Pulver Cooper & Blackley Pty Ltd

Proposed Residential Subdivision
Rayford Street and Daydawn Avenue, Warners Bay

Additional Geotechnical Assessment

Report No. RGS01426.1-AGrev2

29 March 2019

REGIONAL GEOTECHNICAL SOLUTIONS

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Manning-Great Lakes
Port Macquarie
Coffs Harbour

RGS01426.1-AGrev2

29 March 2019

Pulver Cooper Blackley Pty Ltd
98 Lawes Street
EAST MAITLAND NSW 2323

Attention: Mr David England

Dear David

RE: Proposed Residential Subdivision – Rayford Street & Daydawn Avenue, Warners Bay
Additional Geotechnical Assessment

Regional Geotechnical Solutions (RGS) previously undertook a slope stability assessment to assess the feasibility of undertaking residential subdivision development on adjoining sites on Rayford Street and Daydawn Avenue, Warners Bay, which are situated in an area with a history of slope instability.

The assessment was undertaken in accordance with the Australian Geomechanics Society 2007 *Practice Note Guidelines for Landslide Risk Management*, and was reported in RGS report reference number RGS01426.1-AE. Based on the findings of the assessment, it was been concluded that residential development on the lower slopes would be feasible from a geotechnical perspective.

The investigation identified an area of recently active landslide was identified on the upper to mid slopes of the northern end of the site, with a lobe of resultant debris having travelled onto the lower, footslope area. This area was identified and delineated in the report and it was recommended that development should be avoided on the active part of the landslide on the upper slopes.

A second area of historic landslide activity was identified on the lower slopes of the section of the property at 19 Daydawn Avenue. It was recommended that residential development be avoided in that part of the site, however, it was considered that a road could be constructed over the area, with appropriate drainage and remedial works.

It is understood that feedback Council from on the areas proposed for development raised concerns regarding the extent of the areas proposed for development in relation to areas previously identified as restricted areas based on Council's previous zoning in relation to geotechnical issues.

Additional work has therefore been undertaken to more accurately delineate the areas of concern and refine the comments and recommendations of the previous report accordingly.

This report presents the findings of the investigations. If you have any questions regarding the findings of this report, please contact the undersigned.

For and on behalf of

Regional Geotechnical Solutions Pty Ltd

Steve Morton

Principal

Regional Geotechnical Solutions Pty Ltd
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1 INTRODUCTION

Regional Geotechnical Solutions (RGS) previously undertook a slope stability assessment to assess the feasibility of undertaking residential subdivision development on adjoining sites on Rayford Street and Daydawn Avenue, Warners Bay, which are situated in an area with a history of slope instability.

The assessment was undertaken in accordance with the Australian Geomechanics Society 2007 Practice Note Guidelines for Landslide Risk Management, and was reported in RGS report reference number RGS01426.1-AE. Based on the findings of the assessment, it was been concluded that residential development on the lower slopes would be feasible from a geotechnical perspective.

The investigation identified an area of recently active landslide on the upper to mid slopes of the northern end of the site, above the end of Winterlake Road, with a lobe of resultant debris having travelled onto the lower, footslope area. This area is identified and delineated from surface mapping in the previous report and it was recommended that development should be avoided on the active part of the landslide on the upper slopes.

A second area of historic landslide activity was identified on the lower slopes of the section of the property at 19 Daydawn Avenue. The previous report recommended that residential development be avoided in that part of the site, however, it was considered that a road could be constructed over the area, with appropriate drainage and remedial works.

It is understood that feedback from Council raised concerns regarding the extent and location of the areas proposed for development relative to areas previously precluded from development based on Council's geotechnical zoning.

RGS has therefore undertaken additional investigations in conjunction with survey to:

- Identify the extent and location of the areas of known landslide;
- Provide further information on the nature of the landslide and drainage conditions in and around the landslide areas;
- Provide further advice on the extent of potential residential development and the remedial measures that would be required to facilitate such development.

2 LANDSLIDE MECHANISMS AND PREVIOUS RISK ASSESSMENT

The previous report (RGS01426.1-AE) assessed the risk of slope instability at the site using the principles and protocols of the Australian Geomechanics Society publication *Practice Note Guidelines for Landslide Risk Management, 2007*.

The slope risk assessment process identified five potential landslide hazard types, as summarised below:

Hazard 1: Large scale translational slide of conglomerate blocks over saturated tuffaceous claystone layers large movements and possible debris flow and involving more than >100m^3 of material. Such a failure could cause complete destruction or large scale damage of several structures within a typical residential subdivision;

Hazard 2: Translational or rotational slide through the colluvial and residual soil profile. Should such a failure occur it could potentially cause extensive structural damage and require large scale, costly repairs, and possibly temporary evacuation of a typical residential building until repairs are complete. Maintaining good slope drainage to prevent buildup of water pressures within the profile is recommended;

Hazard 3: Soil creep. Creep is an imperceptibly slow movement that takes place on sloping soil sites. It is an ongoing, natural slope process involving the progressive downslope movement of soils over the underlying rock profile. Creep will occur within the soil profile overlying weathered rock at this site, and will require management by undertaking good hillside construction practice as recommended in this report;

Hazard 4: Translational or rotational slide of soil and weathered rock profile on outer edge of profile resulting from ongoing stress relief due to erosion and valley formation processes on the outer slope. Should such a failure occur it could potentially cause extensive structural damage and require large scale, costly repairs, and possibly temporary evacuation of buildings until repairs are complete.

Hazard 5: Small scale slide (<100m^3) due to failure of unsupported cuts and fills or poorly designed, constructed, or otherwise inadequate retaining walls. Such a failure could cause localised damage requiring moderate repairs to part of the structure. These failures can be limited or managed by good hillside development.

The previous report included an assessment of the risks associated with each type of Hazard within the proposed development areas, and nominated general remedial measures or slope management measures that would be required to reduce the assessed risk level for each of the identified hazards to Low Risk, a risk category that would generally be considered tolerable for residential development within Australia. The following general remedial and/or management works were recommended for each potential Hazard type:

Hazard 1: The likelihood of this type of large scale event occurring was considered Rare in accordance with AGS2007 (Refer to definitions reproduced in Report RGS01426.1-AE). The report recommended drainage measures and subdivision works be undertaken in accordance with good hillside practice. Promotion of slope drainage within and around the development areas will further reduce the likelihood of this type of landslide occurring and result in a Low Risk classification;

Hazard 2: Translational or rotational slide through the colluvial and residual soil profile. Maintaining good slope drainage to prevent buildup of water pressures within the profile was recommended, including the installation of subsoil drains. It was also recommended to found all structures in weathered rock where slopes exceed 10 degrees.

Hazard 3: Soil creep. The report recommended founding all structures in rock where slopes exceed 10 degrees, and using good hillside construction and drainage measures;

Hazard 4: Translational or rotational slide of soil and weathered rock profile. The existing slides in the northern part of the site and at 19 Daydawn Avenue as being examples of Hazard 4 failures. The previous assessment recommended avoiding residential development on active slide areas, as well as installing drainage/ remedial measures to enable development within the potential debris zone of the active northern slide area.

Hazard 5: These small scale slides (<100m^3) due to failure of unsupported cuts and fills or poorly designed, constructed, or otherwise inadequate retaining walls can be limited or managed by good hillside development.

3 METHODOLOGY FOR ADDITIONAL INVESTIGATION AND ASSESSMENT

The aim of the investigation was to refine and further assess the extent and nature of the previously identified landslides and their potential impacts on development, particularly the parts of the site potentially affected by the landslides identified at the end of Daydawn Avenue and the northern end of the site above Winterlake Road.

Fieldwork for the assessment was undertaken by a Principal Geotechnical Engineer from RGS on 4 December 2018 and included the following:

- Observation of site features and surrounding features relevant to the geotechnical conditions of the site;
- Walkover assessment and identification by survey (undertaken by PCB surveyors) of features of significance in relation to identification of areas of past instability;
- Logging, sampling and test pitting of ten test pits excavated by tracked excavator to assess subsurface conditions in identified areas of interest;
- Review of historical geotechnical reports undertaken since 1979 on the landslides in the area, associated risks, and potential remedial measures. Reports that were reviewed are referenced 1 to 5 at the end of this report.

Engineering logs of the test pits are attached. Test locations were obtained by survey on the day of the investigations and are shown on the attached Figures 1 and 2.

