



Geotechnical Completion Report

HITCHEN BLOCK STAGES 10E AND 10F

For

DFH JOINT VENTURE LIMITED

11 March 2021

Ref No: J00113

DFH Joint Venture Limited
PO Box 302 877
North Harbour 1330

Attention: Mr R Parkinson

Dear Russell

RE: Geotechnical Completion Report for Hitchen Block Stages 10E & 10F, Pokeno

This report presents all supporting geotechnical data and our Suitability Statement in relation to land development works undertaken at the above location.

It has been prepared in accordance with instructions received from DFH Joint Venture Limited and forms part of the documentation required by Waikato District Council to achieve certification under Section 224(c) of the Resource Management Act.

If you have any queries or you require any further clarification on any aspects of this report, please do not hesitate to contact the undersigned.

For and on behalf of Lander Geotechnical Consultants Limited



S.G. Lander
Principal Geotechnical Engineer
CMEngNZ, CPeng, IntPE(NZ)

TABLE OF CONTENTS



| | | |
|----------|---|----------|
| 1 | INTRODUCTION AND DESCRIPTION OF SUBDIVISION | 1 |
| 2 | RELATED REPORTS | 1 |
| 3 | EARTHWORKS OPERATIONS | 2 |
| | 3.1 Plant | 2 |
| | 3.2 Construction Programme | 2 |
| 4 | QUALITY ASSURANCE AND CONTROLS | 3 |
| | 4.1 Inspections | 3 |
| | 4.2 Quality Control | 3 |
| | 4.2.1 Compaction Criteria | 3 |
| | 4.2.2 Compaction Assurance Testing | 3 |
| 5 | PROJECT EVALUATION | 4 |
| | 5.1 Bearing Capacity and Settlement of Building Foundations | 4 |
| | 5.2 Expansive Soils | 4 |
| | 5.3 Lot Gradients | 5 |
| | 5.4 Fill Induced Settlement | 5 |
| | 5.5 Stormwater Controls | 5 |
| | 5.6 Service Trenches | 5 |
| | 5.7 Underfill Drains | 6 |
| | 5.8 Topsoil | 6 |
| | 5.9 Contractor's Work | 6 |
| 6 | STATEMENT OF PROFESSIONAL OPINION AS TO THE SUITABILITY OF LAND FOR BUILDING DEVELOPMENT | 6 |

Tables

Table 1: CivilPlan Consultants Limited As-Built Plans

Table 2: Lander Geotechnical Consultants Geotechnical Completions Reports

Table 3: Suitability Summary Statement

Appendices

Appendix 1: CivilPlan Consultants Limited As-Built Drawings

Appendix 2: Field Density Summary Sheets

Appendix 3: Soil Classification Test Results

Appendix 4: Post-Construction Borehole Records

Appendix 5: Construction Observation Records

1 INTRODUCTION AND DESCRIPTION OF SUBDIVISION

This Geotechnical Completion Report has been prepared for DFH Joint Venture Limited as part of the documentation required to be submitted to the Waikato District Council following residential subdivisional development.

It contains our Suitability Statement, relevant test data and the CivilPlan Consultants Limited as-built plan set relating to Stages 10E and 10F of the Hitchen Block Residential Subdivision as follows:

Table 1: CivilPlan Consultants Limited As-Built Plans

| Title | Reference No. | Date |
|----------------------------|-----------------|---------------|
| As Built Contours | 136701-10-AB210 | February 2021 |
| As Built Cut-Fill Contours | 136701-10-AB211 | February 2021 |
| Stormwater As Built | 136701-10-AB410 | January 2021 |
| Wastewater As Built | 136701-10-AB411 | January 2021 |

This report covers the construction period February 2018 to May 2018. It is intended to be used for certification purposes as follows:

- 39 residential lots numbered 548 to 558, 564 to 568 and 570 to 592.
- 2 new roads named Clark Rise and Leathem Crescent (part).
- 2 jointly owned access lots that provide vehicle access to lots 564 to 568, 570 and 571.

This stage of the subdivision is located as shown on the attached CivilPlan Consultants Limited as-built plans. As can be seen on the As Built Cut-Fill Contours plan, approximately three quarters of the lots have been partly or totally affected by filling, to a maximum depth of approximately 6m.

2 RELATED REPORTS

A Geotechnical Investigation Report on the subject land was prepared by this Consultancy, reference J00323 (Earthworks Stage 3), dated 30 June 2016. The conclusions and recommendations of that report have been reviewed during the preparation of this document, along with the following Geotechnical Completion Reports (prepared by Lander Geotechnical Consultants Limited) on adjacent recently completed stages of the subdivision which are tabulated below:

Table 2: Lander Geotechnical Consultants Geotechnical Completion Reports

| Subdivision Title | Reference No. | Issue Date |
|--|---------------|------------------|
| Hitchen Block Stage 1 (Residential) | J00113 | 23 December 2016 |
| Gateway Industrial Part Stage 5 (Lots 28 and 29) | J00022 | 27 February 2017 |
| Hitchen Block Stage 2A and 2B (Residential) | J00113 | 14 July 2017 |
| Hitchen Block Stage 2C and 3A (Residential) | J00113 | 27 October 2017 |
| Hitchen Block Stage 3A2, 3B and 3C (Residential) | J00113 | 20 December 2017 |
| Hitchen Block Stage 5A (Residential) | J00113 | 26 January 2018 |
| Hitchen Block Stage 4A (Residential) | J00113 | 23 March 2018 |
| Hitchen Block Stage 6A and 6B (Residential) | J00113 | 23 May 2018 |
| Hitchen Block Stage 4B (Residential) | J00113 | 28 August 2018 |
| Hitchen Block Stage 7A & 7B (Residential) | J00113 | 2 November 2018 |
| Hitchen Block Stage 8A & 8B (Residential) | J00113 | 9 May 2019 |
| Hitchen Block Stage 6D (Residential) | J00113 | 4 November 2019 |
| Hitchen Block Stages 11, 12 and 14 (Residential) | J00113 | 13 March 2020 |
| Hitchen Block Stage 9 (Residential) | J00113 | 24 June 2020 |
| Hitchen Block Stages 6E & 10A to 10D (Residential) | J00113 | 16 December 2020 |

3 EARTHWORKS OPERATIONS

3.1 Plant

The main items of plant used by the Contractor, Kerry Dines Limited were:

- 7 x bulldozers with scoops,
- 1 x elevating motorscraper,
- 3 x articulated dump trucks,
- 2 x 4WD sheepsfoot compactors,
- 4 x 20T hydraulic excavators,
- 1 x Tractor with disc ploughs.

3.2 Construction Programme

Earthworks operations for this stage commenced in February 2018 with topsoil stripping and the muckout of the gully which runs beneath lots 568 and 570 to 573. Following this, underfill drainage (comprising of 160mm perforated drain coils, covered with drainage aggregate and fully wrapped with geotextile cloth) was installed along the gully invert and fill placement commenced.

In the surrounding areas, topsoil stripping and fill placement progressed alongside similar earthworks in the adjacent stages of the subdivision. Bulk filling operations were completed by late May 2018, followed by infrastructure, roading construction and topsoiling of the lots through until early 2021.

4 QUALITY ASSURANCE AND CONTROLS

4.1 Inspections

During earthworks construction, engineering observations were undertaken on a near regular basis to assess compliance with NZS 4431 and our project specific recommendations and specifications. Project specific inspections were required on this stage of the development for:

- Topsoil stripping of earthworks areas;
- Removal of soft sediments in the gully inverts;
- Placement of the underfill drains;
- Fill placement and plant performance upon the subgrade periodically throughout the bulk filling works.

4.2 Quality Control

4.2.1 Compaction Criteria

Due to the varying soil types being used as filling, the compaction control criteria of minimum allowable shear strength and maximum allowable air voids were mainly used for quality assurance purposes.

Specification details were as follows for general fills:

Minimum Shear Strength and Maximum Air Voids Method

| | | |
|-----|--|---------|
| (a) | <u>Air Voids Percentage</u> (As defined in NZS 4402) | |
| | Average value less than | 10% |
| | Maximum single value | 12% |
| (b) | <u>Undrained Shear Strength</u> (Measured by Pilcon shear vane - calibrated using NZGS 2001 method) | |
| | Average value not less than | 140 kPa |
| | Minimum single value | 120 kPa |

Note: The average value shall be determined over any ten consecutive tests

4.2.2 Compaction Assurance Testing

Regular insitu density, strength and water content tests were carried out on all areas of the filling at or in excess of the frequency recommended by NZS 4431, and a series of hand auger boreholes were also drilled at selected locations as an added check on quality control. The results of this testing (including testing some testing undertaken on adjacent stages of the subdivision) are appended in Appendix 2.

5 PROJECT EVALUATION

5.1 Bearing Capacity and Settlement of Building Foundations

Following the completion of earthworks operations, we returned to the site in February 2021 and drilled a series of hand auger boreholes in order to determine representative finished ground conditions and hence evaluate likely foundation options for future building development.

At current subgrade levels all filled and undisturbed natural ground has a geotechnical ultimate bearing capacity of 300 kPa within the influence of conventional shallow residential building foundation loads.

Where any building platforms have been rutted by heavy machinery subsequent to this report, or softened due to ponded rainwater, engineering advice should be sought with a view affected areas be trimmed back to competent ground and reinstated with compacted hardfill to design subgrade level prior to the commencement of building construction.

It should be noted that NZS 3604 only allows a maximum backfill depth of 600mm over the building platform of a dwelling unless an Engineering design solution or endorsement is proposed, on account of the risk of induced consolidation of the subsoils caused by the weight of the backfill.

5.2 Expansive Soils

Two sets of Atterberg Limit expansive soil tests and two Shrink-Swell Index tests were carried out on samples selected from around the site and within the zone of likely influence of shallow building foundations to inform the expansive Site Class for this stage of the subdivision. Our assessment has taken into account both the Atterberg Limit and Shrink-Swell laboratory test results.

The Atterberg Limit tests were carried out in accordance with NZS 4402, "Methods of Testing Soils for Civil Engineering Purposes" test section 2 and were primarily intended to assess the Expansive Classes of the site materials as defined in AS 2870, "Residential Slabs and Footings – Construction".

The Shrink-Swell Index tests were carried out in accordance with AS 1289, "Methods of Testing Soils for Engineering Purposes" test method 7.1.1 and were primarily intended to assess the Expansive Classes of the site materials as defined in AS 2870, "Residential Slabs and Footings – Construction".

Based on the laboratory testing and visual tactile assessments of the soils observed in our post-construction boreholes, the Expansive Site Classes for this stage of the subdivision are S (slight) for residential lots 579 to 583, M (moderate) for residential lots 570 to 575 and H (high) for residential lots 548 to 558, 564 to 568, 576 to 578 and 584 to 592, as defined in MBIE Acceptable Solutions and Verification Methods amendment 19¹.

The characteristic surface ground movement (y_s) for Expansive Site Classes S, M and H is up to 22mm, 44mm and 78mm, respectively. Details relating to these Expansive Site Classes are provided in Appendix 3, and specific design alternatives for these Site Classes are presented in the Suitability

¹ Ministry of Business, Innovation and Employment. Verification Methods and Acceptable Solutions Amendment 19 for NZ Building Code B1/AS1, Section 3 (as relevant to expansive soils and good ground). Effective 28 November 2019.

Statement. These classifications may be re-addressed by end users during building consent if site specific laboratory shrink-swell testing is undertaken, as recommended in the MBIE document attached.

For Class H soils, if slab on-grade floor slab construction takes place during a long dry summer, exposed building platform soils may dry out and become highly desiccated. Over time the rehydration of the soils below the floor slab can cause swelling and floor slab uplift. Floor slab uplift can cause distress of tile floors and in garages where cracks are more apparent. It may also rack upper storeys and/or rooflines if non-load bearing ground floor walls are lifted and act as struts. It is prudent to place hardfill immediately upon completion of subgrade trimming, followed by thorough soaking of the hardfill prior to concrete placement (e.g. for slab on-grade construction), all of which can help to limit the problem.

5.3 Lot Gradients

The appended as built contours plan shows areas having gradients steeper than 1(v) in 4(h) or being immediately adjacent to land having such gradients. The extent of these areas has been determined by the surveyed site gradients and our final walkover inspection, but there may be localised areas having such gradients that have not been shown on the plans.

We are satisfied that these lots are not subject to the hazards described in section 71(3) of the Building Act.

Details of resulting building and earthworks restrictions within the vicinity of these lots are presented in the Suitability Statement.

5.4 Fill Induced Settlement

As a result of our pre-fill inspections, the installation of subsoil drainage, quality control testing and the elapsed time since the placement of the majority of the filling (i.e. in excess of 12 months), we are of the opinion that induced differential settlements beneath or within the certified filling due to its imposed weight should be insignificant with respect to conventional NZS 3604 residential building development.

5.5 Stormwater Controls

It is important on all sloping lots that due care is paid to the design and construction of appropriate stormwater disposal systems. These systems should serve to collect all runoff from roofs, decks and paved areas, together with discharges from retaining wall drains and other subsoil drains and should connect directly into the public stormwater drainage network.

Uncontrolled stormwater discharges onto the ground surface can cause erosion, scour and/or instability on sloping land and should not be permitted under any circumstances where stability could be compromised.

5.6 Service Trenches

As is normal on all subdivisions, building developments involving foundations within a 45° zone of influence from pipe inverts will require Engineering input.

5.7 Underfill Drains

The appended fill as-built cut-fill contour plans show the alignments of perforated underfill drains that were placed in mucked out gully inverts prior to filling to tap groundwater seepages. These drains run beneath portions of residential Lots 568 and 570 to 573.

These drains were intended to intercept localised groundwater seepages during earthworks and/or allow engineered fill placement as required by the project specifications. The drains were installed as a precautionary measure, not as remedial works for any existing instability, and they need no specific maintenance.

Notwithstanding, it is recommended that future foundations or site development works preserve these drains. In the event that they are compromised by any future development in any of the lots they should be reinstated under geotechnical engineering observational guidance.

5.8 Topsoil

Topsoil depths in likely building platform areas were checked by the drilling of a borehole in the approximate centre of lot. Our findings, which are indicative only and subject to variation at other locations, show that likely topsoil depths are between 100 mm and 200 mm. Site specific findings are presented in the Suitability Statement Summary.

5.9 Contractor's Work

We have relied on the Contractor's work practices and assume that the works have been carried out in accordance with:

- (i) The approved Contract drawings and design details,
- (ii) The approved Contract specifications,
- (iii) Authorised Variations to (i) and (ii) during the execution of the works,
- (iv) The conditions of Resource, Earthworks and Building Consents where applicable,
- (v) The relevant Lander Geotechnical Consultants Limited reports, recommendations and site instructions,

and that all as-built information and other details provided to the Client and/or Lander Geotechnical Consultants Limited are accurate and correct in all respects.

6 STATEMENT OF PROFESSIONAL OPINION AS TO THE SUITABILITY OF LAND FOR BUILDING DEVELOPMENT

I, S.G. Lander, of Lander Geotechnical Consultants Limited, Auckland, hereby confirm that:

1. I am a Chartered Professional Engineer experienced in the field of geotechnical engineering as defined in section 1.2.3 of NZS 4404 and was retained by the Owner/Developer as the Geotechnical Engineer on Stages 10E and 10F of the Hitchen Block residential subdivision.
2. The extent of preliminary investigations carried out to date are described in Geotechnical Investigation Report reference J00323, dated 30 June 2016, and the conclusions and recommendations of that document have been re-evaluated in the preparation of this report. The

results of all tests carried out under Lander Geotechnical Consultants Limited direction are appended.

3. In my professional opinion, not to be construed as a guarantee, I consider that:

(a) The earth fills shown on the appended fill as-built plan have been placed in compliance with NZS 4431 and related documents.

(b) The completed earthworks give due regard to land slope and foundation stability considerations within the residential lots, however, as shown on the appended contour as-built plan, lots 548 to 551, 564, 565, 568, 570 to 578 and 588 to 590 have gradients steeper than 1(v) in 4(h).

Any building development and/or earthworks proposals within the areas shown to be steeper than 1(v) in 4(h) on the as-built contours plan are subject to specific geotechnical investigations and/or foundation design.

(c) The function of the underfill drains should not be impaired by any building development or landscaping works. In particular, any bored or driven piles must be positioned to avoid damaging the underfill drains. The drains are shown pass under portions of residential Lots 568 and 570 to 573 at depths typically greater than 1m below existing ground level and therefore should not adversely affect shallow foundation systems (dependant on final earthworks proposals). Further comments relating to these drains is provided in the suitability statement summary.

