

**REPORT ON:  
143 WATERSHED ROAD SUBDIVISION**

**PROJECT:  
GEOTECHNICAL ASSESSMENT**

**CLIENT: LC BUILDERS LTD**

## EXECUTIVE SUMMARY

LC Builders Ltd. engaged Resource Development Consultants Ltd (RDCL) to provide this geotechnical assessment for proposed subdivision at 143 Watershed Road, Bunnythorpe (Legal Description: PART LOT 2 DP 480).

RDCL have been supplied with a scheme plan for the proposed development prepared by Geoworks. (Drawing Number: 20-903-SC-001, revision B, dated 11 February 2021); showing

- Proposed new lots (~5000m<sup>2</sup>) situated on generally flat to gently sloping ground atop an eroded marine terrace; and
- A new cul-de-sac traversing gently sloping ground for the most part, and terminating near the crest of a moderately steep gulley slope.

The results of shallow investigations suggest the soil profile is generally consistent across the proposed development area, comprising:

- Silty TOPSOIL to 0.3m bgl; underlain by
- Stiff silty CLAY to Clayey SILT to between 0.3-2.0m bgl; with
- Stiff CLAY to at least 3.5 m bgl.

Based on the results of this investigation, we consider the proposed subdivision development is generally suitable from a geotechnical perspective:

- House sites suitable for standard foundations in accordance with NZS3604:2011 are available on all lots;
  - Indicative areas suitable for foundations not requiring specific engineering design are shown in Figure 1;
  - Specific engineering may be required for earthworks and/or foundations proposed to extend beyond the recommended setback (Figure 1).

A statement of professional opinion on suitability of land for building construction (Schedule 2a NZS4404:2010) is attached to this report.

We recommend a suitably qualified geotechnical professional be engaged:

- To confirm bearing for specific foundations at the time of construction;
- To consult for detailed design of earthworks and/or foundations should construction be proposed outside of indicative house sites shown;
- Should ground conditions be found to differ from those contained in this report.

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## 1 OVERVIEW

LC Builders Ltd. engaged Resource Development Consultants Ltd (RDCL) to provide this geotechnical assessment for proposed subdivision at 143 Watershed Road, Bunnythorpe (Legal Description: PART LOT 2 DP 480).

### 1.1 UNDERSTANDING OF THE PROJECT

We understand the client intends to subdivide twenty (20) new rural residential lots, and that a geotechnical assessment is required to submit with an application for subdivision consent.

RDCL have been supplied with a scheme plan for the proposed development prepared by Geoworks. (Drawing Number: 19-765-SC-001, revision D, dated 3rd March 2020); showing

- Proposed new lots (~5000m<sup>2</sup>) situated on generally flat to gently sloping ground atop an eroded marine terrace; and
- A new cul-de-sac traversing gently sloping ground for the most part, and terminating on a moderately steep gulley slope.

### 1.2 SCOPE OF WORK

This work was completed in general accordance with RDCL proposal 20825, issued to the client on 25<sup>th</sup> November 2020.

## 2 SITE DESCRIPTION

The proposed development is located northwest of Ashurst, in an area characterized by flat topped ridge spurs and light to moderate incised gulley's generally trending west.

Indicative house sites are predominantly located on generally flat to gently sloping ground surrounding the head of an incised gulley locally dammed (Figure 1).

- Lots 1-10, 12, 14, 16, 18 and 20:
  - Generally flat to gently sloping ground (slopes  $<5^\circ$ ), currently in pasture.
- Lots 11, 13, and 15 (shallow watercourse):
  - Gently sloping ground, with moderate slopes ( $\sim 10^\circ$ ) bounding a shallow gulley toward the southern boundaries.
- Lot 17 (pond):
  - Gently sloping ground ( $<5^\circ$ ) to the north of an existing dammed pond;
- Lot 19 (access crossing watercourse):
  - Proposed house site to the south of a gulley bounded by moderate gulley slopes ( $<17^\circ$ );
  - Access required to cross the overland flow path on the downstream side of the pond.
- Lot 21:
  - Generally flat ground available for house site, bounded by a steep ( $<18^\circ$ ) gulley slope to the southwest.

Slopes are generally smooth and rounded, with minor slip scarps observed on steep sections bounding the watercourse.

## **2.1 REGIONAL GEOLOGY**

Regional geological maps (GNS, 2002) indicate the site is underlain by:

- Middle Pleistocene ocean shoreline deposits, comprising:
  - Gravel, sand, and mud; onlapping
- Early Pleistocene - Middle Pleistocene sedimentary rocks to the east, comprising:
  - Sandstone, siltstone, bioclastic limestone and conglomerate, including OIS 15-9 marine terrace deposits.

## **2.2 ACTIVE FAULTS**

No active faults directly impacting the proposed development are identified in the GNS Active Faults Database (GNS Science, 2018).

The nearest active fault trace the Pohangina Fault is located approximately 3.0 km to the east.

### **3 SUBSURFACE INVESTIGATION**

#### **3.1 SUBSURFACE TESTING**

Subsurface testing completed for this site comprised (Figure 1):

- Nine (9) Test Pits to between 2.6m and 3.5m bgl; and
- Nine (9) Dynamic Cone Penetrometer (DCP) tests terminated between 0.9m and 1.3m bgl.

Field investigations were carried out in mid-summer with intermittent rain and overcast weather.

Site investigation logs are available in Appendix A.

#### **3.2 NEAR SURFACE MATERIALS**

The results of shallow investigations suggest the soil profile is generally consistent across the proposed development area, comprising:

- Silty TOPSOIL to 0.3m bgl; underlain by
- Stiff silty CLAY to Clayey SILT to between 0.3-2.0m bgl; with
  - Undrained shear strengths measured between 96 -140 kPa.
  - Iron concretions and variably well defined pan layers from 0.8-2.0m bgl; and
- Stiff CLAY to at least 3.5 m bgl.