4 DAYDAWN AVENUE

4.1 Previous recommendations

The former landslide is situated in the vacant ground off the western end of Daydawn Avenue. The previous RGS report (RGS01426.1-AE) noted that prior to development of the area, the identified landslide zone will require remediation prior to incorporation in the development area as a road easement. The report noted that remedial measures are likely to involve:

- Installation of drainage measures such as subsoil drains and horizontal drains to promote drainage of the slope and prevent buildup of pore water pressures within the slope;
- Regrading of the failed area to reduce locally steep slope angles.

4.2 Findings of the investigation

Survey and test pitting were undertaken to further define the depth and extent of colluvial soils, disturbed soils, presence of the coal seam, and identification of zones of water inflow within the profile. Figure 1 shows the significant features identified by the assessment. The following features were of particular significance:

- The mapping and survey revealed a landslide morphology comprising a rear scarp (top and toe delineated) a disturbed area, and a large lobe of landslide debris. The extent of each of these features is shown on Figure 1;
- The test pitting and survey indicates that the main landslide area is centred around the approximate centre of the proposed cul-de-sac. The extent of disturbed ground associated with the former landslide, however, extends laterally further than previously considered. As shown on Figure 1, the landslide area extends onto the front of the proposed lots around the cul-de-sac;
- A debris lobe below the landslide extends onto the front half of several lots on the lower part of the slope where the cul-de-sac connects through to the existing road;
- The scarp of the landslide, and visible "slices" of landslide material below the scarp, were encountered and observed in TP101;
- Water inflows were encountered in several of the test pits (TP102, TP104, TP105) within the disturbed area, either through the colluvial soils or at the interface between the colluvial soil profile and underlying disturbed, weathered rock;
- Visible seepage from the disturbed zone was observed in two locations that are marked on Figure 1;
- A coal seam and overlying low strength tuffaceous soils were encountered in TP103 on the northern edge of the disturbed area;
- Fill was encountered overlying the disturbed area indicating there has been some past earthworks undertaken to re-shape the area.

Selected photographs of the above features are presented below:

	
TP101. Stepped profile of slices of landslide material at toe of rear scarp	*Coal seam encountered in TP3.*

	
Area of seepage and cross-slope drainage feature at TP102	*Seepage emerging from ground near TP 105*

4.3 Implications for proposed development

The findings of the investigation indicated a deep, disturbed profile and significant subsurface water within the former landslide area. This is as per the findings and expectations indicated in the previous geotechnical report. As per the previous report, the proposed development area extends onto and across the landslide and development of this area will require works to remediate the landslide and improve subsurface drainage.

The recent test pitting investigation indicated that the disturbed ground extends onto the front of the majority of the lots surrounding the cul-de-sac. Previous remediation concepts discussed included installation of subsoil drains that could be located on property boundaries, to assist in alleviating pore water pressures within the landslide area. This would improve drainage, however, the highly disturbed ground would remain within the proposed building areas of the lots and this is not recommended.

It is therefore proposed to remediate the Daydawn Avenue section of the site by completely excavating the former landslide and associated disturbed soils, and reconstructing the slope incorporating a rockfill drainage blanket, overlain by controlled fill that would be placed and compacted in a manner suitable for the support of high-level residential footings. This methodology not only removes the landslide, but improves site drainage, rehabilitates the landslide area, and allows reconstruction of the slope to a surface form that is more conducive to residential development than the current morphology.

The remediation will involve:

- Undertake additional geotechnical investigation involving drilling to identify the depth of the landslide and landslide debris. This will allow quantification of earthworks volumes and design of the remedial works;
- Excavate the disturbed area down to the base of the former landslide, and stockpile the materials for subsequent re-use. Materials are expected to be predominantly suitable for re-use as engineered fill, pending some drying back to a suitable moisture content;

- Install a geofabric-wrapped drainage blanket of hard, durable rock across the full floor of the excavation. This drainage blanket would be designed to intercept all subsurface flows beneath the area and discharge them to the street stormwater drainage via an appropriately designed system of drainage easements and subsoil drains;
- Following moisture conditioning of the excavated material, place it back into the excavated area as Controlled Fill (AS2870-2011) under Level 1 supervision (AS3798-2007) to the design finished subdivision landform.

Placement of a drainage blanket and controlled backfilling of the excavation in this manner has the following advantages:

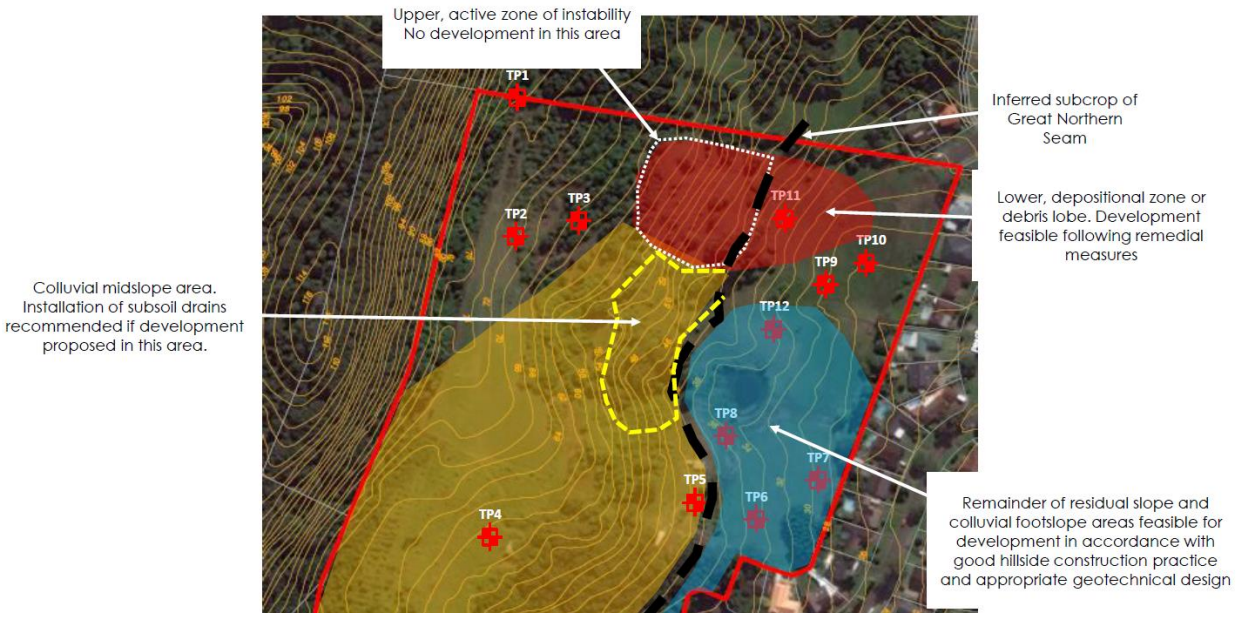
- Reduced delays in terms of investigation, monitoring, design, and post-drain installation monitoring prior to construction;
- Removes, reconstructs, and rehabilitates the ground disturbed by the landslide and provides complete under-drainage as well as a rockfill berm to provide gravitational retention of the reconstructed soil mass upslope;
- Increased property value for lots on which high level footings can be adopted compared to the same lots being designated as Class P lots requiring significant piled foundation systems;
- Reduced risk associated with long term performance of residential structures on the re-engineered controlled fill lots – ie. removes the risk of differential settlement between pile-supported structure and surrounding services, accessways, and utilities on the surrounding disturbed material;
- Reconstructs the site to a landform that suits residential development.

A concept sketch that shows the general remediation method proposed is shown in Figure 3.

5 RAYFORD STREET

5.1 Previous Recommendations

The previous investigations identified a zone of active slope instability at the northern end of the site, surrounded by colluvial deposits that were remnants of flows or ancient mass movement. The areas were plotted into broad zones as shown on the figure reproduced below from report ref.RGS01426.1-AE.



Extract from Fig 8 of previous report showing extent of geotechnical zones identified in the northern end of the proposed development site.

The report provided the following recommendations in relation to development on the delineated areas:

Upper, active landslide zone (shaded red with white dashed outline) – No development

Lower depositional zone (shaded red, no outline) – Not an active slide area, but contains debris of past landslides and may be impacted by debris flows from further mass movement upslope. Development feasible following remedial measures to reduce potential impacts from landslides occurring upslope. Measures are likely to involve:

- Installation of drainage such as subsoil drains or horizontal drains to promote drainage of the slope and prevent buildup of pore water pressures;
- Regrading of the failed slope above the proposed development area, to allow control of erosion and remove soils that appear prone to short term onset of instability;
- Possibly undertake regrade in conjunction with installation of mesh, topsoil, and anchors to stabilise the disturbed soil mantle directly upslope of the development area.

