Job No.: 23-186
Our Ref: 3666
Author: Dennis Alazigha

Qualtest Laboratory
Est. 1987

May 30, 2023

Hall Contracting,
PO Box 519,
Buderim Qld 4556.

ATTENTION: MR ANTHONY SELLIN

Email: AnthonySellin@hallcontracting.com.au
Cc: GregBusse@hallcontracting.com.au
Cc: HaydynCliff@hallcontracting.com.au

Dear Sir,

RE: THIRD PARTY PEER REVIEW AND ASSESSMENT OF THE SUITABILITY OF EXISTING EARTHWORKS TO SUPPORT RESIDENTIAL CONSTRUCTION NORTH HARBOUR PHASE 4B BURPENGARY EAST QLD 4505

1.0 INTRODUCTION

As part of the North Harbour Phase 4B residential development in Burpengary East Qld, Hall Contracting (The Client) commissioned Morrison Geotechnic to carry out Level 1 bulk earthworks supervision and testing program at Stages 30, 31, 32, 33, 39, 40, and 41 in accordance with AS3798-2007. Based on the Client-supplied information, it is understood that the earthworks in these Stages were undertaken at the same time between June 2021 and December 2021.

The geographical location of the North Harbour Phase 4B site, consisting of the above Stages, is presented in Figure 1.

Available information also shows that about 177,400 m^3 of fill was placed throughout Phase 4B, as presented in the layout plan/'heat' map in Figure 2, indicating areas of fill up to about 2.5 m thick at some portions in Stages 31, 32, and 41.

Following the completion of the bulk earthworks by Morrison Geotechnic, a Level 1 Compliance report for Phase 4B was issued to Hall Contracting with reference number 3355 - ML20/105. However, the report omitted the stages mentioned above. Hence, Hall Contracting seeks a peer review of the bulk earthworks and a compliant report for the Phase 4B development.

Hall Contracting has provided documentation covering the bulk earthworks in Phase 4B for review by Qualtest to ascertain the project's compliance with AS3798. Additionally, Qualtest undertook field investigation of the site on May 22, 2023.

The work was commissioned by Mr Haydyn Cliff, representing Hall Contracting, following acceptance of our proposal dated May 4, 2023.

This report provides information about the site, the allowable bearing capacity (q_a), the modulus of subgrade reaction (k_s), the expected settlement behaviour of the existing bulk earthworks, and most importantly, provide a statement of compliance that the earthworks at Phase 4B were undertaken in accordance with AS3798.

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The Geographical Location of The Site, Highlighted in Red

Figure 2: North Harbour Phase 4B Showing Bulk Earthwork and Layout Plan

1.1 Purpose

To conduct field testing and undertake a third-party review of all the Level documents provided by Hall Contracting for the North Harbour Phase 4B development and provide a statement of compliance that the earthworks were undertaken in accordance with AS3798-2007.

1.2 Information Provided

The following information was provided to Qualtest to aid the preparation of this report:

- Level One Earthworks Compaction Reports carried out by Morrison Geotechnic;
- Level One Site Record Sheets carried out by Morrison Geotechnic;
- Heat map of the constructed fill;
- Compaction test locations;
- The Level 1 daily reports;
- Field density testing, including locations, levels, sample numbers, and results obtained;
- Laboratory compaction testing;
- Protest Engineering report – Bulk Earthworks Audit – Level 1 Third Party Peer Review, Proposed Residential Development, North Harbour Phase 4B, Eurpengary East, Project No.: PTP/11327, Letter No.: PTP/11327 – 0001 – Rev 1, Dated March 29, 2023;
- Strip inspection records; and
- Site photos.

1.3 Scope of Work

Based on discussions with Hall Contracting representative and the information provided via email dated May 5, 2023, it is understood that the following information is required as a minimum:

- To undertake a geotechnical investigation of the North Habour Phase 4B site;
- To undertake a third-party review of all the Level documents provided by Hall;
- To provide a statement of compliance or non-compliance of the earthworks in the North Harbour Phase 4B in accordance with AS3798-2007.

1.4 The Site

The site is part of the North Harbour Phase 4B residential subdivision, consisting of Stages 30, 31, 32, 33, 39, 40, and 41, located along Buckley Road, Burpengary East Qld. Cut-to-fill operations have been completed, with sales of lots ongoing. The site bulk earthworks are understood to have been completed in December 2021. The fill depth was noted to increase southward, measuring up to about 2.5m at the southern portion. Fill at the northern portion was observed to be about 0.3 to 1.0m in thickness, with the majority of the northern portion being cut pads.

Following the completion of bulk earthworks, a topsoil of about 0.2m in thickness has been placed across the site resulting in a grass cover with a gently sloping surface of about 2 to 5^{o} towards the south.

The layout plan shows the proposed pavements, parks, sewer, water mains, and associated infrastructure. Due to recent rainfall, the proposed pavements at the site's southern portion are covered with roadbase materials for easy tracking of excavators used for the ongoing installation of precast reinforced concrete pipe stormwater drainage systems.

2.0 METHODOLOGY

Our findings and conclusions are drawn from two phases of investigation, consisting of the review of the documentation in relation to the completed bulk earthworks by Morrison Geotechnic and the field investigation conducted by Qualtest. These two components of our investigation are discussed below:

2.1 Review of all Earthworks Documentation

All QA/documentation has been reviewed, including the Level 1 Daily Reports, Level One Earthworks Compaction Reports carried out by Morrison Geotechnic; Level One Site Record Sheets carried out by Morrison Geotechnic; Heat map of the constructed filling operations; Foundation preparation; filling operations; site photographs; Field density testing, including locations, levels, sample numbers, and results obtained; Laboratory compaction testing; and Protest Engineering report – Bulk Earthworks Audit – Level 1 Third Party Peer Review, Proposed Residential Development, North Harbour Phase 4B, Eurpengary East of March 29, 2023.