(d) A geotechnical ultimate bearing capacity of 300 kPa may be assumed for foundation design on all lots (except where specific geotechnical endorsement is required on account of sloping land greater than 1(v) in 4(h)).

Where a geotechnical bearing capacity greater than 300 kPa is required, (i.e. outside the limits of NZS 3604, such as when piling is undertaken), further specific site investigation and design of foundations should be carried out prior to building consent application.

(e) The backfilling and compaction of the stormwater and sanitary sewer trenches on this subdivision has where possible been carried out to appropriate standards having regard for the prevailing ground conditions and associated compaction induced pipe loadings.

(f) The assessed Expansive Site Class in terms of MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure, effective 28 November 2019, is S (slight) for lots 579 to 583, M (moderate) for lots 570 to 575, and H (high) for lots 548 to 558, 564 to 568, 576 to 578 and 584 to 592. The characteristic surface ground movement for these Site Classes is up to 22mm (Class S), 44mm (Class M) and 78mm (Class H), respectively in regard to the above standard. Site specific laboratory testing may be undertaken by end-users to re-assess the expansive site class during building consent stage.

(g) Subject to the geotechnical limitations, restrictions, recommendations and expansive soil assessments associated with 3(b) to 3(f) above:

(i) The filled and undisturbed original ground within residential lot boundaries is generally suitable for residential buildings constructed in accordance with NZS 3604 and related documents.

(ii) On residential lots 579 to 583 foundation design may be carried out in accordance with Class S (in terms of MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure, effective 28 November 2019) or alternatively, a specific foundation and

structural design may be undertaken by a Chartered Professional Engineer who should allow for expansive soil effects referenced above in the design.

For buildings having brittle exterior cladding appropriate control joints should also be specifically designed depending on architectural specifications and structural form.

- (iii) On residential lots 570 to 575 foundation design may be carried out in accordance with Class M (in terms of MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure, effective 28 November 2019) or alternatively, a specific foundation and structural design may be undertaken by a Chartered Professional Engineer who should allow for expansive soil effects referenced above in the design.

For buildings having brittle exterior cladding appropriate control joints should also be specifically designed depending on architectural specifications and structural form.

- (iv) On residential lots 548 to 558, 564 to 568, 576 to 578 and 584 to 592 foundation design may be carried out in accordance with Class H (in terms of MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure, effective 28 November 2019) or alternatively, a specific foundation and structural design may be undertaken by a Chartered Professional Engineer who should allow for expansive soil effects referenced above in the design.

For buildings having brittle exterior cladding appropriate control joints should also be specifically designed depending on architectural specifications and structural form.

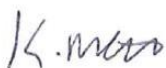
4. Road subgrades and lot accessway subgrades have been formed having due regard for slope stability and settlement, available subgrade strengths are dependent on-site conditions and on construction trafficking and variable results should be expected.

The professional opinion contained within this report is furnished to the Waikato District Council and DFH Joint Venture Limited for their purposes alone, with respect to the particular brief given to us. It may not be relied upon in any other context of for any other purpose without our prior review and agreement. It does not remove the necessity for the normal inspection of site conditions at the time of erection of any dwelling.

The appended table summarises the status of each residential lot covered by this Suitability Statement.

For and on behalf of Lander Geotechnical Consultants Limited

Prepared by:



K. Meffan
Engineering Geologist
MEngNZ

Reviewed By:



C.J. Edwards
Senior Engineering Geologist
CMEngNZ (PEngGeol)

Authorised by:



S.G. Lander
Principal Geotechnical Engineer
CMEngNZ, CPeng, IntPE(NZ)

Table 3: Suitability Statement Summary

| Lot No. | Comments | Topsoil Depth (mm) | Ultimate Bearing (kPa) | Expansive Site Class (B1/AS1) |
|---------|---|--------------------|------------------------|-------------------------------|
| 548 | Specific site investigation, foundation design and construction inspections required in area shown hatched on gradient as-built plan due to 1(v) in 4(h) gradient restrictions. Elsewhere, Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design. | 200 | 300 | H |
| 549 | Specific site investigation, foundation design and construction inspections required in area shown hatched on gradient as-built plan due to 1(v) in 4(h) gradient restrictions. Elsewhere, Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design. | 100 | 300 | H |
| 550 | Specific site investigation, foundation design and construction inspections required in area shown hatched on gradient as-built plan due to 1(v) in 4(h) gradient restrictions. Elsewhere, Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design. | 100 | 300 | H |
| 551 | Specific site investigation, foundation design and construction inspections required in area shown hatched on gradient as-built plan due to 1(v) in 4(h) gradient restrictions. Elsewhere, Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design. | 100 | 300 | H |
| 552 | Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design. | 200 | 300 | H |
| 553 | Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design. | 100 | 300 | H |
| 554 | Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design. | 100 | 300 | H |

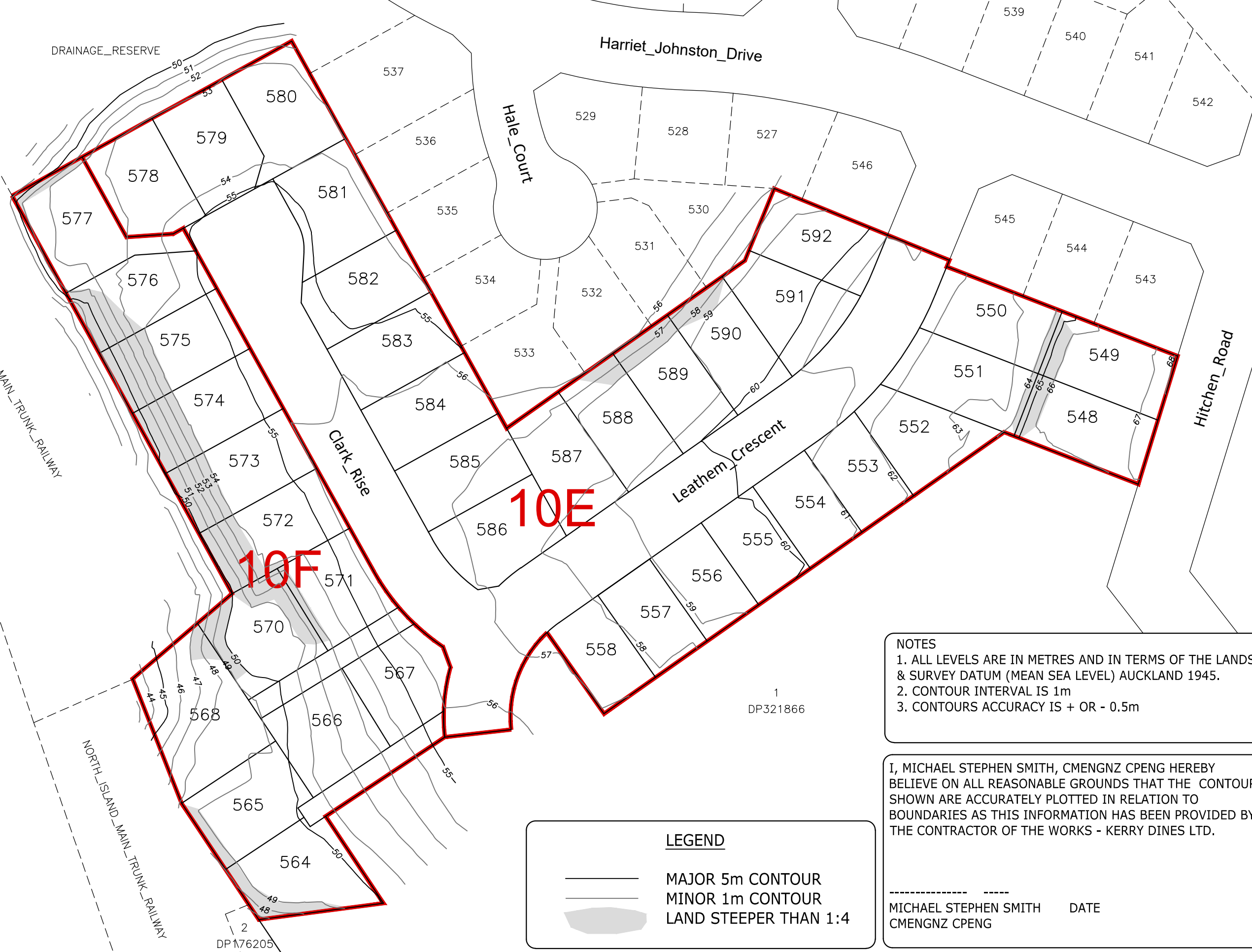
| Lot No. | Comments | Topsoil Depth (mm) | Ultimate Bearing (kPa) | Expansive Site Class (B1/AS1) |
|---------|---|--------------------|------------------------|-------------------------------|
| 555 | Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design. | 100 | 300 | H |
| 556 | Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design. | 100 | 300 | H |
| 557 | Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design. | 200 | 300 | H |
| 558 | Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design. | 100 | 300 | H |
| 564 | Specific site investigation, foundation design and construction inspections required in area shown hatched on gradient as-built plan due to 1(v) in 4(h) gradient restrictions. Elsewhere, Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design. | 100 | 300 | H |
| 565 | Specific site investigation, foundation design and construction inspections required in area shown hatched on gradient as-built plan due to 1(v) in 4(h) gradient restrictions. Elsewhere, Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design. | 200 | 300 | H |
| 566 | Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design. | 100 | 300 | H |
| 567 | Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design. | 100 | 300 | H |

| Lot No. | Comments | Topsoil Depth (mm) | Ultimate Bearing (kPa) | Expansive Site Class (B1/AS1) |
|---------|---|--------------------|------------------------|-------------------------------|
| 568 | <p>Specific site investigation, foundation design and construction inspections required in area shown hatched on gradient as-built plan due to 1(v) in 4(h) gradient restrictions.</p> <p>Elsewhere, Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design.</p> <p>Function of underfill drains to be maintained (refer Section 5.7 and 6(3c) for further details). Any cuts deeper than 1m to be assessed by geotechnical engineer as underfill drain may be intercepted and require re-alignment under engineering direction, dependant on final development/earthworks proposals.</p> | 100 | 300 | H |
| 570 | <p>Specific site investigation, foundation design and construction inspections required in area shown hatched on gradient as-built plan due to 1(v) in 4(h) gradient restrictions.</p> <p>Elsewhere, Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design.</p> <p>Function of underfill drains to be maintained (refer Section 5.7 and 6(3c) for further details).</p> | 200 | 300 | M |
| 571 | <p>Specific site investigation, foundation design and construction inspections required in area shown hatched on gradient as-built plan due to 1(v) in 4(h) gradient restrictions.</p> <p>Elsewhere, Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design.</p> <p>Function of underfill drains to be maintained (refer Section 5.7 and 6(3c) for further details).</p> | 200 | 300 | M |
| 572 | <p>Specific site investigation, foundation design and construction inspections required in area shown hatched on gradient as-built plan due to 1(v) in 4(h) gradient restrictions.</p> <p>Elsewhere, Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design.</p> <p>Function of underfill drains to be maintained (refer Section 5.7 and 6(3c) for further details).</p> | 200 | 300 | M |

| Lot No. | Comments | Topsoil Depth (mm) | Ultimate Bearing (kPa) | Expansive Site Class (B1/AS1) |
|---------|--|--------------------|------------------------|-------------------------------|
| 573 | <p>Specific site investigation, foundation design and construction inspections required in area shown hatched on gradient as-built plan due to 1(v) in 4(h) gradient restrictions.</p> <p>Elsewhere, Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design.</p> <p>Function of underfill drains to be maintained (refer Section 5.7 and 6(3c) for further details).</p> | 200 | 300 | M |
| 574 | <p>Specific site investigation, foundation design and construction inspections required in area shown hatched on gradient as-built plan due to 1(v) in 4(h) gradient restrictions.</p> <p>Elsewhere, Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design.</p> | 100 | 300 | M |
| 575 | <p>Specific site investigation, foundation design and construction inspections required in area shown hatched on gradient as-built plan due to 1(v) in 4(h) gradient restrictions.</p> <p>Elsewhere, Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design.</p> | 200 | 300 | M |
| 576 | <p>Specific site investigation, foundation design and construction inspections required in area shown hatched on gradient as-built plan due to 1(v) in 4(h) gradient restrictions.</p> <p>Elsewhere, Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design.</p> | 200 | 300 | H |
| 577 | <p>Specific site investigation, foundation design and construction inspections required in area shown hatched on gradient as-built plan due to 1(v) in 4(h) gradient restrictions.</p> <p>Elsewhere, Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design.</p> | 100 | 300 | H |

| Lot No. | Comments | Topsoil Depth (mm) | Ultimate Bearing (kPa) | Expansive Site Class (B1/AS1) |
|---------|---|--------------------|------------------------|-------------------------------|
| 578 | Specific site investigation, foundation design and construction inspections required in area shown hatched on gradient as-built plan due to 1(v) in 4(h) gradient restrictions. Elsewhere, Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design. | 100 | 300 | H |
| 579 | Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design. | 100 | 300 | S |
| 580 | Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design. | 200 | 300 | S |
| 581 | Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design. | 100 | 300 | S |
| 582 | Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design. | 100 | 300 | S |
| 583 | Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design. | 100 | 300 | S |
| 584 | Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design. | 200 | 300 | H |
| 585 | Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design. | 100 | 300 | H |
| 586 | Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design. | 100 | 300 | H |
| 587 | Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design. | 100 | 300 | H |

| Lot No. | Comments | Topsoil Depth (mm) | Ultimate Bearing (kPa) | Expansive Site Class (B1/AS1) |
|---------|--|--------------------|------------------------|-------------------------------|
| 588 | <p>Specific site investigation, foundation design and construction inspections required in area shown hatched on gradient as-built plan due to 1(v) in 4(h) gradient restrictions.</p> <p>Elsewhere, Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design.</p> | 100 | 300 | H |
| 589 | <p>Specific site investigation, foundation design and construction inspections required in area shown hatched on gradient as-built plan due to 1(v) in 4(h) gradient restrictions.</p> <p>Elsewhere, Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design.</p> | 100 | 300 | H |
| 590 | <p>Specific site investigation, foundation design and construction inspections required in area shown hatched on gradient as-built plan due to 1(v) in 4(h) gradient restrictions.</p> <p>Elsewhere, Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design.</p> | 100 | 300 | H |
| 591 | <p>Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design.</p> | 100 | 300 | H |
| 592 | <p>Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design.</p> | 100 | 300 | H |



2
DP206719

1
DP321866

2
DP176205

NOTES

1. ALL LEVELS ARE IN METRES AND IN TERMS OF THE LANDS & SURVEY DATUM (MEAN SEA LEVEL) AUCKLAND 1945.
2. CONTOUR INTERVAL IS 1m
3. CONTOURS ACCURACY IS + OR - 0.5m

I, MICHAEL STEPHEN SMITH, CMENGNZ CPENG HEREBY BELIEVE ON ALL REASONABLE GROUNDS THAT THE CONTOURS SHOWN ARE ACCURATELY PLOTTED IN RELATION TO BOUNDARIES AS THIS INFORMATION HAS BEEN PROVIDED BY THE CONTRACTOR OF THE WORKS - KERRY DINES LTD.

MICHAEL STEPHEN SMITH DATE
CMENGNZ CPENG

LEGEND

———— MAJOR 5m CONTOUR
 - - - - - MINOR 1m CONTOUR
 [Shaded Area] LAND STEEPER THAN 1:4

| REV | ISSUED FOR | RJP | DATE |
|-----|------------------|-----|------|
| A | ISSUED FOR 224C | RJP | 1-21 |
| | REVISION DETAILS | BY | DATE |

| | | |
|-----------|-------|------|
| FLOTTED: | DATE: | 2-21 |
| RJP | DATE: | 2-21 |
| APPROVED: | DATE: | 2-21 |
| MSS | | |

THIS DRAWING AND DESIGN REMAINS THE PROPERTY OF, AND MAY NOT BE REPRODUCED OR ALTERED, WITHOUT THE WRITTEN PERMISSION OF CIVILPLAN CONSULTANTS LIMITED. NO LIABILITY SHALL BE ACCEPTED FOR UNAUTHORISED USE OF THIS DRAWING.