Colluvial midslope area (yellow dashed outline) – Development will require specific investigation and remedial measures including installation of subsoil drains to prevent water travelling through the weathered rock profile from becoming trapped beneath the low permeability colluvial clay soils that cover the slope.

Remainder of site – development feasible subject to good hillside construction practice and specific geotechnical guidance on earthworks, drainage and retention.

5.2 Findings of this Investigation

Test pitting and survey undertaken for this investigation supported the findings of the previous assessment and allowed more accurate delineation of the extent of each of the previously identified zones.

The locations of the test pits and the extent of relevant surface features surveyed are shown on Figure 2. Of note:

- Deep colluvial deposits in test pit TP106 and TP107 support the previous identification of colluvial slopes in this area;
- Since the previous assessment, clearing of thick vegetation on the slope behind the TP106/107 area revealed an irregular surface with some features indicative of past disturbance or movement;
- Colluvial deposits were shallower in the lower slopes that encroach onto the rear of proposed residential lots. The colluvium in test pits TP108 and TP109 was underlain by residual soils and weathered rock at 2.4 and 2.2m respectively;
- Evidence of active movement at the northern end of the site was observed and the visible extent delineated by survey.

Some observed site conditions are shown in the photographs below:

	
Zone of active slope instability in northwestern corner of site	*Irregular slope with features indicative of past disturbance or mass movement on slope behind TP107.*

5.3 Implications for proposed development

Based on the findings of this investigation, the geotechnical risk zones identified in the previous report have been further defined as shown in Figure 4. Issues regarding the development of each of these zones are discussed below:

Zone A – It is recommended that no residential development be undertaken in this zone. Some remedial work is required to reduce the risk of landslides within this zone impacting on residential lots downslope.

Zone B – This is a steeply sloping area that shows evidence of disturbance and possible past mass movement. It is not clear whether the irregular ground and visible features of disturbance are

related to mass movement, or near surface disturbance associated with past use of this part of the site for orcharding. A 2007 Google Earth image of the site (shown below) shows remnant orchards on the slope currently delineated as Zone B. It also shows an area of possible localised slope movement.

Approximate Extent of Zone B overlain on 2007 site image.

Residential development of the Zone B area will require extensive geotechnical investigation, design, and remedial works.

Zone C – Zone C contains no evidence of past landslide activity within the zone itself, but there are colluvial deposits from ancient upslope activity within this zone. Instability within Zone C is not expected to occur, however, prior to residential development in this area some remedial works would be undertaken to reduce the risk of the area being impacted by instability in the steep slopes to the west.

As per the recommendations of the previous report, remediation prior to residential development in the Zone C area will involve:

- Installation of deep subsoil drains to promote drainage of the slope and prevent buildup of pore water pressures within the slope;
- Regrading of the failed slope, including installation of a rockfill berm, to stabilise the slope, improve drainage, to allow control of erosion, and to remove soils that appear prone to short term onset of instability;
- Regrade of the colluvial deposits downslope of the active slide area.

Detailed geotechnical investigation and modelling of the slope are to be undertaken to allow the design and implementation of appropriate remedial measures to reduce the risk of slope instability

behind the potential development area. A concept sketch showing the nature of the works to be undertaken is presented in Figure 5.

6 CONCLUSION

The assessment presented herein included a review of the previous geotechnical reports (Ref.1 to 5) in the area, dating back to 1979, which contributed to the geotechnical zoning restrictions that remain in place on some parts of the study area. These previous reports identified the extent and nature of landslides affecting the area and provided recommendations on potential remedial measures that included measures such as deep subsoil drainage and use of rockfill to improve drainage and increase shear resistance within the zones potential of instability.

The assessment has concluded that residential development over the Daydawn Avenue landslide area is feasible, provided the affected landslide area is removed, provided with full underdrainage, then replaced and compacted as Controlled engineered fill.

The active landslide area at the northern end of the site does not encroach on residential lots within the proposed subdivision layout, however, subdivision development could be impacted by debris flows from further upslope instability, as evidenced by existing colluvial deposits. Development of the proposed subdivision is considered feasible provided works are undertaken to remediate the active landslide on the upper slopes. Proposed measures include installation of deep subsoil drains within the landslide area, provision of a rockfill berm around the toe of the landslide area, and regrading of both the landslide area and the colluvial slopes below.

The remedial works proposed are consistent with recommended remedial measures contained in the earlier geotechnical reports. Following remediation it is considered that residential development of the currently proposed subdivision areas will be feasible from a geotechnical perspective.

7 LIMITATIONS

The findings presented in the report and used as the basis for recommendations presented herein were obtained using normal, industry accepted geotechnical design practises and standards. To our knowledge, they represent a reasonable interpretation of the general condition of the site. Under no circumstances, however, can it be considered that these findings represent the actual state of the site at all points. If site conditions encountered during construction vary significantly from those discussed in this report, Regional Geotechnical Solutions Pty Ltd should be contacted for further advice.

This report alone should not be used by contractors as the basis for preparation of tender documents or project estimates. Contractors using this report as a basis for preparation of tender documents should avail themselves of all relevant background information regarding the site before deciding on selection of construction materials and equipment.

I

f you have any questions regarding this project, or require any additional consultations, please contact the undersigned.

For and on behalf of

Regional Geotechnical Solutions Pty Ltd

Steve Morton

Principal Geotechnical Engineer

References:

1. Coffey & Partners Pty Ltd, Report N1211-AA, *Slope Stability of Subdivision, Winterlake Street Speers Point*, November 1979

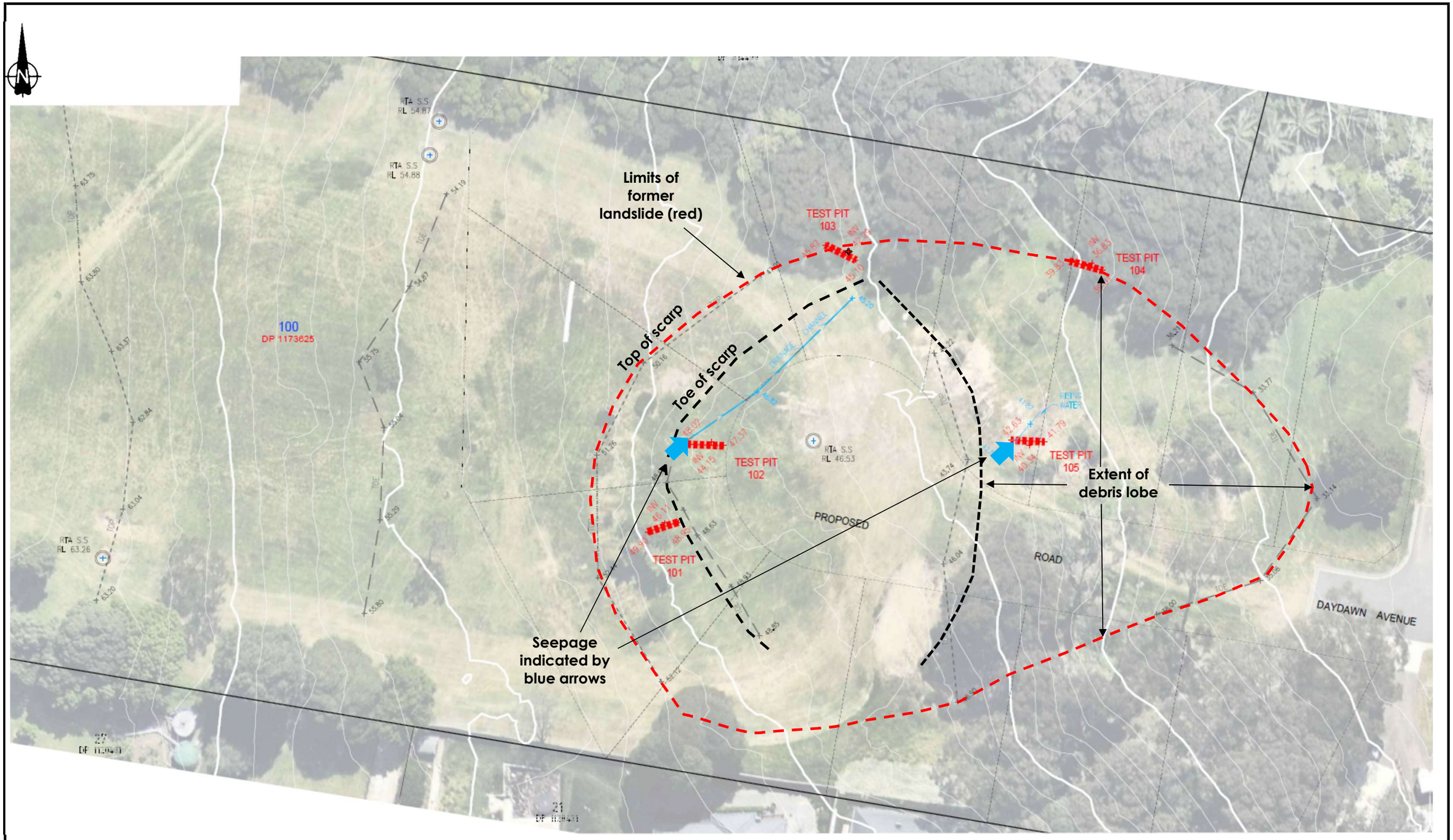
2. Coffey and Partners Pty Ltd, Report S7089/1-AH, *Slope Stability and Urban Capability Study, Speers Point*, NSW, December 1983