Based on the above-reviewed documentation for Phase 4B, consisting of Stages 30, 31, 32, 33, 39, 40, and 41, Qualtest is of the opinion that the fill was placed and compacted in uniformly thick layers at suitable moisture contents that meet the requirements set out in AS3798 – 2007. However, a final conclusion of compliance is dependent on the outcome of the fieldwork component of this Bulk Earthwork Third-Party Peer Review study.

2.2 Fieldwork by Qualtest

2.2.1 DCP Test

To address the above scope of work, Qualtest conducted dynamic cone penetrometer (DCP) tests at random locations across Phase 4B, especially at locations with fill greater than 1.0m thick. A total of thirty (30) DCPs were carried out, as illustrated in Figure 3.

The existing clayey sand topsoil layer returned blow counts per 100 penetration of about 3 to 26, indicating firm to hard clays. Underneath the topsoil is sandy clay fill with DCP blow counts of about 3 to 9 per 100mm penetration, indicative of firm to stiff clay soils.

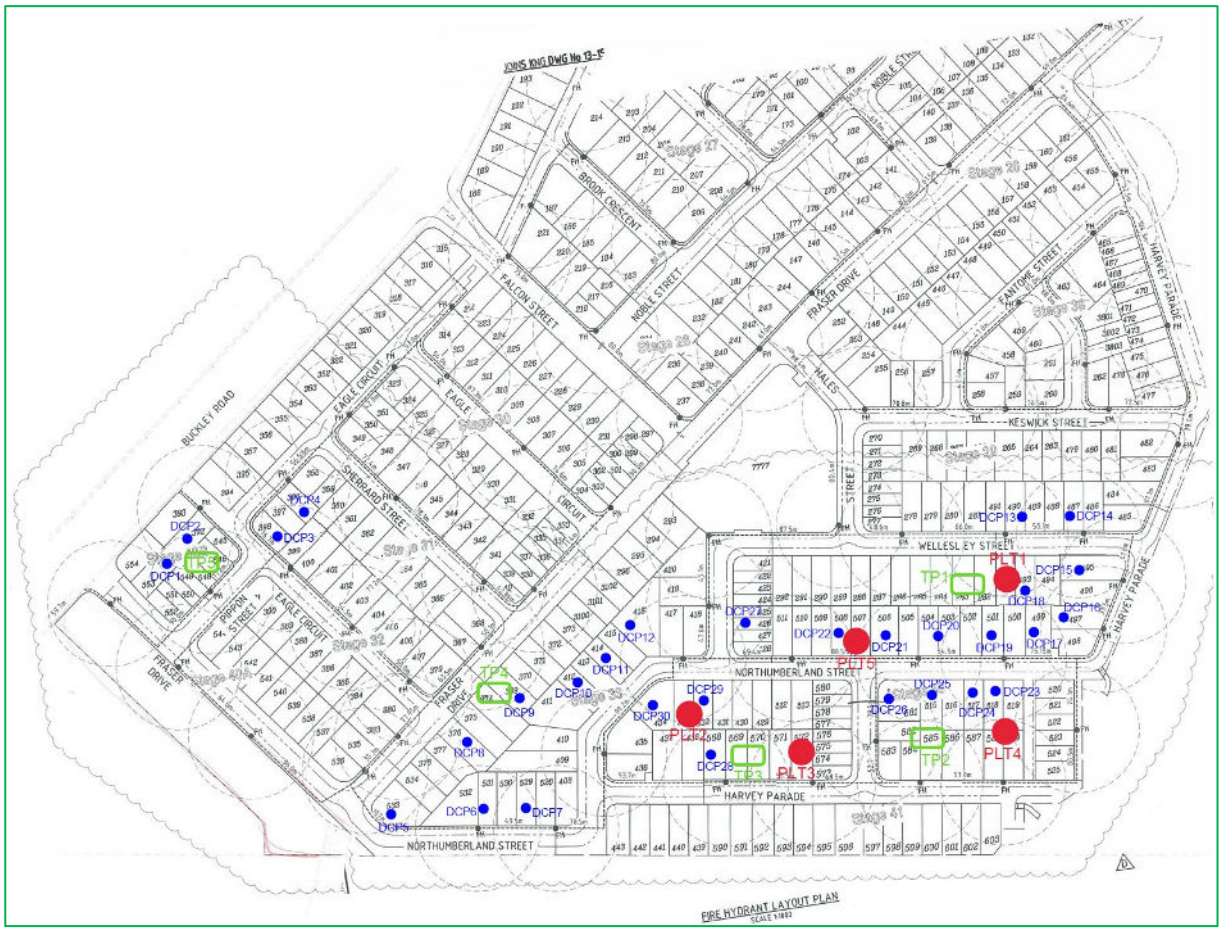

Figure 3: The Approximate Locations of DCP, Test Pits, and Plate Load Tests

2.2.1.1 Bearing Capacity of Soils

The bearing capacity of the subsurface fill profile encountered onsite was determined using DCP test data acquired during the investigation on May 24, 2023.

The approximate DCP test locations are shown in Figure 3 above.

Stockwell (1977) developed a correlation between DCP blow counts and the bearing capacity of soils. This relation was adopted in deriving the allowable bearing capacity of the existing fill with a safety factor of 3.0.

The bearing capacity of the fill at the DCP test locations across the site with depth is presented in Figure 4.

The allowable bearing capacity for the fill underneath the topsoil to about 1.5m depth ranges from 90 to about 180kPa. This range of bearing capacity shows the fill is controlled with few localised firm layers, as shown by the lower and upper bound dotted red lines. Beyond the 1.5m depth, the bearing capacity is greater than equal to about 250kPa.

Qualtest recommends a generally conservative allowable bearing capacity of 100kPa from beneath the topsoil to about 1.5m depth. Beyond this depth, an allowable bearing pressure of 250kPa is considered suitable for the site.

It must be noted that site-specific inspection of all foundations is recommended prior to fill placement by a qualified geotechnical engineer.

