

22 June 2021

45 STATION ROAD, STAGE 1B

HUAPAI

GEOTECHNICAL COMPLETION REPORT

Cabra Developments Limited

Ref: AKL2016_0634AP Rev. 0

AKL2016_0634AP		
Date	Revision	Comments
14 June 2021	A	Initial draft for internal review
22 June 2021	0	Final issue to client




	Name	Signature	Position
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Authorised by	Richard Knowles		Principal Geotechnical Engineer, CPEng



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1. INTRODUCTION

In accordance with our instructions, this Geotechnical Completion Report has been prepared for Cabra Development Limited as part of the documentation to be submitted to Auckland Council following earthworks to form Stage 1B of the Huapai Triangle Sub Precinct A (45 Station Road, Huapai) Development. Construction of this residential subdivision has been undertaken in accordance with the Auckland Council Resource Consent number ENG 60068582 and SUB 60035794 and Engineering Approval letter dated 23 February 2017. Specific structures constructed during the civil works to create the subdivision include timber pole retaining walls and a keystone retaining wall.

This report contains our Suitability Statement, specific comments related to items raised in the Resource Consent, relevant test data and the Cato Bolam Consultants As-built plan set as provided in Appendix B.

This report covers the construction period December 2016 to March 2021 and is intended to be used for certification purposes for new lots (listed below) created from Lot 1 DP 540873 as follows:

- 27 new residential lots numbered 59 and 67 to 92;
 - Lots 67 and 68 are to be further subdivided into Lots 1 to 10 under Resource Consent number BUN 60372292;
 - Lots 86 and 87 are to be further subdivided into Lots 1 to 10 under Resource Consent number SUB 60374214;
 - Lot 92 is to be further subdivided into Lots 1 to 11 under Resource Consent number SUB 60368220.
- an extension to the existing Schoolside Road;
- 2 new avenues named Croatia Avenue and Podgora Avenue respectively;

This stage of the 45 Station Road Development is located off Station Road, Huapai. As can be seen from the As-built plans, 21 of the lots have been affected by filling as part of the earthworks operations to a maximum depth of approximately 6.1 metres.

2. PROJECT BACKGROUND

The geotechnical investigations and design were undertaken by CMW Geosciences as presented in the following reports:

- Geotechnical Report for Huapai Development Stage 1, Huapai, prepared by CMW Geosciences referenced 2015_1029AB Rev.0 dated 24 November 2014;
- Geotechnical Investigation Report prepared by CMW Geosciences, referenced AKL2017_0089AB Rev.0 dated 12 July 2017;
- Geotechnical Investigation Report prepared by CMW Geosciences, referenced AKL2018-0195AA Rev.0 dated 12 December 2018;
- Stage 1A & 1B Retaining Wall Designs prepared by CMW Geosciences, referenced AKL2016_0634AD Rev.0 dated 23 March 2017;
- Remaining Scope of Stage 1A & 1B Retaining Wall Designs prepared by CMW Geosciences, referenced AKL2016_0634AH Rev.1 dated 19 March 2019;

3. DESCRIPTION OF EARTHWORKS

Earthworks operations for the entire 45 Station Road Development began in early December 2016 with the installation of silt fences and other environmental controls, including formation of a sediment retention pond

in the southern end of Lot 92. Cut and fills for Stage 1B were conducted in conjunction with the other stages of this development and with neighbouring developments, all of which were under the observation of CMW Geosciences. The majority of this stage is in fill, with an area of cut required to form approximately 9 of the northern lots and a portion of Croatia Avenue, Schoolside Road and Podgora Avenue.

Bulk cut to fill was ongoing from December 2016 through to March 2017 within Stage 1B and the wider subdivision. A gully muck-out was completed in the southern portion of the stage, falling from west to east, and two subsoil drain coils were placed surrounded by scoria and Bidim cloth in the base of this muck-out. The subsoil drains from this undercut extend through from Stage 1A in the west, under retaining wall 11C and through Lot 69 towards the southeast.

Additional areas of soft and/or unsuitable materials were undercut below Lots 85 to 88 and the southern end of Lot 92. Subsoil drains were installed within the undercuts to capture groundwater springs and these drains were then connected into the main subsoil drain network.

Retaining wall construction for timber pole walls 13A, 13B and 13C began in May 2017. The retaining wall construction and earthworks within Stage 1B were then put on hold from the end of the 2017 earthworks season while the surrounding stages were developed.

In September 2020 the earthworks within Stage 1B was restarted with the muck out of the existing sediment retention pond in Lot 92 and filling beginning in early October 2020. The sediment retention pond was reduced in size through the earthworks operations, with a Decanting Earth Bund (DEB) left for sediment control during civil works operations. October also saw the construction of the remainder of the timber pole retaining walls within this stage.

Civil works including road construction also began in October 2020 and continued until completion of this stage in March 2021. A keystone retaining wall along the northern boundary of Lot 77 was constructed and completed in March 2021. The muck out and filling of the DEB within Lot 92 was the final area to be completed in Stage 1B and saw the completion of the subdivision in late March 2021.

4. GEOTECHNICAL QUALITY CONTROL

4.1. Site Observations

During the earthworks, site visits were typically undertaken several times each week to assess compliance with NZS 4431 and specific design recommendations and specifications.

Site visits were carried out to observe and confirm compliance relating to:

- Adequate topsoil stripping;
- Fill areas prior to the placement of fill materials to ascertain that all mullock and soft inorganic subsoils had been removed;
- Installation and backfilling of subsoil drains;
- Excavation and backfilling of sewer and stormwater trenches;
- Construction of cantilever timber pole retaining walls including ground conditions, pile size, spacing and depth; and
- Construction of keystone walls including ground conditions, block placement, geogrid placement and hardfill backfill;
- Placement and compaction of engineered fills.

4.2. Compaction Control

Compaction of engineered earth fills was controlled by undrained shear strength measured by handheld shear vane calibrated using the NZGS 2001 method and by air voids as defined by NZS4402.

The criteria for undrained shear strength were a minimum single value of 110 kPa and minimum average of any 10 consecutive tests of 140 kPa.

The criteria for air voids were a maximum single value of 12% and maximum average of any 10 consecutive tests of 10%.

Vane shear strength, water content and in situ density tests were carried out on all areas of the engineered filling to at least the frequency recommended by NZS 4431.

These tests showed on occasions that the contractor was struggling to achieve the required compaction standards with the prevailing site and soil conditions, but to the best of our knowledge, all areas of fill were re-worked as necessary. Subsequent testing confirmed compliance with the specification.

5. EVALUATION OF COMPLETED EARTHWORKS

5.1. Natural Hazards

The appended as-built drawings depict the extents of a series of zones that contain limitations intended to ensure that future building and/ or earthworks on the lots is undertaken in a manner that does not lead to buildings being subject to any of the natural hazards described in Section 71(3) of the Building Act, i.e. erosion, falling debris, subsidence, slippage, and inundation. Consideration of the inundation hazard was outside the scope of CMW's brief and has been assessed by others. The applied zones on this subdivision are all **Specific Design Zones (retaining)** - intended to protect the subdivision retaining walls from overloading at the crest or undermining at the toe that could lead to instability.

Full descriptions of the restrictions associated with these zones are presented in the Suitability Statement (Appendix A). Additional information is also provided in some of the following sections.

5.2. Natural Soils Geotechnical Assessment

Portions of lots within this stage of the subdivision are formed partially within natural soils, which are predominantly of alluvial origin.

Hand auger boreholes conducted in the centre of each lot as part of the post earthworks investigations did not encounter further lenses of organically stained soils but observed some lower strength natural subsoils.

While not expected, some discrete lenses of organic stained clay soils may still exist within the natural soils beneath lot areas. We do not consider that liquefaction and/or settlement due to discrete lenses of organically stained clay soils are a significant geotechnical risk for development or future residential dwellings built in general accordance with NZS 3604.

5.3. Land Stability and Erosion Control

The subdivision scheme layout includes a series of batters to form the slope above some of the subdivision retaining walls. The batters are part of the residential lots with maximum gradients of 1(v) in 2.5(h) as depicted on the as-built drawings.

Design of the works to provide appropriate stability conditions that meet regulatory requirements for the land within this stage has led to the construction of deep subsoil drainage, cantilever pole retaining walls and keystone walls.

Building and landscape designers must ensure that all runoff from solid surfaces is directed into the stormwater system. It is also important that care is paid to the disposal of stormwater during construction so that concentrated discharges (e.g. from unconnected spouting) are not directed towards steep ground.

Depths of mulch and topsoil applied to sloping areas should be limited to less than 150mm to minimise the risks of saturation leading to localised slumping on batter faces. Wherever practical on such land, and particularly on steep batters, existing vegetation and grass cover should be well maintained. Any vegetation cleared beyond the immediate area of building platforms for temporary construction purposes should be replanted or replaced as soon as possible. The roots of an established vegetation cover can serve to bind the surface soils while the foliage can reduce rain infiltration and soil saturation, resulting in better resistance to erosion and shallow slumping.

5.4. Retaining Walls

Cantilever timber pole and keystone retaining walls have been constructed in the locations shown on the appended Cato Bolam Limited As-built Plans. These walls reach a maximum height of approximately 1.5 metres and were designed by CMW Geosciences, and the construction was also observed by this consultancy. Copies of the Producer Statements - Construction Review (PS4) are provided in Appendix E.

The timber pole retaining walls along the western boundary of Lots 59 and 67 to 73 were constructed as part of the Stage 1A development under the Building Consent number BCO10092414-1-B and the associated PS4 is also provided in Appendix E.

Descriptions of the building and earthworks restrictions within the vicinity of these walls (Specific Design Zones – retaining) are contained in the Suitability Statement in Appendix A. Lots containing these zones include lots 59 and 67 to 91 inclusive.

5.5. Fill Induced Settlement

On the basis of the elapsed time since fill has been placed across this stage of the subdivision, we consider that remaining post-construction settlements will be within code limits.

5.6. Service Line Trenches

As part of the civil works, sanitary sewer and stormwater services were trenched throughout the development as shown on the appended Cato Bolam Consultants Stormwater and Wastewater As-built Plans.

As is normal on all subdivisions, building developments involving foundations within a 45 degree zone of influence from pipe inverts will require engineering input. The Auckland Council drawing referenced SW22 provided in Appendix B extracted from Chapter 4 of the Auckland Council Code of Practice for Land Development and Subdivision depicts their requirements for stormwater pipes. Details for water and wastewater pipes are available in the Watercare COP1 - General Requirements and Procedures. The majority of lots are known to have service trenches within the lots as shown on the appended stormwater and wastewater as-built plans, with the relevant zone of influence related to the stormwater pipes indicated on the Cato Bolam drawing titled Stormwater Zone of Influence As Built Plan Stage 1B, reference 42358-DR-SU-9304. The resulting restrictions are presented in the Suitability Statement below.

5.7. Subsoil Drains

The appended Cato Bolam Consultants Cut/Fill As-built Plans show the positions of counterfort drains which were constructed in the natural ground during the earthworks operations. The drains were installed to help control groundwater levels and are either linked to the reticulated storm water system or extend to formed outlets within bush reserve areas. The ongoing operation of these drains is important to the overall stability conditions of the site.

Typical trench excavations extended into natural ground and lie between 2.8 and 6.1 metres below the finished surface. Accordingly, they are predominantly beyond the depths of anticipated foundations.

Descriptions of the restrictions related to these subsoil drains are contained in the appended Suitability Statement.

5.8. Road Subgrades

Penetration resistance testing was carried out on the road subgrades during construction and the results of this testing were forwarded to Cato Bolam Consultants for pavement remedial design. Where soft ground with low equivalent CBR values was identified it was generally undercut and replaced with engineered fill, including placement of geogrid and geotextile cloth. All road subgrade areas were subsequently lime/cement stabilised to achieve appropriate CBR values.

5.9. Design of Shallow Foundations

5.9.1. Bearing Capacity

Once bulk earthworks and top-soiling of the building platforms had been completed, our staff drilled hand auger boreholes on platforms in natural ground to determine representative finished ground conditions and hence evaluate likely foundation options for future building development. Our assessments of bearing capacity for the design of shallow foundations on each building platform are contained in the appended Suitability Statement.

At current subgrade levels Lots 59 and 67 to 92 inclusive have been assessed as having a geotechnical ultimate bearing capacity of 300kPa within the influence of conventional shallow residential building foundation loads.

If higher geotechnical ultimate bearing capacities are required, further specific site investigation and design of foundations should be carried out prior to Building Consent application.

5.9.2. Seismic Site Subsoil Category

Based on the ground conditions observed during earthworks testing, combined with experience working in the surrounding area, the seismic site subsoil category for all lots within Stage 1B is assessed as being Class C (shallow soil site) in accordance with NZS 1170.5.

5.9.3. Foundation Settlements

At the bearing pressures specified above, and subject to the design requirements for soil expansiveness provided below, differential settlement of shallow foundations for buildings designed in accordance with NZS 3604 (including the 600mm subfloor fill depth limit) should be within code limits.