3. Coffey & Partners Pty Ltd, Report S7089/2-AA, *Supplementary Investigation Report*, February 1984

4. Coffey & Partners Pty Ltd, Report S7089/4-AC, *Speers Point Landslides, installation of Piezometers and Assessment of Stability*, December 1984

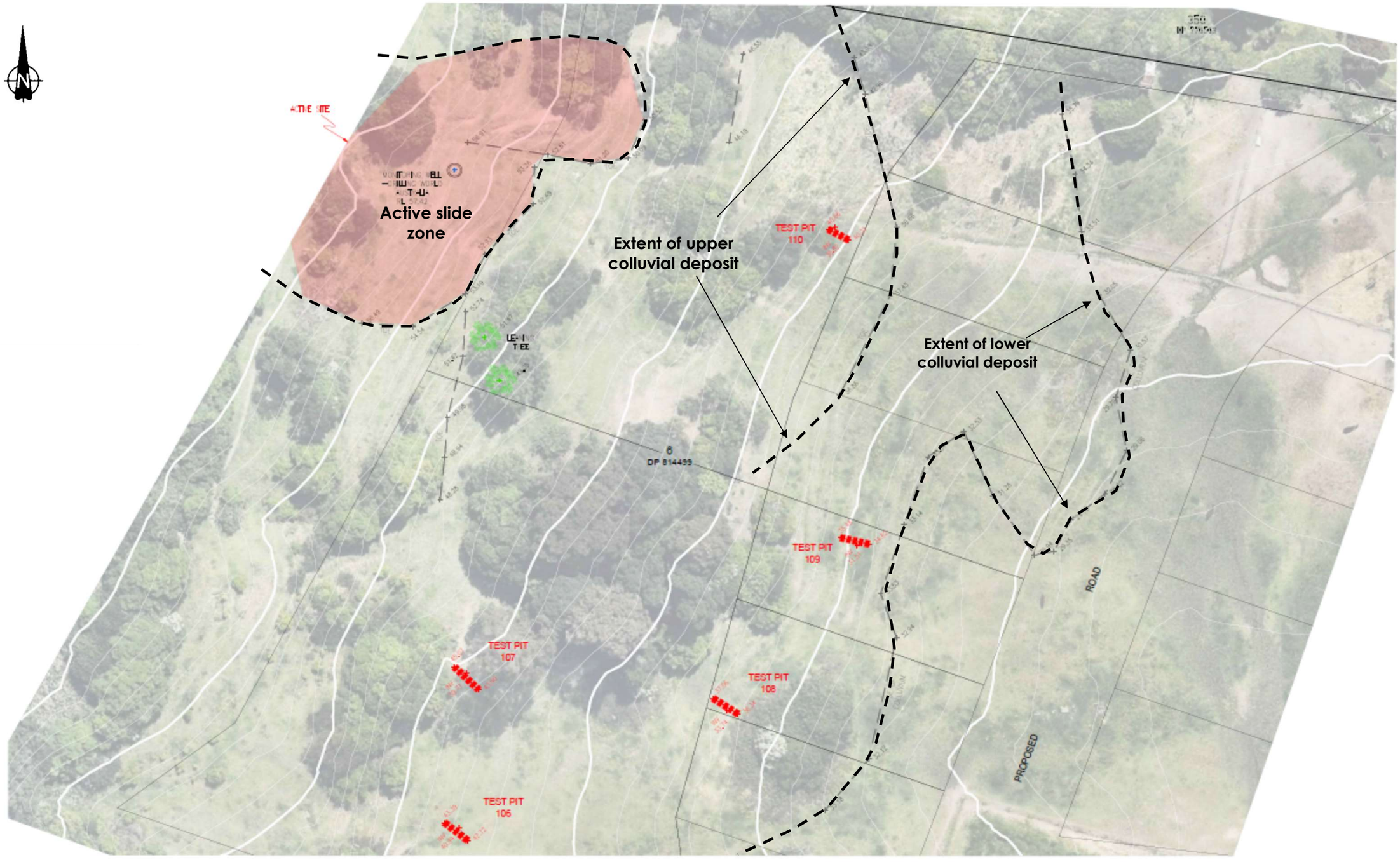
5. Shirley Partners Pty Ltd, Report RN84051/1/K051, *Geotechnical Report on Proposed Townhouse Development at Winterlake Street, Speers Point*, June 1987