Soil's moisture content influences DCP test data and, thus, could differ significantly from tests conducted during persistent rain events. It is recommended that all foundations be inspected and probably tested by a suitably qualified geotechnical engineer during the construction phase.

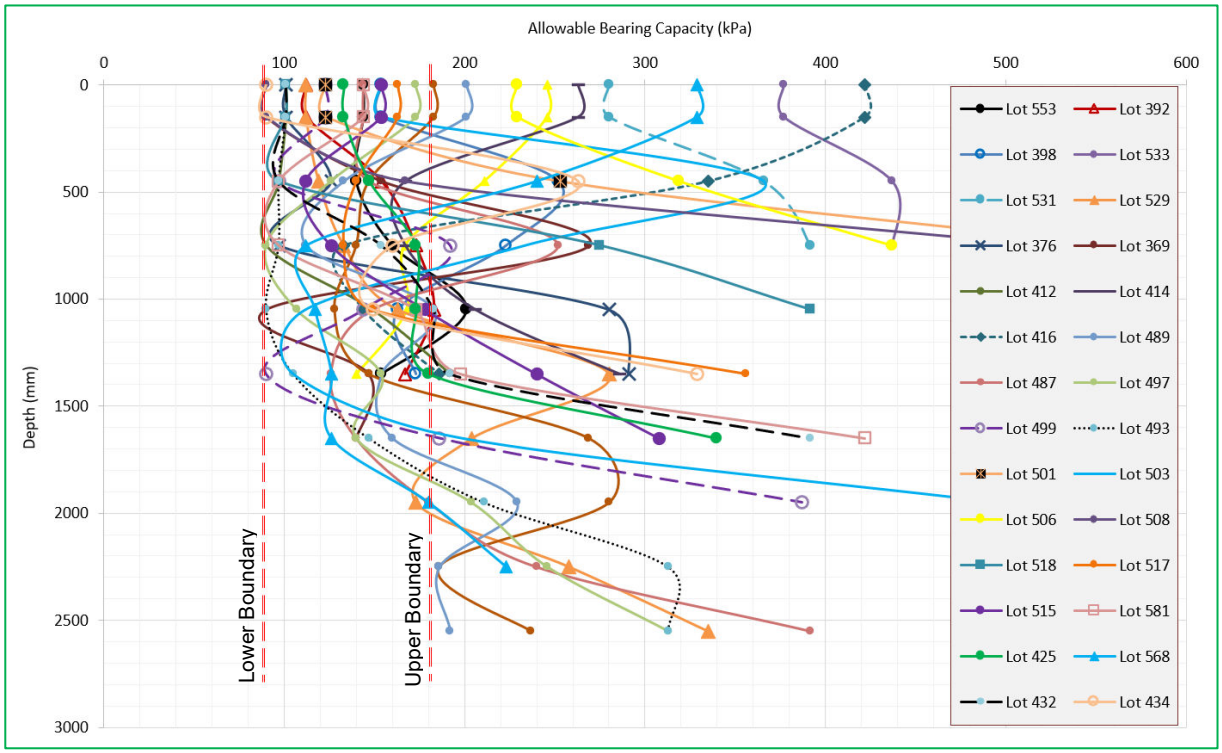

Figure 4: Bearing Capacity of Onsite Fill with Depth; Derived from DCP Data

2.2.2 Test Pit

To address the above scope of work, Qualtest carried out test pitting activities at random locations across Phase 4B site.

Five (5) test pits were excavated across the site for a visual-tactical assessment of the existing fill. The approximate location of the test pits is presented in Figure 3 above. All excavation walls show seamlessness, indicative of a typically controlled fill, as shown in Figure 5.

The excavations show the presence of clayey sand as topsoil, loose to very dense consistency, fine to coarse-grained sand, low plasticity clay, dark-brown, moist < PL, with root, root fibre. Underneath the topsoil is medium to high plasticity firm to very stiff sandy clay fill, fine to coarse-grained sand, with fine

to medium-grained angular gravel, dark-brown, mottled red, grey, orange, moist≈PL extending to varying depth as per test location. The fill layer is underlain by natural alluvial sandy clays/clayey sands, usually very stiff, that were encountered at about 0.5m or greater depths.

The engineering logs and photographs of the test pits are shown in Appendix A and B, respectively.

Figure 5: Typical Appearances of Test Pits Excavated Walls Across The Site

2.2.3 Plate Load Test

To address the above scope of work, Qualtest carried out five (5) plate load tests at random locations across the existing fill, as shown in Figure 3 above.

A 300mm diameter plate was used for the plate load test at the five locations. The test predicts the behaviour of the soil underneath the plate to a depth of about twice the width of the bearing plate. Therefore, the influence depth will be about 0.6m below the test surface.

Prior to the commencement of each test, the topsoil was removed to expose the fill for testing.

The plate load test locations were set out by Qualtest to maximise geotechnical information gathering. These locations were targeted at areas with greater fill depth, corresponding to the southern section of the site. Five locations were selected for plate load testing with fill depth greater than or equal to 1.5m.

Plate load test (PLT) is a process in which a load is repeatedly applied and released in increments using a circular loading plate aided by a loading device, with the settlement of the loading plate being measured. The plate load test permits the relationship between load and settlement (load-settlement curve) to be determined; the aim is to assess the deformation and strength characteristics of the test material.

Qualtest-owned plate load test equipment, Plate Load Test AX01, was used for the investigation. The typical test setup for the electronic plate load test equipment is shown in Figure 6.

Figure 6: The Instrumented Plate Load Test Equipment Used for the Investigation

2.2.3.1 Test Methodology

The plate load test with the electronic plate bearing tester AX01 is designed to determine load-settlement curves of soils. The obtained load-settlement curves enable the user to evaluate the deformability and load-bearing capacity of the tested materials.

The electronics of the AX01 automatically determine the needed indicators by means of the measuring results: strain modulus, E_v and modulus of subgrade reaction, k_s.