#### **3.3 SHALLOW BEARING CAPACITY**

DCP test results have been correlated to Ultimate Bearing Capacity (UBC) in accordance with (Stockwell, M.J. 1977).

- Bearing capacity is variable in the upper ~1.2m; with
  - 300 kPa ultimate bearing capacity is generally from 0.6-1.2m bgl.
  - 200 kPa ultimate bearing capacity is available from a level stripped of topsoil.

#### **3.4 GROUNDWATER**

Groundwater was not encountered at the time of site investigations.

## 4 GEOTECHNICAL ASSESSMENT

### 4.1 SUITABILITY FOR DEVELOPMENT

Based on the results of this investigation, we consider the proposed subdivision development is generally suitable from a geotechnical perspective:

- House sites suitable for standard foundations in accordance with NZS3604:2011 are available on all lots;
  - Indicative areas suitable for foundations not requiring specific engineering design are shown in Figure 1;
  - Specific engineering may be required for earthworks and/or foundations proposed to extend beyond the recommended setback (Figure 1).

A statement of professional opinion on suitability of land for building construction (Schedule 2a NZS4404:2010) is attached to this report.

### 4.2 FOUNDATION RECOMMENDATIONS

Shallow foundations are considered generally appropriate for the proposed building areas, with:

- For piles in accordance with NZS3604:2011;
  - 300 kPa ultimate bearing capacity generally available from 0.6-1.2m bgl; and
- For specific engineering of slab foundations (i.e., waffle type slab);
  - 200 kPa ultimate bearing capacity is available at a level stripped of topsoil.

All organic, loose and/or deleterious materials should be stripped from beneath building foundations and fills.



## 4.3 EARTHWORKS

### 4.3.1 BATTERS

As a general guide:

- Unsupported batters should be finished at angles set out in Table 1; and
- All constructed slopes should be seeded or planted to limit erosion potential.

**TABLE 1: INDICATIVE BATTER SLOPE ANGLES**

Batter Type	Material Type	Finished Cut Slope Angle
Cut batter	Topsoil and soft to firm soils	2.5H:1V
	Stiff to very stiff SILT & CLAY	2H:1V
Fill batter	All	2H:1V

### 4.3.2 ENGINEERED FILL

Should fill be required for construction of building platforms and/or access:

- All fill should be placed and compacted in accordance with NZS4431:1989 “Code of Practice for Earth Fill for Residential Development”; and
- Unsupported fill batters should be finished at maximum 2H:1V.

### 4.3.3 RETAINING WALLS

Should retaining walls be required to form building platforms:

- Soil parameters should be confirmed based on specific excavation locations;
  - Indicative parameters for soils encountered are  $c' = 6\text{kPa}$ ,  $\phi' = 30^\circ$ ,  $S_u = 100\text{ kPa}$ ;

All retaining walls should be backfilled with free draining materials with “Novaflo” style piping to capture and direct water away for adequate disposal.

#### 4.4 ACCESS

As it relates to development of the right of way access:

- Appropriate surfacing of roadways needs to consider subgrade conditions, drainage, likely traffic loads, especially construction loads during house building:
  - Subgrade should be stripped of all organic loose and deleterious materials;
  - Indicative CBR  $\geq 5\%$  is generally available from a level stripped of topsoil;
- The carriageway should be shaped to manage surface water flows in a controlled manner. This should at least include:
  - A well-defined “table drain” on the inside of the access-way;
  - Well defined culverts and discharge points to shed water; and
  - Adequate protection of both against erosion.

Access should be specifically designed and constructed under engineering control and in accordance with NZS4404:2010.

#### 4.5 STORMWATER

Stormwater disposal should be specifically designed by professionals with competence in the field. Any comments in this report as it relates to stormwater are for guidance only.

As a minimum we recommend:

- All developments should be undertaken in a manner so as to redirect stormwater from proposed building platforms and other impervious surfaces;
- Stormwater should discharge to a suitable point away from existing slopes and in a manner that reduces the risk of erosion.

## 4.6 EFFLUENT DISPOSAL

Effluent disposal fields should be specifically designed by a competent practitioner experienced in such matters. Any comments in this report as it relates to effluent fields are for guidance only.

- Discharge rate should be specifically tailored to meet the requirements as they relate to the slope angle and soil conditions on site;
- Planting between driplines should be undertaken with suitable species at density recommended by the effluent specialist; and
- Effluent disposal fields should be situated to avoid steep slopes and waterways.

We see no significant impediment to the appropriate placement of effluent fields from a geotechnical perspective;

- Lot 17 may be constrained due to area occupied by the existing pond;
  - Proposed layout should be confirmed suitable for building consent.

## 5 FURTHER GEOTECHNICAL INPUT

We recommend a suitably qualified geotechnical professional be engaged:

- To confirm bearing for specific foundations at the time of construction;
- To consult for detailed design of earthworks and/or foundations should construction be proposed outside of indicative house sites shown;
- Should ground conditions be found to differ from those contained in this report.