Figures

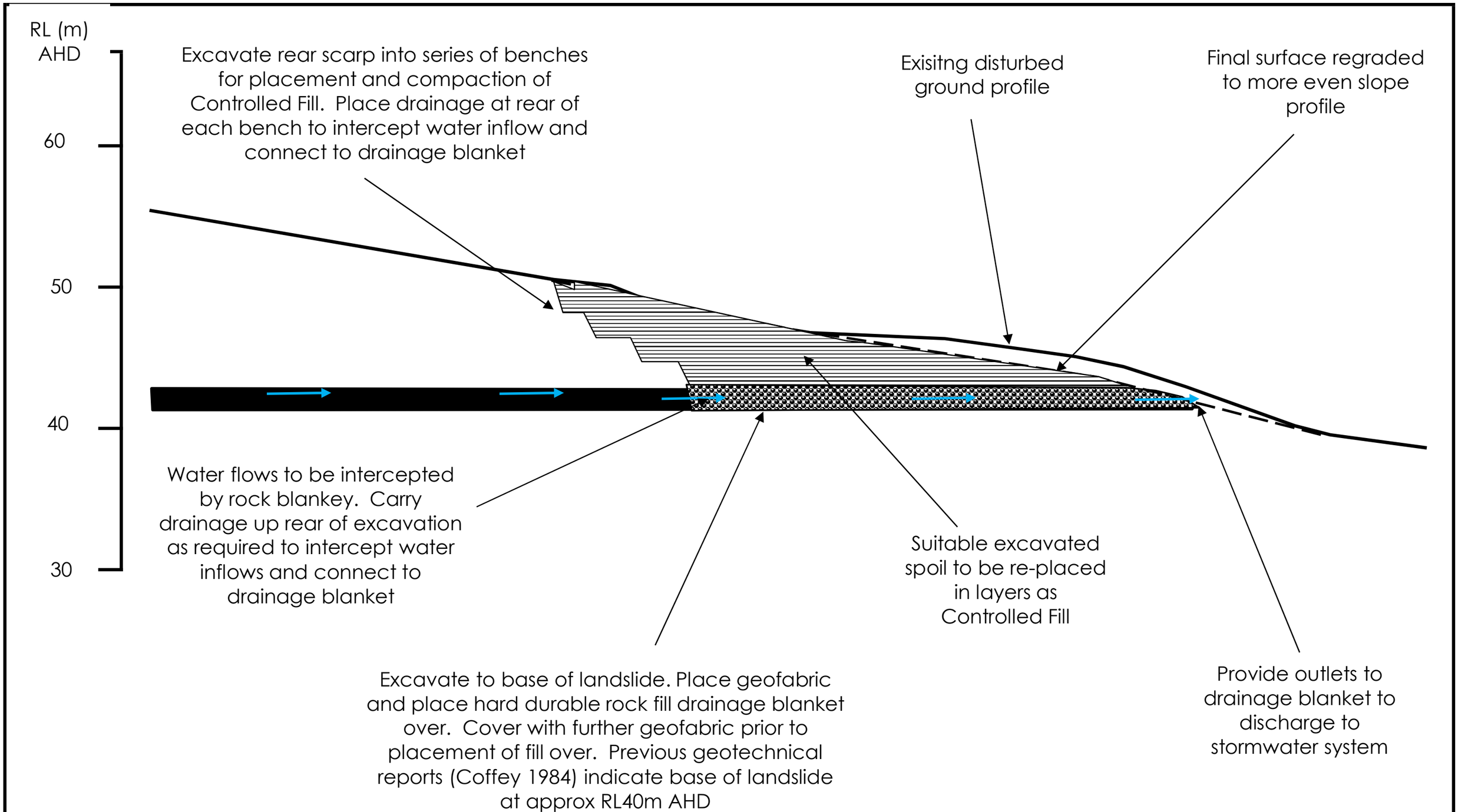


Based on survey provided by Pulver Cooper Blackley Pty Ltd

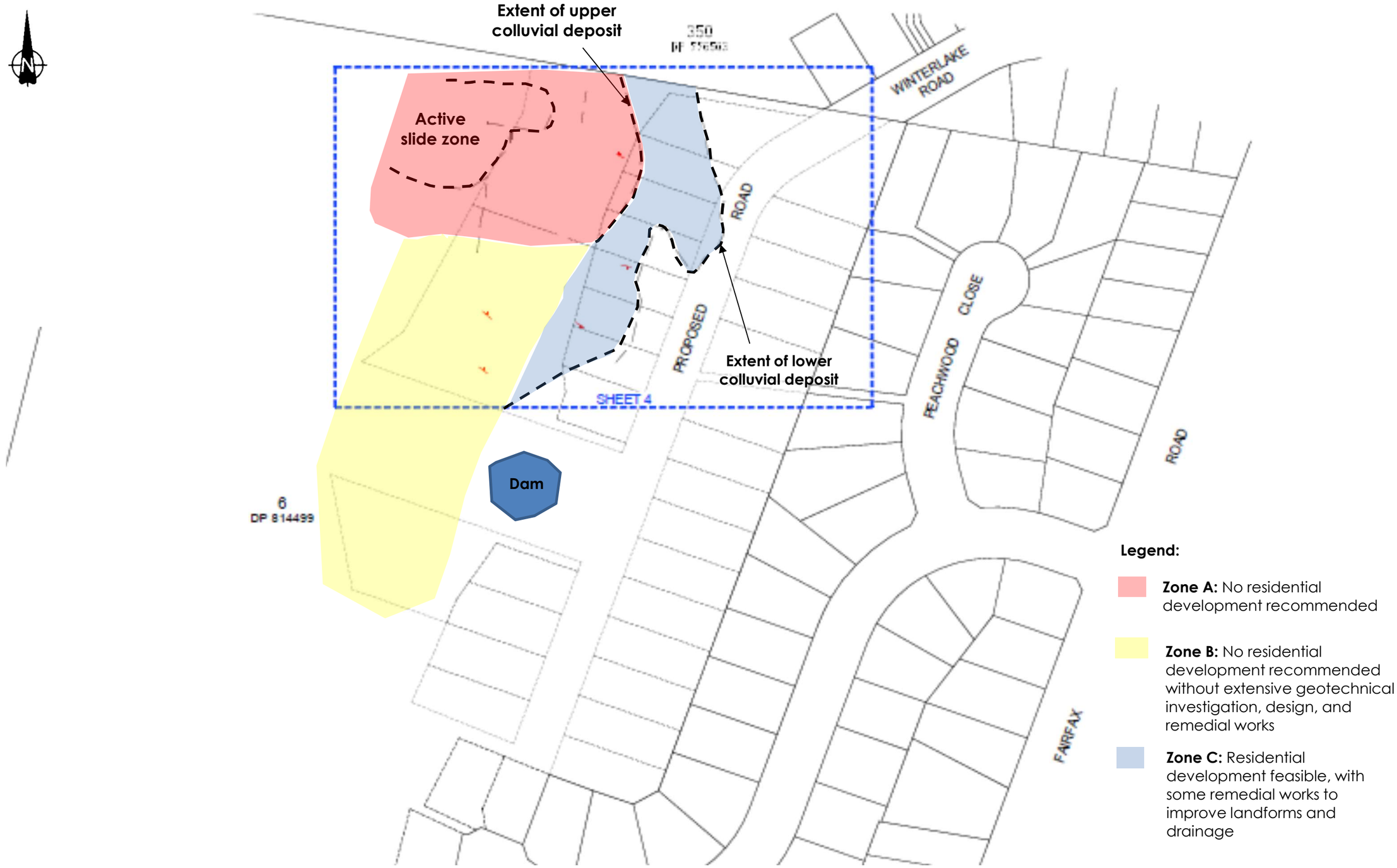
REGIONAL GEOTECHNICAL SOLUTIONS	**Client**	Pulver Cooper Blackley Pty Ltd	Job No.	RGS01426.1
	Project:	Residential Subdivision Geotechnical Assessment	Drawn By:	SRM
		19 Daydawn Ave and 40 Rayford Street, Warners Bay	Date:	15-Jan-19
	Title:	Extent of Landslide Affected Area - Daydawn Avenue	Drawing No.	**Figure 1**



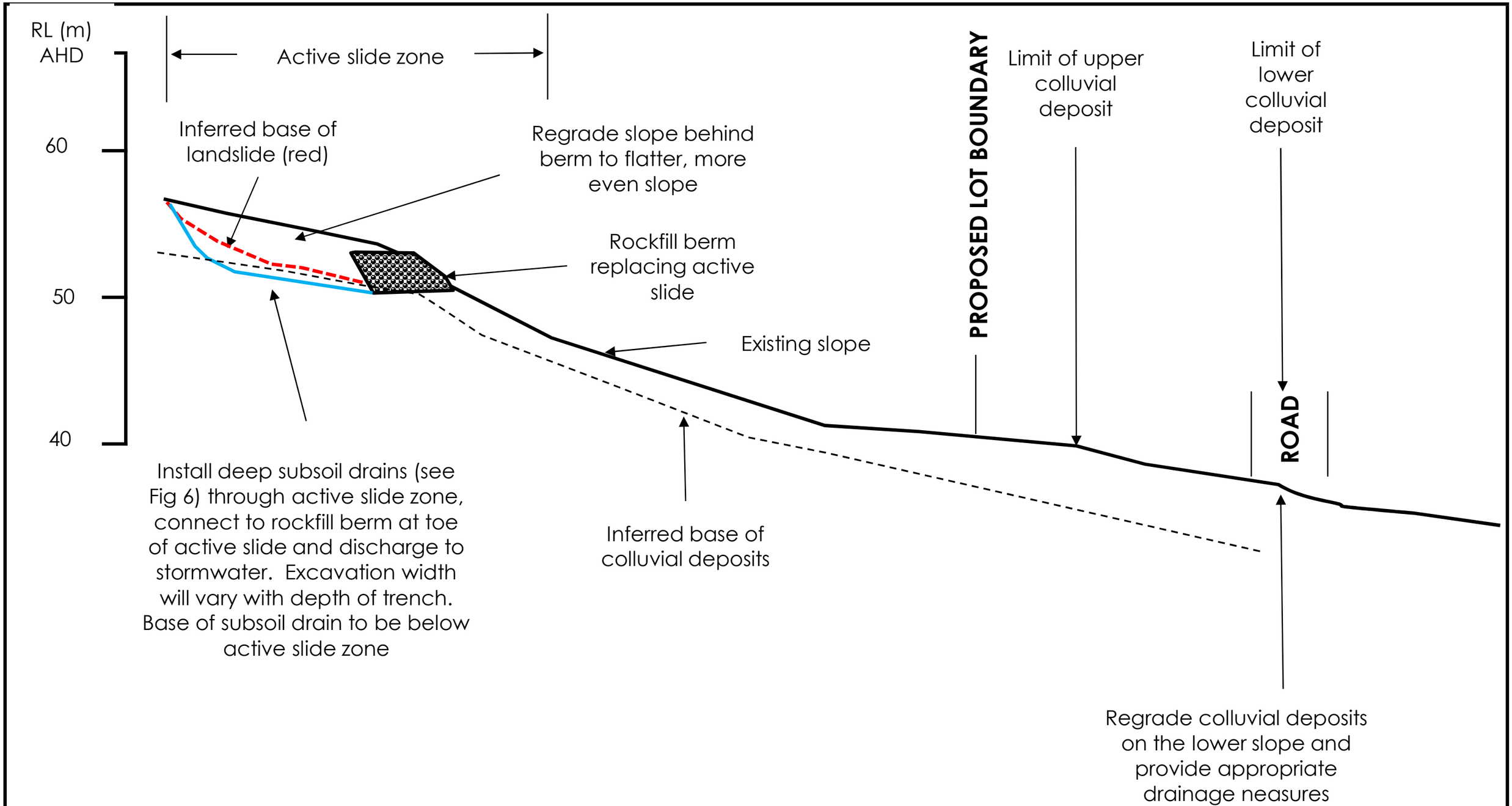
REGIONAL GEOTECHNICAL SOLUTIONS	Client	Pulver Cooper Blackley Pty Ltd	Job No.	RGS01426.1
	Project:	Residential Subdivision Geotechnical Assessment	Drawn By:	SRM
		19 Daydawn Ave and 40 Rayford Street, Warners Bay	Date:	15-Jan-19
	Title:	Extent of Landslide Affected Area - Northern Landslide Area	Drawing No.	**Figure 2**