The test was conducted in accordance with the Germany Standard, DIN 18134:2012-04.

The test procedure is as follows:

- The test ground surface was carefully leveled, and any loose materials removed;
- A 300mm diameter load-bearing plate with a force sensor was then placed on the plate's centre surface, ensuring proper contact with the plate;
- A hydraulic loading jack (200kN) was placed on top of the load-bearing plate head;
- A counterweight (a loaded water truck) weighing about 15 tonnes was used as the reaction load over the bearing plate. Steel-spacer were added where needed;
- The measuring beam of the AX01 was aligned and leveled; and
- Preloading the test surface to proceed as per Table 1 of load cycles from DIN 18134.

The 300mm plate was subjected to incremental loading. Settlement at each load increment was measured, and load-settlement curves were plotted automatically by the PLT AX01 equipment.

Table 1: Load Cycles from DIN 18134 - 2012

Normal stress - DIN 18134-2012, 300mm		Time per load (Sec)
Normal stress (MN/m2)	To be set on the device (kN/m2)	
Preload		
0.010	10	30
First Loading Cycle		
0.080	80	60
0.160	160	60
0.250	250	60
0.330	330	60
0.420	420	60
0.500	500	60
Unloading Cycle		
0.250	250	60
0.125	125	60
0.010	10	60
Second Loading Cycle		
0.080	80	60
0.160	160	60
0.250	250	60
0.330	330	60
0.420	420	60

2.2.3.2 Data Evaluation

The loading, unloading, and reloading of the materials in fixed steps and the corresponding plate settlements are recorded with an electrical force sensor and an inductive displacement gauge to determine the deflection.

The test results were stored on a memory chip card, and with a chip card reader, the results were transferred into an MS Excel sheet for further analysis.

2.2.3.3 Bearing Capacity

The allowable bearing capacity of the fill materials was derived from the plate load-settlement graph. An analytical method was adopted in determining the allowable bearing capacity of the tested locations with the 2nd loading relationship, as shown in Figures 7a, b, c, d, and e.

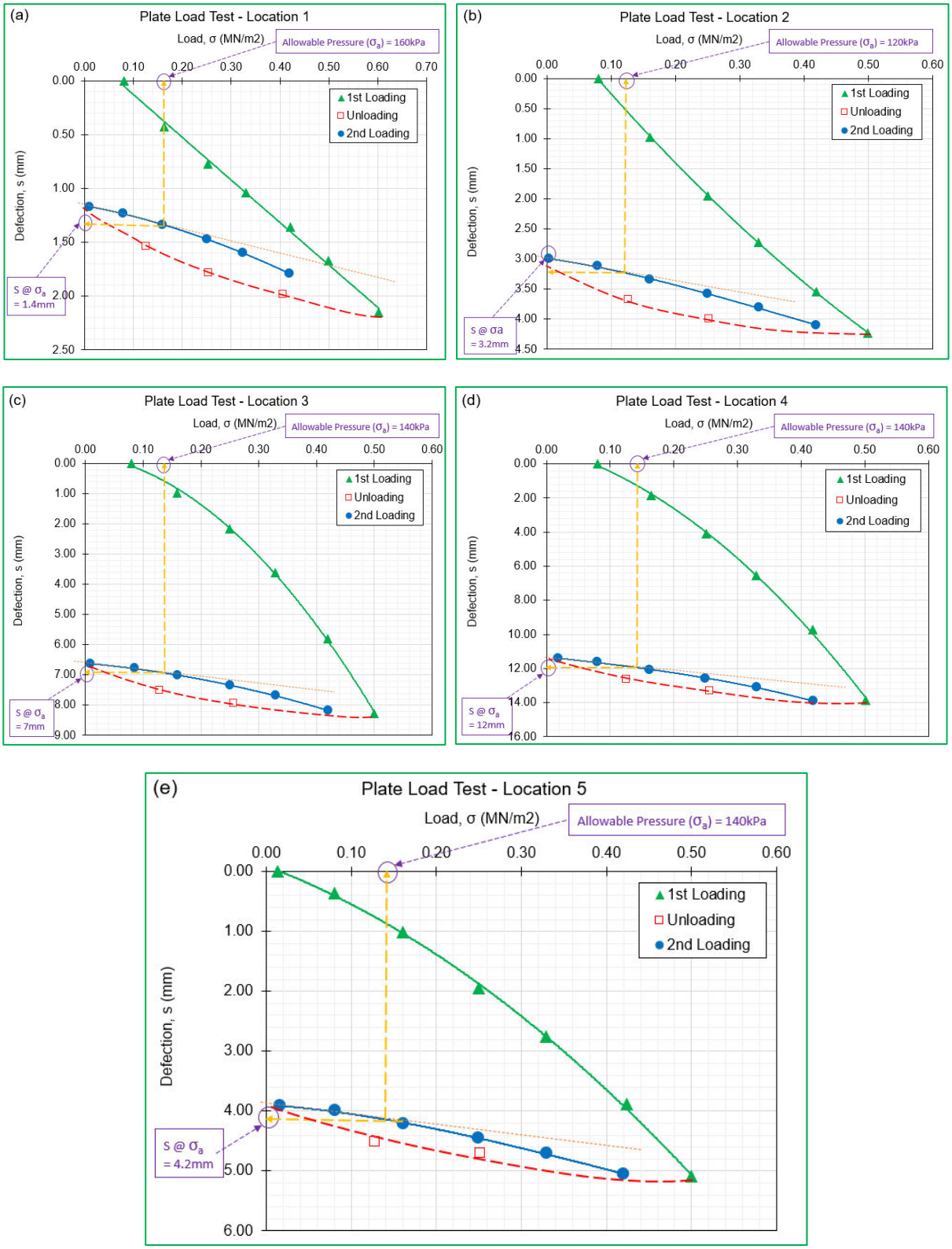

Figure 7(a): Analytical Derivation of the Allowable Bearing Capacity at Test Location 1, (b): Analytical Derivation of the Allowable Bearing Capacity at Test Location 2; (c): Analytical Derivation of the Allowable Bearing Capacity at Test Location 3; (d): Analytical Derivation of the Allowable Bearing Capacity at Test Location 4; (e): Analytical Derivation of the Allowable Bearing Capacity at Test Location 5.