CIVILPLAN
CONSULTANTS

Level 9, Laidlaw House, 20 Amersham Way, Manukau, Auckland. Phone: 09 222 2445

PROJECT TITLE:
DFH JOINT VENTURE
HITCHEN STAGES 10E, 10F
POKENO

SHEET TITLE:
AS BUILT CONTOURS

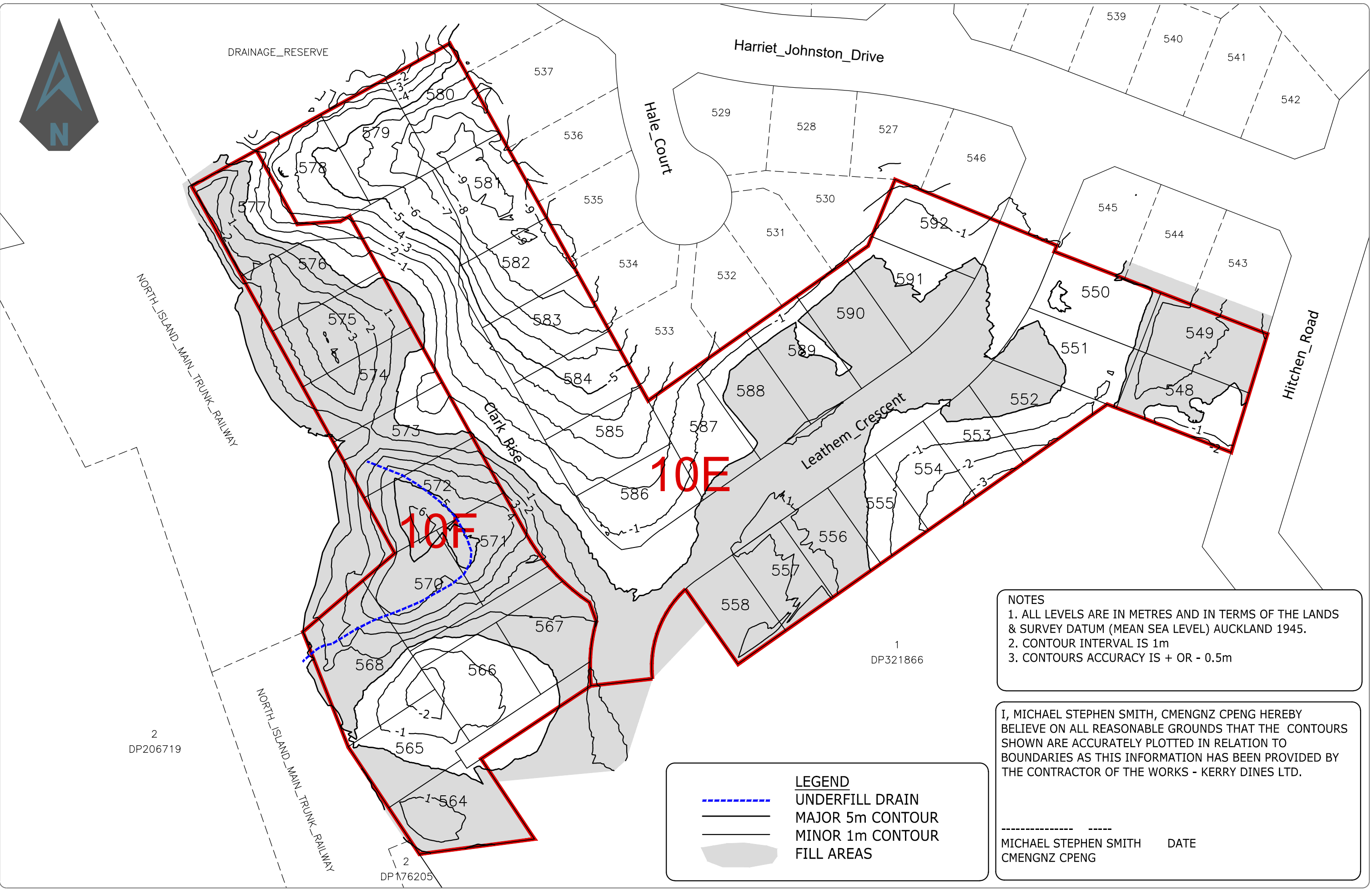
ISSUE STATUS: **AS BUILT**

SCALE: (A1/A3) 1:500 / 1:1000

SCALE BAR 0 10 20 30 40 50m

DRAWING NUMBER: **136701-10-AB210** REV: **A**

Filepath: P:\APPPDATA\LOCAL\AUTODESK\C3D 2020\ENU\TEMPLATE C:\DATA\POKENO\HITCHEN\STAGE 10\AS BUILT\136701-10E-AB210.DWG



NOTES
 1. ALL LEVELS ARE IN METRES AND IN TERMS OF THE LANDS & SURVEY DATUM (MEAN SEA LEVEL) AUCKLAND 1945.
 2. CONTOUR INTERVAL IS 1m
 3. CONTOURS ACCURACY IS + OR - 0.5m

I, MICHAEL STEPHEN SMITH, CMENGNZ CPENG HEREBY BELIEVE ON ALL REASONABLE GROUNDS THAT THE CONTOURS SHOWN ARE ACCURATELY PLOTTED IN RELATION TO BOUNDARIES AS THIS INFORMATION HAS BEEN PROVIDED BY THE CONTRACTOR OF THE WORKS - KERRY DINES LTD.

 MICHAEL STEPHEN SMITH DATE
 CMENGNZ CPENG

LEGEND
 ----- UNDERFILL DRAIN
 _____ MAJOR 5m CONTOUR
 _____ MINOR 1m CONTOUR
 [Grey Shaded Area] FILL AREAS

| | | | |
|-----|------------------|-----|------|
| | | | |
| | | | |
| | | | |
| | | | |
| A | ISSUED FOR 224C | RJP | 1-21 |
| REV | REVISION DETAILS | BY | DATE |

FLOTTED: DATE: 2-21
 RJP
 DRAWN: DATE: 2-21
 RJP
 APPROVED: DATE: 2-21
 MSS

THIS DRAWING AND DESIGN REMAINS THE PROPERTY OF, AND MAY NOT BE REPRODUCED OR ALTERED, WITHOUT THE WRITTEN PERMISSION OF CIVILPLAN CONSULTANTS LIMITED. NO LIABILITY SHALL BE ACCEPTED FOR UNAUTHORIZED USE OF THIS DRAWING.

CIVILPLAN
 CONSULTANTS

Level 9, Laidlaw House, 20 Amersham Way, Manukau, Auckland. Phone: 09 222 2445

PROJECT TITLE:
**DFH JOINT VENTURE
 HITCHEN STAGES 10E,10F
 POKENO**

SHEET TITLE:
AS BUILT CUT-FILL CONTOURS

ISSUE STATUS: **AS BUILT**

SCALE: (A1/A3) **1:500 / 1:1000**
 SCALE BAR 0 10 20 30 40 50m
 1:1000@A3
 DRAWING NUMBER: **136701-10-AB211** REV: **A**

Filepath: P:\APPPDATA\LOCAL\AUTODESK\C3D 2020\ENU\TEMPLATE C:\DATA\POKENO\HITCHEN\STAGE 10\AS BUILTS\136701-10E-AB211.DWG



DRAINAGE_RESERVE

Harriet_Johnston_Drive

Hale_Court

Hitchen_Road

NORTH_ISLAND_MAIN_TRUNK_RAILWAY

Clark_Rise

Leathem_Crescent

10F

10E

2 DP206719

1 DP321866

2 DP176205

- NOTES**
1. ALL COORDINATES ARE IN METRES AND IN TERMS OF GEODETIC 2000 MT. EDEN
 2. ALL LEVELS ARE IN METRES AND IN TERMS OF THE LANDS AND SURVEY DATUM (MEAN SEA LEVEL) AUCKLAND 1946
 3. ALL LOT CONNECTIONS ARE 100NB PVC UNLESS SHOWN OTHERWISE.
 4. MANHOLE INVERT LEVELS ARE LISTED CLOCKWISE FROM THE OUTLET PIPE.
 5. ALL MANHOLES ARE 1050NB WITH STANDARD DUTY LIDS AND COVERS UNLESS SHOWN OTHERWISE. ALL STORMWATER PIPES 225NB AND OVER ARE RCRRJ CLASS 2 UNLESS SHOWN OTHERWISE EXCEPT FOR CATCHPIT LEADS WHICH ARE ALL CLASS 4. ALL CATCHPIT LEADS ARE 225NB UNLESS SHOWN OTHERWISE.
 6. ALL CONCRETE PIPES AND STRUCTURES ARE MANUFACTURED BY HYNDS PIPES. ALL PLASTIC PIPES ARE MANUFACTURED BY MARLEY.

I, MICHAEL STEPHEN SMITH, CMENGNZ CPENG HEREBY BELIEVE ON ALL REASONABLE GROUNDS THAT THE PIPE SIZES, FITTINGS, POSITIONS, COORDINATES AND LEVELS SHOWN ARE ACCURATELY PLOTTED IN RELATION TO BOUNDARIES AND IS CORRECT AS THIS INFORMATION HAS BEEN PROVIDED BY THE CONTRACTOR OF THE WORKS - KERRY DINES LTD.

 MICHAEL STEPHEN SMITH DATE
 CMENGNZ, CPENG

LEGEND

| | | | |
|--|----------|--|-------------|
| | MANHOLE | | EX.MANHOLE |
| | OUTLET | | EX.CATCHPIT |
| | CATCHPIT | | EX.SW LINE |
| | SW LINE | | |

| REV | ISSUED FOR 224C | RJP | 1-21 |
|-----|------------------|-----|------|
| A | ISSUED FOR 224C | RJP | 1-21 |
| | REVISION DETAILS | BY | DATE |

| | | |
|-----------|-------|------|
| FLOTTED: | DATE: | 1-21 |
| RJP | DATE: | 1-21 |
| DRAWN: | DATE: | 1-21 |
| RJP | DATE: | 1-21 |
| APPROVED: | DATE: | 1-21 |
| MSS | DATE: | 1-21 |

THIS DRAWING AND DESIGN REMAINS THE PROPERTY OF, AND MAY NOT BE REPRODUCED OR ALTERED, WITHOUT THE WRITTEN PERMISSION OF CIVILPLAN CONSULTANTS LIMITED. NO LIABILITY SHALL BE ACCEPTED FOR UNAUTHORISED USE OF THIS DRAWING.

CIVILPLAN CONSULTANTS

Level 9, Laidlaw House, 20 Amersham Way, Manukau, Auckland. Phone: 09 222 2445

PROJECT TITLE:
 DFH JOINT VENTURE
 HITCHEN STAGES 10E,10F
 POKENO

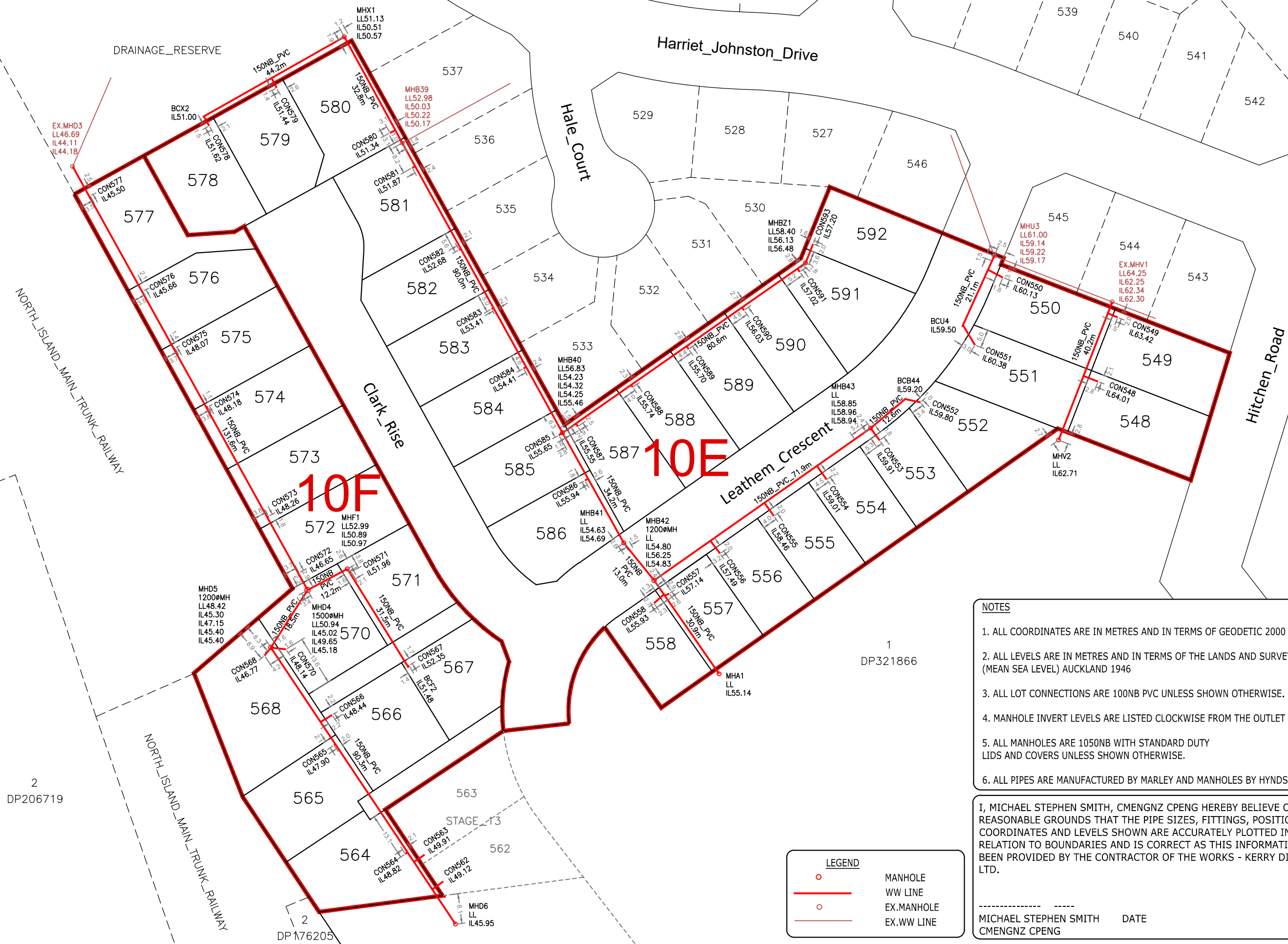
SHEET TITLE:
 AS BUILT STORMWATER DRAINAGE

ISSUE STATUS: **AS BUILT**

SCALE: (A1/A3) 1:500 / 1:1000

SCALE BAR 0 10 20 30 40 50m

DRAWING NUMBER: **136701-10-AB410** REV: **A**



- NOTES**
1. ALL COORDINATES ARE IN METRES AND IN TERMS OF GEODETIC 2000 MT. EDEN
 2. ALL LEVELS ARE IN METRES AND IN TERMS OF THE LANDS AND SURVEY DATUM (MEAN SEA LEVEL) AUCKLAND 1946
 3. ALL LOT CONNECTIONS ARE 100NB PVC UNLESS SHOWN OTHERWISE.
 4. MANHOLE INVERT LEVELS ARE LISTED CLOCKWISE FROM THE OUTLET PIPE.
 5. ALL MANHOLES ARE 1050NB WITH STANDARD DUTY LIDS AND COVERS UNLESS SHOWN OTHERWISE.
 6. ALL PIPES ARE MANUFACTURED BY MARLEY AND MANHOLES BY HYNDS PIPES.

I, MICHAEL STEPHEN SMITH, CMENGNZ CPENG HEREBY BELIEVE ON ALL REASONABLE GROUNDS THAT THE PIPE SIZES, FITTINGS, POSITIONS, COORDINATES AND LEVELS SHOWN ARE ACCURATELY PLOTTED IN RELATION TO BOUNDARIES AND IS CORRECT AS THIS INFORMATION HAS BEEN PROVIDED BY THE CONTRACTOR OF THE WORKS - KERRY DINES LTD.