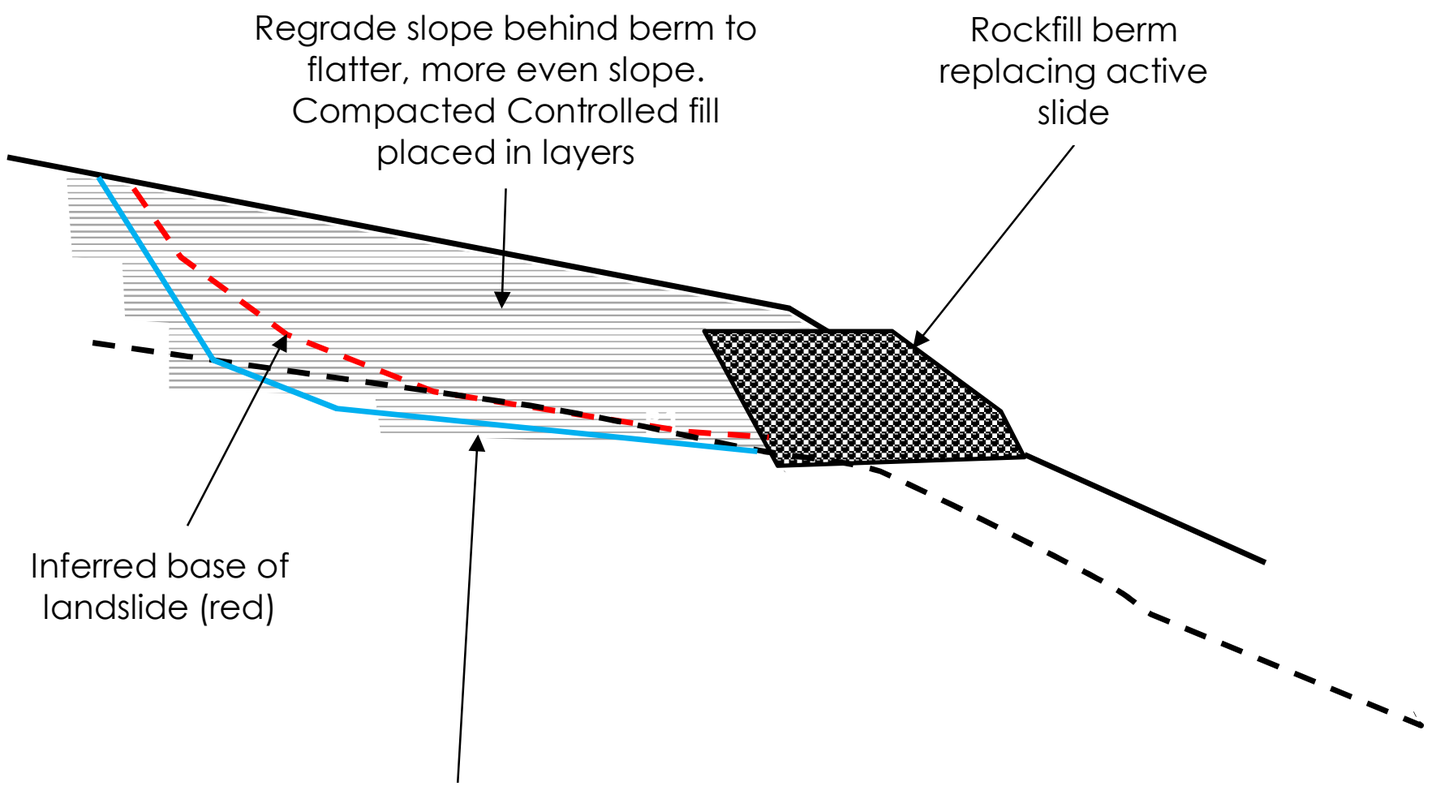
REGIONAL GEOTECHNICAL SOLUTIONS	**Client**	Pulver Cooper Blackley	Job No.	RGS01426.1
	Project:	19 Daydawn Avenue & 40 Rayford Street	Drawn By:	SRM
		Warners Bay	Date:	28-Mar-19
	Title:	Proposed Landslide Remediation works - Daydawn Avenue	Drawing No.	**Figure 3**



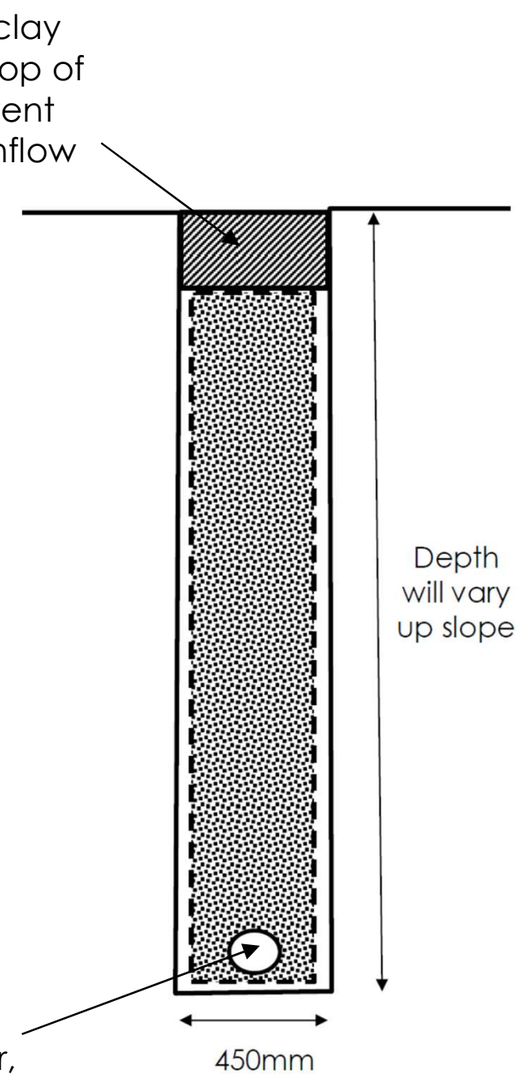
REGIONAL GEOTECHNICAL SOLUTIONS	Client	Pulver Cooper Blackley Pty Ltd	Job No.	RGS01426.1
	Project:	Residential Subdivision Geotechnical Assessment	Drawn By:	SRM
		19 Daydawn Ave and 40 Rayford Street, Warners Bay	Date:	15-Jan-19
	Title:	Geotechnical Zoning of Northern Landslide Area	Drawing No.	**Figure 4**



REGIONAL GEOTECHNICAL SOLUTIONS	**Client**	Pulver Cooper Blackley	Job No.	RGS01426.1
	Project:	19 Daydawn Avenue & 40 Rayford Street	Drawn By:	SRM
		Warners Bay	Date:	28-Mar-19
	Title:	Proposed Landslide Remediation Works North End of site	Drawing No.	**Figure 5**



Install deep subsoil drains (see Fig 6) through active slide zone, connect to rockfill berm at toe of active slide and discharge to stormwater. Excavation width will vary with depth of trench. Base of subsoil drain to be below active slide zone



100mm slotted ag drain in base of trench following placement of geofabric liner, subsequently filled with 20mm drainage aggegate and then geofabric wrapped over.