## 6 REFERENCES

1. Beetham, R.D.; Begg, J.G.; Barker, P.; Levick, S.; Beetham, J. 2011. Assessment of liquefaction and related ground failure hazards in Palmerston North, New Zealand. GNS Science Consultancy Report CR 2011/108 90p.
2. Burns, D., Farquhar, G., Mills, M. and Williams, A. ed. 2005. Field Description of Soil and Rock: New Zealand Geotechnical Society.
3. GNS Science. 2002. WAIRARAPA. *Institute of Geological and Nuclear Sciences, 1:250,000 Geological Map 11*. (Lee, J.M.; Begg, J.G., Compilers) GNS Science.
4. GNS Science. 2018. *New Zealand Active Faults Database: Active Faults 250K*. [online] Available at <https://data.gns.cri.nz/af/> [Accessed 5/10/2020].
5. Ministry of Business, Innovation and Employment. 2012. *Guidance: Repairing and rebuilding houses affected by the Canterbury earthquakes (Part A: Technical Guidance)*.
6. Standards New Zealand. 2004. *Structural Design Actions Part 5: Earthquake Actions*. NZS 1170.5:2004. Wellington: Standards New Zealand.
7. Standards New Zealand. 2011. *Timber-framed Buildings*. NZS3604:2011. Wellington: Standards New Zealand.
8. Standards New Zealand. 1989. *Code of Practice for Earthfill for Residential Development*. NZS4431:1989. Wellington: Standards New Zealand.
9. Stockwell, M. 1977. *Determination of allowable bearing pressure under small structures*. New Zealand Engineering, 32(6), pp.132-135.

## 7 LIMITATIONS

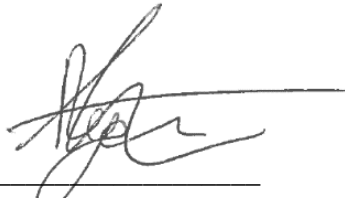
- This report has been prepared for the particular purpose outlined in the project brief and no responsibility is accepted for the use of any part in other contexts or for any other purpose.
- Ground conditions assessed in this report are inferred from published sources, site inspection and the investigations described. Variations from the interpreted conditions may occur, and special conditions relating to the site may not have been revealed by this investigation, and which are therefore not taken into account. No warranty is included either expressed or implied that the actual conditions will conform to the interpretation contained in this report.
- Groundwater conditions can vary with season or due to other events. Any comments on groundwater conditions are based on observations at the time.
- This report is provided for sole use by the client and their professional advisors. No responsibility whatsoever for the contents of this report shall be accepted for any person other than the client.

## 8 CLOSURE

We trust this meets your current needs. Should you wish to discuss any aspect of the contents of this document please contact the undersigned (Elizabeth) on 021 884 837.

Sincerely,

Prepared by:



Ryan Steadman  
MSc  
Engineering Geologist



Elizabeth Cairns  
MSc  
Engineering Geologist

Approved by:



CA Wylie  
MSc; MIPENZ; CPEng  
Principal

Attachments:

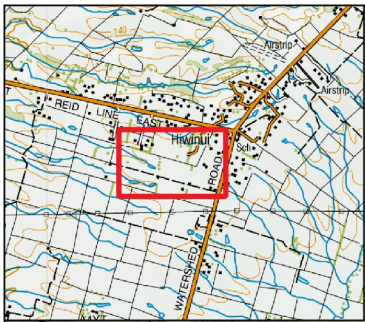
Figure 1: Indicative Site Plan

Appendix A: Investigation Logs

Schedule 2a NZS4404:2010 - Statement of Professional Opinion

Important Information about this Geotechnical Report

## FIGURES



**Legend**

- Proposed lot boundaries
  - Suitable for house construction not requiring specific design
  - Recommended slope setback
  - Indicative slope angle
- RDCL test locations
- ⊗ Dynamic Cone Penetrometer
  - + Test Pit
  - Overland Flow Path
  - Contour 0.5m interval



	RDCL PO Box 28057   8/308 Queen St East Hastings NZ Tel: +64 6 8771652   Fax: +64 6 877 5015 Email: info@rdcl.co.nz www.rdcl.co.nz	<b>Title</b> Indicative Site Plan	<b>Drawn By</b> EC	<b>Date</b> 11/02/21	A3
	<b>Project</b> 208250602 - Watershed Road Subdivision	<b>Checked By</b>	<b>Date</b>		
	<b>Client</b> LC Builders Ltd.	<b>Approved By</b> CAW	<b>Date</b> 12/02/21	Figure 1	



## APPENDIX A– INVESTIGATION LOGS

CLIENT: LC Builders	PROJECTION: NZTM2000	STARTED: 19/01/2021
PROJECT: 208250602	EASTING: 1829598.00	FINISHED: 19/01/2021
LOCATION: 143 Watershed Road	NORTHING: 5538246.00	
OFFICE: RDCL - WGTN	DATUM: -	LOGGED BY: EC DATE: 19/01/2021
ENGINEER: EC	ELEVATION: -	CHECKED BY: EC DATE: 11/02/2021
	DIMENSIONS m x m	STATUS: Final data

CONTRACTOR: Sutherland	MACHINE TYPE & MODEL
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DEPTH (m)	RL (m)	WATER	GRAPHIC LOG	ROCK / SOIL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / DENSITY	CLASSIFICATION	DCP BLOWS	SAMPLES & TESTS	ADDITIONAL REMARKS
				Silty TOPSOIL; brown. Dry.	D					
0.5	-0.5			CLAY; grey and orange mottling. Soft to firm; moderate plasticity; moist; Ironstone layers between 1.2 to 1.4 and 1.9 to 2.1.			S - FM		FSV: 0.50m 160/54kPa	
1.0	-1.0									
1.5	-1.5									
2.0	-2.0									
2.5	-2.5			CLAY; bluish grey. Stiff; high plasticity; moist.			SF			
3.0	-3.0			EOH: 3.00m						
3.5	-3.5									

**REMARKS**  
Soils logged in accordance with NZGS (2005) Field Description of Soil and Rock

**SYMBOLS**

- ▼ Standing Water Level
- ↔ Out flow
- ▷ In flow



# TEST PIT LOG

**TP02**  
SHEET 1 OF 1

CLIENT: LC Builders	PROJECTION: NZTM2000	STARTED: 19/01/2021
PROJECT: 208250602	EASTING: 1829536.00	FINISHED: 19/01/2021
LOCATION: 143 Watershed Road	NORTHING: 5538178.00	
OFFICE: RDCL - WGTN	DATUM: -	LOGGED BY: EC DATE: 19/01/2021
ENGINEER: EC	ELEVATION: -	CHECKED BY: EC DATE: 11/02/2021
	DIMENSIONS m x m	STATUS: Final data