----- DATE
 MICHAEL STEPHEN SMITH
 CMENGNZ CPENG

LEGEND

- MANHOLE
- WW LINE
- EX.MANHOLE
- EX.WW LINE

| | | |
|------------------|-----|------|
| ISSUED FOR 224C | RJP | 1-21 |
| REVISION DETAILS | BY | DATE |

| | | |
|-----------|-------|------|
| PLOTTED: | DATE: | 1-21 |
| RJP | DATE: | 1-21 |
| APPROVED: | DATE: | 1-21 |
| MSS | DATE: | 1-21 |

CIVILPLAN CONSULTANTS

Level 9, Laidlaw House, 20 Amersham Way, Manukau, Auckland. Phone: 09 222 2445

PROJECT TITLE:
 DFH JOINT VENTURE
 HITCHEN STAGES 10E,10F
 POKENO

SHEET TITLE:
 AS BUILT WASTE WATER DRAINAGE



ISSUE STATUS: **AS BUILT**

SCALE: (A1/A3) 1:500 / 1:1000

SCALE BAR 0 10 20 30 40 50m

DRAWING NUMBER: **136701-10-AB411** REV: **A**

Filepath: P:\APPDATA\LOCAL\AUTODESK\C3D 2020\ENU\TEMPLATE C:\DATA\POKENO\HITCHEN\STAGE 10\AS BUILT\136701-10E-AB411.DWG

| | |
|--|--|
| Client: Lander Geotechnical Consultants Limited Address: PO Box 97 385, Manukau 2241 Attention: Chris Edwards c.c.: - Project: J00113 - Hitchen Block - Stage 2 Pokeno Location: Pokeno | PROJECT CODE: GENZETAM01177AA Page: 1 of 2 <div style="text-align: center;">  <p>Tests indicated as not accredited are outside the scope of the laboratory's accreditation</p> </div> <div style="text-align: right; margin-top: 20px;">  Approved Signatory: Cesar Pura Issue date: 29/11/2017 </div> |
|--|--|

Test method: Test Methods in accordance with: Shear Strength (using field Shear vane in accordance with NZGS 2001): Nuclear Densometer Testing (in accordance with NZS 4407:2015 Test 4.2): Water Content Testing (in accordance with NZS 4402:1986 Test 2.1): Density Calculations (in accordance with NZS 4402:1986 Tests 4.1.1.5(b)). Please note that Air Void calculations are not IANZ endorsed as part of this report.

| Date | Work Order No: | Tested by | Test No. | Layer | Material tested | Location | Easting | Northing | RL | Test Probe Depth (mm) | Comments (FL = Finished level) | Field Shear Strength in kPa | | | | Wet Density (t/m ³) | Oven Water Content (%) | Dry Density (t/m ³) | Solid Density | Air Voids (%) |
|------------|----------------|-----------|----------|-------|-----------------|----------|---------|----------|----|-----------------------|-----------------------------------|-----------------------------|-----|-----|-----|---------------------------------|------------------------|---------------------------------|---------------|---------------|
| | | | | | | | | | | | | 154 | 154 | 154 | 134 | | | | | |
| 24/11/2017 | ETAM17W04199 | AB | 256 | Fill | Silty CLAY | Fill L | 1777814 | 5875272 | - | 150 | 0.4m to Subgrade level | 141 | 154 | 154 | 134 | 1.73 | 38.1 | 1.25 | 2.7 | 6.0 |
| 24/11/2017 | ETAM17W04199 | AB | 257 | Fill | Silty CLAY | Fill L | 1777829 | 5875274 | - | 150 | 0.2m to Subgrade level | 168 | 141 | 141 | UTP | 1.77 | 45.4 | 1.21 | 2.7 | 0.0 |

SITE PLAN

NOT TO SCALE

Project No: GENZETAM01177AA

Work Order No: ETAM17W04199

Page: 2 of 2

Project: J00113 - Hitchen Block - Stage 2 Pokeno

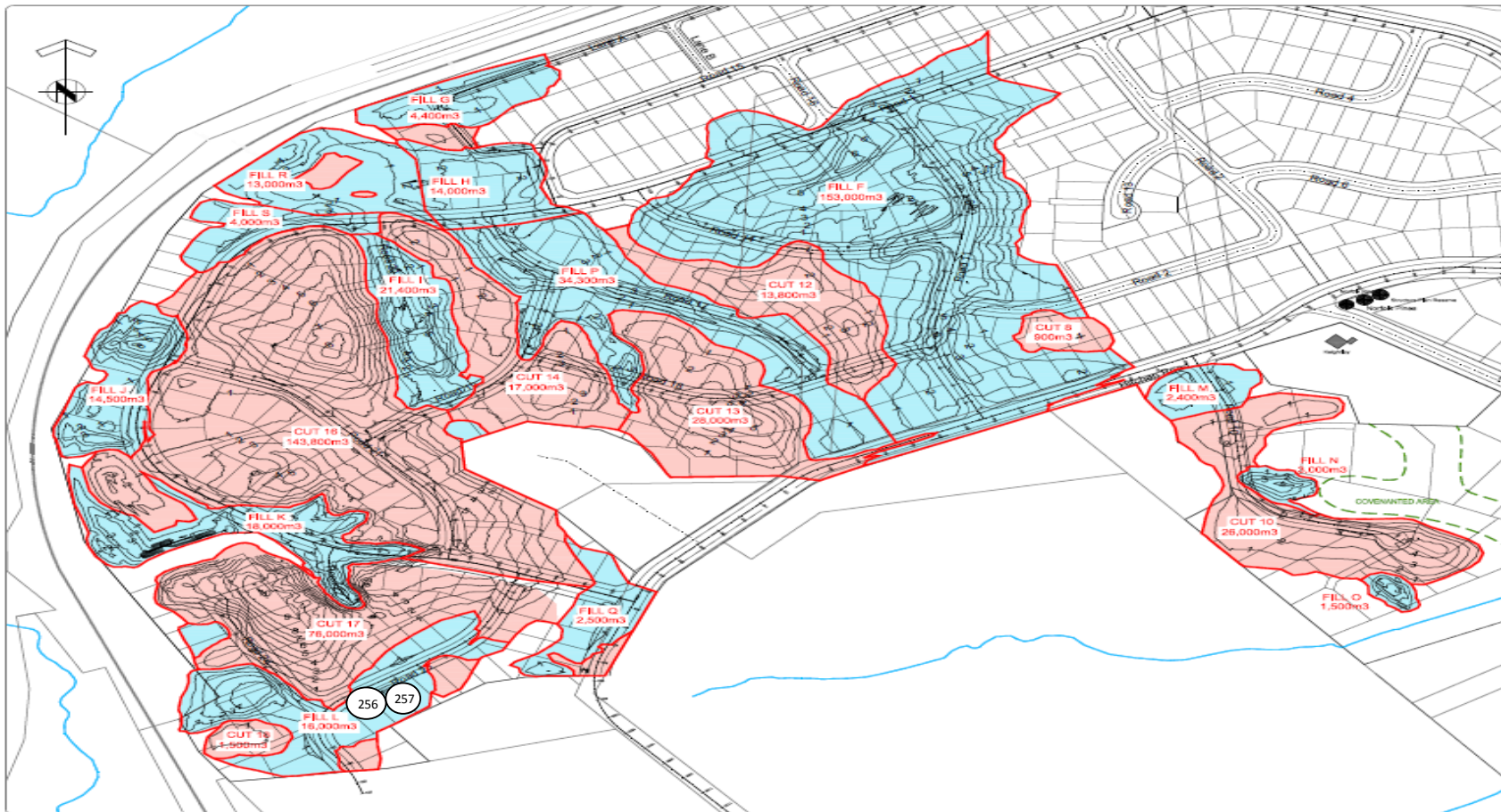
Location: Fill L Area

Tested by:

AB

Date tested:

24/11/2017



CUT - 308,000m³
FILL - 302,000m³
UNSUITABLE - 8,000m³
TOPSOIL - 60,000m³
TOTAL EARTHWORKS AREA - 30.3ha

| | | | |
|-----|----------|-----|----------|
| REP | DATE | BY | CHKD BY |
| REP | 04-11-17 | REP | 04-11-17 |
| REP | 04-11-17 | REP | 04-11-17 |
| REP | 04-11-17 | REP | 04-11-17 |

CIVILPLAN CONSULTANTS
Level 2 APT 04/01, 15 Clevedon Way, Manukau City, Phone: 0223444

PROJECT: DFH JOINT VENTURE
HITCHEN BLOCK EARTHWORKS
POKENO

DESCRIPTION: STAGE 3
EARTHWORKS PLAN
OVERALL CUT FILL PLAN

SCALE: 1:2500 A1 1:3000 A3
DRAWING NO: 136701-03-202
REVISION: B

| | |
|--|--|
| <p>Client: Lander Geotechnical Consultants Limited Address: PO Box 97 385, Manukau 2241 Attention: Chris Edwards c.c.: - Project: J00113 - Hitchen Block - Stage 2 Pokeno Location: Pokeno</p> | <p>PROJECT CODE: GENZETAM01177AA Page: 1 of 2</p> <div style="display: flex; justify-content: space-between; align-items: center;"> <div style="text-align: center;">  <p>Tests indicated as not accredited are outside the scope of the laboratory's accreditation</p> </div> <div style="text-align: right;">  Approved Signatory: Cesar Pura Issue date: 30/11/2017 </div> </div> |
|--|--|

Test method: Test Methods in accordance with: Shear Strength (using field Shear vane in accordance with NZGS 2001): Nuclear Densometer Testing (in accordance with NZS 4407:2015 Test 4.2): Water Content Testing (in accordance with NZS 4402:1986 Test 2.1): Density Calculations (in accordance with NZS 4402:1986 Tests 4.1.1.5(b)). Please note that Air Void calculations are not IANZ endorsed as part of this report.

| Date | Work Order No: | Tested by | Test No. | Layer | Material tested | Location | Easting | Northing | RL | Test Probe Depth (mm) | Comments (FL = Finished level) | Field Shear Strength in kPa UTP = Unable to penetrate | | | | Wet Density (t/m ³) | Oven Water Content (%) | Dry Density (t/m ³) | Solid Density | Air Voids (%) |
|------------|----------------|-----------|----------|-------|-----------------|----------|---------|----------|----|-----------------------|-----------------------------------|--|-----|-----|-----|---------------------------------|------------------------|---------------------------------|---------------|---------------|
| | | | | | | | | | | | | UTP | UTP | UTP | UTP | | | | | |
| 27/11/2017 | ETAM17W04248 | AB | 258 | Fill | Silty CLAY | Fill P | 1777941 | 5875764 | - | 150 | At Subgrade Level | UTP | UTP | UTP | UTP | 1.86 | 27.2 | 1.46 | 2.7 | 5.9 |
| 27/11/2017 | ETAM17W04248 | AB | 259 | Fill | Silty CLAY | Fill L | 1777632 | 5875546 | - | 150 | 1.8m to Subgrade level | 168 | 131 | 161 | 154 | 1.84 | 34.1 | 1.37 | 2.7 | 2.6 |

SITE PLAN

NOT TO SCALE

Project No: GENZETAM01177AA

Work Order No: ETAM17W04248

Page: 2 of 2

Project: J00113 - Hitchen Block - Stage 2 Pokeno

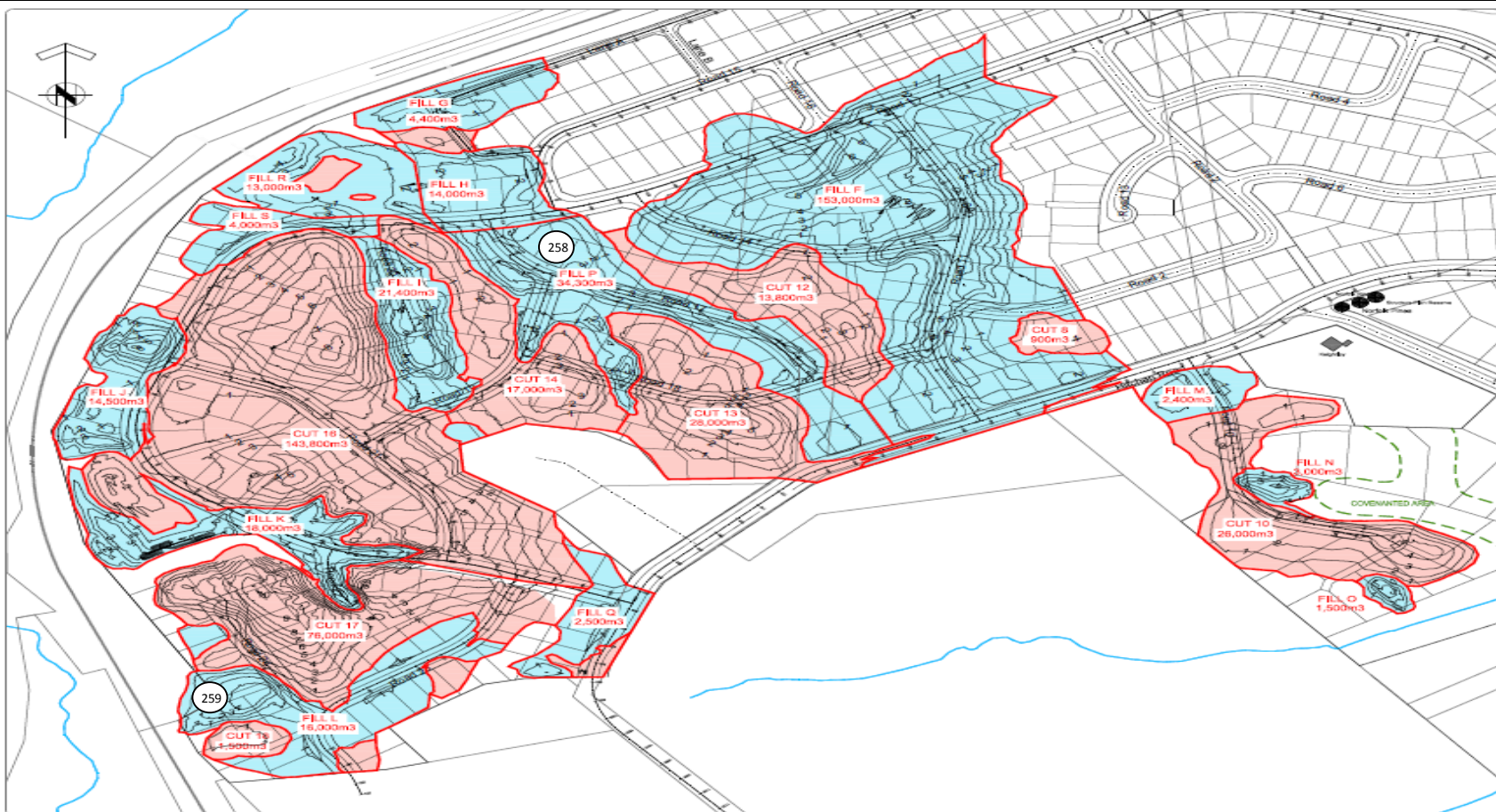
Location: Fill L and P, Refer to Plan

Tested by:

AB

Date tested:

27/11/2017



CUT - 308,000m³
FILL - 302,000m³
UNSUITABLE - 8,000m³
TOPSOIL - 60,000m³
TOTAL EARTHWORKS AREA - 30.3ha



| | | | |
|-----|------------|----|---------|
| NO. | DATE | BY | CHKD BY |
| 1 | 27/11/2017 | AB | AB |
| 2 | | | |
| 3 | | | |
| 4 | | | |



DFH JOINT VENTURE
HITCHEN BLOCK EARTHWORKS
POKENO

STAGE 3
EARTHWORKS PLAN
OVERALL CUT FILL PLAN

RESOURCE CONSENT
1:1500 A1 1:3000 A3
136701-03-202

| | |
|---|--|
| <p>Client: Lander Geotechnical Consultants Limited</p> <p>Address: PO Box 97 385, Manukau 2241</p> <p>Attention: Chris Edwards</p> <p>c.c.: Michael Chan</p> <p>Project: J00113 - Hitchen Block - Stages 1, 2 and 3, Pokeno</p> <p>Location: Pokeno</p> | <p>PROJECT CODE: GENZETAM01177AA</p> <p>Page: 1 of 2</p> <div style="display: flex; align-items: center;">  <p>Tests indicated as not accredited are outside the scope of the laboratory's accreditation</p> </div> <div style="text-align: right; margin-top: 20px;"> <p>Approved Signatory:  Cesar Pura</p> <p>Issue date: 11/04/2018</p> </div> |
|---|--|

Test method: Test Methods in accordance with: *Shear Strength (using field Shear vane in accordance with NZGS 2001): Nuclear Densometer Testing (in accordance with NZS 4407:2015 Test 4.2): Water Content Testing (in accordance with NZS 4402:1986 Test 2.1): Moisture contents and dry densities are corrected against oven dried moisture content testing.