5.9.4. Soil Expansiveness Classification

Seasonal shrinking and swelling results in vertical surface ground movement which can cause significant cracking of floor slabs and walls. NZS 3604:2011¹ excludes from the definition of 'good ground', soils with a liquid limit of more than 50% and a linear shrinkage of more than 15% due to their potential to shrink and swell as a result of seasonal fluctuations in water content. For soils exceeding these limits, NZS 3604 has historically referenced AS 2870² for foundation design advice. However, the November 2019 update of Acceptable Solution B1/AS1³ provides amendments to NZS 3604 that define a method for testing and

¹ Standards New Zealand (2011) Timber-framed buildings, NZS 3604:2011, NZ Standard

² Standards Australia Limited (2011) *Residential slabs and footings*, AS 2870-2011, Australian Standard, NSW

³ Ministry of Business, Innovation and Employment (2019) *Acceptable Solutions and Verification Methods for NZ Building Code Clause B1 Structure*, B1/AS1, Amendment 19

classifying the soils and provides foundation designs for specific, simple house configurations across the range of expansive soil conditions.

Nevertheless, there is evidence⁴ indicating that the use of the B1/AS1 method of assessment of expansiveness may be inaccurate.

8 sets of soil tests were carried out on samples taken from likely foundation level on lots within this stage of the development. Testing was carried out in accordance with NZS 4402, "Methods of Testing Soils for Civil Engineering Purposes" test 2.2 and 2.6 and were used in conjunction with visual-tactile assessment of the site soils and BRANZ Report SR120A⁵ to determine expansive site Classes as defined in AS 2870, "Residential Slabs and Footings – Construction". All test results are appended.

The expansive soil hazard is addressed by a combination of appropriate foundation design, careful site preparation and diligent maintenance of plantings near the foundations.

Foundation Design

We have assessed the AS 2870 Site Class for lots on this stage of the development to be as detailed below:

- M (Medium) – Lots 59, 67 to 76 inclusive and Lot 92,
- H1 (High) – Lots 79 to 84 inclusive and Lots 88 to 91 inclusive,
- E (Extreme) – Lots 77, 78 and 85 to 87 inclusive.

Details of foundation options for these Classes are contained in the appended Suitability Statement.

Site Preparation

There have been instances of concrete floors and/ or foundations that have been poured on dry, desiccated subgrades in summer months on expansive soils and have undergone heaving and cracking requiring extensive repairs or re-building once the soil moisture contents have returned to higher levels. In some instances, perimeter foundations have been appropriately treated but floor slabs have been poured on dry ground. Infiltration of moisture via pipe bedding has then occurred.

Foundation contractors need to be made aware of the extreme damage potentially caused by these circumstances and the need to maintain appropriate moisture contents in the footings and building platform subgrade between the time of excavation and the pouring of concrete.

Remedial actions that may be appropriate include platform protection with a hard fill layer, pouring of a blinding layer of concrete in footing bases and soaking of the building platform with sprinklers for an extended period.

Site Maintenance

Landowners must be mindful that either the planting or removal of high water demand plants where their roots may extend close to footings (i.e. within a lateral distance of 1.5 times the mature tree height) can cause settlement or heave damage.

5.10. Topsoil Depths

Topsoil depths have been checked by the drilling of a borehole in the approximate centre of the building platform on each lot. The results are considered indicative for each lot, but may be subject to variations. Topsoil depths range between 100 and 300mm on these stages of the development.

⁴ Rogers, N., McDougall, N., Twose, G., Teal, J. & Smith, T. (2020) The Shrink Swell Test: A Critical Analysis, *NZ Geomechanics News*, Issue 99, pages 66-80.

⁵ Fraser Thomas Limited (2008) - Addendum Study Report (BRANZ SR120A), Soil Expansivity in the Auckland Region – Final Report

Site specific findings are contained in the appended Suitability Statement Summary (Appendix A). However, it is possible that further levelling works have been undertaken since our investigations and accordingly, we strongly recommend that lot purchasers complete their own checks of topsoil depths.

6. CLOSURE

The appended Statement of Professional Opinion is provided to the Auckland Council and Cabra Developments Limited for their purposes alone on the express condition that it will not be relied upon by any other person. It is important that prospective purchasers satisfy themselves as to any specific conditions pertaining to their particular land interest.

Although regular site visits have been undertaken for observation, for providing guidance and instruction and for testing purposes, the geotechnical services scope did not include full time site presence. To this end, our appended Suitability Statement also relies on the Contractors' work practices and assumes that when we have not been present to observe the work, it has been completed to high standards and in accordance with the drawings, instructions and consent conditions provided to them.

Similarly it assumes that all as-built information and other details provided to the Client and/or CMW by other members of the project team are accurate and correct in all respects.

**Appendix A: Statement of Professional Opinion
as to the Suitability of Land for Building
Development**

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

I, Richard Knowles, of CMW Geosciences (NZ) Limited, Auckland, hereby confirm that:

1. As a Chartered Professional Engineer experienced in the field of geotechnical engineering, I am a Geotechnical Engineer as defined in Section 1.2.2 of NZS 4404 and was retained by the Developer as the Geotechnical Engineer on Stage 1B of the Huapai Triangle Sub Precinct A (45 Station Road, Huapai) Development.
2. The extent of preliminary investigations carried out to date are described in:
 - Geotechnical Report for Huapai Development Stage 1, Huapai, prepared by CMW Geosciences referenced 2015_1029AB Rev.0 dated 24 November 2014;
 - Geotechnical Investigation Report prepared by CMW Geosciences, referenced AKL2017_0089AB Rev.0 dated 12 July 2017;
 - Geotechnical Investigation Report prepared by CMW Geosciences, referenced AKL2018-0195AA Rev.0 dated 12 December 2018;

The conclusions and recommendations of these documents have been re-evaluated in the preparation of this report. The results of all tests carried out are also appended.

3. In my professional opinion, not to be construed as a guarantee, I consider that:
 - (a) The earth fills shown on the appended Cato Bolam Consultants Cut/Fill As-built Plans have been placed in compliance with NZS 4431, the Auckland Council Unitary Plans and related documents.
 - (b) **Specific Design Zone (Retaining) areas** have been applied on lots 59 and 67 to 91 inclusive for the protection of the function of the retaining walls. The retaining walls on, or adjacent to, this stage of the development were designed for the following limits:
 - Timber Pole Wall 9 and 10 (Lot 59) – Maximum of 1(V):2.5(H) slope behind the wall, 5° toe slope and 12kPa surcharge;
 - Timber Pole Wall 11A (Lots 67 to 73) – Maximum of 1(V):2.5(H) slope behind the wall, 5° toe slope and 12kPa surcharge;
 - Timber Pole Wall 11B (Lots 74 to 76) – Maximum of 5° slope behind the wall, 5° toe slope and 12kPa surcharge;
 - Timber Pole Wall 11C (Lot 76) – Maximum of 5° slope behind the wall, 5° toe slope and 12kPa surcharge;
 - Timber Pole Wall 13B (Lots 84 to 91) – Maximum of 1(V):2.5(H) slope behind the wall, 5° toe slope and 12kPa surcharge;
 - Timber Pole Wall 13C (Lot 91) – Maximum of 5° slope behind the wall, 5° toe slope and 12kPa surcharge;
 - Keystone Retaining Wall 12 (Lot 77) – Maximum of 1(V):2.5(H) slope behind the wall, 0° toe slope and 12kPa surcharge;

No building construction and no earthworks (i.e. cut or fills) should take place within the Specific Design Zone areas that exceed these design limits on the walls unless endorsed by a Chartered Professional Engineer experienced in geomechanics and familiar with the contents of this report who has considered the stability implications of the earthworks and/ or building proposals on the retaining walls.

- (c) The function of the subsoil drains installed beneath lots 68, 69, 85 to 87 and 92 inclusive must not be impaired by any building development or landscaping works. Any bored or driven piles must be positioned to avoid damaging the draincoils. Where any subsoil drain is intercepted by building works, it must be reinstated under the direction of a Chartered Professional Engineer to ensure the integrity of the subsoil drainage system.
- (d) A geotechnical ultimate bearing capacity of 300kPa may be assumed for shallow foundation design on the building platforms of Lots 59 and 67 to 92 inclusive.

If for any reason higher geotechnical bearing capacities are required, further specific site investigation and design of foundations should be carried out prior to Building Consent application.

- (e) The expansive site Class for all lots in Stage 1B has been assessed as the following from AS2870:
- M (Medium) – Lots 59, 67 to 76 inclusive and Lot 92,
 - H1 (High) – Lots 79 to 84 inclusive and Lots 88 to 91 inclusive,
 - E (Extreme) – Lots 77, 78 and 85 to 87 inclusive.
- (f) The backfilling and compaction of the stormwater and sanitary sewer trenches on this subdivision has been carried out to appropriate standards having regard for the prevailing ground conditions and associated compaction induced pipe loadings.

However, no building development should take place within the 45 degree zone of influence of drain inverts unless endorsed by specific design and by construction inspections undertaken by a Chartered Professional Engineer experienced in geomechanics to ensure that lateral stability and differential settlement issues are addressed and that building loads are transferred beyond the influence of the pipe and trench backfill. A copy of drawing SW22 extracted from Chapter 4 of the Auckland Council Code of Practice for Land development and Subdivision this document is provided in Appendix B for clarification. Details for water and wastewater pipes are available in the Watercare COP1 - General Requirements and Procedures. Cato Bolam have also provided a plan within their As-Built set showing the general extent of the zone of influence of these pipes.

- (g) Subject to the geotechnical limitations, restrictions and recommendations contained in clauses 3(b), 3(c), 3(d), 3(e) and 3(f) above:
- (i) The filled and natural ground is generally suitable for residential buildings constructed in accordance with NZS 3604 and the requirements of AS2870 for the appropriate expansive soil class.
- (ii) Where shallow foundations are appropriate, design may be carried out in accordance with AS2870 (soil classifications for lots within this stage are detailed in clause (e) above) or alternately, a specific foundation and structural design may be undertaken by a Chartered Professional Engineer.

4. Road subgrades have been formed with appropriate regard for slope stability and settlement risks.

The following table summarises the conditions on each of each residential lot.

For and on behalf of CMW Geosciences



Richard Knowles

Principal Geotechnical Engineer, CPEng.

Condition	Specific Design Zone (retaining)	Subsoil Drains Present	Geotechnical Ultimate Bearing Capacity (kPa)	AS2870 Expansive Class	Service Lines Restrictions	Indicative Topsoil Depth (mm)
GCR SOPO Clause	3(b)	3(c)	3(d)	3(e)	3(f)	
Lot number						
59	●		300	M	●	300
67	●		300	M	●	300
68	●	●	300	M	●	300
69	●	●	300	M	●	300
70	●		300	M	●	300
71	●		300	M	●	200
72	●		300	M	●	300
73	●		300	M	●	300
74	●		300	M	●	300
75	●		300	M	●	300
76	●		300	M	●	300
77	●		300	E	●	200
78	●		300	E	●	200
79	●		300	H1	●	300
80	●		300	H1	●	300
81	●		300	H1	●	250
82	●		300	H1	●	300
83	●		300	H1	●	200
84	●		300	H1	●	200

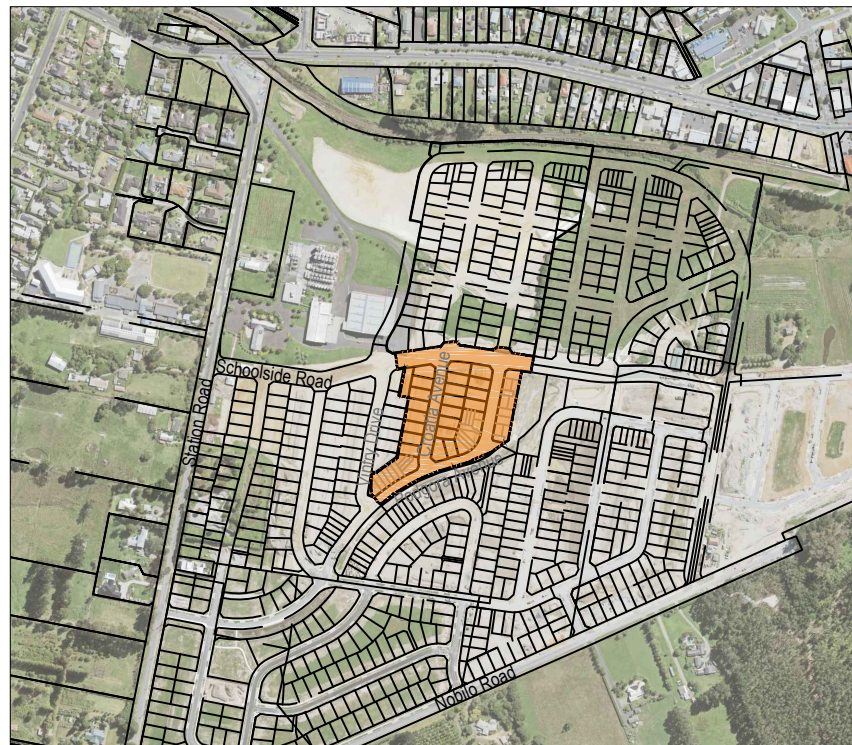
Condition	Specific Design Zone (retaining)	Subsoil Drains Present	Geotechnical Ultimate Bearing Capacity (kPa)	AS2870 Expansive Class	Service Lines Restrictions	Indicative Topsoil Depth (mm)
GCR SOPO Clause	3(b)	3(c)	3(d)	3(e)	3(f)	
85	●	●	300	E	●	100
86	●	●	300	E	●	300
87	●	●	300	E	●	200
88	●		300	H1	●	300
89	●		300	H1	●	200
90	●		300	H1	●	300
91	●		300	H1	●	250
92		●	300	M		200