SUBSOIL DRAIN DETAIL

REGIONAL GEOTECHNICAL SOLUTIONS	**Client**	Pulver Cooper Blackley	Job No.	RGS01426.1
	Project:	19 Daydawn Avenue & 40 Rayford Street	Drawn By:	SRM
		Warners Bay	Date:	28-Mar-19
	Title:	Proposed Subsoil Drains	Drawing No.	**Figure 6**

Appendix A

Results of Field Investigations

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - TEST PIT

TEST PIT NO: TP101

CLIENT: Pulver Cooper Blackley
PAGE: 1 of 1
PROJECT NAME: Residential Subdivision
JOB NO: RGS01426.1
SITE LOCATION: Rayford Street, Warners Bay
LOGGED BY: SM
TEST LOCATION: See Figure 1
DATE: 4/12/18

EQUIPMENT TYPE: Kobelco 8T Excavator
EASTING:
SURFACE RL:
TEST PIT LENGTH: 3.4 m
WIDTH: 0.5 m
NORTHING:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
EXCAVATOR	Not Encountered			0.5			**FILL:** Silty SAND, fine to medium grained, dark grey-brown, with some Clay and organics 0.45m	M				FILL - Original Topsoil, Fill, plastic bags and vegetation at base of Fill
							TOPSOIL: Silty SAND, fine to medium grained, dark grey-brown 0.70m					TOPSOIL
				1.0 1.5 2.0 2.5 3.0		CH	**Sandy CLAY:** Medium plasticity, pale grey and orange-brown, Sand fine to medium grained 3.10m	M > w_P	VSt	HP	220	RESIDUAL SOIL Upper surface of residual profile step down slope
				3.5 4.0 4.5			Hole Terminated at 3.10 m					

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

RG LIB 1.04.4.GLB Log RG NON-CORED BOREHOLE - TEST PIT RGS01426.1 TP LOGS.GPJ <<DrawingFile>> 19/12/2018 10:50 8.30.004 Datgel Lab and In Situ Tool

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - TEST PIT

TEST PIT NO: TP102

CLIENT: Pulver Cooper Blackley
PAGE: 1 of 1
PROJECT NAME: Residential Subdivision
JOB NO: RGS01426.1
SITE LOCATION: Rayford Street, Warners Bay
LOGGED BY: SM
TEST LOCATION: See Figure 1
DATE: 4/12/18

EQUIPMENT TYPE: Kobelco 8T Excavator
EASTING:
SURFACE RL:
TEST PIT LENGTH: 3.5 m
WIDTH: 0.5 m
NORTHING:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
EXCAVATOR				0.5			**TOPSOIL:** Clayey SILT, dark grey-brown, Clay medium to high plasticity	M > w_P	Fb	HP	50	TOPSOIL Moist to wet
				1.0			0.70m **Sandy CLAY:** Medium to high plasticity, pale grey and orange-brown, Sand fine to coarse grained	M > w_P	St			COLLUVIUM Moisture content decreasing with depth
				1.5			Becoming Gravelly with depth			HP	120	
				2.0						HP	250	
	▶			2.5			2.60m **SANDSTONE:** Fine to medium grained, pale grey and orange-brown	M < w_P	H / Fb			EXTREMELY TO HIGHLY WEATHERED SANDSTONE Steady water inflow at 2.6m from downslope side of pit
				3.0			3.40m					
				3.5			Hole Terminated at 3.40 m					
				4.0								
				4.5								

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_P	Plastic Limit
W_L	Liquid Limit

RG LIB 1.04.4.GLB Log RG NON-CORED BOREHOLE - TEST PIT RGS01426.1 TP LOGS.GPJ <<DrawingFile>> 19/12/2018 10:50 8.30.004 Datgel Lab and In Situ Tool

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - TEST PIT

TEST PIT NO: TP103

CLIENT: Pulver Cooper Blackley
PAGE: 1 of 1
PROJECT NAME: Residential Subdivision
JOB NO: RGS01426.1
SITE LOCATION: Rayford Street, Warners Bay
LOGGED BY: SM
TEST LOCATION: See Figure 1
DATE: 4/12/18

EQUIPMENT TYPE: Kobelco 8T Excavator
EASTING:
SURFACE RL:
TEST PIT LENGTH: 3.1 m
WIDTH: 0.5 m
NORTHING:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
EXCAVATOR	Not Encountered			0.5			**TOPSOIL:** Silty Clayey SAND, fine to medium grained, dark grey-brown	M > w_P				TOPSOIL
							0.40m					
							Sandy CLAY: Medium plasticity, pale grey-brown, Sand fine grained		St			SLOPEWASH
							0.70m					
				1.0		CH	**Gravelly Sandy CLAY:** Medium plasticity, pale grey and orange brown, Sand and Gravel fine to coarse grained	M > w_P	St / VSt			COLLUVIUM - Disturbed Conglomerate. Blocks of disturbed Conglomerate at rear of pit
				1.5								
				2.0								
							2.30m					
				2.5			**CLAYSTONE:** Fine grained, grey, blocky structure	M	Fb / H			HIGHLY WEATHERED TUFFACEOUS CLAYSTONE - Water on defect surfaces
							2.60m					
				3.0			**COAL:** Black					COAL MODERATELY WEATHERED. No water inflow observed
							3.10m					
				3.5			Hole Terminated at 3.10 m					
				4.0								
				4.5								

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - TEST PIT

TEST PIT NO: TP104

CLIENT: Pulver Cooper Blackley
PAGE: 1 of 1
PROJECT NAME: Residential Subdivision
JOB NO: RGS01426.1
SITE LOCATION: Rayford Street, Warners Bay
LOGGED BY: SM
TEST LOCATION: See Figure 1
DATE: 4/12/18

EQUIPMENT TYPE: Kobelco 8T Excavator
EASTING:
SURFACE RL:
TEST PIT LENGTH: 3.1 m
WIDTH: 0.5 m
NORTHING:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
EXCAVATOR				0.0			**FILL:** Silty CLAY, medium plasticity, dark grey-brown	M > w_P				FILL - Reworked Topsoil
							0.40m					
				0.5			**TOPSOIL:** Sandy Silty CLAY, medium to high plasticity, dark grey-brown	W	F			TOPSOIL - Wet
							0.75m					
							Sandy Gravelly CLAY: Medium to high plasticity, pale grey and orange brown		F			COLLUVIUM
	▶			1.0						HP	50	
									St			
							1.40m					
				1.5			**Sandy Clayey GRAVEL:** Fine to coarse grained, orange-brown and grey, Clay medium to high plasticity, Sand fine to coarse grained	M > w_P	VSt	HP	240	COLLUVIUM Moisture lower then overlying layers
				2.0								
							2.40m			HP	400	
				2.5			Hole Terminated at 2.40 m					
				3.0								
				3.5								
				4.0								
				4.5								

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

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REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - TEST PIT

TEST PIT NO: TP105

CLIENT: Pulver Cooper Blackley
PAGE: 1 of 1
PROJECT NAME: Residential Subdivision
JOB NO: RGS01426.1
SITE LOCATION: Rayford Street, Warners Bay
LOGGED BY: SM
TEST LOCATION: See Figure 1
DATE: 4/12/18

EQUIPMENT TYPE: Kobelco 8T Excavator
EASTING:
SURFACE RL:
TEST PIT LENGTH: 3.3 m
WIDTH: 0.5 m
NORTHING:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
EXCAVATOR				0.5		GC	**Sandy Clayey GRAVEL:** Fine to coarse grained, pale grey-orange brown, Clay medium to high plasticity, Sand fine to coarse grained	W	F			COLLUVIUM Seepage at surface. Minor inflows upslope side of pit to 0.7m
							0.70m					
				1.0		CL	**Sandy Gravelly CLAY:** Medium plasticity, grey and orange-brown, Sand and Gravel fine to coarse grained	M > w_P	VSt / Fb	HP	250	COLLUVIUM
				1.5						HP	300	
							1.90m					Water inflow at 1.8m upslope end of pit
				2.0			Hole Terminated at 1.90 m					
				2.5								
				3.0								
				3.5								
				4.0								
				4.5								