CONTRACTOR: Sutherland MACHINE TYPE & MODEL




DEPTH (m)	RL (m)	WATER	GRAPHIC LOG	ROCK / SOIL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / DENSITY	CLASSIFICATION	DCP BLOWS	SAMPLES & TESTS	ADDITIONAL REMARKS
				Silty TOPSOIL; brown. Dry; Rootlets.						
0.5	-0.5			SILT; light brown grey and orange. Firm to stiff; dry; Blocky and Friable.	D	FM - SF				
1.0	-1.0			CLAY; orange with grey mottling. Stiff; moderate plasticity to high plasticity; moist; with Ironstone lenses - less well defined.						
1.5	-1.5									
2.0	-2.0			CLAY; greenish grey. Stiff; high plasticity; moist.	M	SF				
2.5	-2.5									
3.0	-3.0			EOH: 3.00m						
3.5	-3.5									

	<p><b>REMARKS</b></p> <p>Soils logged in accordance with NZGS (2005) Field Description of Soil and Rock</p>
	<p><b>SYMBOLS</b></p> <p>▼ Standing Water Level</p> <p>↔ Out flow</p> <p>▷ In flow</p>

CLIENT: LC Builders	PROJECTION: NZTM2000	STARTED: 19/01/2021
PROJECT: 208250602	EASTING: 1829450.00	FINISHED: 19/01/2021
LOCATION: 143 Watershed Road	NORTHING: 5538236.00	
OFFICE: RDCL - WGTN	DATUM: -	LOGGED BY: EC DATE: 19/01/2021
ENGINEER: EC	ELEVATION: -	CHECKED BY: EC DATE: 11/02/2021
	DIMENSIONS m x m	STATUS: Final data

CONTRACTOR: Sutherland	MACHINE TYPE & MODEL
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DEPTH (m)	RL (m)	WATER	GRAPHIC LOG	ROCK / SOIL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / DENSITY	CLASSIFICATION	DCP BLOWS	SAMPLES & TESTS	ADDITIONAL REMARKS
0.0	-0.5			Clayey silty TOPSOIL; brown; blocky. Dry.	D					
0.5	-0.5			Silty CLAY / Clayey SILT; orangish brown; blocky. Stiff; moderate plasticity; dry to moist.					FSV: 0.70m 162/56kPa	
1.0	-1.0								FSV: 1.00m 197/57kPa	
1.5	-1.5			1.3m - 1.6m: Ironstone lenses.						
2.0	-2.0									
2.5	-2.5			CLAY; greenish grey. Firm to stiff; high plasticity; moist.	M	FM-SF				
3.0	-3.0									
3.5	-3.5			EOH: 3.50m						

<b>REMARKS</b> Soils logged in accordance with NZGS (2005) Field Description of Soil and Rock
<b>SYMBOLS</b>  Standing Water Level  Out flow  In flow

CLIENT: LC Builders	PROJECTION: NZTM2000	STARTED: 19/01/2021
PROJECT: 208250602	EASTING: 1829311.00	FINISHED: 19/01/2021
LOCATION: 143 Watershed Road	NORTHING: 5538339.00	
OFFICE: RDCL - WGTN	DATUM: -	LOGGED BY: EC DATE: 19/01/2021
ENGINEER: EC	ELEVATION: -	CHECKED BY: EC DATE: 11/02/2021
	DIMENSIONS m x m	STATUS: Final data

CONTRACTOR: Sutherland	MACHINE TYPE & MODEL
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





DEPTH (m)	RL (m)	WATER	GRAPHIC LOG	ROCK / SOIL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / DENSITY	CLASSIFICATION	DCP BLOWS	SAMPLES & TESTS	ADDITIONAL REMARKS
				Silty TOPSOIL; brown. Dry.	D					
0.5	-0.5			Silty CLAY; orange and grey mottle; blocky. Stiff; low plasticity to moderate plasticity; dry to moist; friable where dry above 1m.	D - M	SF			FSV: 0.60m 147/67kPa	
1.5	-1.5			Dark Brown, moderately thin; IRONSTONE; strong; blocks, at least two distinct horizons.						
2.5	-2.5			EOH: 2.50m						
3.0	-3.0									
3.5	-3.5									




**REMARKS**  
Soils logged in accordance with NZGS (2005) Field Description of Soil and Rock

**SYMBOLS**  
 ▼ Standing Water Level  
 ↙ Out flow  
 ↘ In flow

CLIENT: LC Builders	PROJECTION: NZTM2000	STARTED: 19/01/2021
PROJECT: 208250602	EASTING: 1829238.00	FINISHED: 19/01/2021
LOCATION: 143 Watershed Road	NORTHING: 5538287.00	
OFFICE: RDCL - WGTN	DATUM: -	LOGGED BY: EC DATE: 19/01/2021
ENGINEER: EC	ELEVATION: -	CHECKED BY: EC DATE: 11/02/2021
	DIMENSIONS m x m	STATUS: Final data









CONTRACTOR: Sutherland	MACHINE TYPE & MODEL
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DEPTH (m)	RL (m)	WATER	GRAPHIC LOG	ROCK / SOIL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / DENSITY	CLASSIFICATION	DCP BLOWS	SAMPLES & TESTS	ADDITIONAL REMARKS
0.0	-0.5			Silty TOPSOIL; brown. Dry; friable.	D					
0.5	-1.0			Clayey SILT; orange brown. Moderate plasticity; moist; Iron concretions abundant 1.3 to 2.0m and blocky in upper 0.8m.					FSV: 0.70m 137/51kPa	
1.0	-1.5				M					
1.5	-2.0									
2.0	-2.5			CLAY; greenish grey. Stiff; high plasticity; moist.		SF				
2.5	-3.0									
3.0	-3.5									
3.5	-4.0									
				EOH: 2.80m						