Appendix B: Drawings

Title	Reference No.	Date	Revision
Cato Bolam Consultants Lot Number Reference Asbuilt Plans – Stage 1B	42358-DR-SU-0001	May 2021	0
Cato Bolam Consultants Final Contours and Retaining Walls Asbuilt Plans – Stage 1B (Sheets 1 to 3)	42358-DR-SU-9000 to 9002	May 2021	0
Cato Bolam Consultants Retaining Wall Specific Design Asbuilt Plans – Stage 1B (Sheets 1 to 2)	42358-DR-SU-9005 to 9006	May 2021	0
Cato Bolam Consultants Retaining Wall Cut/Fill Asbuilt Plan – Stage 1B (Sheets 1 to 3)	42358-DR-SU-9010 to 9012	May 2021	0
Cato Bolam Consultants Wastewater Asbuilt Plans – Stage 1B (Sheets 1 to 3)	42358-DR-SU-9200 to 9202	May 2021	0
Cato Bolam Consultants Stormwater Asbuilt Plans – Stage 1B (Sheets 1 to 3)	42358-DR-SU-9300 to 9302	May 2021	1
Cato Bolam Consultants Stormwater Connections Asbuilt Plan – Stage 1B	42358-DR-SU-9303	May 2021	0
Cato Bolam Consultants Stormwater Zone of Influence Asbuilt Plan – Stage 1B	42358-DR-SU-9304	May 2021	0
Auckland Council Stormwater Pipe and Manhole Construction Clearance Requirements	ACSD SW22	September 2013	1

Cabra Developments Ltd - 45 Station Road, Huapai - Stage 1B

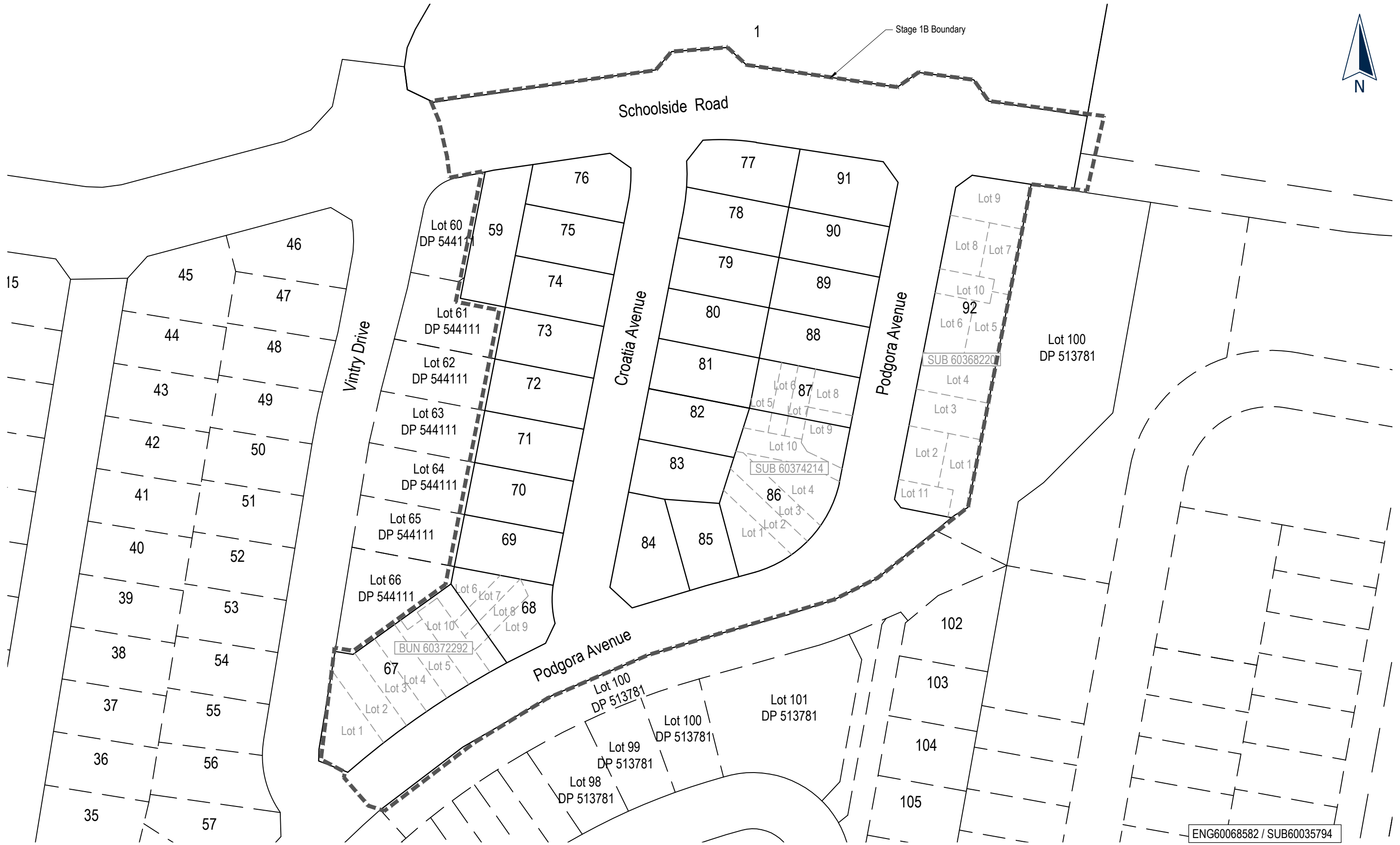
For Completion



LOCATION DIAGRAM

Scale 1:10,000

Plan No	Rev	Plan Title	Plan No	Rev	Plan Title
General					
9800	0	Lot Number Reference As Built Plan Stage 1B	9300	0	Stormwater As Built Plan Stage 1B (Sheet 1 of 3)
Earthworks					
9000	0	Final Contours & Retaining Walls As Built Plan Stage 1B (Sheet 1 of 3)	9301	0	Stormwater As Built Plan Stage 1B (Sheet 2 of 3)
9001	0	Final Contours & Retaining Walls As Built Plan Stage 1B (Sheet 2 of 3)	9302	0	Stormwater As Built Plan Stage 1B (Sheet 3 of 3)
9002	0	Final Contours & Retaining Walls As Built Plan Stage 1B (Sheet 3 of 3)	9303	0	Stormwater Connections As Built Plan Stage 1B
9005	0	Retaining Wall Specific Design As Built Plan Stage 1B (Sheet 1 of 2)	9304	0	Stormwater Zone of Influence As Built Plan Stage 1B
9006	0	Retaining Wall Specific Design As Built Plan Stage 1B (Sheet 2 of 2)	Water		
9010	0	Cut Fill As Built Plan Stage 1B (Sheet 1 of 3)	9400	1	Water Supply As Built Plan Stage 1B (Sheet 1 of 4)
9011	0	Cut Fill As Built Plan Stage 1B (Sheet 2 of 3)	9401	0	Water Supply As Built Plan Stage 1B (Sheet 2 of 4)
9012	0	Cut Fill As Built Plan Stage 1B (Sheet 3 of 3)	9402	0	Water Supply As Built Plan Stage 1B (Sheet 3 of 4)
Roading					
9100	0	Roading As Built Plan Stage 1B (Sheet 1 of 4)	9403	0	Water Supply As Built Plan Stage 1B (Sheet 4 of 4)
9101	0	Roading As Built Plan Stage 1B (Sheet 2 of 4)			
9102	0	Roading As Built Plan Stage 1B (Sheet 3 of 4)			
9103	0	Roading As Built Plan Stage 1B (Sheet 4 of 4)			
Wastewater					
9200	1	Wastewater As Built Plan Stage 1B (Sheet 1 of 3)			
9201	0	Wastewater As Built Plan Stage 1B (Sheet 2 of 3)			
9202	0	Wastewater As Built Plan Stage 1B (Sheet 3 of 3)			



ENG60068582 / SUB60035794



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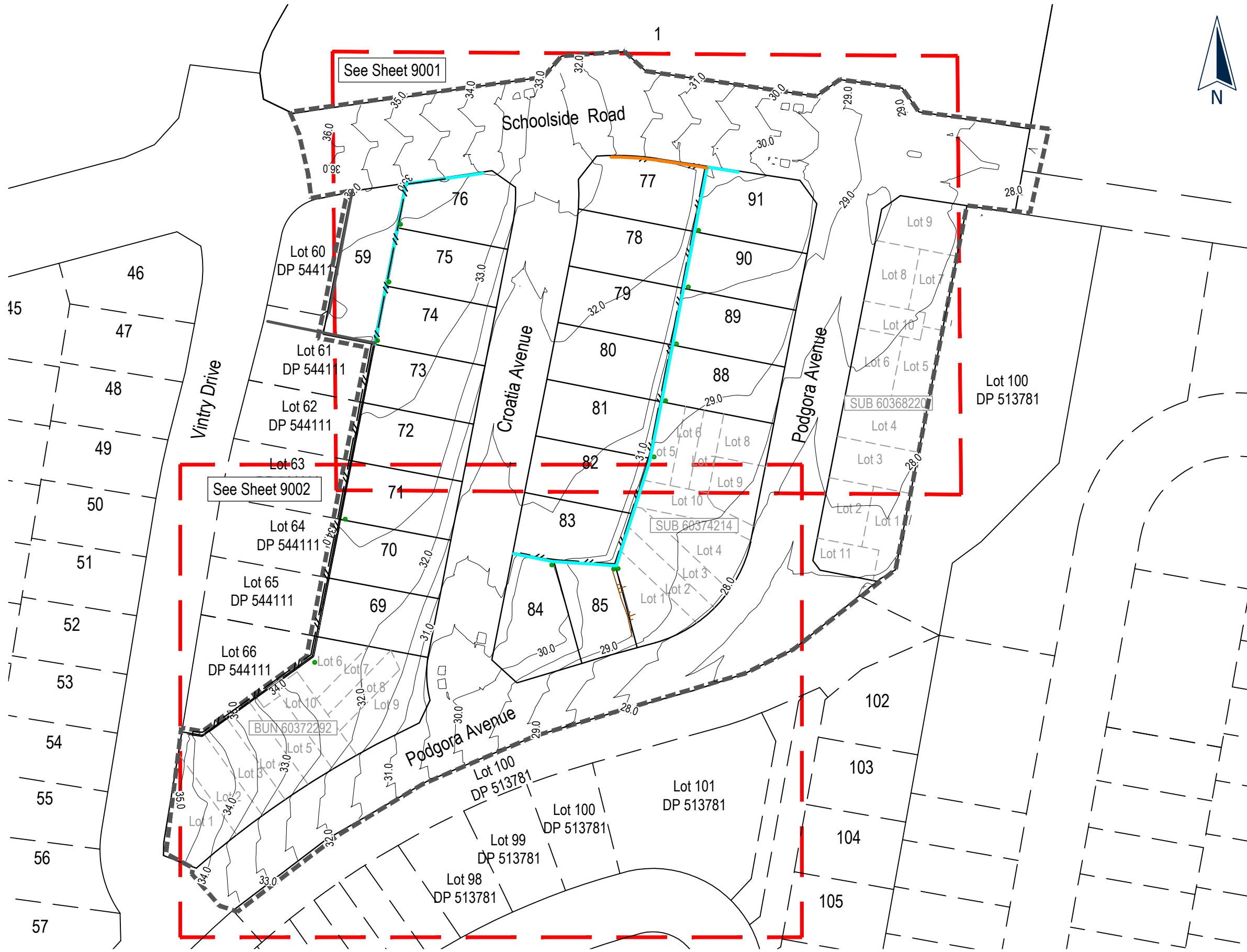
Cabra Developments Ltd
45 Station Road,
Huapai

Lot Number Reference
As Built Plan
Stage 1B

No.	REVISION (DESCRIPTIONS)	NAME	DATE
0	Issued for completion	TL	28/05/2021

FOR COMPLETION

	NAME	DATE
SURVEYED	HB	01/03/21
DESIGNED	KM	09/2016
DRAWN	KJM	28/05/2021
DATE	ORIGINAL SCALE	ORIGINAL SIZE
28/05/2021	1:1000	A3
DRAWING NO.	REVISION	
42358-DR-SU-9800	0	



Final Contours & Retaining Walls As Built Legend

- 38.0 As built Contour (1m interval)
- As built Contour (0.5m interval)
- Top of Bank
- Bottom of Bank
- Timber Retaining Wall
- Keystone Retaining Wall
- Retaining Wall Height
- Durapanel Titan Safety Fencing unless shown otherwise
- Private Field Catchpit for Wall Subsoil drain outlets
- Extent of Works

I certify that these As-Built Plans are an accurate record of the works undertaken and that:

- * The Coordinates (X, Y) are in terms of NZTM on NZGD(2000), and are within ± 50mm.
- * The levels (Z) are in terms of the Auckland 1946 (MSL) LINZ datum (DOSLI datum), and are within ± 10mm.