There is a linear relationship at the upper end of the load-settlement curve for the 2nd loading cycle. From the initial test point to the point of inflexion, a straight line could be drawn to join all data points. The point at which the maximum inflexion occurs corresponds to the material's allowable bearing capacity (qa), as shown in Figures 5a, b, c, d, and e, representing the five test locations.

The allowable bearing pressures at the tested locations returned values as shown in Table 2.

Table 2: Allowable Bearing Capacity at Tested Locations, Derived from Plate Load Test

Test ID	Allowable Bearing Capacity (kN/m^2)
PLT1	160
PLT2	120
PLT3	140
PLT4	140
PLT5	140

The allowable bearing pressures obtained at the five test locations are within the lower and upper limits of the bearing pressures obtained from the DCP test data in Figure 4 above. Therefore, the plate load test results support our findings that the existing fill is engineered.

2.2.3.4 Modulus of Subgrade Reaction, ks

The load-settlement graph, showing settlement at any given load, was used to calculate the Modulus of the Subgrade Reaction, a measure of the stiffness of the subgrade known as the k_s value.

It is expressed as load per unit area per unit of settlement, e.g., KN/m^2/m or KPa/m or MN/m^3.

The instrumented plate load test AX01 automatically calculates the modulus of subgrade reaction at the locations, as presented in Table 3.

Table 3: Modulus of Subgrade Reaction at Tested Locations

Test ID	Modulus of Subgrade Reaction, k_s (MN/m^3)
PLT1	137
PLT2	37
PLT3	76
PLT4	43
PLT5	61

The recommended allowable modulus of subgrade reaction for the site is 37MN/m^3 to account for ground variation.

2.2.3.5 Ground Settlement

At each test location, a series of loads were applied to the fill materials, and the corresponding settlements were recorded. The test locations were loaded up to 500kPa, and the settlement behaviour of the fill materials was determined per Figures 5a, b, c, d, and e. The settlement behaviour of the materials at the end of the first and second loading cycles is presented in Table 4.

Table 4: Summary of Measured Settlements after 1st and 2nd Loading Cycles

Test ID	Settlement Magnitude (mm)	
	End of 1st Load Cycle (@ 500kPa)	End of 2nd Loading Cycle (@ 420kPa)
Test 1	2.15	1.79
Test 2	4.23	4.10
Test 3	8.27	8.18
Test 4	13.85	13.93
Test 5	5.09	5.05

If a 500kPa pressure is applied on the existing fill material, an estimated 14mm settlement should be expected. However, it is recommended that pressures no greater than 100kPa be allowed on the fill.

For applied pressures equal to or less than 100kPa, the fill materials will respond within the elastic range; hence, it is expected to regain its strength, but at pressure beyond 100kPa, the materials will exhibit plastic behaviour that might result in serviceability problems.

3.0 FINDINGS/CONCLUSION

Qualtest has completed a comprehensive review of the documents provided in relation to the bulk earthworks at the North Harbour Phase 4B residential development. Additionally, Qualtest completed a site investigation at Phase 4B, i.e., Stages 30, 31, 32, 33, 39, 40, and 41.

Based on the reviewed documents and our findings from the site investigation, Qualtest affirms the following in relation to AS3798-2007 requirements:

- Foundation preparation - adequate;
- Foundation proof rolling test - adequate;
- Fill placement - adequate;
- Degree of field compaction in accordance with AS3798 - adequate;
- Material testing undertaken - adequate;
- Frequency of field density testing undertaken - adequate;
- Laboratory compaction testing - adequate;
- Test location spread - adequate;
- Field observation notes - adequate;
- Potential bearing pressures - adequate; and
- Settlement potential - adequate.

Some photographs of the site activities taken from June to December 2021 are appended in Appendix C.

3.1 Bulk Earthwork Certification

Based on the above findings, Qualtest provides this statement of compliance that the fill at Stages 30, 31, 32, 33, 39, 40, and 41 were placed and compacted in accordance with the requirements set out in AS3798 – 2007.

4.0 Limitations

This report is for the sole benefit and use of Hall Contracting (**The Client**) and its consultants to provide geotechnical information regarding the bulk earthworks completed at the North Harbour Phase 4B Stages 30, 31, 32, 33, 39, 40, and 41. The report only intends to address those issues expressly described in the scope of work and the proposal letter.

A significant data analysed in preparing this report is from others. It is assumed that the information provided truly reflects the activities throughout the bulk earthwork, as Qualtest cannot guarantee the correctness of the data provided.

Should you require further information regarding the above, please do not hesitate to contact this office.

Yours faithfully,

MICHAEL MORRISON
For and on behalf of
QUALTEST LABORATORY PTY LTD

DENNIS ALAZIGHA, *RPEQ 22169*

Appendix A – Test Pit Logs
Appendix B – Photographs of Test Pits
Appendix C – Photographs of Fill Activities

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APPENDIX A

Test Pit Logs

Qualtest Laboratory
Est. 1987

Engineering Log - Test Pit

Test Pit No.: QTP1

Job Number: 23-186

Client: Hall Contracting Pty Ltd

Project: Peer Review & Suitability of Earthworks

Location: North Harbour Phase 4B

Easting:
Northing:
RL:
Total Depth: 1.50

Drilling Rig: Backhoe
Driller: Hall Contracting
Logged By: KD
Date: 22/05/2023

Drilling Information				Material Description							Test Samples			
Drill Method	Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	Description	Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result
TC Bit with 100mm Dia. Auger			0.2	Topsoil		CL	**Sandy CLAY**: Firm, low plasticity, fine to coarse grained sand, roots and root fibres, dark brown, moist<pl		M<PL	F				
			1.0	Fill		Cl	**Sandy CLAY**: Very stiff, medium plasticity, fine to coarse grained sand, with fine to medium grained angular gravel, brown mottled red, grey orange, moist≈PL		M≈PL	VSt				
			1.5				**1.50m: BOREHOLE TERMINATED**							
			2.0											

Comments:

Authorised by: ……

Date: ……..……..