| Date | Work Order No. | Tested by | Test No. | Layer | Material tested | Location | Easting | Northing | RL (m) | Test Probe Depth (mm) | Comments | Field Shear Strength in kPa | | | | Wet Density (t/m ³) | Oven Water Content (%) | Dry Density (t/m ³) | Solid Density (t/m ³) Assumed | Air Voids (%) |
|-----------|----------------|-----------|----------|-------|-----------------|----------|---------|----------|--------|-----------------------|-------------------|-----------------------------|-----|-----|-----|---------------------------------|------------------------|---------------------------------|---|---------------|
| | | | | | | | | | | | | UTP = Unable to penetrate | | | | | | | | |
| 6/04/2018 | ETAM18W01401 | SC | 292 | Fill | Silty CLAY | Fill L | 1777756 | 5875262 | - | 150 | At Finished Level | 160 | 183 | 155 | 151 | 1.77 | 37.2 | 1.29 | 2.7 | 4.4 |
| 6/04/2018 | ETAM18W01401 | SC | 293 | Fill | Silty CLAY | Fill L | 1777726 | 5875298 | - | 150 | At Finished Level | UTP | UTP | 183 | 178 | 1.90 | 43.1 | 1.33 | 2.7 | 0 |

SITE PLAN

NOT TO SCALE

Project No: GENZETAM01177AA

Work Order No: ETAM18W01401

Page: 2 of 2

Project: J00113 - Hitchen Block - Stages 1, 2 and 3, Pokeno

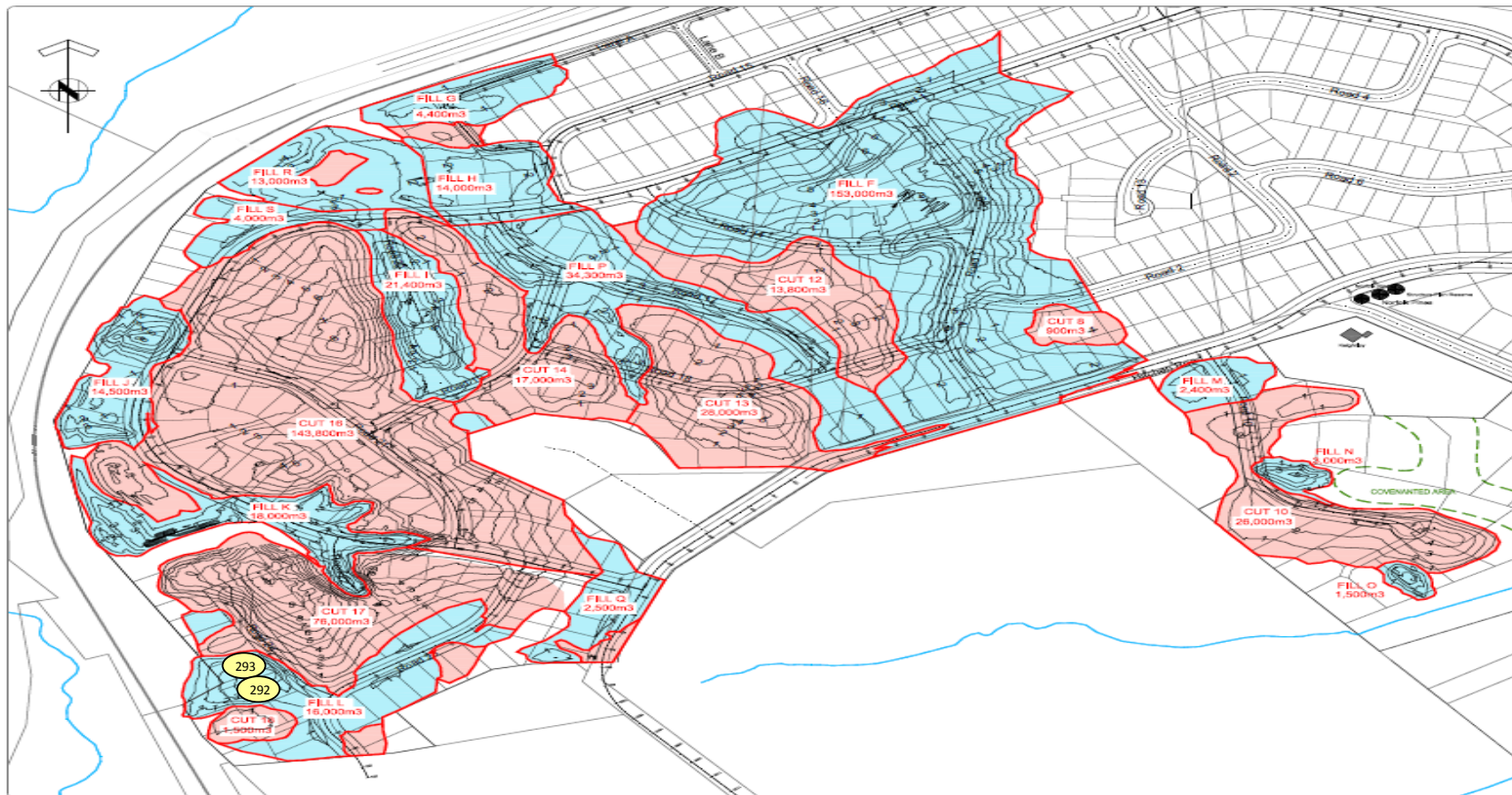
Location: Fill L, As below

Tested by:

SC

Date tested:

6/04/2018



CUT = 308,000m³
FILL = 302,000m³
UNSUITABLE = 8,000m³
TOPSOIL = 80,000m³
TOTAL EARTHWORKS AREA = 30.3ha



| | | | |
|-----|------|--------------------|----------|
| NO. | REV. | DESCRIPTION | DATE |
| 1 | 01 | ISSUED FOR CONSENT | 06/04/18 |
| 2 | 02 | ISSUED FOR CONSENT | 06/04/18 |



PROJECT: DFH JOINT VENTURE
HITCHEN BLOCK EARTHWORKS
POKENO

SHEET NO.: STAGE 3
EARTHWORKS PLAN
OVERALL CUT FILL PLAN

SCALE: 1:1500 A3
DRAWING NO: 136701-03-202
DATE: 06/04/18

| | |
|---|---|
| <p>Client: Lander Geotechnical Consultants Limited</p> <p>Address: PO Box 97 385, Manukau 2241</p> <p>Attention: Chris Edwards</p> <p>c.c.: Michael Chan</p> <p>Project: J00113 - Hitchen Block - Stages 1, 2 and 3, Pokeno</p> <p>Location: Pokeno</p> | <p>PROJECT CODE: GENZETAM01177AA</p> <p>Page: 1 of 2</p> <div style="display: flex; justify-content: space-between; align-items: center;"> <div style="text-align: center;">  <p>IANZ ACCREDITED LABORATORY</p> </div> <div style="text-align: center;"> <p>Tests indicated as not accredited are outside the scope of the laboratory's accreditation</p> </div> <div style="text-align: right;">  <p>Approved Signatory: Cesar Pura</p> <p>Issue date: 23/05/2018</p> </div> </div> |
|---|---|

Test method: Test Methods in accordance with: *Shear Strength (using field Shear vane in accordance with NZGS 2001): Nuclear Densometer Testing (in accordance with NZS 4407:2015 Test 4.2): Water Content Testing (in accordance with NZS 4402:1986 Test 2.1): Moisture contents and dry densities are corrected against oven dried moisture content testing.

| Date | Work Order No. | Tested by | Test No. | Layer | Material tested | Location | Easting | Northing | RL (m) | Test Probe Depth (mm) | Comments | Field Shear Strength in kPa | | | | Wet Density (t/m ³) | Oven Water Content (%) | Dry Density (t/m ³) | Solid Density (t/m ³) Assumed | Air Voids (%) |
|-----------|----------------|-----------|----------|-------|-----------------|----------|---------|----------|--------|-----------------------|----------|-----------------------------|-----|-----|-----|---------------------------------|------------------------|---------------------------------|---|---------------|
| | | | | | | | | | | | | UTP = Unable to penetrate | | | | | | | | |
| 4/05/2018 | ETAM18W02082 | SC | 294 | Fill | Silty CLAY | Fill L | 1777774 | 5875437 | 49.13 | 150 | - | 167 | 167 | 179 | 179 | 1.89 | 31.6 | 1.43 | 2.7 | 2 |
| 4/05/2018 | ETAM18W02082 | SC | 295 | Fill | Silty CLAY | Fill L | 1777766 | 5875452 | 44.95 | 150 | - | 160 | 160 | 167 | 167 | 1.80 | 28.5 | 1.40 | 2.7 | 8 |

SITE PLAN

NOT TO SCALE

Project No: GENZETAM01177AA

Work Order No: ETAM18W02082

Page: 2 of 2

Project: J00113 - Hitchen Block - Stages 1, 2 and 3, Pokeno

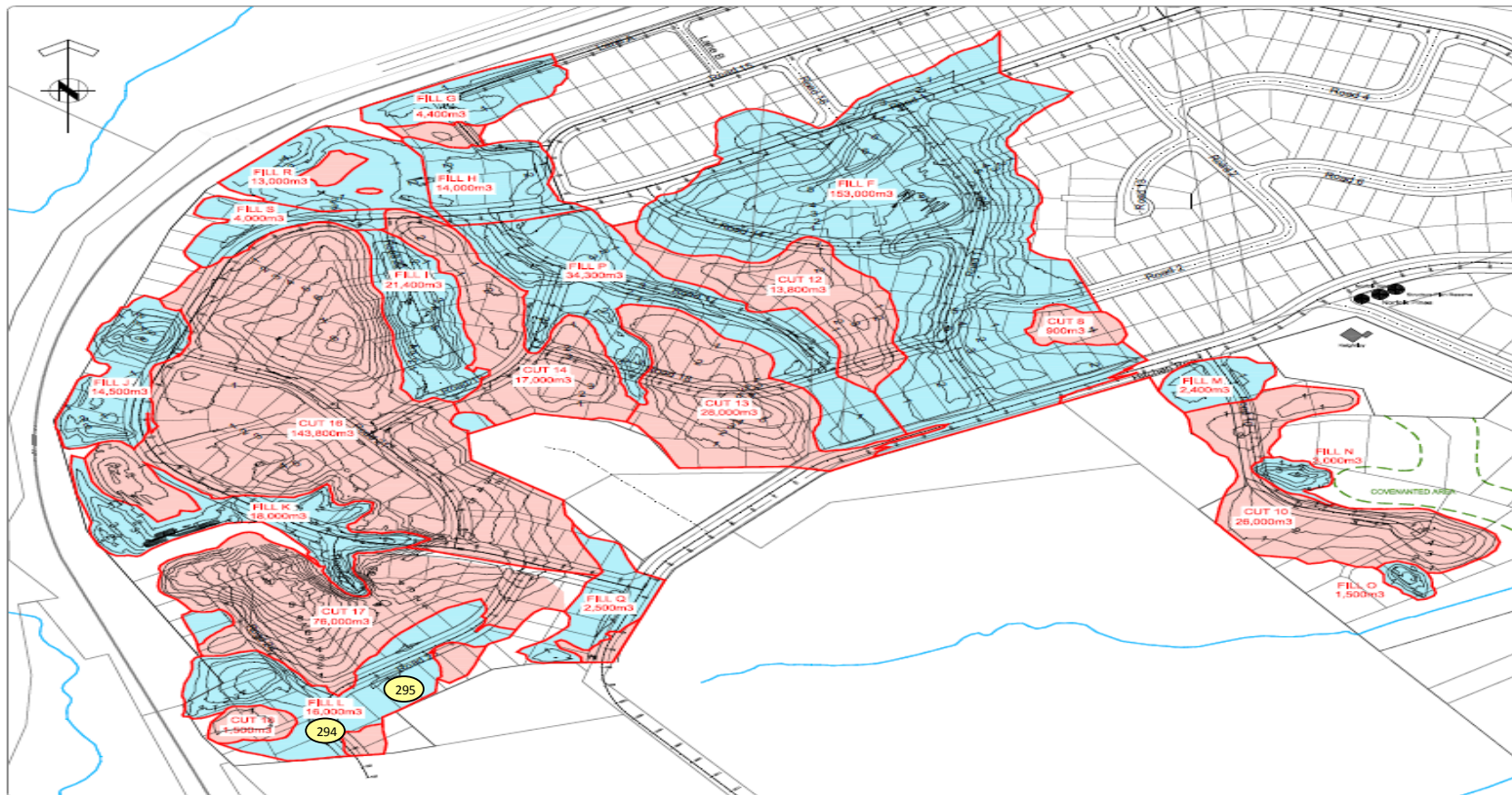
Location: Fill L, As below

Tested by:

SC

Date tested:

4/05/2018



CUT = 308,000m³
FILL = 302,000m³
UNSUITABLE = 8,000m³
TOPSOIL = 80,000m³
TOTAL EARTHWORKS AREA = 30.3ha

| | | | |
|-----|----------|--------------------|----|
| REV | DATE | DESCRIPTION | BY |
| 1 | 04/05/18 | ISSUED FOR CONSENT | SC |
| 2 | 04/05/18 | REVISED | SC |



PROJECT: DFH JOINT VENTURE
HITCHEN BLOCK EARTHWORKS
POKENO

PROJECT: STAGE 3
EARTHWORKS PLAN
OVERALL CUT FILL PLAN

SCALE: 1:1500 A3
DRAWING NUMBER: 136701-03-202
REVISION: B



Our Ref: 1009521.1125.0.0/Rep1
Customer Ref: J00113
19 February 2021

Lander Geotechnical Consultants Limited
Level 3, 3 Osterley way
Manukau
Auckland 2104

Attention: Kyle Meffan

Dear Kyle

Hitchen Road Stages 10E + F Pokeno
Laboratory Test Report

Samples from the above mentioned site have been tested as received according to your instructions and the results are included in this report. Results apply only to the sample(s) tested.

Descriptions are enclosed for your information, but are not covered under the IANZ endorsement of this report.

This report has been prepared for the benefit of Lander Geotechnical Consultants Limited , with respect to the particular brief given to us and it cannot be relied upon in other contexts or for any other purpose without our prior review and agreement.

This report may be reproduced only in full.

Samples not destroyed during testing will be retained for one month from the date of this report before being discarded. If we can be of any further assistance, feel free to get in touch. Contact details are provided at the bottom of this page.

GEOTECHNICS LTD

Report prepared by:

Authorised for Geotechnics by:

P.P.

Tylah Wardrope
Laboratory Technician

Paul Burton
Project Director

Report checked by:

Ryan Milligan
Project Manager
Approved Signatory

19-Feb-21

t:\geotechnicsgroup\projects\1009521\1009521.1125\20210219.hitchen road stages 10e + f pokeno .tywa.docx



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation



Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (4 Point), 2.3 & 2.4

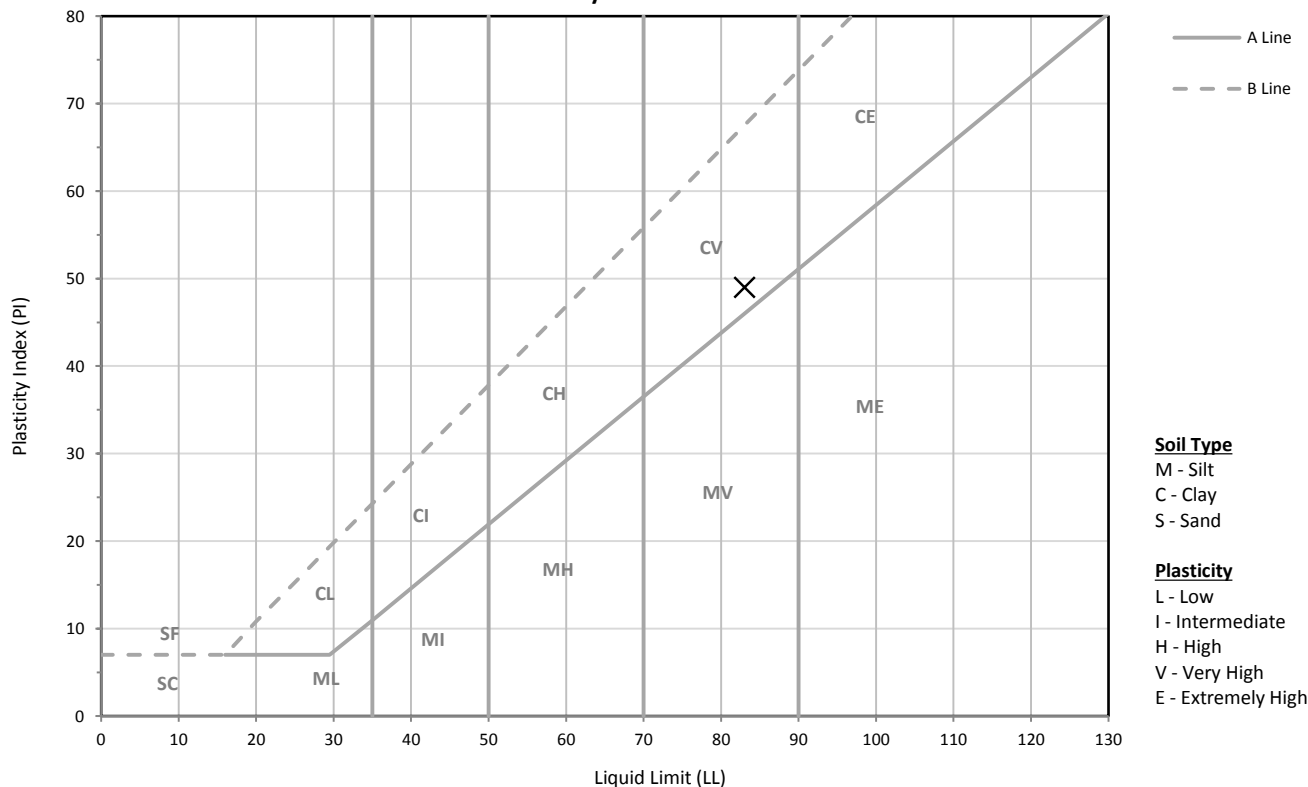
TEST DETAILS

| | | | | |
|-----------------|-----------------------|--|---------------------|------|
| LOCATION | Description | Hitchen Road Stages 10E + F Pokeno | | |
| | Data | N/A | | |
| SAMPLE | Geotechnics ID | S21TG000068 | | |
| | Reference | Lot548 | Top Depth | 0.5m |
| | Sampled By | Others, Tested As Received | Bottom Depth | 1.0m |
| | Description | silty CLAY with trace rootlets; brown. moist to dry, very high plasticity. | | |
| SPECIMEN | Reference | N/A | Depth | N/A |
| | Description | N/A | | |