Signed: Registered Professional Surveyor

Date: 31/05/2021

Name: Tom Lemon

Phone: (09) 427 0072
Email: catobolam@catobolam.co.nz

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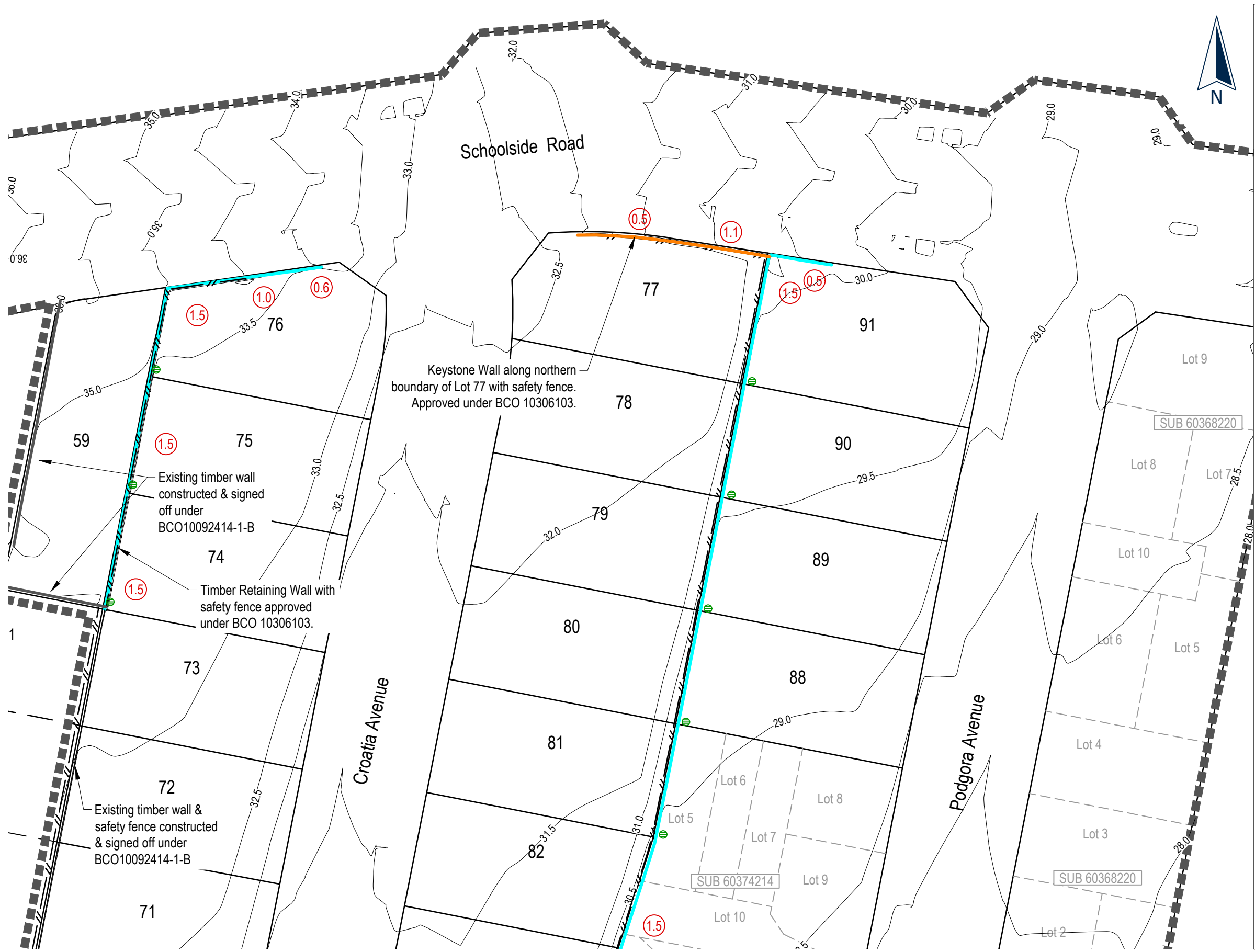
Cabra Developments Ltd
45 Station Road,
Huapai

Final Contours & Retaining Walls
As Built Plan - Stage 1B
(Sheet 1 of 3)

No.	REVISION (DESCRIPTIONS)	NAME	DATE
0	Issued for completion	TL	28/05/2021

FOR COMPLETION

SURVEYED	DESIGNED	DRAWN	DATE	ORIGINAL SCALE	ORIGINAL SIZE	NAME	DATE
			16/03/21	1:1000	A3	HB	01/03/21
						KM	09/2016
						AA	16/03/21
DRAWING NO. 42358-DR-SU-9000						REVISION 0	



Final Contours & Retaining Walls As Built Legend

- 38.0 As built Contour (1m interval)
- As built Contour (0.5m interval)
- Top of Bank
- Bottom of Bank
- Timber Retaining Wall
- Keystone Retaining Wall
- Retaining Wall Height
- Durapanel Titan Safety Fencing unless shown otherwise
- Private Field Catchpit for Wall Subsoil drain outlets
- Extent of Works

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Signed: Registered Professional Surveyor

Date: 31/05/2021

Name: Tom Lemon

Phone : (09) 427 0072
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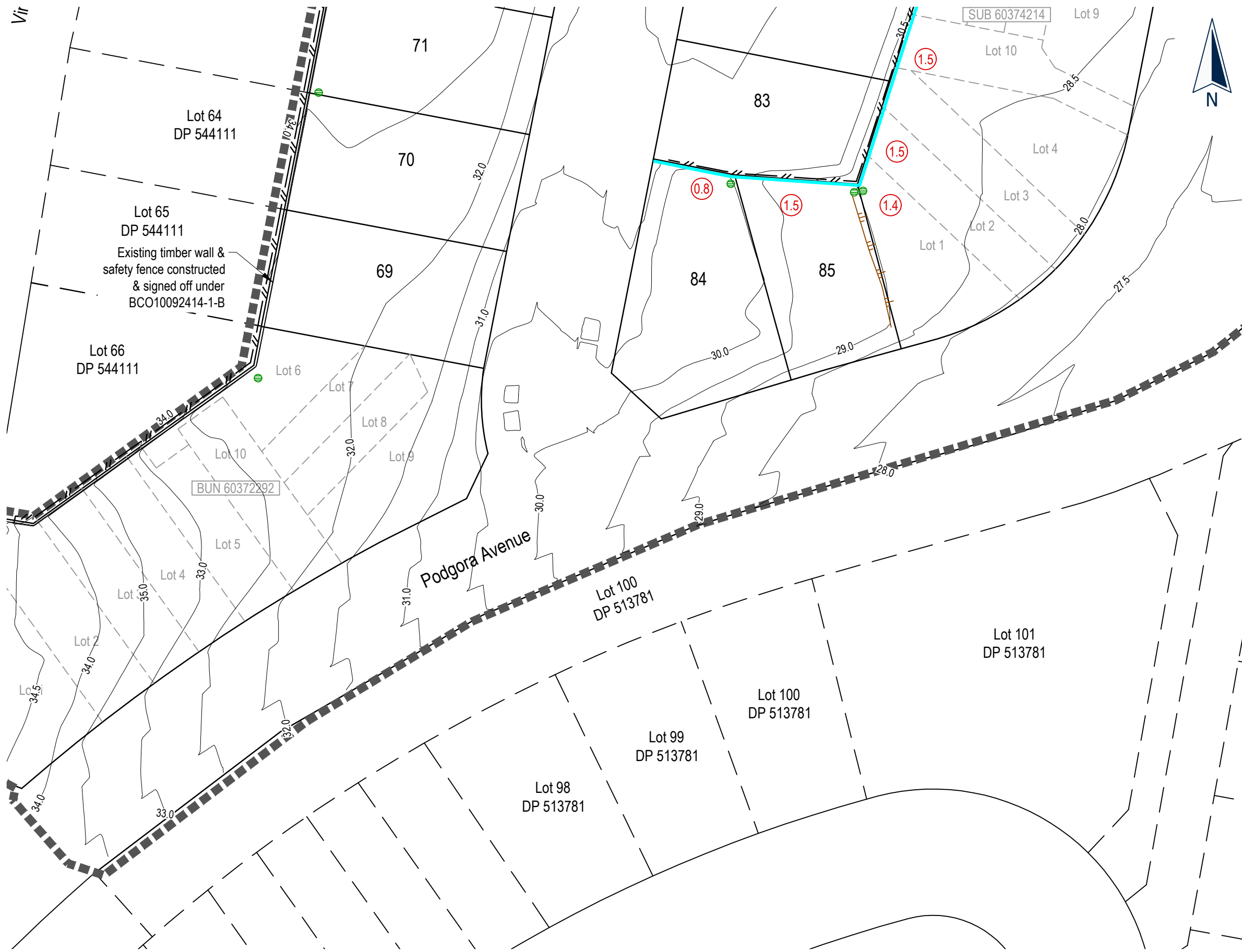
Cabra Developments Ltd
45 Station Road,
Huapai

Final Contours & Retaining Walls
As Built Plan - Stage 1B
(Sheet 2 of 3)

No.	REVISION (DESCRIPTIONS)	NAME	DATE
0	Issued for completion	TL	28/05/2021

FOR COMPLETION

SURVEYED	NAME	DATE
DESIGNED	HB	01/03/21
DRAWN	KM	09/2016
DATE	AA	16/03/21
16/03/21	ORIGINAL SCALE	ORIGINAL SIZE
	1:500	A3
DRAWING NO.	42358-DR-SU-9001	REVISION
		0



Final Contours & Retaining Walls As Built Legend

- 38.0 As built Contour (1m interval)
- As built Contour (0.5m interval)
- Top of Bank
- Bottom of Bank
- Timber Retaining Wall
- Keystone Retaining Wall
- Retaining Wall Height
- Durapanel Titan Safety Fencing unless shown otherwise
- Private Field Catchpit for Wall
Subsoil drain outlets
- Extent of Works

I certify that these As-Built Plans are an accurate record of the works undertaken and that:

- * The Coordinates (X, Y) are in terms of NZTM on NZGD(2000), and are within ± 50mm.
- * The levels (Z) are in terms of the Auckland 1946 (MSL) LINZ datum (DOSLI datum), and are within ± 10mm.

Signed:
Registered Professional Surveyor

Date: 31/05/2021

Name: Tom Lemon

Phone : (09) 427 0072
Email : catobolam@catobolam.co.nz

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Cabra Developments Ltd
45 Station Road,
Huapai

Final Contours & Retaining Walls
As Built Plan - Stage 1B
(Sheet 3 of 3)

No.	REVISION (DESCRIPTIONS)	NAME	DATE
0	Issued for completion	TL	28/05/2021

FOR COMPLETION

	NAME	DATE
SURVEYED	HB	01/03/21
DESIGNED	KM	09/2016
DRAWN	AA	16/03/21
DATE	ORIGINAL SCALE	ORIGINAL SIZE
16/03/21	1:500	A3
DRAWING NO.	REVISION	
42358-DR-SU-9002	0	



Retaining Wall As Built Legend

- (1.5) Timber Retaining Walls with height of wall
- (1.5) Keystone Retaining Wall with height of wall
- Private SW catchpit and pipe for wall drainage
- Stage Boundary
- Top of Bank
— Bottom of Bank
- 38.0 Final Contours Major
— 38.5 Final Contours Minor
- Durapanel Titan Safety Fencing unless shown otherwise.
- Retaining Walls specific design zone with dimensions to boundary. (Refer to CMW Geosciences Ltd Geotechnical Completion Report)

I certify that these As-Built Plans are an accurate record of the works undertaken and that:

- * The Coordinates (X, Y) are in terms of NZTM on NZGD(2000), and are within ± 50mm.
- * The levels (Z) are in terms of the Auckland 1946 (MSL) LINZ datum (DOSLI datum), and are within ± 10mm.

Signed: Registered Professional Surveyor

Date: 31/05/2021

Name: Tom Lemon

Phone : (09) 427 0072
Email : catobolam@catobolam.co.nz

NOTES

GENERAL

1. Levels are in terms of LINZ Datum 1946.
2. Coordinates are in terms of NZTM.

Information regarding the location and dimensions associated retaining wall drainage has been provided by Opies.