Water
- Water level on date shown
- Water inflow
- Water outflow

Weathering
- RS Residual soil
- XW Extremely weathered
- DW Distinctly weathered
- SW Slightly weathered
- FR Fresh

Consistency
- VS Very soft
- S Soft
- F Firm
- St Stiff
- VSt Very stiff
- H Hard

Moisture
D Dry M Moist W Wet

Density
- VL Very loose
- L Loose
- MD Medium dense
- D Dense
- VD Very dense

Rock Strength
- ELS Extremely low
- VLS Very low
- LS Low
- MS Medium
- HS High
- VHS Very high
- EHS Extremely high

Tests & Results
- U50 Undisturbed 50mm diam tube.
- D Disturbed sample.
- SPT Standard Penetration Test, N = number of blows to drive 50mm sampler 300mm with a 63.6kg hammer falling 762mm.
- PP Hand penetrometer estimate of unconfined compressive strength, kPa.
- S Vane shear value kPa
- DC Dynamic Cone test, 9.09kg hammer, fall 508mm, driving 20mm, 30 deg taper cone fitted to rods of smaller section.

From AS1289-1993 Methods of Testing Soils for Engineering Purposes

Engineering Log - Test Pit

Test Pit No.: QTP2

Job Number: 23-186

Client: Hall Contracting Pty Ltd

Project: Peer Review & Suitability of Earthworks

Location: North Harbour Phase 4B

Easting:
Northing:
RL:
Total Depth: 1.50

Drilling Rig: Backhoe
Driller: Hall Contracting
Logged By: KD
Date: 22/05/2023

Drilling Information				Material Description							Test Samples			
Drill Method	Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	Description	Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result
TC Bit with 100mm Dia. Auger			0.2	Topsoil		SM	**Silty SAND**: Loose, fine to coarse grained sand, low plasticity, dark brown, dry		D	L				
			1.0	FillL		Cl	**Sandy CLAY**: Vey stiff, medium plasticity, fine to coarse grained sand, orange-brown, mottled grey, red, moist≈PL		M≈PL	VSt				
			1.5				**1.50m: BOREHOLE TERMINATED**							
			2.0											

Comments:

Authorised by: ……

Date: ……..……..

Water
- Water level on date shown
- Water inflow
- Water outflow

Weathering
- RS Residual soil
- XW Extremely weathered
- DW Distinctly weathered
- SW Slightly weathered
- FR Fresh

Consistency
- VS Very soft
- S Soft
- F Firm
- St Stiff
- VSt Very stiff
- H Hard

Moisture
D Dry M Moist W Wet

Density
- VL Very loose
- L Loose
- MD Medium dense
- D Dense
- VD Very dense

Rock Strength
- ELS Extremely low
- VLS Very low
- LS Low
- MS Medium
- HS High
- VHS Very high
- EHS Extremely high

Tests & Results
- U50 Undisturbed 50mm diam tube.
- D Disturbed sample.
- SPT Standard Penetration Test, N = number of blows to drive 50mm sampler 300mm with a 63.6kg hammer falling 762mm.
- PP Hand penetrometer estimate of unconfined compressive strength, kPa.
- S Vane shear value kPa
- DC Dynamic Cone test, 9.09kg hammer, fall 508mm, driving 20mm, 30 deg taper cone fitted to rods of smaller section. From AS1289-1993 Methods of Testing Soils for Engineering Purposes

Engineering Log - Test Pit

Test Pit No.: QTP3

Job Number: 23-186

Client: Hall Contracting Pty Ltd

Project: Peer Review & Suitability of Earthworks

Location: North Harbour Phase 4B

Easting:
Northing:
RL:
Total Depth: 1.50

Drilling Rig: Backhoe
Driller: Hall Contracting
Logged By: KD
Date: 22/05/2023

Drilling Information				Material Description							Test Samples			
Drill Method	Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	Description	Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result
TC Bit with 100mm Dia. Auger			0.2	Topsoil		SM	**Silty SAND**: Loose, fine to coarse grained sand, low plasticity, roots and root fibres, dark brown, dry		D	L				
			1.0	Fill		Cl	**Sandy CLAY**: Very stiff, medium plasticity, with fine to coarse sand, orange, brown, mottled grey, moist≈PL		M≈PL	VSt				
			1.3	Alluvium		SC	**Clayey SAND**: Dense, fine to coarse grained sand, low plasticity, pale grey, dry		D	D				
			1.5				**1.50m: BOREHOLE TERMINATED**							
			2.0											

Comments:

Authorised by: ……

Date: ……..……..

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- Water level on date shown
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- S Vane shear value kPa
- DC Dynamic Cone test, 9.09kg hammer, fall 508mm, driving 20mm, 30 deg taper cone fitted to rods of smaller section.

From AS1289-1993 Methods of Testing Soils for Engineering Purposes

Engineering Log - Test Pit

Test Pit No.: QTP4

Job Number: 23-186

Client: Hall Contracting Pty Ltd

Project: Peer Review & Suitability of Earthworks

Location: North Harbour Phase 4B

Easting:
Northing:
RL:
Total Depth: 1.50

Drilling Rig: Backhoe
Driller: Hall Contracting
Logged By: KD
Date: 22/05/2023

Drilling Information				Material Description							Test Samples			
Drill Method	Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	Description	Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result
TC Bit with 100mm Dia. Auger			0.2	Topsoil		SM	**Silty SAND**: Loose, fine to coarse grained sand, low plasticity, dark brown, roots and root fibres, dry		D	L				
			1.0	Fill		Cl	**Sandy CLAY**: Very stiff, medium plasticity, with fine to coarse grained sand, brown, mottled red, white, moist≈PL		M≈PL	VSt				
			1.5				**1.50m: BOREHOLE TERMINATED**							
			2.0											

Comments:

Authorised by: ……

Date: ……..……..