TEST RESULTS

Liquid Limit **83**
Plastic Limit **34**
Plasticity Index **49**

Plasticity Chart - BS 5930:1999



Soil Type
M - Silt
C - Clay
S - Sand

Plasticity
L - Low
I - Intermediate
H - High
V - Very High
E - Extremely High

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • This test result is IANZ accredited. • Date tested 18/02/2021

Approved Signatory Ryan Milligan
Date 19/02/2021



15C Amber Crescent
 Judea
 Tauranga 3110
 New Zealand
 p +64 7 571 0280

Geotechnics Project Number 1009521.1125.0.0
QESTLab Work Order ID W21TG-0030
Customer Project ID

Determination of the Linear Shrinkage - NZS 4402:1986 Test 2.6

TEST DETAILS

| | | | | |
|-----------------|-----------------------|--|---------------------|------|
| LOCATION | Description | Hitchen Road Stages 10E + F Pokeno | | |
| | Data | N/A | | |
| SAMPLE | Geotechnics ID | S21TG000068 | | |
| | Reference | Lot548 | Top Depth | 0.5m |
| | Sampled By | Others, Tested As Received | Bottom Depth | 1.0m |
| | Description | silty CLAY with trace rootlets; brown. moist to dry, very high plasticity. | | |
| SPECIMEN | Reference | | | |
| | Description | Depth | | |

Linear Shrinkage **23%**

TEST REMARKS

• This test result is IANZ accredited. • Date tested 18/02/2021

Approved Signatory Ryan Milligan
Date 19/02/2021



Tauranga
15C Amber Crescent
Judea
Tauranga 3110
New Zealand

p +64 7 571 0280

Report No: MAT:S21TG000068

Issue No: 1

Material Test Report

Customer: Lander Geotechnical
Address: Level 3, 3 Osterley Way
Manukau, 2104
Project: Hitchen Road Stages 10E + F Pokeno
Project No.: 1009521.1125.0.0
Customer Reference No.:
Report Authorised By : Ryan Milligan

Approved By:
Ryan Milligan
(Development Manager)
Date of Issue: 19/02/2021

Please reproduce this report in full when transmitting to others or including in internal reports.

Sample Details

Location Hitchen Road Stages 10E + F Pokeno
Geotechnics ID S21TG000068
Sample Reference Lot548
Sample Description silty CLAY with trace rootlets; brown.
moist to dry, very high plasticity.
Sample Depth 0.5m
Bottom Depth 1.0m

Test Results

| Description | Method | Result | Limits |
|---|--------|------------|--------|
| Moisture Content [NZS 4402:1986 Test 2.1] | | | |
| Moisture Content (%) | | 27.6 | |
| Date Tested | | 18/02/2021 | |

Comments

This test result is IANZ accredited.

If samples have been taken, and were not destroyed during testing, they will be retained for one month from the date of this report before being discarded.



15C Amber Crescent
 Judea
 Tauranga 3110
 New Zealand
 p +64 7 571 0280

Geotechnics Project Number 1009521.1125.0.0
QESTLab Work Order ID W21TG-0030
Customer Project ID

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (4 Point), 2.3 & 2.4

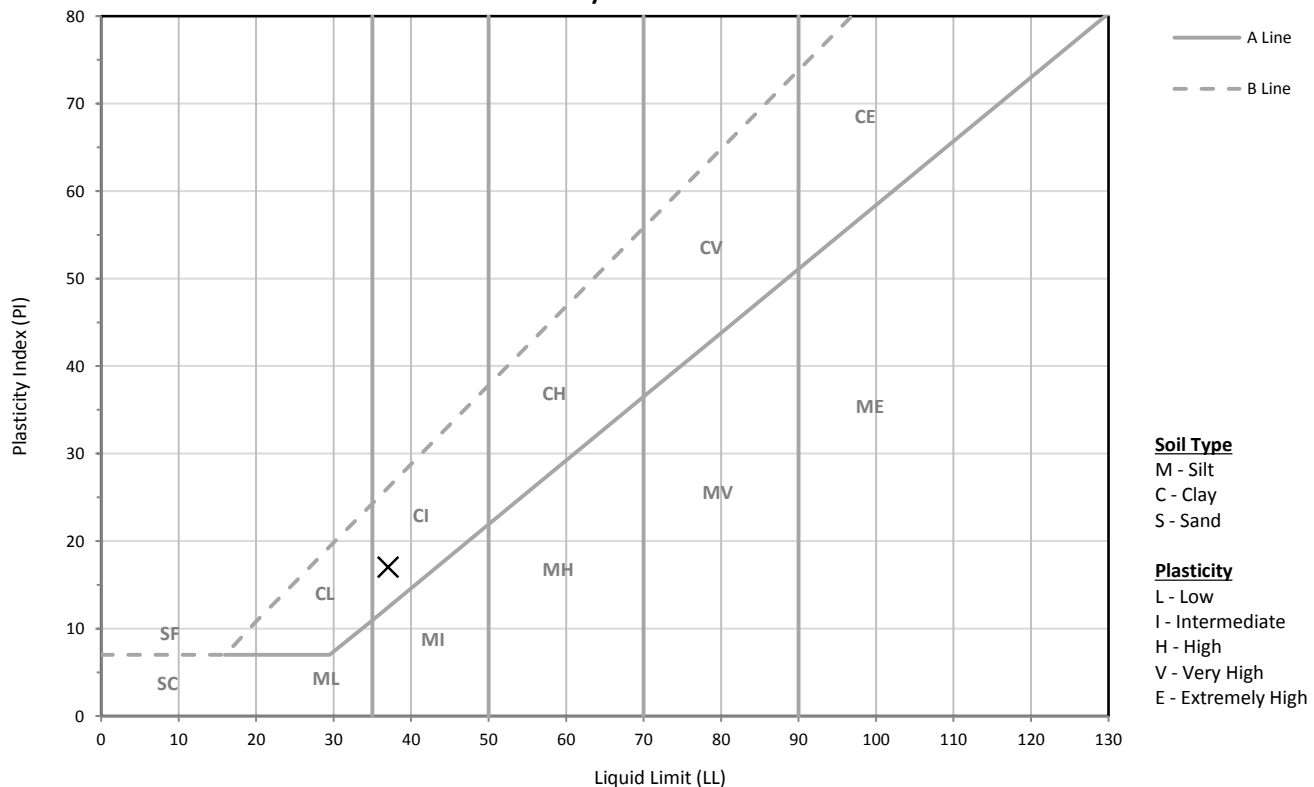
TEST DETAILS

| | | | | |
|-----------------|-----------------------|--|---------------------|------|
| LOCATION | Description | Hitchen Road Stages 10E + F Pokeno | | |
| | Data | N/A | | |
| SAMPLE | Geotechnics ID | S21TG000069 | | |
| | Reference | LOT 581 | Top Depth | 0.5m |
| | Sampled By | Others, Tested As Received | Bottom Depth | 1.0m |
| | Description | SILT with some sand and some clay; lights brown. Dry, intermediate plasticity. | | |
| SPECIMEN | Reference | N/A | Depth | N/A |
| | Description | N/A | | |

TEST RESULTS

Liquid Limit 37
Plastic Limit 20
Plasticity Index 17

Plasticity Chart - BS 5930:1999



Soil Type
 M - Silt
 C - Clay
 S - Sand

Plasticity
 L - Low
 I - Intermediate
 H - High
 V - Very High
 E - Extremely High

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • This test result is IANZ accredited. • Date tested 18/02/2021

Approved Signatory Ryan Milligan
Date 19/02/2021



Tauranga
15C Amber Crescent
Judea
Tauranga 3110
New Zealand

p +64 7 571 0280

Report No: MAT:S21TG000069

Issue No: 1

Material Test Report

Customer: Lander Geotechnical
Address: Level 3, 3 Osterley Way
Manukau, 2104
Project: Hitchen Road Stages 10E + F Pokeno
Project No.: 1009521.1125.0.0
Customer Reference No.:
Report Authorised By : Ryan Milligan

Approved By:
Ryan Milligan
(Development Manager)
Date of Issue: 19/02/2021

Please reproduce this report in full when transmitting to others or including in internal reports.

Sample Details

Location Hitchen Road Stages 10E + F Pokeno
Geotechnics ID S21TG000069
Sample Reference LOT 581
Sample Description SILT with some sand and some clay; lights brown. Dry, intermediate plasticity.
Sample Depth 0.5m
Bottom Depth 1.0m

Test Results

| Description | Method | Result | Limits |
|---|--------|------------|--------|
| Moisture Content [NZS 4402:1986 Test 2.1] | | | |
| Moisture Content (%) | | 18.7 | |
| Date Tested | | 18/02/2021 | |

Comments

This test result is IANZ accredited.

If samples have been taken, and were not destroyed during testing, they will be retained for one month from the date of this report before being discarded.



15C Amber Crescent
 Judea
 Tauranga 3110
 New Zealand
 p +64 7 571 0280

Geotechnics Project Number 1009521.1125.0.0
QESTLab Work Order ID W21TG-0030
Customer Project ID

Determination of the Linear Shrinkage - NZS 4402:1986 Test 2.6

TEST DETAILS

| | | | | |
|-----------------|-----------------------|--|---------------------|------|
| LOCATION | Description | Hitchen Road Stages 10E + F Pokeno | | |
| | Data | N/A | | |
| SAMPLE | Geotechnics ID | S21TG000069 | | |
| | Reference | LOT 581 | Top Depth | 0.5m |
| | Sampled By | Others, Tested As Received | Bottom Depth | 1.0m |
| | Description | SILT with some sand and some clay; lights brown. Dry, intermediate plasticity. | | |
| SPECIMEN | Reference | Depth | | |
| | Description | | | |

Linear Shrinkage **7%**

TEST REMARKS

• This test result is IANZ accredited. • Date tested 00/01/1900

Approved Signatory Ryan Milligan
Date 19/02/2021



Our Ref: 1100674.0003.0.0/Rep1
Customer Ref: J00113
24 February 2021

Lander Geotechnical Limited
PO Box 97 385,
Manukau, Auckland

Attention: Kyle Meffan

Dear Kyle

Hitchen Block, Pokeno
Laboratory Test Report

The samples we collected from the above mentioned site have been tested according to your instructions and the results are included in this report. Results apply only to the sample(s) tested.

Descriptions are enclosed for your information, but are not covered under the IANZ endorsement of this report.

This report has been prepared for the benefit of Lander Geotechnical Limited, with respect to the particular brief given to us and it cannot be relied upon in other contexts or for any other purpose without our prior review and agreement.

This report may be reproduced only in full.

Samples not destroyed during testing will be retained for one month from the date of this report before being discarded. If we can be of any further assistance, feel free to get in touch. Contact details are provided at the bottom of this page.

GEOTECHNICS LTD

Report prepared by:

A blue ink signature of Jack Singh.

.....
Jack Singh
Laboratory Technician
Approved Signatory

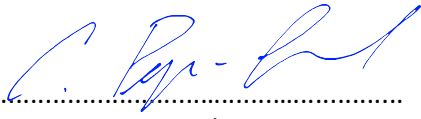
Authorised for Geotechnics by:

.....
Paul Burton
Project Director



All tests reported herein
have been performed in
accordance with the
laboratory's scope of
accreditation

Report checked by:



Corey Papu-Gread
Christchurch Manager

24-Feb-21

\\\\ttgroup.local\corporate\geotechnicsgroup\projects\1100674\1100674.0003\workingmaterial\20210224.jasi.1100674.0003.0.0.rep1.doc
x



45A Parkhouse Road
Wigram
Christchurch 8042
New Zealand
p +64 3 361 0300

Geotechnics Project Number 1100674.0003.0.0
QESTLab Work Order ID W21CH-0018
Customer Project ID J00113

Determination of the Shrink - Swell Index - AS 1289 Test 7.1.1 - 2003

TEST DETAILS

| | | | | |
|-----------------|-----------------------|--|---------------------|---------|
| LOCATION | Description | Hithchen Block, Pokeno - Stage 10E&F | | |
| | Data | N/A | | |
| SAMPLE | Geotechnics ID | S21CH000074 | BH No | Lot 583 |
| | Reference | Lot 583 | Top Depth | 0.6m |
| | Sampled By | Geotechnics | Bottom Depth | |
| | Description | SILT with trace clay and minor sand, brown mottled black. Moist. | | |
| SPECIMEN | Reference | Depth | | |
| | Description | | | |


TEST RESULTS

| | | | |
|----------------------|--|---------------------|-------|
| Applied Pressure | | (kPa) | 25 |
| SWELL TEST | Initial Water Content | (%) | 39.9 |
| | Bulk Density | (t/m ³) | 1.79 |
| | Dry Density | (t/m ³) | 1.28 |
| | Final Water Content | (%) | 41.4 |
| | Swelling Strain | (%) | -0.08 |
| SHRINKAGE TEST | Initial Water Content | (%) | 38.0 |
| | Shrinkage Strain | (%) | 3.3 |
| | Inert Material Estimate in the Soil Specimen | (%) | None |
| | Soil Crumbling During Shrinkage | | None |
| | Cracking of the Shrinkage Specimen | | Major |
| SHRINK - SWELL INDEX | | (%) | 1.8 |

TEST REMARKS

• Estimates of inert material, soil cracking and soil crumbling are enclosed for your information, but are not covered under the IANZ endorsement of this report. • This test result is IANZ accredited. • Date tested 15/02/2021

Approved Signatory Jack Singh
Date 24/02/2021

| | | | | |
|---|--|---|--|----------|
|  GEOTECHNICS | 45A Parkhouse Road | | Geotechnics Project Number 1100674.0003.0.0 | |
| | Wigram | | QESTLab Work Order ID W21CH-0018 | |
| | Christchurch 8042 | | Customer Project ID J00113 | |
| | New Zealand p +64 3 361 0300 | | | |
| Determination of the Shrink - Swell Index - AS 1289 Test 7.1.1 - 2003 | | | | |
| TEST DETAILS | | | | |
| LOCATION | Description | Hithchen Block, Pokeno - Stage 10E&F | | |
| | Data | N/A | | |
| SAMPLE | Geotechnics ID | S21CH000075 | BH No | Lot 572 |
| | Reference | Lot 572 | Top Depth | 0.6m |
| | Sampled By | Geotechnics | Bottom Depth | |
| | Description | SILT with minor clay and trace sand, orange brown mixed with grey. Moist. | | |
| SPECIMEN | Reference | Depth | | |
| | Description | | | |
| TEST RESULTS | | | | |
| | Applied Pressure | (kPa) | | 25 |
| SWELL TEST | Initial Water Content | (%) | | 34.1 |
| | Bulk Density | (t/m ³) | | 1.84 |
| | Dry Density | (t/m ³) | | 1.37 |
| | Final Water Content | (%) | | 35.9 |
| | Swelling Strain | (%) | | -0.04 |
| SHRINKAGE TEST | Initial Water Content | (%) | | 33.5 |
| | Shrinkage Strain | (%) | | 5.5 |
| | Inert Material Estimate in the Soil Specimen | (%) | | None |
| | Soil Crumbling During Shrinkage | | | Minor |
| | Cracking of the Shrinkage Specimen | | | Moderate |
| | SHRINK - SWELL INDEX | (%) | | 3.1 |
| TEST REMARKS | | | | |
| <ul style="list-style-type: none"> • Estimates of inert material, soil cracking and soil crumbling are enclosed for your information, but are not covered under the IANZ endorsement of this report. • This test result is IANZ accredited. • Date tested 15/02/2021 | | | | |
| Approved Signatory | Jack Singh | | | |
| Date | 24/02/2021 | | | |

3.2 Slab-on-ground in expansive soils

3.2.1 NZS 3604 Clause 1.1.2 Buildings covered by this Standard

Amend 1.1.2(a) to read:

“Buildings founded on good ground or on expansive soils where the requirements of 1.1.5 are met”

3.2.2 NZS 3604 New Clause

Add new: “**Clause 1.1.5 Buildings on expansive soils**

Buildings on expansive soils shall be supported on slab-on-ground foundations complying with 7.5.13 and in addition to 1.1.2 shall be limited as follows:

- (a) single storey, stand-alone household unit, and
- (b) maximum length or width of floor of 24.0 m including any attached garage, and
- (c) simple plan shapes such as rectangular, L, T or boomerang, and
- (d) concrete slab-on-ground with a minimum thickness of 100 mm and a minimum concrete compressive strength of 20 MPa, and
- (e) simple roof forms, incorporating hips, valleys, gables or mono pitches, and
- (f) maximum overall height of 7.0 m to roof apex from lowest cleared ground level, and
- (g) maximum roof height of 3.0 m, and
- (h) roof slope between 10° and 35° from the horizontal, and
- (i) maximum span of roof truss 12.0 m, and
- (j) external walls maximum of 2.4 m height studs, other than gable end walls and walls to mono-pitched roofs, which shall not exceed 4.0 m.