ENG60068582 / SUB60035794

No.	REVISION (DESCRIPTIONS)	NAME	DATE
0	Issued for completion	TL	24/01/2021

FOR COMPLETION

SURVEYED	NAME	DATE
DESIGNED	OPIES	2021
DRAWN	KM	09/2016
DATE	AA	16/03/21
16/03/21	ORIGINAL SCALE	ORIGINAL SIZE
	1:500	A3
DRAWING NO.	42358-DR-SU-9005	REVISION
		0



Retaining Wall As Built Legend

- (1.5) Timber Retaining Walls with height of wall
- (1.5) Keystone Retaining Wall with height of wall
- Private SW catchpit and pipe for wall drainage
- Stage Boundary
- Top of Bank
— Bottom of Bank
- 38.0 Final Contours Major
— 38.5 Final Contours Minor
- Durapanel Titan Safety Fencing unless shown otherwise.
- Retaining Walls specific design zone with dimensions to boundary. (Refer to CMW Geosciences Ltd Geotechnical Completion Report)

I certify that these As-Built Plans are an accurate record of the works undertaken and that:

- * The Coordinates (X, Y) are in terms of NZTM on NZGD(2000), and are within ± 50mm.
- * The levels (Z) are in terms of the Auckland 1946 (MSL) LINZ datum (DOSLI datum), and are within ± 10mm.

Signed: Registered Professional Surveyor

Date: 31/05/2021

Name: Tom Lemon

Phone: (09) 427 0072
Email: catobolam@catobolam.co.nz

NOTES

GENERAL

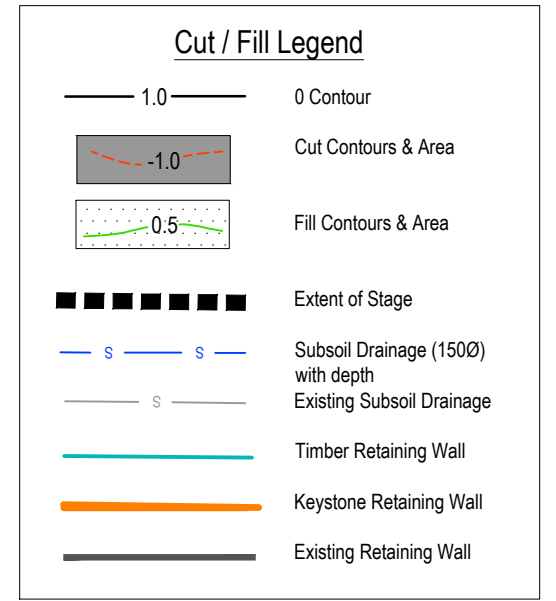
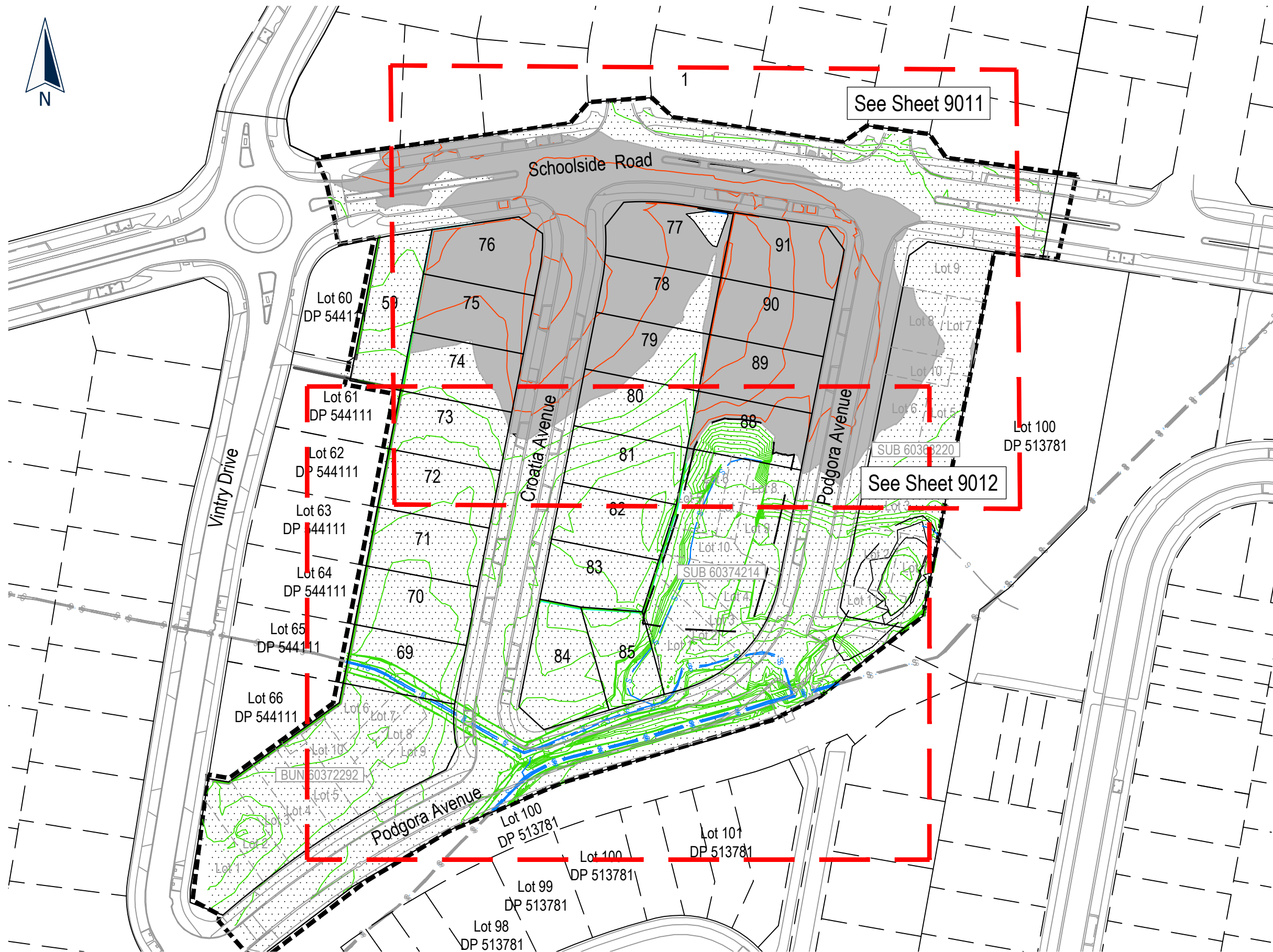
1. Levels are in terms of LINZ Datum 1946.
2. Coordinates are in terms of NZTM.

Information regarding the location and dimensions associated retaining wall drainage has been provided by Opies.

No.	REVISION (DESCRIPTIONS)	NAME	DATE
0	Issued for completion	TL	24/02/2021

FOR COMPLETION

SURVEYED	NAME	DATE
DESIGNED	OPIES	2021
DRAWN	KM	09/2016
DATE	AA	16/03/21
16/03/21	ORIGINAL SCALE	ORIGINAL SIZE
	1:500	A3
DRAWING NO.	REVISION	
42358-DR-SU-9006	0	



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- * The Coordinates (X, Y) are in terms of NZTM on NZGD(2000), and are within ± 50mm.
- * The levels (Z) are in terms of the Auckland 1946 (MSL) LINZ datum (DOSLI datum), and are within ± 10mm.

Signed: 
Registered Professional Surveyor

Date: 31/05/2021
Name: Tom Lemon
Phone: (09) 427 0072
Email: catobolam@catobolam.co.nz

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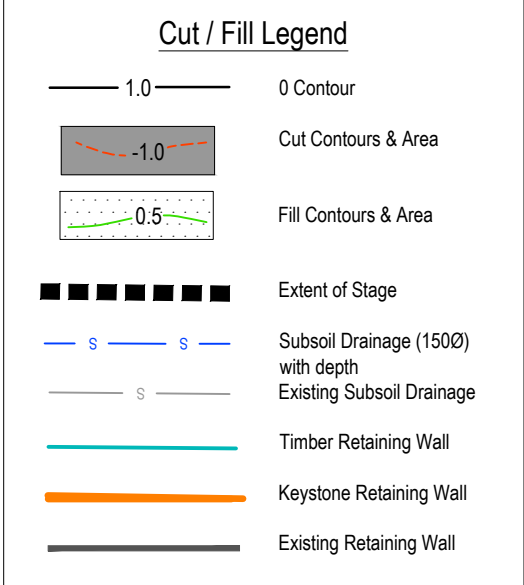
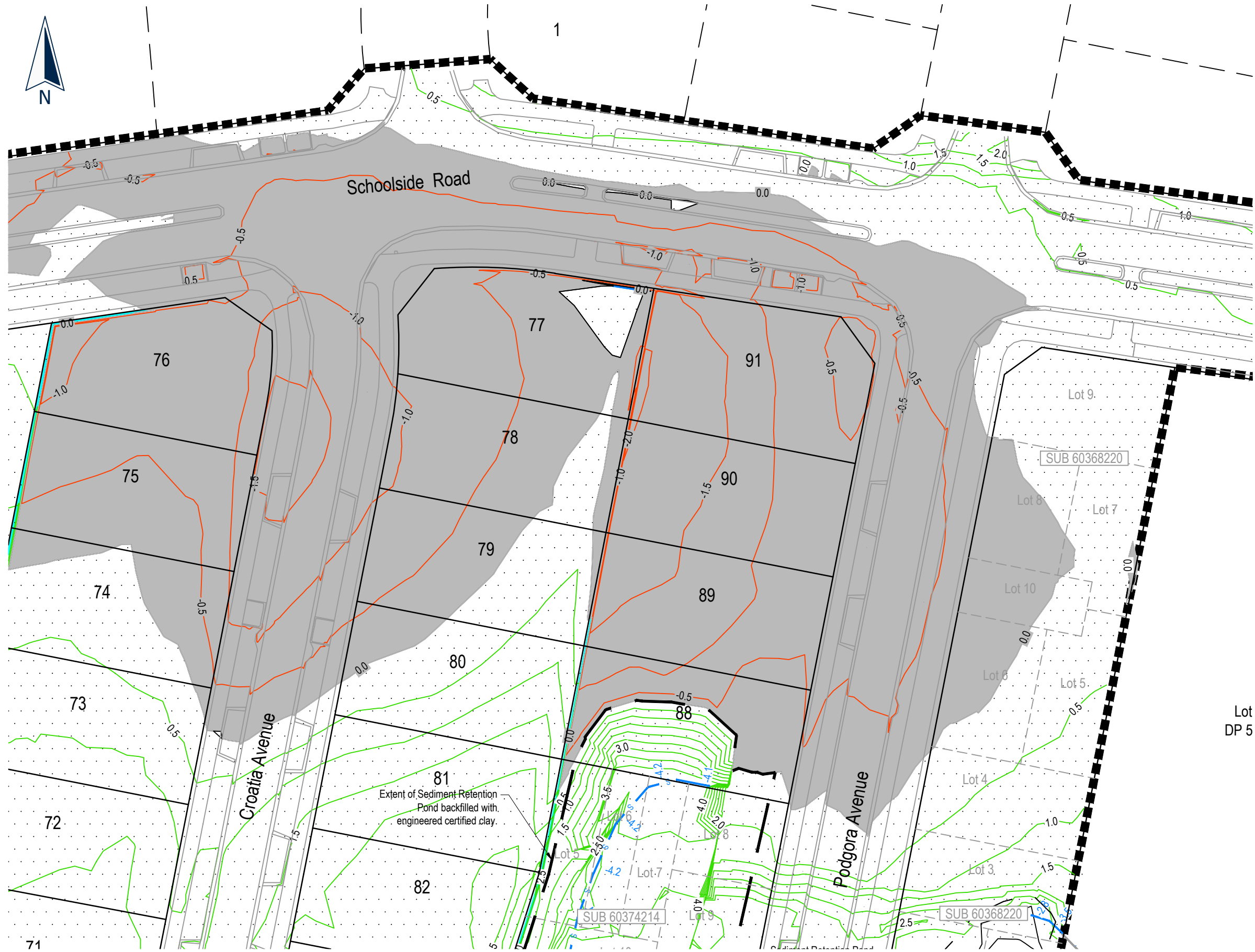
Cabra Developments Ltd
45 Station Road,
Huapai

Cut Fill As Built Plan
Stage 1B
(Sheet 1 of 3)

No.	REVISION (DESCRIPTIONS)	NAME	DATE
0	Issued for completion	TL	24/05/2021


FOR COMPLETION

SURVEYED	DESIGNED	DRAWN	DATE	ORIGINAL SCALE	ORIGINAL SIZE	NAME	DATE
			16/03/21	1:1000	A3	HB	01/03/21
						KM	09/2016
						AA	16/03/21
DRAWING NO. 42358-DR-SU-9010						REVISION 0	



I certify that these As-Built Plans are an accurate record of the works undertaken and that:

- * The Coordinates (X, Y) are in terms of NZTM on NZGD(2000), and are within ± 50mm.
- * The levels (Z) are in terms of the Auckland 1946 (MSL) LINZ datum (DOSLI datum), and are within ± 10mm.