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

RG LIB 1.04.4.GLB Log RG NON-CORED BOREHOLE - TEST PIT RGS01426.1 TP LOGS.GPJ <<DrawingFile>> 19/12/2018 10:50 8.30.004 Datgel Lab and In Situ Tool

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - TEST PIT

TEST PIT NO: TP106

CLIENT: Pulver Cooper Blackley
PAGE: 1 of 1
PROJECT NAME: Residential Subdivision
JOB NO: RGS01426.1
SITE LOCATION: Rayford Street, Warners Bay
LOGGED BY: SM
TEST LOCATION: See Figure 1
DATE: 4/12/18

EQUIPMENT TYPE: Kobelco 8T Excavator
EASTING:
SURFACE RL:
TEST PIT LENGTH: 2.8 m
WIDTH: 0.5 m
NORTHING:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
EXCAVATOR	Not Encountered			0.0			**TOPSOIL:** Silty Sandy CLAY, medium plasticity, grey-brown, Sand fine to coarse grained	M < w_P	Fb			TOPSOIL
				0.40m								
				0.5		CL	**Sandy Gravelly CLAY:** Low to medium plasticity, Sand and Gravel fine to coarse grained	M < w_P	VSt			COLLUVIUM Disturbed Conglomerate
										HP	300	
				1.0						HP	280	
				1.5								Profile generally "tight" and dry. No inflows
				2.0								
				2.10m			Hole Terminated at 2.10 m					
				2.5								
				3.0								
				3.5								
				4.0								
				4.5								

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

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REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - TEST PIT

TEST PIT NO: TP107

CLIENT: Pulver Cooper Blackley
PROJECT NAME: Residential Subdivision
SITE LOCATION: Rayford Street, Warners Bay
TEST LOCATION: See Figure 1

PAGE: 1 of 1
JOB NO: RGS01426.1
LOGGED BY: SM
DATE: 4/12/18

EQUIPMENT TYPE: Kobelco 8T Excavator
TEST PIT LENGTH: 2.8 m **WIDTH:** 0.5 m
EASTING:
NORTHING:
SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		Structure and additional observations
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	
EXCAVATOR	Not Encountered			0.0			**TOPSOIL:** Clayey SILT, dark grey, brown, with some Gravel	M				TOPSOIL
				0.40m								
				0.5		CL	**Sandy Gravelly CLAY:** Low to medium plasticity, orange brown and grey, Sand and Gravel fine to coarse grained	M > w_P	VSt / Fb			COLLUVIUM
										HP	250	
				1.0						HP	300	
				1.5								
				2.0								
				2.10m								
						CL	**Sandy CLAY:** Low to medium plasticity, grey, Sand fine to coarse grained, with some Gravel					COLLUVIUM - Grey, Clayey band irregular
				2.5								
				2.60m								
							Sandy Gravelly CLAY: Low to medium plasticity, pale grey-orange brown, Sand and Gravel fine to coarse grained					COLLUVIUM
				3.0								
				3.5								
				4.0								
				4.10m								
							Sandy CLAY: Low to medium plasticity, grey, Sand fine to coarse grained, some Gravel	M > w_P	Fb / VSt			COLLUVIUM - Higher moisture content than above
				4.5								
				4.80m								
							Hole Terminated at 4.80 m					

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - TEST PIT

TEST PIT NO: TP108

CLIENT: Pulver Cooper Blackley
PAGE: 1 of 1
PROJECT NAME: Residential Subdivision
JOB NO: RGS01426.1
SITE LOCATION: Rayford Street, Warners Bay
LOGGED BY: SM
TEST LOCATION: See Figure 1
DATE: 4/12/18

EQUIPMENT TYPE: Kobelco 8T Excavator
EASTING:
SURFACE RL:
TEST PIT LENGTH: 2.8 m
WIDTH: 0.5 m
NORTHING:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
EXCAVATOR	Not Encountered			0			**TOPSOIL:** Clayey SILT, grey-brown	M				TOPSOIL
							0.30m					
				0.5		CH	**Gravelly Sandy CLAY:** Medium plasticity, grey and orange brown, Sand and Gravel fine to coarse grained	M > w_P	St / VSt	HP HP	180 200	COLLUVIUM
				1.0			Irregular Sand of disturbed Shale at 1.1m					
				1.5								
				2.0								
							2.40m					
				2.5			**CLAY:** High plasticity, pale grey, with some Sand	M > w_P	St	HP HP	120 140	RESIDUAL SOIL - Moist
							2.90m					
				3.0			3.00m **SANDSTONE**	M	H			HIGHLY WEATHERED SANDSTONE
							Hole Terminated at 3.00 m					
				3.5								
				4.0								
				4.5								

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

RG LIB 1.04.4.GLB Log RG NON-CORED BOREHOLE - TEST PIT RGS01426.1 TP LOGS.GPJ <<DrawingFile>> 19/12/2018 10:50 8.30.004 Datgel Lab and In Situ Tool

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - TEST PIT

TEST PIT NO: TP109

CLIENT: Pulver Cooper Blackley
PAGE: 1 of 1
PROJECT NAME: Residential Subdivision
JOB NO: RGS01426.1
SITE LOCATION: Rayford Street, Warners Bay
LOGGED BY: SM
TEST LOCATION: See Figure 1
DATE: 4/12/18

EQUIPMENT TYPE: Kobelco 8T Excavator
EASTING:
SURFACE RL:
TEST PIT LENGTH: 2.8 m
WIDTH: 0.5 m
NORTHING:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
EXCAVATOR	Not Encountered			0.5			**TOPSOIL:** Sandy Silty CLAY, dark grey-brown, tree roots 0.50m	M > w_P	F			DISTURBED TOPSOIL
				1.0		CH	**Sandy CLAY:** Medium to high plasticity, pale grey brown and orange, Sand fine to coarse grained, some Gravel fine to coarse grained		St / VSt	HP HP	200 180	COLLUVIUM
				1.5						HP	240	
				2.0						HP	240	
				2.5		CL	**Sandy CLAY:** Low to medium plasticity, grey, Sand fine to coarse grained, some fissuring and relict Rock structure 2.20m	M < w_P				RESIDUAL SOIL - Possibly tuffaceous Sandstone
				3.0			3.40m					
				3.5			Hole Terminated at 3.40 m					
				4.0								
				4.5								

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

RG LIB 1.04.4.GLB Log RG NON-CORED BOREHOLE - TEST PIT RGS01426.1 TP LOGS.GPJ <<DrawingFile>> 19/12/2018 10:50 8.30.004 Datgel Lab and In Situ Tool

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - TEST PIT

TEST PIT NO: TP110

CLIENT: Pulver Cooper Blackley
PAGE: 1 of 1
PROJECT NAME: Residential Subdivision
JOB NO: RGS01426.1
SITE LOCATION: Rayford Street, Warners Bay
LOGGED BY: SM
TEST LOCATION: See Figure 1
DATE: 4/12/18

EQUIPMENT TYPE: Kobelco 8T Excavator
EASTING:
SURFACE RL:
TEST PIT LENGTH: 3.3 m
WIDTH: 0.5 m
NORTHING:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
EXCAVATOR	Not Encountered			0.5			**TOPSOIL:** Sandy CLAY, low to medium plasticity, grey-brown	M				TOPSOIL
						CL	**Gravelly Sandy CLAY:** Medium plasticity, grey-brown and orange-brown, Sand and Gravel fine to coarse grained	M < w_P	VSt / Fb	HP	220	COLLUVIUM
										HP	230	
				1.0		CH	**Sandy CLAY:** Medium to high plasticity, grey, Sand fine to medium grained		St			RESIDUAL SOIL
				1.5			**SHALE:** Fine grained, grey and dark grey, laminated	M				HIGHLY TO MODERATELY WEATHERED SHALE No apparent disturbance
				2.0			Hole Terminated at 1.90 m					
				2.5								
				3.0								
				3.5								
				4.0								
				4.5								

0.20m
0.70m
1.50m
1.90m

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

RG LIB 1.04.4.GLB Log RG NON-CORED BOREHOLE - TEST PIT RGS01426.1 TP LOGS.GPJ <<DrawingFile>> 19/12/2018 10:50 8.30.004 Datgel Lab and In Situ Tool