Water
- Water level on date shown
- Water inflow
- Water outflow

Weathering
- RS Residual soil
- XW Extremely weathered
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Consistency
- VS Very soft
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- VD Very dense

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- LS Low
- MS Medium
- HS High
- VHS Very high
- EHS Extremely high

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- U50 Undisturbed 50mm diam tube.
- D Disturbed sample.
- SPT Standard Penetration Test, N = number of blows to drive 50mm sampler 300mm with a 63.6kg hammer falling 762mm.
- PP Hand penetrometer estimate of unconfined compressive strength, kPa.
- S Vane shear value kPa
- DC Dynamic Cone test, 9.09kg hammer, fall 508mm, driving 20mm, 30 deg taper cone fitted to rods of smaller section. From AS1289-1993 Methods of Testing Soils for Engineering Purposes

Engineering Log - Test Pit

Test Pit No.: QTP5

Job Number: 23-186

Client: Hall Contracting Pty Ltd

Project: Peer Review & Suitability of Earthworks

Location: North Harbour Phase 4B

Easting:
Northing:
RL:
Total Depth: 1.70

Drilling Rig: Backhoe
Driller: Hall Contracting
Logged By: KD
Date: 22/05/2023

Drilling Information				Material Description							Test Samples			
Drill Method	Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	Description	Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result
TC Bit with 100mm Dia. Auger			0.2	Topsoil		SM	**Silty SAND**: Loose, fine to coarse grained sand, low plasticity, dark brown, roots and root fibres, dry		D	L				
			0.7	Fill		Cl-CH	**Sandy CLAY**: Stiff, medium to high plasticity, with fine to medium grained sand, brown, moist		M	St				
			1.0	Residual		Cl	**Sandy CLAY**: Very stiff, medium plasticity, with fine to medium grained sand, brown, orange, with occasional roots, moist		M	VSt				
			1.7				**1.70m: BOREHOLE TERMINATED**							
			2.0											

Comments:

Authorised by: ……

Date: ……..……..

Water
- Water level on date shown
- Water inflow
- Water outflow

Weathering
- RS Residual soil
- XW Extremely weathered
- DW Distinctly weathered
- SW Slightly weathered
- FR Fresh

Consistency
- VS Very soft
- S Soft
- F Firm
- St Stiff
- VSt Very stiff
- H Hard

Moisture
D Dry M Moist W Wet

Density
- VL Very loose
- L Loose
- MD Medium dense
- D Dense
- VD Very dense

Rock Strength
- ELS Extremely low
- VLS Very low
- LS Low
- MS Medium
- HS High
- VHS Very high
- EHS Extremely high

Tests & Results
- U50 Undisturbed 50mm diam tube.
- D Disturbed sample.
- SPT Standard Penetration Test, N = number of blows to drive 50mm sampler 300mm with a 63.6kg hammer falling 762mm.
- PP Hand penetrometer estimate of unconfined compressive strength, kPa.
- S Vane shear value kPa
- DC Dynamic Cone test, 9.09kg hammer, fall 508mm, driving 20mm, 30 deg taper cone fitted to rods of smaller section.