Signed: 
Registered Professional Surveyor

Date: 31/05/2021

Name: Tom Lemon

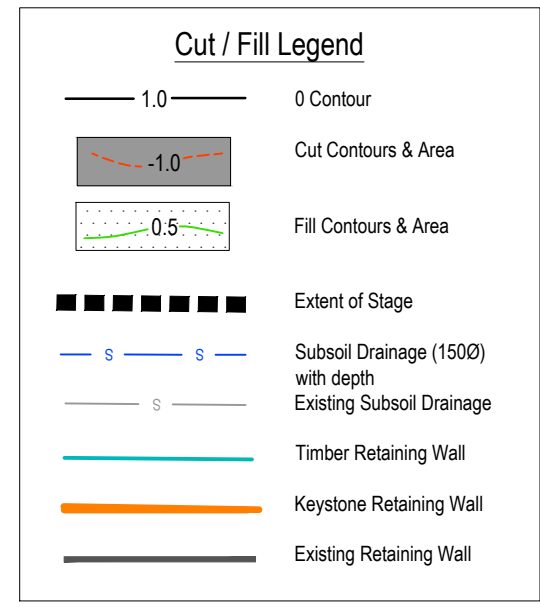
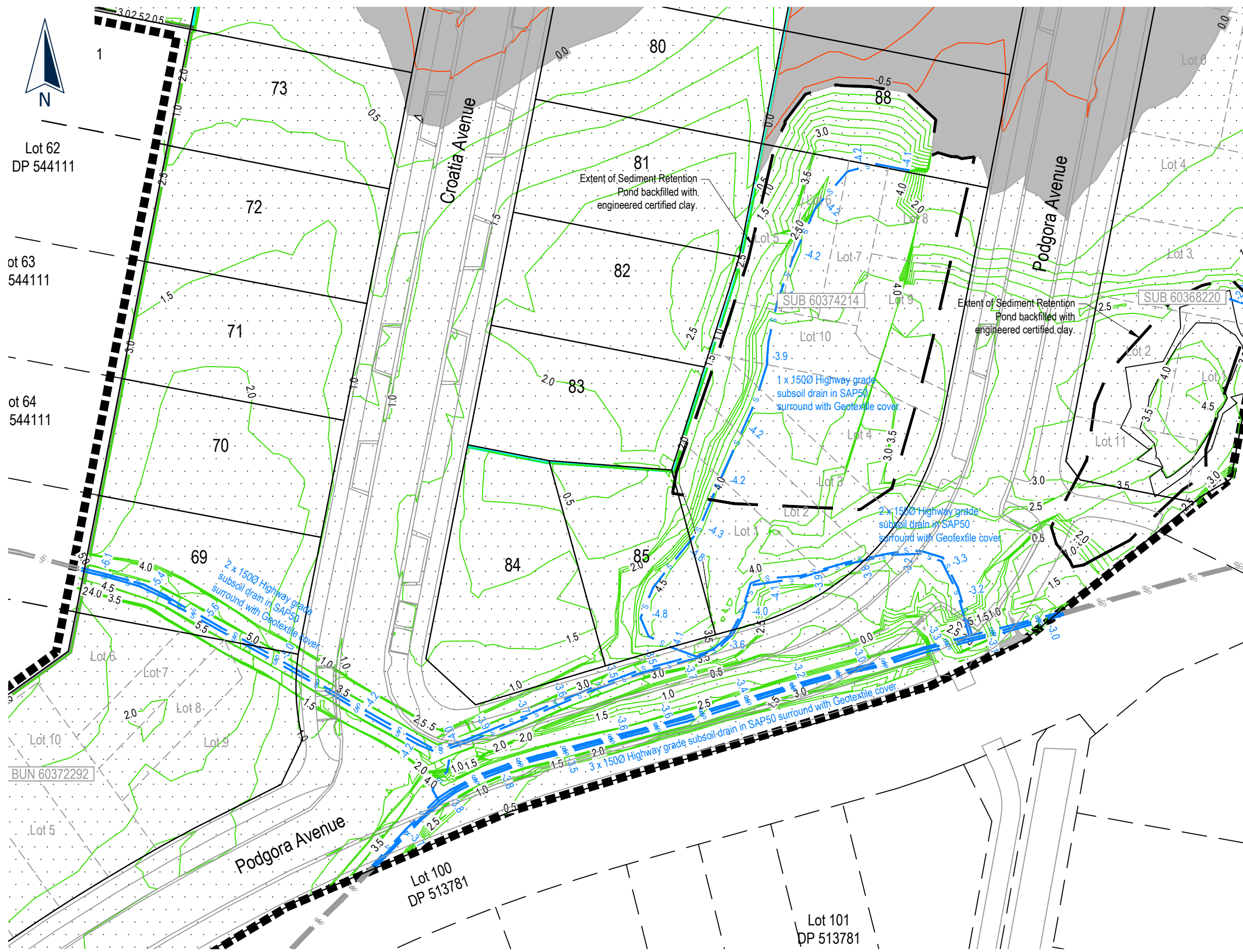
Phone: (09) 427 0072
Email: catobolam@catobolam.co.nz

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No.	REVISION (DESCRIPTIONS)	NAME	DATE
0	Issued for completion	TL	24/05/2021


FOR COMPLETION

	NAME	DATE
SURVEYED	HB	01/03/21
DESIGNED	KM	09/2016
DRAWN	AA	16/03/21
DATE	ORIGINAL SCALE	ORIGINAL SIZE
16/03/21	1:500	A3
DRAWING NO.	REVISION	
42358-DR-SU-9011	0	



I certify that these As-Built Plans are an accurate record of the works undertaken and that:

- * The Coordinates (X, Y) are in terms of NZTM on NZGD(2000), and are within ± 50mm.
- * The levels (Z) are in terms of the Auckland 1946 (MSL) LINZ datum (DOSLI datum), and are within ± 10mm.

Signed: 
Registered Professional Surveyor

Date: 31/05/2021

Name: Tom Lemon

Phone : (09) 427 0072
Email : catobolam@catobolam.co.nz

ENG60068582 / SUB60035794



Cabra Developments Ltd
45 Station Road,
Huapai

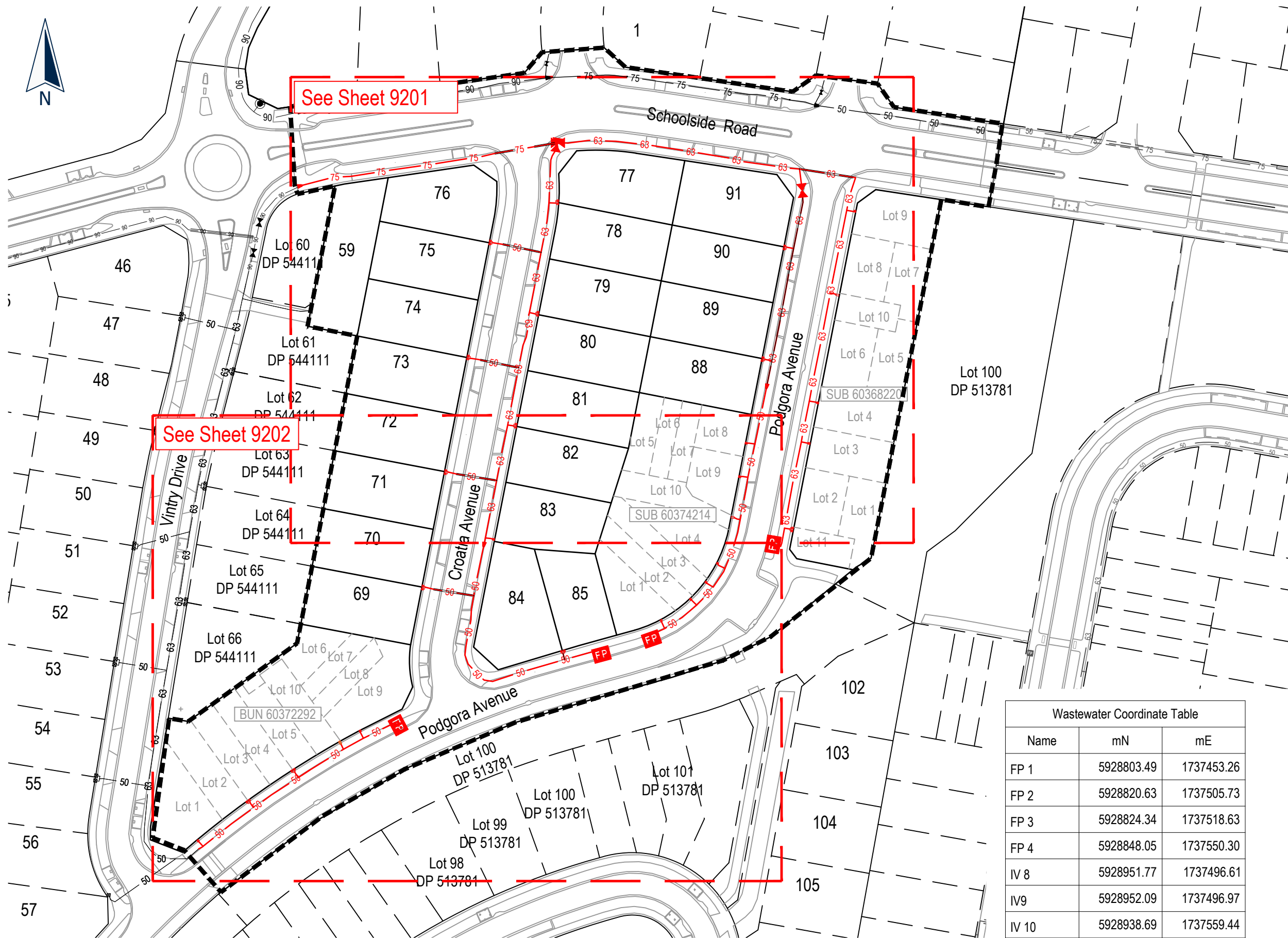
Cut Fill As Built Plan
Stage 1B
(Sheet 3 of 3)

No.	REVISION (DESCRIPTIONS)	NAME	DATE
0	Issued for completion	TL	24/05/2021

FOR COMPLETION

SURVEYED	NAME	DATE
DESIGNED	HB	01/03/21
DRAWN	KM	09/2016
DATE	AA	16/03/21
16/03/21	ORIGINAL SCALE	ORIGINAL SIZE
	1:500	A3
DRAWING NO.	42358-DR-SU-9012	REVISION
		0

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Legend - Wastewater As Built

Existing	New - Constructed under Stage 1B

I certify that these As-Built Plans are an accurate record of the works undertaken and that:

- * The Coordinates (X, Y) are in terms of NZTM on NZGD(2000), and are within ± 50mm.
- * The levels (Z) are in terms of the Auckland 1946 (MSL) LINZ datum (DOSLI datum), and are within ± 10mm.

Signed: Registered Professional Surveyor

Date: 31/05/2021
 Name: Tom Lemon
 Phone: (09) 427 0072
 Email: catobolam@catobolam.co.nz

See Sheet 9202

See Sheet 9201

Wastewater Coordinate Table		
Name	mN	mE
FP 1	5928803.49	1737453.26
FP 2	5928820.63	1737505.73
FP 3	5928824.34	1737518.63
FP 4	5928848.05	1737550.30
IV 8	5928951.77	1737496.61
IV 9	5928952.09	1737496.97
IV 10	5928938.69	1737559.44

NOTES

GENERAL

- Levels are in terms of LINZ Datum 1946.
- Coordinates are in terms of NZTM.
- All infrastructure is public unless otherwise shown.