COMMENT:

Floor plans

Where floor plans incorporate re-entrant corners then continuity of the exterior ground beam shall be maintained by continuing it as an internal beam, with the exterior beam details continued for a length of at least 1.0 m into the internal beam. This is only applicable where internal beams are specified in Tables 7.4A and 7.4B. This is aimed to bring the solution in NZS 3604 in line with Clause 5.3.8 of AS 2870:2011.

Ground movement

Provision for the additional ground movement effects from trees near to foundations in expansive soils should be considered. Trees remove moisture from the soil for a radius equal to the height of the tree. This causes expansive soils to shrink to varying degrees, and when near houses leads to differential settlement occurring under foundations. Movement of the foundations may lead to cracks in the building and door jamming.

Where existing trees (including trees that have been recently removed) are located closer to the foundations than 1.5 times the mature height of a tree, then additional geotechnical advice should be obtained. Planting of new trees should be avoided near foundations of new buildings or neighbouring buildings on sites with expansive soils.

3.2.3 NZS 3604 Clause 7.5.1

Add the following paragraph at the end of Clause 7.5.1:

“Slabs on expansive soils for buildings meeting the requirements of 1.1.5 shall, in addition to meeting the requirements of 7.5.1 to 7.5.12, meet the requirements of 7.5.13. Where there is conflict the requirements of 7.5.13 shall apply.”

3.2.4 NZS 3604 New clause, tables and figures

Add new: **Clause 7.5.13 Slab-on-ground in expansive soils**

7.5.13.1 Identification of expansive soils

7.5.13.1.1 Should reasonable enquiry as outlined in 3.1.3 show any signs of expansive soils, the expansive soil class, as defined in AS 2870, shall be established by one or all of:

- (a) enquiry to the local territorial authority, and/or
- (b) reference to the certificate of suitability issued in terms of NZS 4431, and/or
- (c) a soil test undertaken by a suitably qualified soils engineer.

7.5.13.1.2 Expansive soil class shall be defined as:

- (a) Slightly ‘S’, having an I_{SS} range of 0–1.9%, and a 500 year design characteristic surface movement return (y_S) of 22 mm, or
- (b) Moderately ‘M’, having an I_{SS} range of 2.0–3.7% and a 500 year design characteristic surface movement return (y_S) of 44 mm, or

(c) Highly 'H', having an I_{SS} range of 3.8–6.5% and a 500 year design characteristic surface movement return (y_S) of 78 mm, or

(d) Extremely 'E', having an I_{SS} range of 6.6–7.5% and a 500 year design characteristic surface movement return (y_S) of 90 mm.

7.5.13.2 Maximum aspect ratio of concrete slabs

The aspect ratio of the concrete slabs or bays of concrete slabs, such as in the case of L, T or boomerang concrete slab shapes, shall not exceed 5 to 1 (length to width).

7.5.13.3 Foundation details

7.5.13.3.1 For the identified expansive soil class the foundation details, external and internal thickenings shall be as follows.

(a) For light wall claddings refer to Table 7.4A and Figure 7.22.

(b) For medium wall or heavy wall claddings refer to Table 7.4B and Figure 7.23.

7.5.13.3.2 Situations where no internal thickenings shall be required are limited to a rectangular slab with long side not exceeding 17.0 m. Where this limit is exceeded, add additional internal thickenings across the slab with the same cross section dimensions and reinforcing as the external footing, so that the centre to centre spacing of thickenings is always less than 17.0 m.

COMMENT:

Design constraints:

a) The characteristic surface movements and the corresponding expansivity classifications have been calculated based on design for ultimate limit state (ULS) conditions for a 1 in 1000 year "extreme" drought event, and the serviceability limit state (SLS) conditions for a 1 in 500 year drought event.

b) Maximum soil movements are calculated to be based on a 500 year return period for SLS, and a 1000 year return period for ULS*;

(*NB: This differed from the recommendations contained within BRANZ Study Report 120A (BSR120A) which used a 300 year return period for the design level drought conditions)

c) Climate parameters adopted from BSR120A of $\Delta u = 1.2$ pF, $H_s = 1.5$ m, and a crack depth of 0.5 H_s

d) The I_{SS} (soil stability index) ranges attributed to the expansivity classifications as defined in 3.2.4 above have been calculated using the parameters presented in BSR120A and Equation 2.3.1 of AS 2870:2011.

e) Sites subject to parameters that differ from those mentioned above, in particular sites where the crack depth is less than 0.75 m, such as cut natural ground or clay backfill, require specific engineering assessment to confirm their appropriate site classification.

f) The effects of nearby trees (whether existing, recently removed, or future planting) are not considered in these solutions. It is recommended that specific geotechnical engineering advice is obtained where a tree is within a lateral distance of 1.5 times its mature height of the foundations.

Maintenance of foundations in expansive soils

Normal maintenance is that work generally recognised as necessary to achieve the expected performance over time of the foundation located on expansive soils. Unless otherwise specified by the designer and noted on the drawings, basic normal maintenance tasks should ensure that:

a) the drainage and wetting of the site is controlled so that extremes of wetting and drying of the soils are prevented, and

b) the position and operation of gardens adjacent to the dwelling are controlled, and the planting of trees near to foundations is suitably restricted, and

c) any leaks which develop in plumbing, storm water or sanitary sewage systems are repaired promptly.

| Table 7.4A Reinforced concrete foundations in expansive soils for light wall claddings Clause 7.5.13 and Figure 7.22 | | | | |
|--|------------------------|------------------------|--------------|---------------|
| Expansive soil class | Slightly 'S' | Moderately 'M' | Highly 'H' | Extremely 'E' |
| Soil embedment (De) | 375 mm | 525 mm | 575 mm | 625 mm |
| Top steel (A _s top) | 2/D 16 | 2/D16 | 2/D16 | 2/D16 |
| Bottom steel (A _s bottom) | 1/D16 | 1/D25 | 1/D20 | 1/D25 |
| Stirrups | R6/ 125 crs. | R6/ 125 crs. | R6/ 300 crs. | R6/ 300 crs. |
| Maximum spacing of internal thickenings | no internal thickening | no internal thickening | 2.5 m crs. | 2.5 m crs. |
| Depth of thickening (D1) | – | – | 400 mm | 450 mm |
| Base width (B1) | – | – | 300 mm | 350 mm |
| Top steel (A _s top) | – | – | 2/D20 | 2/D20 |
| Bottom steel (A _s bottom) | – | – | 2/D16 | 2/D20 |
| Stirrups | – | – | R6/ 150 crs. | R6/ 150 crs. |

| Table 7.4B Reinforced concrete foundations in expansive soils for medium wall and heavy wall claddings Clause 7.5.13 and Figure 7.23 | | | | |
|--|--------------|----------------|--------------|---------------|
| Expansive soil class | Slightly 'S' | Moderately 'M' | Highly 'H' | Extremely 'E' |
| Soil embedment (De) | 500 mm | 550 mm | 775 mm | 800 mm |
| Top steel (A _s top) | 2/D16 | 2/D20 | 2/D20 | 3/D20 |
| Bottom steel (A _s bottom) | 2/D16 | 2/D16 | 2/D20 | 2/D20 |
| Stirrups | R6/ 125 crs. | R6/ 250 crs. | R6/ 300 crs. | R6/ 300 crs. |
| Maximum spacing of internal thickenings | – | 2.5 m crs. | 2.5 m crs. | 2.5 m crs. |
| Depth of thickening (D1) | – | 350 mm | 450 mm | 500 mm |
| Base width (B1) | – | 300 mm | 300 mm | 350 mm |
| Top steel (A _s top) | – | 2/D16 | 3/D20 | 3/D20 |
| Bottom steel (A _s bottom) | – | 2/D16 | 2/D16 | 2/D20 |
| Stirrups | – | R6/ 125 crs. | R6/ 150 crs. | R6/ 150 crs. |

Amend 19
Nov 2019

Client : DFH JOINT VENTURE LIMITED
Project Location : HITCHEN BLOCK STAGE 2, POKENO

Auger Borehole Nos. 548 & 550

Sheet 1 of 8

Job Number: J00113

Vane Head: 2784
 Logged By: PL
 Processor : PL
 Date: 04.02.21

| Borehole Location: | mN | mE | Ground R.L. | Legend | Depth (m) | Standing Water Level | Vane Shear (kPa) peak/ residual | Soil Sensitivity | Sample and Laboratory / Other Test Details |
|--|----|----|-------------|--------|-----------|----------------------|---------------------------------|------------------|--|
| Description: Refer to site plan | | | | | | | | | |
| SOIL DESCRIPTION | | | | | | | | | |
| Lot 548 | | | | | | | | | |
| TOPSOIL | | | | | 0.0 | | | | |
| clayey SILT, orange, red and grey streaked brown. Very stiff, moist, low plasticity, with trace fine gravel [FILL] | | | | | | | | | |
| silty CLAY, orange, white and red streaked brown. Very stiff, moist, medium plasticity, with trace fine gravel | | | | | 0.5 | UTP | | | |
| silty CLAY, orange streaked grey/brown. Very stiff, moist, high plasticity [NATURAL] becoming orange and brown streaked light grey | | | | | 1.0 | | 188+ | | |
| becoming red and orange streaked light grey | | | | | 1.5 | | 188+ | | |
| becoming medium plasticity | | | | | 2.0 | | 188+ | | |
| E.O.B. at 2.0m. Target Depth. | | | | | | | | | |
| Lot 550 | | | | | | | | | |
| TOPSOIL | | | | | 0.0 | | | | |
| silty CLAY with trace fine sand, orange and brown streaked orange. Very stiff, moist, medium to high plasticity, insensitive [NATURAL] | | | | | | | | | |
| becoming orange and brown streaked light grey, high plasticity | | | | | 0.5 | | 177/102 | 1.7 | |
| becoming red and orange streaked light grey | | | | | 1.0 | | 158/83 | 1.9 | |
| becoming orange, light grey streaked red/brown | | | | | 1.5 | | 132/94 | 1.4 | |
| becoming medium plasticity | | | | | 2.0 | | 132/97 | 1.4 | |
| E.O.B. at 2.0m. Target Depth. | | | | | | | | | |



Comments:
 Groundwater not encountered. (unless noted)
 UTP = unable to penetrate.
 EOB = end of borehole.

| | | | | |
|--------------------|---------|---------|-----------|----------|
| Borehole Diameter: | Topsoil | Sand | Sandstone | Plutonic |
| 50mm | Fill | Gravel | Siltstone | No Core |
| Checked: | Clay | Organic | Limestone | |
| KM | Silt | Pumice | Volcanic | |

Client : DFH JOINT VENTURE LIMITED
Project Location : HITCHEN BLOCK STAGE 2, POKENO

Auger Borehole Nos. 552 & 554

Sheet 2 of 8

Job Number: J00113

Vane Head: 2784
 Logged By: PL
 Processor : PL
 Date: 04.02.21

| Borehole Location: | mN | mE | Ground R.L. | Legend | Depth (m) | Standing Water Level | Vane Shear (kPa) peak/ residual | Soil Sensitivity | Sample and Laboratory / Other Test Details |
|---|----|----|-------------|--------|-----------|----------------------|---------------------------------|------------------|--|
| Description: Refer to site plan | | | | | | | | | |
| SOIL DESCRIPTION | | | | | | | | | |
| Lot 552 | | | | | | | | | |
| TOPSOIL | | | | | 0.0 | | | | |
| silty CLAY with trace fine sand, orange streaked orange/brown. Very stiff, moist, medium to high plasticity [NATURAL] | | | | | | | | | |
| becoming orange and light grey streaked orange/brown, high plasticity | | | | | 0.5 | | 188+ | | |
| becoming red and light grey streaked orange/brown | | | | | | | | | |
| becoming light grey and orange streaked red/brown, medium plasticity | | | | | 1.0 | | 188+ | | |
| becoming insensitive | | | | | 1.5 | | 150/107 | 1.4 | |
| becoming orange/brown streaked light grey | | | | | 2.0 | | 134/105 | 1.3 | |
| E.O.B. at 2.0m. Target Depth. | | | | | | | | | |
| Lot 554 | | | | | | | | | |
| TOPSOIL | | | | | 0.0 | | | | |
| silty CLAY, red and orange streaked light grey. Stiff, moist, medium plasticity, insensitive [NATURAL] | | | | | | | | | |
| becoming orange and light grey streaked red | | | | | 0.5 | | 81/51 | 1.6 | |
| becoming orange, black and orange/grey mottled, high plasticity | | | | | 1.0 | | 81/48 | 1.7 | |
| becoming very stiff | | | | | 1.5 | | 102/67 | 1.5 | |
| E.O.B. at 2.0m. Target Depth. | | | | | 2.0 | | 134/70 | 1.9 | |



Comments:
 Groundwater not encountered. (unless noted)
 UTP = unable to penetrate.
 EOB = end of borehole.

| | | | | | | | | |
|----------------------------|---------|--|---------|--|-----------|--|----------|--|
| Borehole Diameter: 50mm | Topsoil | | Sand | | Sandstone | | Plutonic | |
| | Fill | | Gravel | | Siltstone | | No Core | |
| Checked: KM | Clay | | Organic | | Limestone | | | |
| | Silt | | Pumice | | Volcanic | | | |

Client : DFH JOINT VENTURE LIMITED
Project Location : HITCHEN BLOCK STAGE 2, POKENO

Auger Borehole Nos. 557 & 567

Sheet 3 of 8

Job Number: J00113

Vane Head: 2784/1750
 Logged By: PL/NM
 Processor : PL
 Date: 09.02.21

| Borehole Location: | mN | mE | Ground R.L. | Legend | Depth (m) | Standing Water Level | Vane Shear (kPa) peak/ residual | Soil Sensitivity | Sample and Laboratory / Other Test Details |
|---|----|----|-------------|-------------------------|-----------|----------------------|---------------------------------|------------------|--|
| Description: Refer to site plan | | | | SOIL DESCRIPTION | | | | | |
| Lot 557 | | | | | | | | | |
| TOPSOIL | | | | 0.0 | | | | | |
| silty CLAY, light grey and orange streaked brown. Very stiff, moist, medium plasticity, with trace fine gravel [FILL] becoming red and white streaked orange/brown | | | | 0.5 | | | | | |
| becoming orange streaked dark grey | | | | | | | | | |
| becoming light grey streaked orange, high plasticity, insensitive | | | | 1.0 | | | | | |
| becoming orange streaked dark grey | | | | | | | | | |
| becoming red, white, orange, grey streaked orange/brown | | | | 1.5 | | | | | |
| becoming dark grey, moderately sensitive | | | | | | | | | |
| E.O.B. at 2.0m. Target Depth. | | | | 2.0 | | | | | |
| Lot 567 | | | | | | | | | |
| TOPSOIL | | | | 0.0 | | | | | |
| clayey SILT, brown, red and light grey mottled. Very stiff, dry to moist, low to no plasticity [FILL] | | | | 0.5 | | | | | |
| clayey SILT with trace fine sand, red speckled light grey. Hard, moist, low plasticity, insensitive [NATURAL] | | | | 1.0 | | | | | |
| silty CLAY with trace fine sand, red/orange streaked light grey. Very stiff, wet, high plasticity, insensitive | | | | 1.5 | | | | | |
| becoming white, medium to high plasticity, with trace medium sand | | | | 2.0 | | | | | |
| E.O.B. at 2.0m. Target Depth. | | | | | | | | | |



