level: **mRL**
 Coordinates: **6443233.00 mN**
2681378.00 mE
 Permit No:

Client:
WaterCare Services

DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	GEOLOGICAL DESCRIPTION	FIELD SHEAR STRENGTH (kPa)	PENETROMETER BLOWS (N)	SAMPLING AND OTHER TESTING	GROUND WATER DATA AND COMMENTS
SILT; dark brown. Soft to firm, non-plastic, moist. Occasional rootlets. [TOPSOIL]		0.0	SOUTH AUCKLAND VOLCANIC FIELD	0.5m: 150/62 136/71		1.0m: BULK SAMPLE	1.8m: WATER SEEPAGE
SILT, some clay; orange brown to reddish brown, occasional dark brown mottles. Stiff, moist to wet, slightly plastic. Occasional rootlets. [VOLCANIC ASH]		0.2					
From 0.4m; Becomes very stiff, occasion pockets (<10mm) of clayey SILT; light brown, moderately plastic.		0.4					
		0.6					
From 0.8m; No rootlets present.		0.8					
		1.0	1.0m: 124/41 118/35				
		1.2					
		1.4					
		1.6	1.5m: 118/52 100/35				
		1.8					
		2.0	2.0m: 115/32 100/40				

TEST PIT W REMARKS 42070678 TP LOGS.GPJ WCCNZ.GDT 19/7/11

REMARKS:
 VANE: GEO734 19mm - ALL VALUES CORRECTED
 TEST PIT EXCAVATION COMPLETED AT 2.0m DEPTH

TEST PIT TERMINATED AT:
 Target Depth
 Refusal
 Flooding
 Caving/collapse

SAMPLE TYPE:
 Bulk Sample **BS**
 Tube Sample **TS**
 Disturbed Sample **DS**



TEST PIT LOG TP05

URS New Zealand Limited
13-15 College Hill, Auckland

Phone: (09) 355 1300
Fax: (09) 355 1333

Project No.:
42070678

Project Reference:
Pukekohe No.1 and Buckland Watermains

Drilling Contractor: **HEBS**

Excavation Method:
1 TON EXCAVATOR

Logged By: **J. Power**
Checked By: **E. Ross**
Date Started: **11-7-11**
Date Finished: **11-7-11**

Relative Level: **mRL**
Coordinates: **6443164.00 mN**
2681071.00 mE
Permit No:

Client:
WaterCare Services

DESCRIPTION OF STRATA	GRAPHIC LOG	DEPTH (m)	GEOLOGICAL DESCRIPTION	FIELD SHEAR STRENGTH (kPa)	PENETROMETER BLOWS (N)	SAMPLING AND OTHER TESTING	GROUND WATER DATA AND COMMENTS
SILT, trace of gravel; dark brown. Firm, moist, non-plastic. Gravel, fine to coarse. Occasional rootlets. [TOPSOIL]		0.0 0.2	SOUTH AUCKLAND VOLCANIC FIELD	0.5m: 85/29 84/32		1.0m: BULK SAMPLE	1.8m: BULK SAMPLE 1.8m: MINOR WATER SEEPAGE
SILT, some clay; light orange brown, minor dark brown mottles. Firm to stiff, moist, slightly plastic. [VOLCANIC ASH]		0.4 0.6					
From 0.8m; Becomes reddish brown and orange brown. Stiff to very stiff.		0.8 1.0					
From 1.2m; Becomes orange brown. Stiff. Occasional; pockets of clayey SILT; light brown, moderately plastic.		1.2 1.4 1.6					
		1.8 2.0					
				2.0m: 118/44 91/44			

TEST PIT W REMARKS 42070678 TP LOGS.GPJ WCCNZ.GDT 19/7/11

REMARKS:

VANE: GEO734 19mm - ALL VALUES CORRECTED
TEST PIT EXCAVATION COMPLETED AT 2.0m DEPTH

TEST PIT TERMINATED AT:

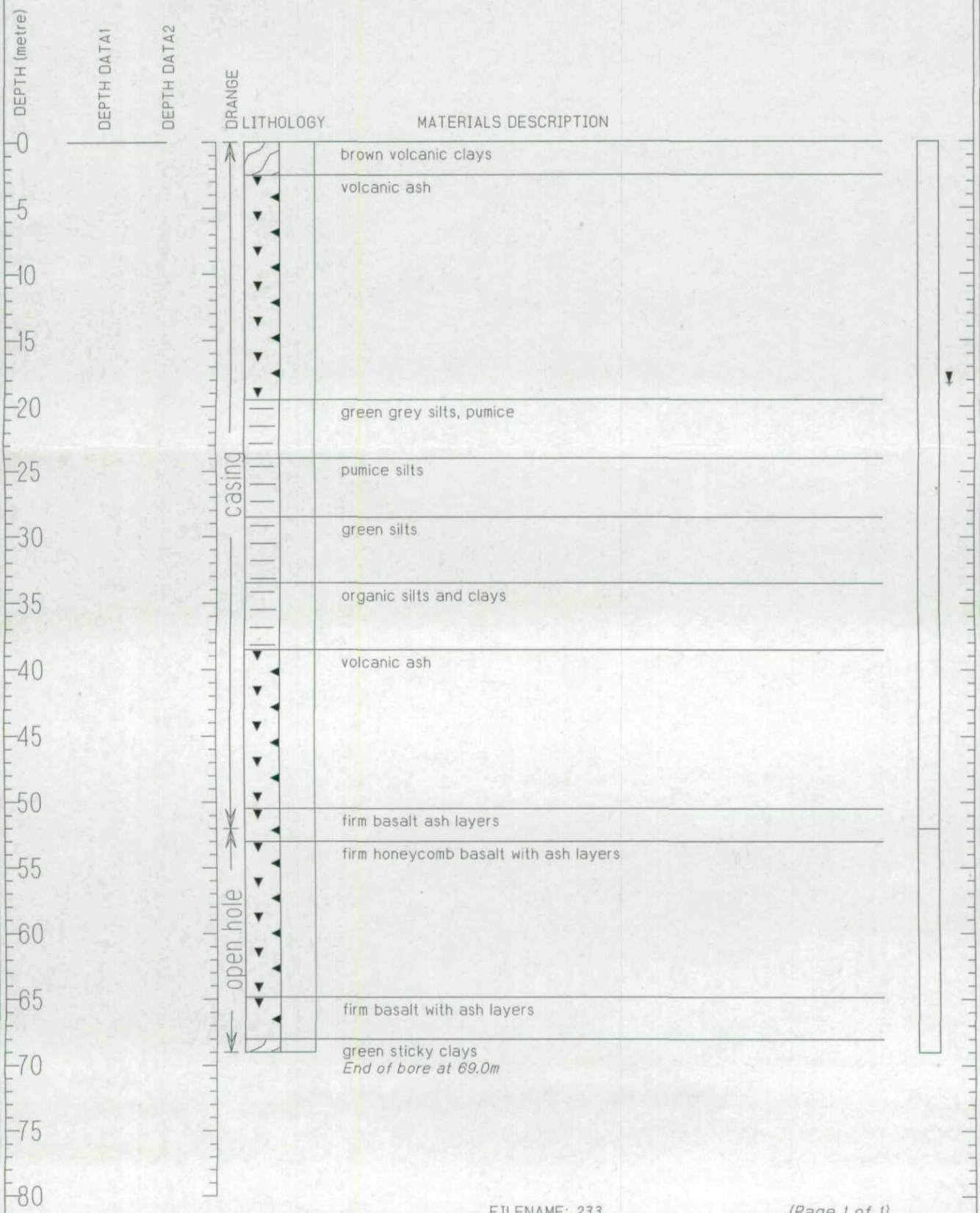
- Target Depth
- Refusal
- Flooding
- Caving/collapse

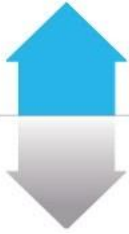
SAMPLE TYPE:

- Bulk Sample **BS**
- Tube Sample **TS**
- Disturbed Sample **DS**

BORE: C J Adams

ADDRESS Golding Rd, RD@ Pukekohe East PERMIT NO. 14/17/167
 MAP REFERENCE R12:815428 TIEDA NO. _____
 USE _____ DRILLER _____ DATE 11/7/88
 LOGGED BY _____ ELEVATION m.rsl DIAMETER 100mm mm BORE CONS. y INTERPOLATED n
 WATER DEPTH 18.20 m.btc TOTAL DEPTH 69.0 m. PUMP TEST n WATER CHEM. n GEOPHYSICS n





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Appendix B

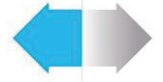
Historical Aerial Photographs

Geotechnical

Environmental

Stormwater

Hydrogeology



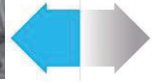
Soil&Rock Consultants
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Retrolens
1942

Historical Aerial Photography
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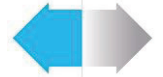
Retrolens

1988

Historical Aerial Photography
Auckland Council GeoMaps







Soil&Rock Consultants

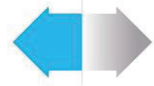
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Auckland Council

2017

Historical Aerial Photography

Auckland Council GeoMaps



Soil&Rock Consultants

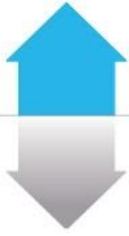
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Google Earth Pro

2021

Historical Aerial Photography

Auckland Council GeoMaps



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Appendix C

Site Identification Plan

Geotechnical

Environmental

Stormwater

Hydrogeology



KEY:

- Site Boundary
- Minor Scarp
- Gully / Overland Flow Path
- Areas of Shallow Instability
- Inferred Gully Alluvium
- Pond/Welland
- Inferred Non-Engineered Fill (Existing and Historical Structures)

NOTES:

1. Locations of features approximate only.
2. Original sheet size A3.
3. Boundary information Auckland Council GIS Data.
4. Aerial Base Map from Auckland Council GIS Website

210968 / 1	DATE: July 2022
SCALE: 1:2500	CHECKED: CW
AT A3	DESIGNED: REV.
Filename: 210968 - rev 15 plan.dwg	

SITE IDENTIFICATION PLAN

**50 PUKEKOHE EAST STREET & 47 GOLDING ROAD
PUKEKOHE**

Check all dimensions and levels on site before commencing construction.
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DATE	REV	DESCRIPTION