WASTEWATER RETICULATION

- Cover for wastewater reticulation.
 - Mains under grass berms and footpaths 600mm
 - Mains under road carriageway 900mm
- Wastewatermain 75, 63, 50 & 400D - PE100 PN16
- Stainless Steel bolts and nuts used for flanged connections.
- Metallic Detector Tape provided above all wastewatermains and ridermains

ENG60068582 / SUB60035794



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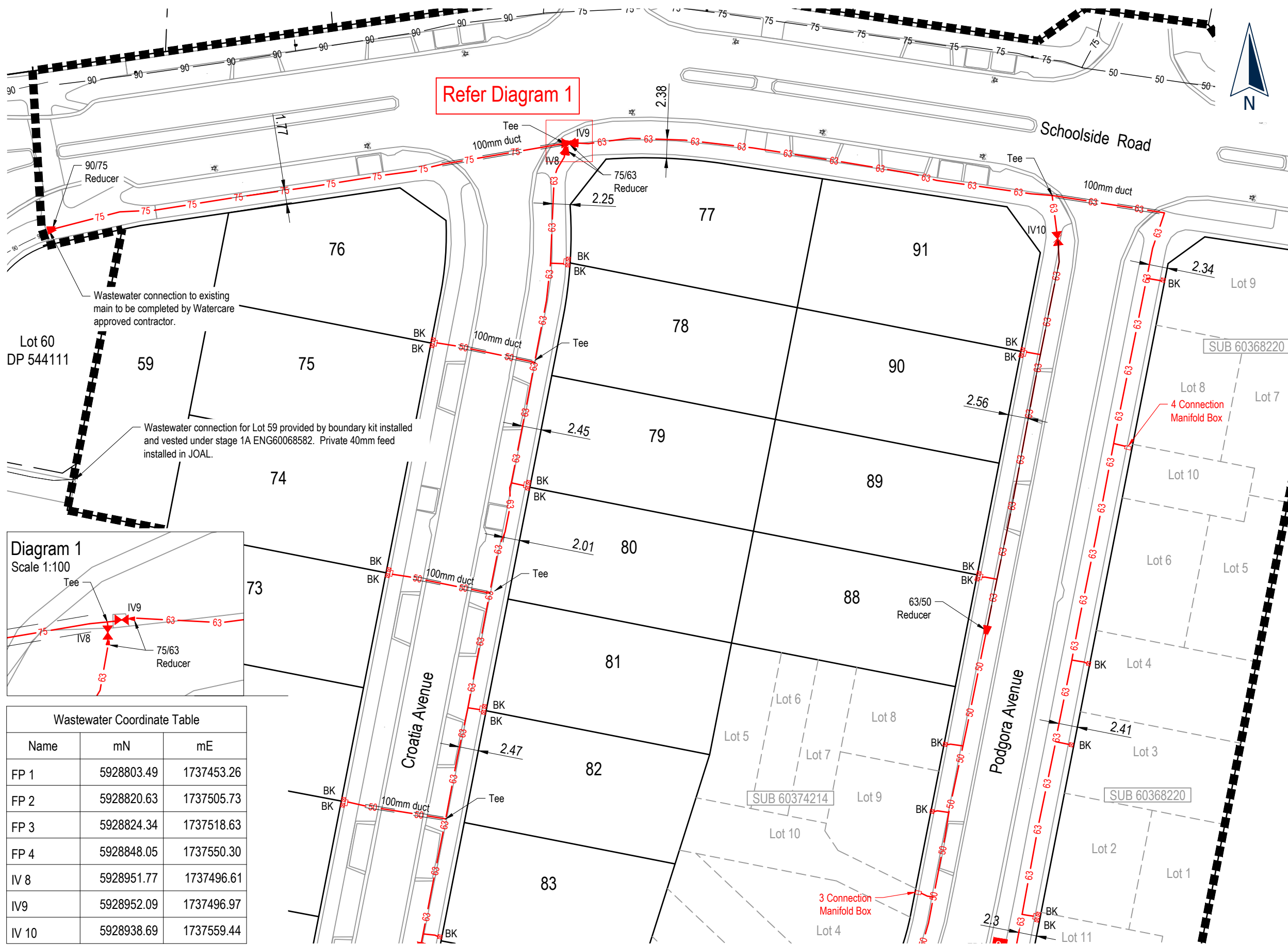
Cabra Developments Ltd
45 Station Road,
Huapai

Wastewater
As Built Plan Stage 1B
(Sheet 1 of 3)

No.	REVISION (DESCRIPTIONS)	NAME	DATE
0	Issue for As Built Completion	DL	25/02/2021
1	Issued for completion	TL	24/05/2021

FOR COMPLETION

SURVEYED	DESIGNED	DRAWN	DATE	ORIGINAL SCALE	ORIGINAL SIZE	NAME	DATE
			17/02/2021	1:1000	A3	OPIES	03/2021
						KM	11/2016
						GH	17/02/2021
DRAWING NO. 42358-DR-SU-9200						REVISION 1	



Refer Diagram 1

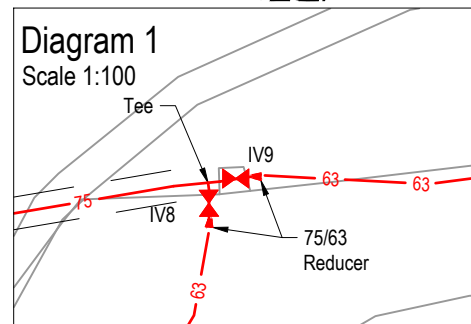
Legend - Wastewater As Built

Existing	New - Constructed under Stage 1B
90 110	PWC Sewer
40 50 63	
IV	Isolation Valve
Red triangle	Reducer
FP	Flushing Pit
Box with X	Boundary Kit
Dashed line	Extent of Works

I certify that these As-Built Plans are an accurate record of the works undertaken and that:
 * The Coordinates (X, Y) are in terms of NZTM on NZGD(2000), and are within ± 50mm.
 * The levels (Z) are in terms of the Auckland 1946 (MSL) LINZ datum (DOSLI datum), and are within ± 10mm.

Signed:
 Registered Professional Surveyor

Date: 31/05/2021
 Name: Tom Lemon
 Phone: (09) 427 0072
 Email: catobolam@catobolam.co.nz



Name	mN	mE
FP 1	5928803.49	1737453.26
FP 2	5928820.63	1737505.73
FP 3	5928824.34	1737518.63
FP 4	5928848.05	1737550.30
IV 8	5928951.77	1737496.61
IV 9	5928952.09	1737496.97
IV 10	5928938.69	1737559.44

- NOTES
- GENERAL**
- Levels are in terms of LINZ Datum 1946.
 - Coordinates are in terms of NZTM.
 - All infrastructure is public unless otherwise shown.
- WASTEWATER RETICULATION**
- Cover for wastewater reticulation.
 - Mains under grass berms and footpaths 600mm
 - Mains under road carriageway 900mm
 - Wastewatermain 75, 63, 50 & 40OD - PE100 PN16
 - Stainless Steel bolts and nuts used for flanged connections.
 - Metallic Detector Tape provided above all wastewatermains and ridermains

ENG60068582 / SUB60035794



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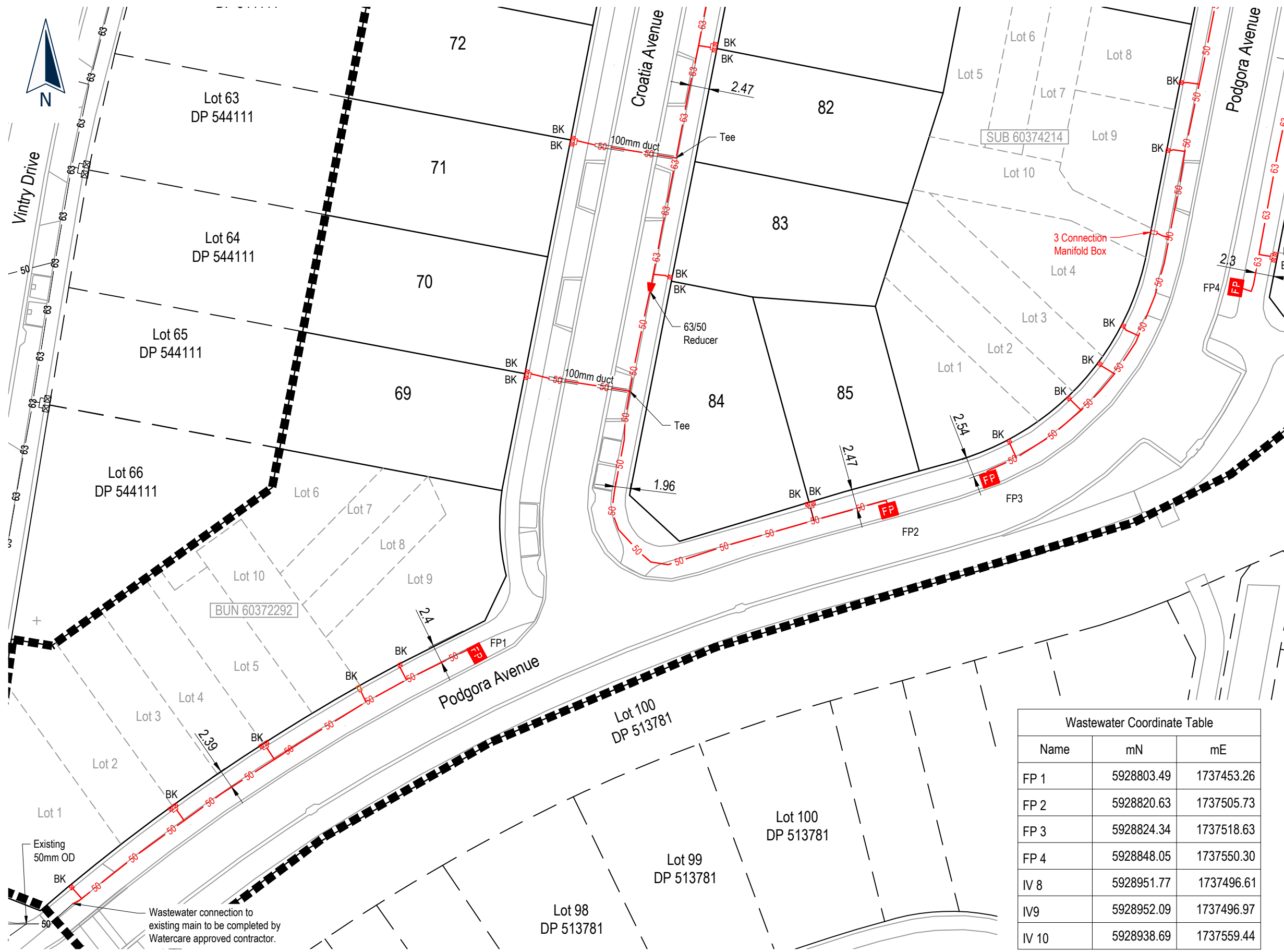
Cabra Developments Ltd
 45 Station Road,
 Huapai

Wastewater
 As Built Plan Stage 1B
 (Sheet 2 of 3)

No.	REVISION (DESCRIPTIONS)	NAME	DATE
0	Issued for completion	TL	24/05/2021

FOR COMPLETION

	NAME	DATE
SURVEYED	OPIES	03/2021
DESIGNED	KM	11/2016
DRAWN	GH	17/02/2021
DATE	ORIGINAL SCALE	ORIGINAL SIZE
17/02/2021	1:500	A3
DRAWING NO.	REVISION	
42358-DR-SU-9201	0	




Legend - Wastewater As Built

Existing	New - Constructed under Stage 1B
90 110	PWC Sewer
40 50 63	
Isolation Valve	Reducer
Flushing Pit (FP)	Flushing Pit (FP)
Boundary Kit (BK)	Boundary Kit (BK)
Extent of Works	

I certify that these As-Built Plans are an accurate record of the works undertaken and that:

- * The Coordinates (X, Y) are in terms of NZTM on NZGD(2000), and are within ± 50mm.
- * The levels (Z) are in terms of the Auckland 1946 (MSL) LINZ datum (DOSLI datum), and are within ± 10mm.

Signed: 
Registered Professional Surveyor

Date: 31/05/2021

Name: Tom Lemon

Phone: (09) 427 0072
Email: catobolam@catobolam.co.nz

Wastewater Coordinate Table

Name	mN	mE
FP 1	5928803.49	1737453.26
FP 2	5928820.63	1737505.73
FP 3	5928824.34	1737518.63
FP 4	5928848.05	1737550.30
IV 8	5928951.77	1737496.61
IV 9	5928952.09	1737496.97
IV 10	5928938.69	1737559.44

- NOTES**
- GENERAL**
- Levels are in terms of LINZ Datum 1946.
 - Coordinates are in terms of NZTM.
 - All infrastructure is public unless otherwise shown.
- WASTEWATER RETICULATION**
- Cover for wastewater reticulation.
 - Mains under grass berms and footpaths 600mm
 - Mains under road carriageway 900mm
 - Wastewatermain 75, 63, 50 & 40OD - PE100 PN16
 - Stainless Steel bolts and nuts used for flanged connections.
 - Metallic Detector Tape provided above all wastewatermains and ridermains

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Cabra Developments Ltd
45 Station Road,
Huapai

Wastewater
As Built Plan Stage 1B
(Sheet 3 of 3)

No.	REVISION (DESCRIPTIONS)	NAME	DATE
0	Issued for completion	TL	24/05/2021

FOR COMPLETION

SURVEYED	DESIGNED	DRAWN	DATE	ORIGINAL SCALE	ORIGINAL SIZE	NAME	DATE
			17/02/2021	1:500	A3	OPIES	03/2021
						KM	11/2016
						GH	17/02/2021
DRAWING NO. 42358-DR-SU-9202						REVISION 0	