<b>REMARKS</b> Soils logged in accordance with NZGS (2005) Field Description of Soil and Rock
<b>SYMBOLS</b>  Standing Water Level  Out flow  In flow

CLIENT: LC Builders	PROJECTION: NZTM2000	STARTED: 19/01/2021
PROJECT: 208250602	EASTING: 1829188.00	FINISHED: 19/01/2021
LOCATION: 143 Watershed Road	NORTHING: 5538359.00	
OFFICE: RDCL - WGTN	DATUM: -	LOGGED BY: EC DATE: 19/01/2021
ENGINEER: EC	ELEVATION: -	CHECKED BY: EC DATE: 11/02/2021
	DIMENSIONS m x m	STATUS: Final data

CONTRACTOR: Sutherland	MACHINE TYPE & MODEL
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






DEPTH (m)	RL (m)	WATER	GRAPHIC LOG	ROCK / SOIL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / DENSITY	CLASSIFICATION	DCP BLOWS	SAMPLES & TESTS	ADDITIONAL REMARKS
0.0	-0.5			Silty TOPSOIL; brown. Dry.	D					
0.5	-1.0			Clayey SILT; grey orange; blocky. Stiff; moderate plasticity; moist; tending to pan with iron concretions from 1.2m.			SF		FSV: 0.70m ● >0 kPa	
1.0	-1.5			CLAY; greenish grey. Stiff to very stiff; high plasticity; moist.			SF - VSF			
1.5	-2.0									
2.0	-2.5									
2.5	-3.0									
3.0	-3.5									
3.5	-4.0									
				EOH: 2.80m						

**REMARKS**  
Soils logged in accordance with NZGS (2005) Field Description of Soil and Rock

**SYMBOLS**  
 ▼ Standing Water Level  
 ⇐ Out flow  
 ▷ In flow

CLIENT: LC Builders	PROJECTION: NZTM2000	STARTED: 19/01/2021
PROJECT: 208250602	EASTING: 1829037.00	FINISHED: 19/01/2021
LOCATION: 143 Watershed Road	NORTHING: 5538396.00	
OFFICE: RDCL - WGTV	DATUM: -	LOGGED BY: EC DATE: 19/01/2021
ENGINEER: EC	ELEVATION: -	CHECKED BY: EC DATE: 11/02/2021
	DIMENSIONS m x m	STATUS: Final data

CONTRACTOR: Sutherland	MACHINE TYPE & MODEL
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DEPTH (m)	RL (m)	WATER	GRAPHIC LOG	ROCK / SOIL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / DENSITY	CLASSIFICATION	DCP BLOWS	SAMPLES & TESTS	ADDITIONAL REMARKS
0.0	-0.5			Clayey silty TOPSOIL; brownish. Dry to moist.	D - M					
0.5	-1.0			Clayey SILT/Silty CLAY; orange and grey mottles. Stiff; moderate plasticity; moist; Ironstone lenses from 0.8m.					FSV: 0.70m 162/70kPa	
1.0	-1.5									
1.5	-2.0									
2.0	-2.5			CLAY; greenish grey. Stiff; high plasticity; moist.	M	SF				
2.5	-3.0									
3.0	-3.5									
3.5	-4.0									
				EOH: 2.70m						

**REMARKS**  
Soils logged in accordance with NZGS (2005) Field Description of Soil and Rock

**SYMBOLS**  
 ▼ Standing Water Level  
 ↖ Out flow  
 ↗ In flow



CLIENT: LC Builders	PROJECTION: NZTM2000	STARTED: 19/01/2021
PROJECT: 208250602	EASTING: 1828937.00	FINISHED: 19/01/2021
LOCATION: 143 Watershed Road	NORTHING: 5538446.00	
OFFICE: RDCL - WGTN	DATUM: -	LOGGED BY: EC DATE: 19/01/2021
ENGINEER: EC	ELEVATION: -	CHECKED BY: EC DATE: 11/02/2021
	DIMENSIONS m x m	STATUS: Final data

CONTRACTOR: Sutherland	MACHINE TYPE & MODEL
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DEPTH (m)	RL (m)	WATER	GRAPHIC LOG	ROCK / SOIL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / DENSITY	CLASSIFICATION	DCP BLOWS	SAMPLES & TESTS	ADDITIONAL REMARKS
				Silty TOPSOIL; brown. Dry to moist.	D - M					
0.5	-0.5			Clayey SILT; grey and orange. Stiff; moderate plasticity; moist; Iron concretions abundant 0.8 to 1.2m.					FSV: 0.70m ● 188/64kPa	
1.0	-1.0									
1.5	-1.5				M	SF				
2.0	-2.0			CLAY; greenish grey. Stiff; high plasticity; moist.						
2.5	-2.5			EOH: 2.60m						
3.0	-3.0									
3.5	-3.5									

**REMARKS**  
Soils logged in accordance with NZGS (2005) Field Description of Soil and Rock

**SYMBOLS**  
 ▼ Standing Water Level  
 ◁ Out flow  
 ▷ In flow

CLIENT: LC Builders	PROJECTION: NZTM2000	STARTED: 19/01/2021
PROJECT: 208250602	EASTING: 1828904.00	FINISHED: 19/01/2021
LOCATION: 143 Watershed Road	NORTHING: 5538343.00	
OFFICE: RDCL - WGTN	DATUM: -	LOGGED BY: EC DATE: 19/01/2021
ENGINEER: EC	ELEVATION: -	CHECKED BY: EC DATE: 11/02/2021
	DIMENSIONS m x m	STATUS: Final data