Comments:
 Groundwater not encountered. (unless noted)
 UTP = unable to penetrate.
 EOB = end of borehole.

| | | | | |
|--------------------|---------|---------|-----------|----------|
| Borehole Diameter: | Topsoil | Sand | Sandstone | Plutonic |
| 50mm | Fill | Gravel | Siltstone | No Core |
| Checked: | Clay | Organic | Limestone | |
| KM | Silt | Pumice | Volcanic | |

Client : DFH JOINT VENTURE LIMITED
Project Location : HITCHEN BLOCK STAGE 2, POKENO

Auger Borehole Nos. 572 & 577

Sheet 4 of 8

Job Number: J00113

Vane Head: 2784/1750
 Logged By: PL/NM
 Processor: PL
 Date: 09.02.21

| Borehole Location: | mN | mE | Ground R.L. | Legend | Depth (m) | Standing Water Level | Vane Shear (kPa) peak/ residual | Soil Sensitivity | Sample and Laboratory / Other Test Details |
|---|----|----|-------------|-------------------------|-----------|----------------------|------------------------------------|------------------|--|
| Description: Refer to site plan | | | | SOIL DESCRIPTION | | | | | |
| Lot 572 | | | | | | | | | |
| TOPSOIL | | | | 0.0 | | | | | |
| silty CLAY, orange, white and brown streaked red/brown. Very stiff, moist, medium plasticity, with trace fine gravel [FILL] | | | | 188+ | | | | | |
| becoming orange, black, light grey and red/brown streaked, without fine gravel | | | | 0.5 | | | | | |
| with trace fine gravel | | | | 1.0 | | | | | |
| becoming orange and brown | | | | 1.5 | | | | | |
| becoming red, white, black and brown mottled | | | | 188+ | | | | | |
| clayey SILT, light grey streaked grey/brown. Very stiff, moist, low plasticity | | | | 2.0 | | | | | |
| E.O.B. at 2.0m. Target Depth. | | | | | | | | | |
| Lot 577 | | | | | | | | | |
| TOPSOIL | | | | 0.0 | | | | | |
| clayey SILT, orange/red and grey speckled brown. Very stiff, dry to moist, low plasticity [NATURAL] | | | | 188+ | | | | | |
| becoming insensitive | | | | 1.0 | | | | | |
| becoming black streaked orange/red, grey and brown | | | | 134/70 1.9 | | | | | |
| | | | | 1.5 | | | | | |
| | | | | 161/78 2.1 | | | | | |
| fine SAND, orange/yellow. Medium dense, moist, no plasticity | | | | 2.0 | | | | | |
| E.O.B. at 2.0m. Target Depth. | | | | UTP | | | | | |



Comments:
 Groundwater not encountered. (unless noted)
 UTP = unable to penetrate.
 EOB = end of borehole.

| | | | | |
|--------------------|---------|---------|-----------|----------|
| Borehole Diameter: | Topsoil | Sand | Sandstone | Plutonic |
| 50mm | Fill | Gravel | Siltstone | No Core |
| Checked: | Clay | Organic | Limestone | |
| KM | Silt | Pumice | Volcanic | |

Client : DFH JOINT VENTURE LIMITED
Project Location : HITCHEN BLOCK STAGE 2, POKENO

Auger Borehole Nos. 579 & 581
 Sheet 5 of 8

Job Number: J00113

Vane Head: 1750/2784
 Logged By: NM/PL
 Processor : PL
 Date: 09.02.21

| | | | |
|--------------------|---------------------------------|----|-------------|
| Borehole Location: | mN | mE | Ground R.L. |
| | Description: Refer to site plan | | |

SOIL DESCRIPTION

| SOIL DESCRIPTION | Legend | Depth (m) | Standing Water Level | Vane Shear (kPa) peak/ residual | Soil Sensitivity | Sample and Laboratory / Other Test Details |
|--|--------|-----------|----------------------|---------------------------------|------------------|--|
| Lot 579 | | | | | | |
| TOPSOIL | | 0.0 | | | | |
| fine SAND, orange/yellow. Medium dense, dry to moist, no plasticity [NATURAL] becoming orange streaked grey | | 0.5 | | 270+ | | |
| becoming moderately sensitive | | 1.0 | | 227/58 | 3.9 | |
| becoming sensitive | | 1.5 | | 250/62 | 4.0 | |
| at 2.0m, becoming moderately sensitive E.O.B. at 2.0m. Target Depth. | | 2.0 | | 227/58 | 3.9 | |
| Lot 581 | | | | | | |
| TOPSOIL | | 0.0 | | | | |
| slightly clayey SILT with trace fine sand, orange streaked light grey/orange. Very stiff, moist, no plasticity [NATURAL] silty CLAY, light grey and orange streaked red. Very stiff, moist, medium to high plasticity becoming orange and light grey streaked brown/orange | | 0.5 | | 188+ | | |
| clayey SAND, orange streaked light grey. Hard, moist, no plasticity | | 1.0 | | UTP | | |
| becoming orange streaked brown becoming orange streaked light grey | | 1.5 | | UTP | | |
| E.O.B. at 2.0m. Target Depth. | | 2.0 | | UTP | | |



Comments:
 Groundwater not encountered. (unless noted)
 UTP = unable to penetrate.
 EOB = end of borehole.

| | | | | | | | | |
|----------------------------|---------|--|---------|--|-----------|--|----------|--|
| Borehole Diameter: 50mm | Topsoil | | Sand | | Sandstone | | Plutonic | |
| | Fill | | Gravel | | Siltstone | | No Core | |
| Checked: KM | Clay | | Organic | | Limestone | | | |
| | Silt | | Pumice | | Volcanic | | | |

Client : DFH JOINT VENTURE LIMITED
Project Location : HITCHEN BLOCK STAGE 2, POKENO

Auger Borehole Nos. 583 & 585

Sheet 6 of 8

Job Number: J00113

Vane Head: 2784
 Logged By: PL
 Processor : PL
 Date: 04.02.21

| | | | |
|--------------------|---------------------------------|----|-------------|
| Borehole Location: | mN | mE | Ground R.L. |
| | Description: Refer to site plan | | |

SOIL DESCRIPTION

| Legend | Depth (m) | Standing Water Level | Vane Shear (kPa) peak/ residual | Soil Sensitivity | Sample and Laboratory / Other Test Details |
|---|-----------|----------------------|------------------------------------|------------------|--|
| Lot 583 | | | | | |
| TOPSOIL | 0.0 | | | | |
| silty CLAY with trace fine sand, orange, white and brown streaked dark grey. Very stiff, moist, medium plasticity [NATURAL] at 0.3m, becoming orange and light grey streaked brown/orange | 0.5 | | 188+ | | |
| becoming stiff, insensitive | 1.0 | | 97/59 | 1.6 | |
| becoming high plasticity | 1.5 | | 137/94 | 1.5 | |
| becoming very stiff | 2.0 | | 188+ | | |
| becoming red/brown, orange and light grey streaked orange/brown | | | | | |
| becoming medium plasticity | | | | | |
| E.O.B. at 2.0m. Target Depth. | | | | | |
| Lot 585 | | | | | |
| TOPSOIL | 0.0 | | | | |
| silty CLAY with trace fine sand, orange. Very stiff, moist, medium plasticity, moderately sensitive [NATURAL] | 0.5 | | 158/43 | 3.7 | |
| clayey SILT with minor fine sand, orange. Very stiff, moist, low plasticity, moderately sensitive | 1.0 | | 140/40 | 3.5 | |
| becoming red streaked light grey and orange | 1.5 | | 172/54 | 3.2 | |
| becoming yellow/orange | 2.0 | | 124/54 | 2.3 | |
| becoming orange steaked light grey | | | | | |
| E.O.B. at 2.0m. Target Depth. | | | | | |



Comments:
 Groundwater not encountered. (unless noted)
 UTP = unable to penetrate.
 EOB = end of borehole.

| | | | | | | | | |
|----------------------------|---------|--|---------|--|-----------|--|----------|--|
| Borehole Diameter: 50mm | Topsoil | | Sand | | Sandstone | | Plutonic | |
| | Fill | | Gravel | | Siltstone | | No Core | |
| Checked: KM | Clay | | Organic | | Limestone | | | |
| | Silt | | Pumice | | Volcanic | | | |

Client : DFH JOINT VENTURE LIMITED
Project Location : HITCHEN BLOCK STAGE 2, POKENO

Auger Borehole Nos. 588

Sheet 7 of 8

Job Number: J00113

Vane Head: 2784
 Logged By: PL
 Processor : PL
 Date: 04.02.21

| Borehole Location: | mN | mE | Ground R.L. | Legend | Depth (m) | Standing Water Level | Vane Shear (kPa) peak/ residual | Soil Sensitivity | Sample and Laboratory / Other Test Details |
|---|----|----|-------------|--------|-----------|----------------------|---------------------------------|------------------|--|
| Description: Refer to site plan | | | | | | | | | |
| SOIL DESCRIPTION | | | | | | | | | |
| Lot 588 | | | | | | | | | |
| TOPSOIL | | | | | 0.0 | | | | |
| silty CLAY, red, white and orange streaked brown. Very stiff, moist, medium plasticity, with trace fine gravel [FILL] | | | | | 0.5 | | 188+ | | |
| silty CLAY, orange streaked light grey. Very stiff, moist, medium to high plasticity [NATURAL] | | | | | 1.0 | | 188+ | | |
| becoming high plasticity | | | | | 1.5 | | 167/129 | 1.3 | |
| becoming insensitive | | | | | 2.0 | | 150/105 | 1.4 | |
| becoming medium plasticity | | | | | | | | | |
| E.O.B. at 2.0m. Target Depth. | | | | | | | | | |



Comments:
 Groundwater not encountered. (unless noted)
 UTP = unable to penetrate.
 EOB = end of borehole.

| | | | | |
|--------------------|---------|---------|-----------|----------|
| Borehole Diameter: | Topsoil | Sand | Sandstone | Plutonic |
| 50mm | Fill | Gravel | Siltstone | No Core |
| Checked: | Clay | Organic | Limestone | |
| KM | Silt | Pumice | Volcanic | |

Client : DFH JOINT VENTURE LIMITED
Project Location : HITCHEN BLOCK STAGE 2, POKENO

Auger Borehole Nos. 590 & 592

Sheet 8 of 8

Job Number: J00113

Vane Head: 2784
 Logged By: PL
 Processor : PL
 Date: 04.02.21

| Borehole Location: | mN | mE | Ground R.L. | Legend | Depth (m) | Standing Water Level | Vane Shear (kPa) peak/ residual | Soil Sensitivity | Sample and Laboratory / Other Test Details |
|--|----|----|-------------|-------------------------|-----------|----------------------|---------------------------------|------------------|--|
| Description: Refer to site plan | | | | SOIL DESCRIPTION | | | | | |
| Lot 590 | | | | | | | | | |
| TOPSOIL | | | | | 0.0 | | | | |
| clayey SILT, orange, grey and red streaked brown/orange. Very stiff, moist, low plasticity, with trace fine gravel [FILL] | | | | | 0.5 | | 188+ | | |
| silty CLAY, light grey/orange streaked, black mottled, brown/orange. Very stiff, moist, medium plasticity, without fine gravel | | | | | | | | | |
| silty CLAY, orange streaked brown/orange. Very stiff, moist, medium plasticity [NATURAL] | | | | | 1.0 | | 188+ | | |
| becoming orange streaked light grey/orange, high plasticity | | | | | | | | | |
| becoming insensitive becoming orange, red streaked light grey | | | | | 1.5 | | 183/99 | 1.8 | |
| becoming medium plasticity | | | | | | | | | |
| E.O.B. at 2.0m. Target Depth. | | | | | 2.0 | | 188+ | | |
| Lot 592 | | | | | | | | | |
| TOPSOIL | | | | | 0.0 | | | | |
| silty CLAY, light grey streaked orange. Very stiff, moist, medium to high plasticity [NATURAL] | | | | | | | | | |
| becoming orange, red streaked light grey, medium plasticity | | | | | 0.5 | | 188+ | | |
| becoming light grey, orange streaked red/brown | | | | | | | | | |
| becoming insensitive | | | | | 1.0 | | 148/86 | 1.7 | |
| becoming high plasticity | | | | | 1.5 | | 161/107 | 1.5 | |
| E.O.B. at 2.0m. Target Depth. | | | | | 2.0 | | 132/94 | 1.4 | |



Comments:
 Groundwater not encountered.
 (unless noted)
 UTP = unable to penetrate.
 EOB = end of borehole.

| | | | | |
|--------------------|---------|---------|-----------|----------|
| Borehole Diameter: | Topsoil | Sand | Sandstone | Plutonic |
| 50mm | Fill | Gravel | Siltstone | No Core |
| Checked: | Clay | Organic | Limestone | |
| KM | Silt | Pumice | Volcanic | |

16/02/18

Friday, 16 February 2018 12:27 p.m.

Site Inspection Record

| | |
|-------------------|------------------------|
| Project # & Name: | J00113 - Hitchen Block |
| Date & Time: | 16/02/18 10am |
| Author: | CE |
| Plant Operating: | |
| Weather: | |

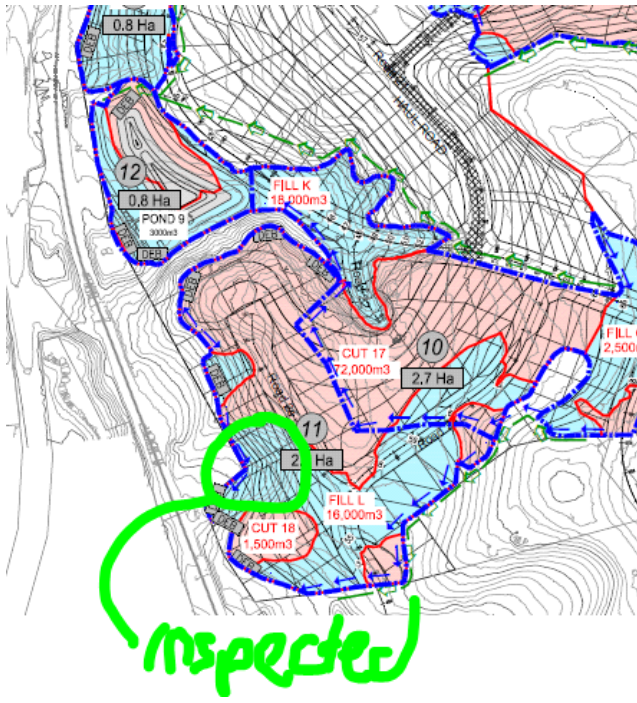
Site Observations and Instructions:

Requested to site by Trevor to inspect topsoil strip of Fill area L.

Noted that the topsoil had been stripped adequately to expose stiff natural ground. Requested that an underfill drain is installed as per the picture below, the slope still needs to be benched.



Requested underfill drain in green.



19/02/18

Monday, 19 February 2018 9:28 a.m.

Site Inspection Record

| | |
|-------------------|------------------------|
| Project # & Name: | J00113 - Hitchen Block |
| Date & Time: | 19/02/18 9am |
| Author: | CE |
| Plant Operating: | |
| Weather: | Fine |

Site Observations and Instructions:

Photos from Trevor of Fill L drainage installation. Installation appears to have occurred as per CAN that we issued on the matter.







19/03/18

Tuesday, 20 March 2018 3:02 p.m.

Site Inspection Record

| | |
|-------------------|------------------------|
| Project # & Name: | J00113 - Hitchen Block |
| Date & Time: | 19/03/18 1pm |
| Author: | CE |
| Plant Operating: | |
| Weather: | Fine |

Site Observations and Instructions:

Observation of progress of works on site. They have only 2 scrapers and 1 compactor working (as rest of plant is on the Bridge and Hynds).

Cut to fill around the pond area in the western part of stage 3 is the focus currently. Have asked Mike to get in contact with Trevor to ensure the appropriate level of fill testing is taking place.