From AS1289-1993 Methods of Testing Soils for Engineering Purposes

APPENDIX B

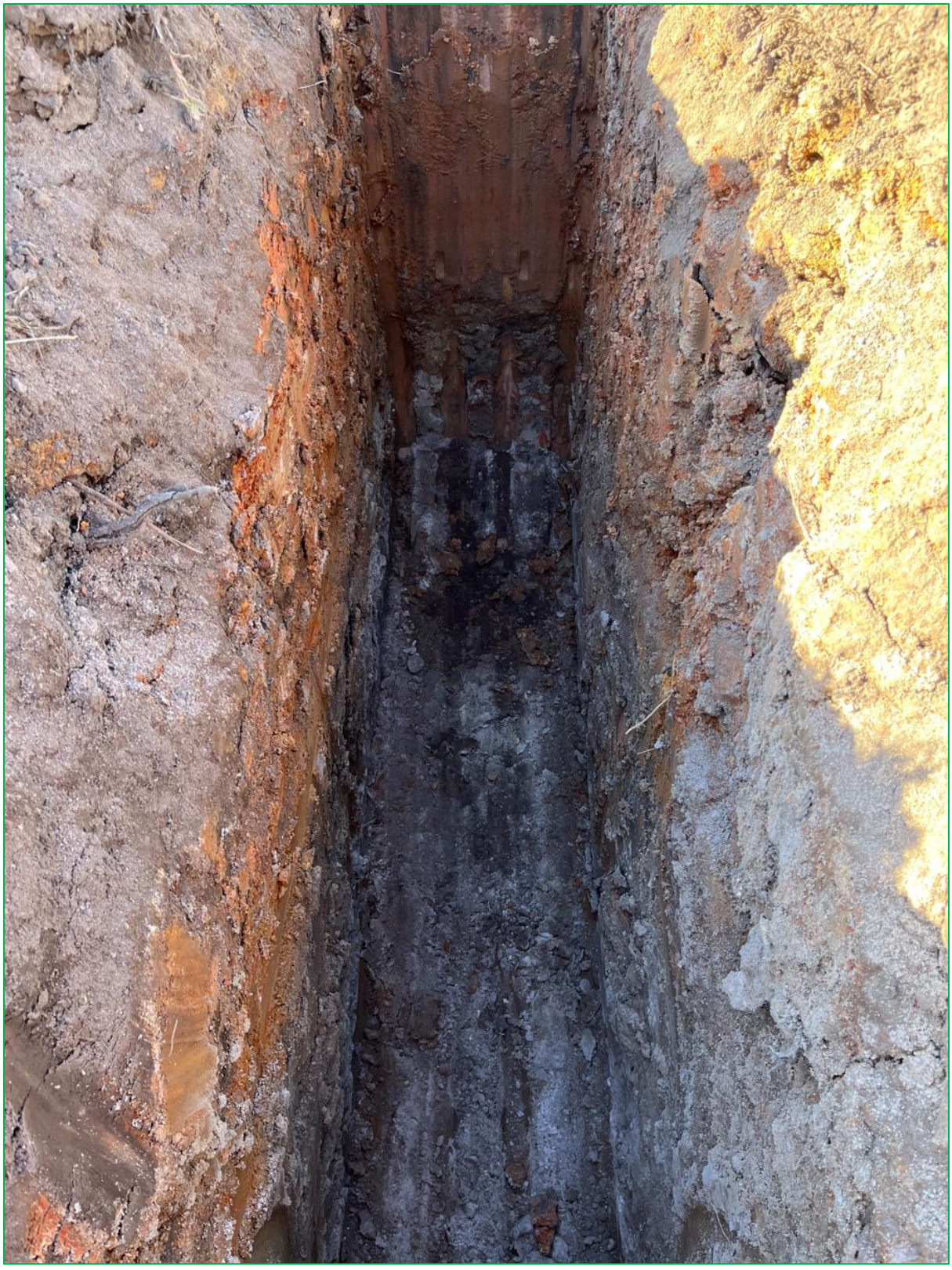
Photographs of Test Pits

Qualtest Laboratory
Est. 1987

Appendix B: Photographs of Test Pits

Appendix B1: Test Pit 1 – Engineered Fill

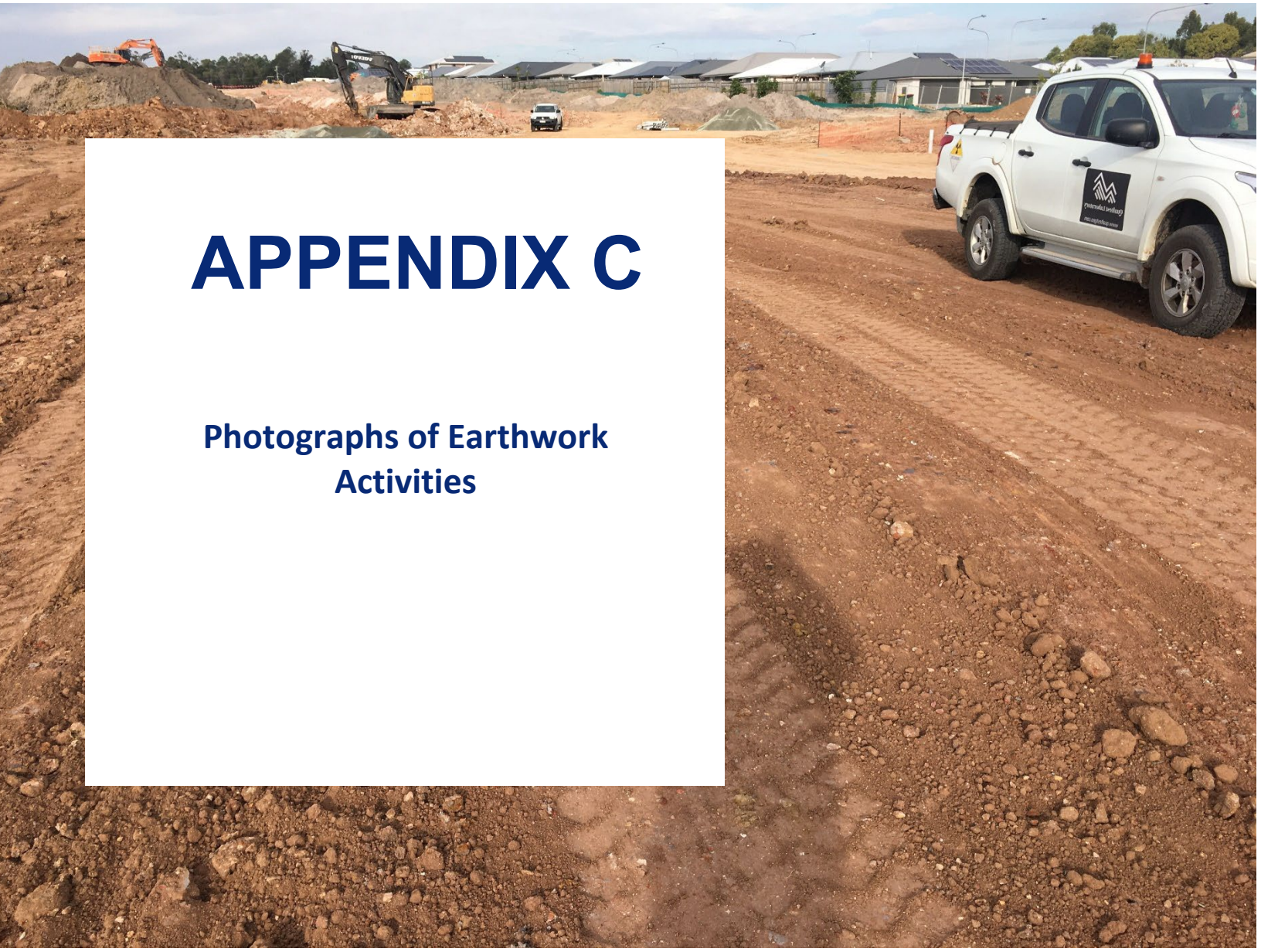
Appendix B2: Test Pit 2 – Engineered Fill



Appendix B3: Test Pit 3 – Engineered Fill

Appendix B4: Test Pit 4 – Engineered Fill

Appendix B5: Test Pit 5 – Engineered Fill



APPENDIX C

Photographs of Earthwork Activities

Qualtest Laboratory
Est. 1987

Appendix C: Photographs of Earthwork Activities at Phase 4B


TOYO