CONTRACTOR: Sutherland	MACHINE TYPE & MODEL
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DEPTH (m)	RL (m)	WATER	GRAPHIC LOG	ROCK / SOIL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / DENSITY	CLASSIFICATION	DCP BLOWS	SAMPLES & TESTS	ADDITIONAL REMARKS
				Clayey silty TOPSOIL; brown; blocky. Dry.	D					
0.5	-0.5	Groundwater Not Encountered		Clayey SILT; orange and grey. Firm; moderate plasticity; moist; Iron concretion lenses abundant 1.0 to 1.8m.			FM		FSV: 0.70m ● 143/57kPa	
1.0	-1.0					M				
1.5	-1.5									
2.0	-2.0			CLAY; greenish grey. Stiff; high plasticity; moist.			SF			
2.5	-2.5			EOH: 2.60m						
3.0	-3.0									
3.5	-3.5									

**REMARKS**  
Soils logged in accordance with NZGS (2005) Field Description of Soil and Rock

**SYMBOLS**  
 ▼ Standing Water Level  
 ◁ Out flow  
 ▷ In flow



# DCP LOG

**DCP01**

SHEET 1 OF 1

CLIENT: LC Builders PROJECT: 208250602 LOCATION: 143 Watershed Road OFFICE: RDCL - WGTN ENGINEER: EC	PROJECTION: NZTM2000 EASTING: 1828927.18 NORTHING: 5538338.31 DATUM: - ELEVATION: - AZIMUTH: PLUNGE: 90°	SUB-LOCATION: STARTED: 19/01/2021 FINISHED: 19/01/2021 LOGGED BY: EC      DATE: 19/01/2021 CHECKED BY: EC     DATE: 11/02/2021 STATUS: Final data
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DEPTH (m)	RL (m)	WATER	GRAPHIC LOG	DATA	DCP BLOWS	SAMPLES & TESTS	ADDITIONAL REMARKS
					4                  8                  12                  16		
0.5	-0.5	Groundwater Not Encountered		3	4		
			4	7			
			4	4			
			5	6			
			9	17			
1.0	-1.0						
1.5	-1.5						
2.0	-2.0						
2.5	-2.5						
3.0	-3.0						
3.5	-3.5						
4.0	-4.0						
4.5	-4.5						

REMARKS  
Soils tested in accordance with NZGS

- SYMBOLS
- ▼ Standing Water Level
  - ⇐ Out flow
  - ▷ In flow



# DCP LOG

**DCP02**

SHEET 1 OF 1

CLIENT: LC Builders PROJECT: 208250602 LOCATION: 143 Watershed Road OFFICE: RDCL - WGTN ENGINEER: EC	PROJECTION: NZTM2000 EASTING: 1828972.00 NORTHING: 5538410.00 DATUM: - ELEVATION: - AZIMUTH: PLUNGE: 90°	SUB-LOCATION: STARTED: 19/01/2021 FINISHED: 19/01/2021 LOGGED BY: EC DATE: 19/01/2021 CHECKED BY: EC DATE: 11/02/2021 STATUS: Final data
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DEPTH (m)	RL (m)	WATER	GRAPHIC LOG	DATA	DCP BLOWS	SAMPLES & TESTS	ADDITIONAL REMARKS
					4      8      12      16		
0.5	-0.5	Groundwater Not Encountered		2	4		
			3	4			
			3	4			
			4	4			
			4	4			
			4	4			
			4	4			
			4	4			
			13	13			
1.0	-1.0		5	5			
				for 40mm Double Bounce			
1.5	-1.5						
2.0	-2.0						
2.5	-2.5						
3.0	-3.0						
3.5	-3.5						
4.0	-4.0						
4.5	-4.5						

REMARKS  
 Soils tested in accordance with NZGS  
 Double Bouncing

SYMBOLS  
 ▼ Standing Water Level  
 ◀ Out flow  
 ▶ In flow



# DCP LOG

**DCP03**

SHEET 1 OF 1

CLIENT: LC Builders	PROJECTION: NZTM2000	SUB-LOCATION:
PROJECT: 208250602	EASTING: 1829047.00	STARTED: 19/01/2021
LOCATION: 143 Watershed Road	NORTHING: 5538434.00	FINISHED: 19/01/2021
OFFICE: RDCL - WGTN	DATUM: -	LOGGED BY: EC DATE: 19/01/2021
ENGINEER: EC	ELEVATION: -	CHECKED BY: EC DATE: 11/02/2021
	AZIMUTH: PLUNGE: 90°	STATUS: Final data

DEPTH (m)	RL (m)	WATER	GRAPHIC LOG	DATA	DCP BLOWS	SAMPLES & TESTS	ADDITIONAL REMARKS
					4 8 12 16		
0.5	-0.5	Groundwater Not Encountered		2 3 4 4 3 2 2 3 15			
1.0	-1.0						
1.5	-1.5						
2.0	-2.0						
2.5	-2.5						
3.0	-3.0						
3.5	-3.5						
4.0	-4.0						
4.5	-4.5						

REMARKS  
Soils tested in accordance with NZGS

- SYMBOLS
- ▼ Standing Water Level
  - ⇐ Out flow
  - ▷ In flow



# DCP LOG

**DCP04**

SHEET 1 OF 1

CLIENT: LC Builders	PROJECTION: NZTM2000	SUB-LOCATION:
PROJECT: 208250602	EASTING: 1829077.00	STARTED: 19/01/2021
LOCATION: 143 Watershed Road	NORTHING: 5538358.00	FINISHED: 19/01/2021
OFFICE: RDCL - WGTN	DATUM: -	LOGGED BY: EC DATE: 19/01/2021
ENGINEER: EC	ELEVATION: -	CHECKED BY: EC DATE: 11/02/2021
	AZIMUTH: PLUNGE: 90°	STATUS: Final data

DEPTH (m)	RL (m)	WATER	GRAPHIC LOG	DCP BLOWS	SAMPLES & TESTS	ADDITIONAL REMARKS	
				4      8      12      16			
0.5	-0.5	Groundwater Not Encountered		4			
			3				
			5				
			3				
			3				
			2				
			3				
			3				
			4				
1.0	-1.0		11				
			15				
					for 80mm Double Bounce		
1.5	-1.5						
2.0	-2.0						
2.5	-2.5						
3.0	-3.0						
3.5	-3.5						
4.0	-4.0						
4.5	-4.5						

**REMARKS**  
 Soils tested in accordance with NZGS  
 Double Bouncing

**SYMBOLS**  
 ▼ Standing Water Level  
 ◀ Out flow  
 ▶ In flow



# DCP LOG

**DCP05**

SHEET 1 OF 1

CLIENT: LC Builders	PROJECTION: NZTM2000	SUB-LOCATION:
PROJECT: 208250602	EASTING: 1829161.00	STARTED: 19/01/2021
LOCATION: 143 Watershed Road	NORTHING: 5538330.00	FINISHED: 19/01/2021
OFFICE: RDCL - WGTN	DATUM: -	LOGGED BY: EC DATE: 19/01/2021
ENGINEER: EC	ELEVATION: -	CHECKED BY: EC DATE: 11/02/2021
	AZIMUTH: PLUNGE: 90°	STATUS: Final data

DEPTH (m)	RL (m)	WATER	GRAPHIC LOG	DCP BLOWS	SAMPLES & TESTS	ADDITIONAL REMARKS
				4 8 12 16		
0.5	-0.5	Groundwater Not Encountered		3		
			2			
			3			
			7			
			2			
			2			
			3			
			6			
			8			
1.0	-1.0				18	
				Double Bounce		
1.5	-1.5					
2.0	-2.0					
2.5	-2.5					
3.0	-3.0					
3.5	-3.5					
4.0	-4.0					
4.5	-4.5					

REMARKS Soils tested in accordance with NZGS Double Bouncing	SYMBOLS ▼ Standing Water Level ◁ Out flow ▷ In flow
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# DCP LOG

**DCP06**

SHEET 1 OF 1

CLIENT: LC Builders	PROJECTION: NZTM2000	SUB-LOCATION:
PROJECT: 208250602	EASTING: 1829256.00	STARTED: 19/01/2021
LOCATION: 143 Watershed Road	NORTHING: 5538348.00	FINISHED: 19/01/2021
OFFICE: RDCL - WGTN	DATUM: -	LOGGED BY: EC DATE: 19/01/2021
ENGINEER: EC	ELEVATION: -	CHECKED BY: EC DATE: 11/02/2021
	AZIMUTH: PLUNGE: 90°	STATUS: Final data

DEPTH (m)	RL (m)	WATER	GRAPHIC LOG	DATA	DCP BLOWS	SAMPLES & TESTS	ADDITIONAL REMARKS	
					4      8      12      16			
0.5	-0.5	Groundwater Not Encountered		4	4			
			5	5				
			6	6				
			4	4				
			3	3				
			2	2				
			2	2				
			4	4				
1.0	-1.0		4	4				
			6	6				
			7	7				
			14	14				
1.5	-1.5							
2.0	-2.0							
2.5	-2.5							
3.0	-3.0							
3.5	-3.5							
4.0	-4.0							
4.5	-4.5							

**REMARKS**  
Soils tested in accordance with NZGS

**SYMBOLS**  
 ▼ Standing Water Level  
 ◁ Out flow  
 ▷ In flow





# DCP LOG

**DCP07**

SHEET 1 OF 1

CLIENT: LC Builders	PROJECTION: NZTM2000	SUB-LOCATION:
PROJECT: 208250602	EASTING: 1829318.00	STARTED: 19/01/2021
LOCATION: 143 Watershed Road	NORTHING: 5538278.00	FINISHED: 19/01/2021
OFFICE: RDCL - WGTN	DATUM: -	LOGGED BY: EC DATE: 19/01/2021
ENGINEER: EC	ELEVATION: -	CHECKED BY: EC DATE: 11/02/2021
	AZIMUTH: PLUNGE: 90°	STATUS: Final data

DEPTH (m)	RL (m)	WATER	GRAPHIC LOG	DATA	DCP BLOWS	SAMPLES & TESTS	ADDITIONAL REMARKS
					4 8 12 16		
0.5	-0.5	Groundwater Not Encountered		2 3 4 5 6			
1.0	-1.0			3 2 2 4 5 8 15			
1.5	-1.5						
2.0	-2.0						
2.5	-2.5						
3.0	-3.0						
3.5	-3.5						
4.0	-4.0						
4.5	-4.5						

**REMARKS**  
Soils tested in accordance with NZGS

**SYMBOLS**  
 ▼ Standing Water Level  
 ◁ Out flow  
 ▷ In flow



# DCP LOG

**DCP08**

SHEET 1 OF 1

CLIENT: LC Builders	PROJECTION: NZTM2000	SUB-LOCATION:
PROJECT: 208250602	EASTING: 1829484.00	STARTED: 19/01/2021
LOCATION: 143 Watershed Road	NORTHING: 5538278.00	FINISHED: 19/01/2021
OFFICE: RDCL - WGTN	DATUM: -	LOGGED BY: EC DATE: 19/01/2021
ENGINEER: EC	ELEVATION: -	CHECKED BY: EC DATE: 11/02/2021
	AZIMUTH: PLUNGE: 90°	STATUS: Final data

DEPTH (m)	RL (m)	WATER	GRAPHIC LOG	DCP BLOWS	SAMPLES & TESTS	ADDITIONAL REMARKS
				4 8 12 16		
0.5	-0.5	Groundwater Not Encountered		4		
				3		
				5		
				5		
				6		
				2		
				2		
				2		
				3		
1.0	-1.0			44	>>	
				9		
				16		
1.5	-1.5					
2.0	-2.0					
2.5	-2.5					
3.0	-3.0					
3.5	-3.5					
4.0	-4.0					
4.5	-4.5					

**REMARKS**  
Soils tested in accordance with NZGS

- SYMBOLS**
- ▼ Standing Water Level
  - ◁ Out flow
  - ▷ In flow



# DCP LOG

**DCP09**

SHEET 1 OF 1

CLIENT: LC Builders PROJECT: 208250602 LOCATION: 143 Watershed Road OFFICE: RDCL - WGTN ENGINEER: EC	PROJECTION: NZTM2000 EASTING: 1829433.00 NORTHING: 5538199.00 DATUM: - ELEVATION: - AZIMUTH: PLUNGE: 90°	SUB-LOCATION: STARTED: 19/01/2021 FINISHED: 19/01/2021 LOGGED BY: EC      DATE: 19/01/2021 CHECKED BY: EC     DATE: 11/02/2021 STATUS: Final data
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DEPTH (m)	RL (m)	WATER	GRAPHIC LOG	DATA	DCP BLOWS	SAMPLES & TESTS	ADDITIONAL REMARKS
					4      8      12      16		
0.5	-0.5	Groundwater Not Encountered		5	4		
			4	4			
			4	4			
			6	6			
			4	4			
			2	2			
			2	2			
			2	2			
			6	6			
1.0	-1.0		5	5			
			7	7			
			12	12			
1.5	-1.5						
2.0	-2.0						
2.5	-2.5						
3.0	-3.0						
3.5	-3.5						
4.0	-4.0						
4.5	-4.5						

<b>REMARKS</b> Soils tested in accordance with NZGS	<b>SYMBOLS</b> ▼ Standing Water Level ⇐ Out flow ▷ In flow
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**SCHEDULE 2A**

**STATEMENT OF PROFESSIONAL OPINION ON SUITABILITY OF LAND FOR BUILDING CONSTRUCTION**

Development ..... Watershed Road Subdivision (Part Lot 2 DP 480)

Developer ..... LC Builders Ltd.

Location ..... 143 Watershed Road, Bunnythorpe

I ..... Cam Wylie ..... of ..... Resource Development Consultants Limited (RDCL) .....  
 (Full name) ..... (Name and address of firm)

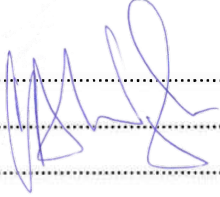
Hereby confirm that:

1. I am a geo-professional as defined in clause 1.2.2 of NZS 4404:2010 and was retained by the developer as the geo-professional on the above development.
2. The extent of my preliminary investigations are described in my Report(s) number ..R208250602..A..01., dated ...12 February 2021 and the conclusions and recommendations of that/those document(s) have been re-evaluated in the preparation of this report. The extent of my inspections during construction, and the results of all tests and/or re-evaluations carried out are as described in my geotechnical completion report dated .....
3. In my professional opinion, not to be construed as a guarantee, I consider that (delete as appropriate):
  - (a) The earth fills shown on the attached Plan No..... have been placed in compliance with the requirements of the ..... Council and my specification.
  - (b) The completed works take into account land slope and foundation stability considerations, subject to the appended foundation recommendations and earthworks restrictions, (which should be read in conjunction with the appended final site contour plan).
  - (c) Subject to 3(a) and 3(b) of this Schedule, the original ground not affected by filling is suitable for the erection of buildings designed according to NZS 3604 provided that:
    - (i) ...Recommended setbacks, as shown, should be maintained for all buildings .....
    - (ii) .....
  - (d) Subject to 3(a) and 3(b) of this Schedule, the filled ground is suitable for the erection of buildings designed according to NZS 3604 provided that:
    - (i) .....
    - (ii) .....
  - (e) The original ground not affected by filling and the filled ground are not subject to erosion, subsidence, or slippage in accordance with the provisions of section 106 of the Resource Management Act 1991 provided that:
    - (i) .....
    - (ii) .....

NOTE – These subclauses may be deleted or added to as appropriate, to include such considerations as expansive soils where excluded from NZS 3604, and site seismic characteristics as covered in clause 3.1.3 of NZS 1170.5.

4. This professional opinion is furnished to the TA and the developer for their purposes alone on the express condition that it will not be relied upon by any other person and does not remove the necessity for the normal inspection of foundation conditions at the time of erection of any building.
5. This certificate shall be read in conjunction with my geotechnical report referred to in clause 2 above and shall not be copied or reproduced except in conjunction with the full geotechnical completion report.

Signed .....



Date 12/02/2021.....

.....  
.....  
.....  
*(Name, title, and professional qualifications)*

Copyright waived

# Important Information about This

# Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

**The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.**

## **Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects**

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled.* No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

## **Read this Report in Full**

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

## **You Need to Inform Your Geotechnical Engineer about Change**

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

## **This Report May Not Be Reliable**

*Do not rely on this report* if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be, and, in general, if you are the least bit uncertain about the continued reliability of this report, contact your geotechnical engineer before applying it.* A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

## **Most of the "Findings" Related in This Report Are Professional Opinions**

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

## This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

## This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

## Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may

perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

## Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

## Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old*.

## Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, *proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration*. Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. *Geotechnical engineers are not building-envelope or mold specialists*.



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