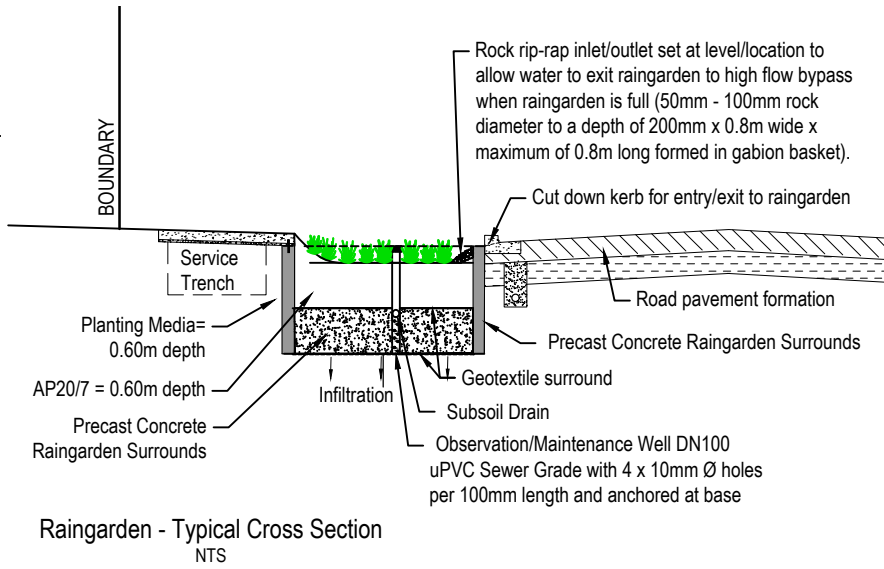
NOTES

GENERAL

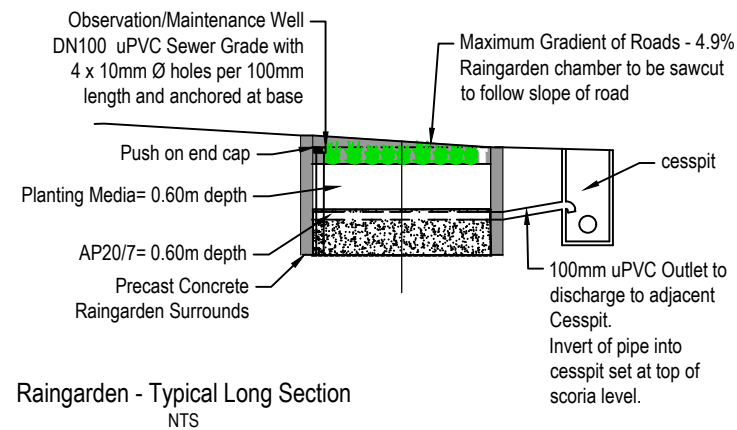
1. Levels are in terms of LINZ Datum 1946.
2. Coordinates are in terms of NZTM.
3. All infrastructure is public unless otherwise shown.

STORMWATER

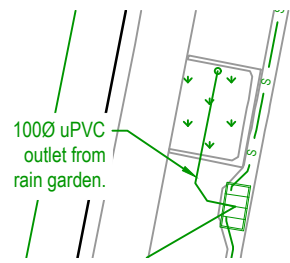
1. All pipes are Class 4 reinforced concrete rubber ring jointed (RCRRJ), unless otherwise shown.
2. All manholes are 1050mmØ concrete flange base and riser, unless otherwise shown.
3. Bedding is H2 type unless otherwise stated.
4. All catchpits are 675mm x 450mm cycle friendly grate lids semi recessed unless otherwise shown.
5. For house connection boundary offsets, see Sheet 9303.
6. House connections 100Ø uPVC SN16
7. All Private retaining wall outlets are 100uPVC SN16 unless otherwise shown.



Raingarden - Typical Cross Section NTS

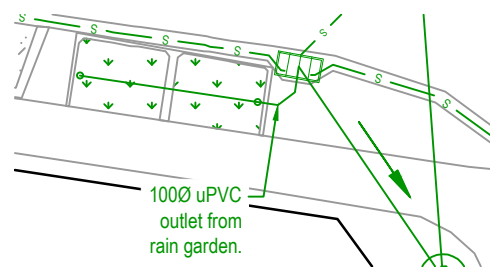


Raingarden - Typical Long Section NTS



Typical RG Connection (Single)

Scale 1:250



Typical RG Connection (Double)
Scale 1:250

I certify that these As-Built Plans are an accurate record of the works undertaken and that:

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- * The levels (Z) are in terms of the Auckland 1946 (MSL) LINZ datum (DOSLI datum), and are within ± 10mm.

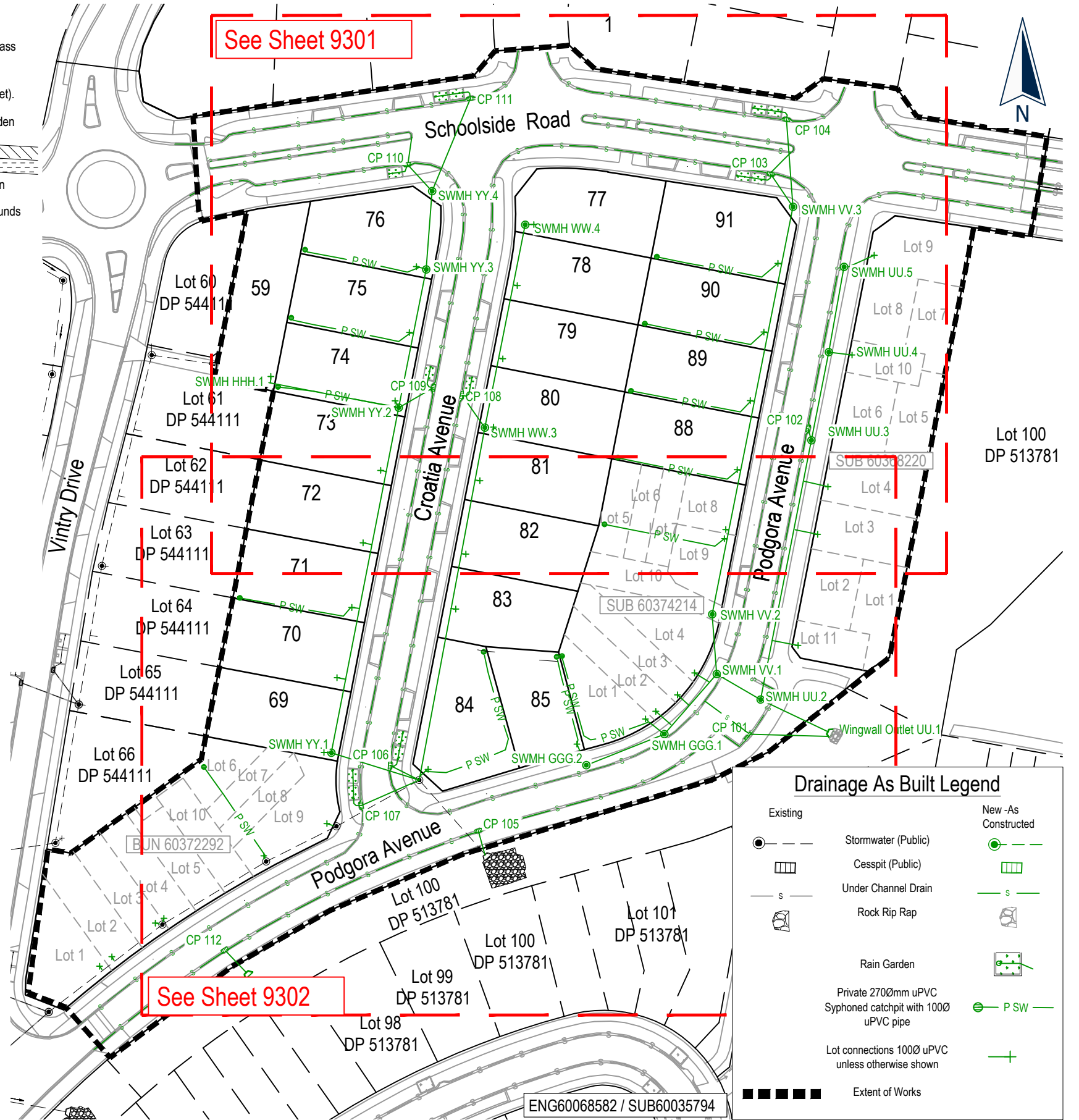
Signed: _____
Registered Professional Surveyor

Date: 31/05/2021

Name: Tom Lemon

Phone : (09) 427 0072

Email : catobolam@catobolam.co.nz



Drainage As Built Legend	
Existing	New -As Constructed
●	●
▭	▭
s	s
⬢	⬢
	⬢
	⬢
	⬢
	⬢
■	■



Cabra Developments Ltd
45 Station Road,
Huapai

Stormwater As Built Plan
Stage 1B
(Sheet 1 of 3)

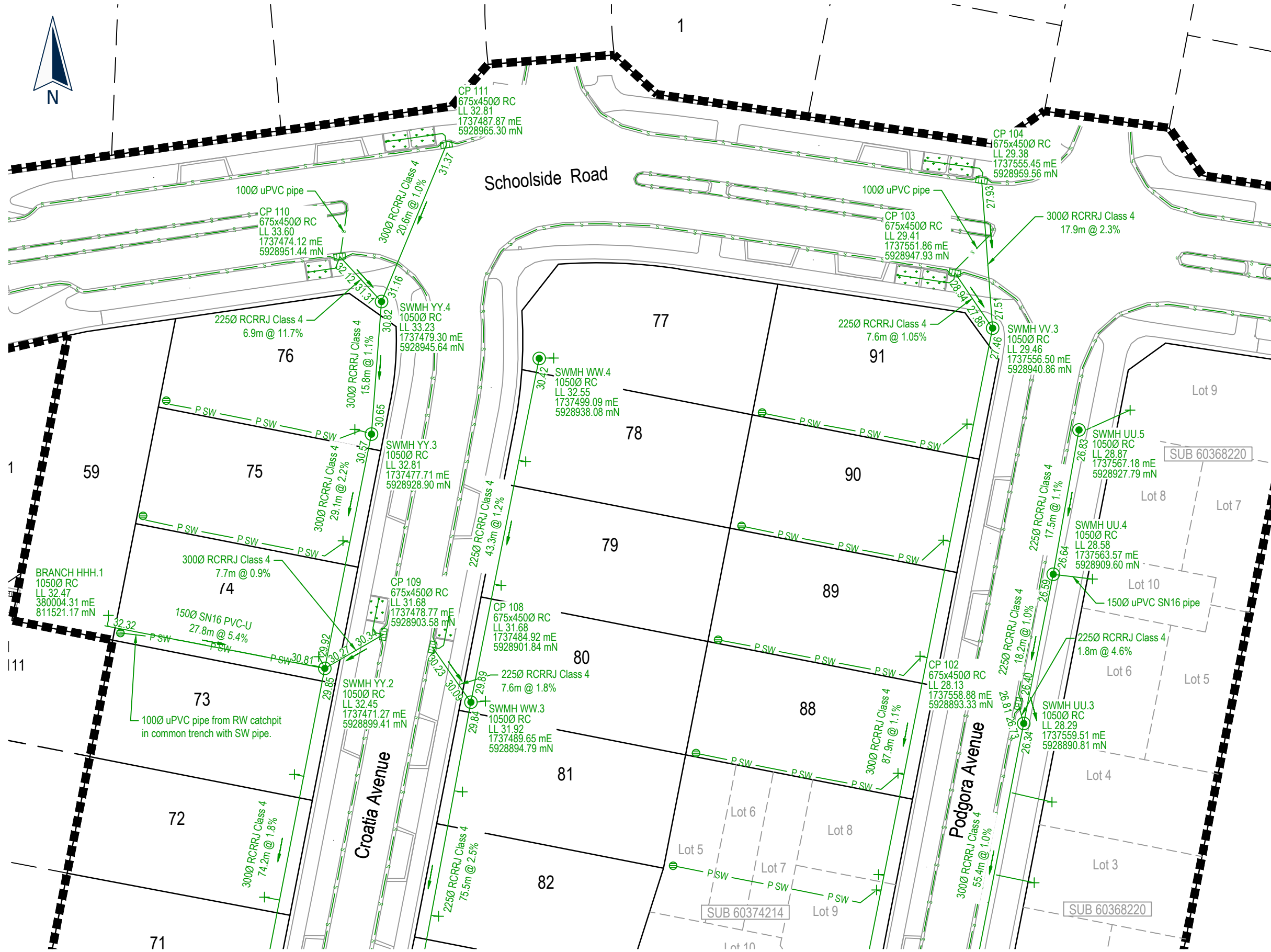
No.	REVISION (DESCRIPTIONS)	NAME	DATE
0	Issued for completion	TL	24/05/2021

FOR COMPLETION

SURVEYED	DESIGNED	DRAWN	DATE	ORIGINAL SCALE	ORIGINAL SIZE	NAME	DATE
			18/05/2021	1:1000	A3	HB	01/03/21
						KM	09/2016
						KJM	18/05/2021

DRAWING NO. **42358-DR-SU-9300** REVISION **0**

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Drainage As Built Legend

Existing	New -As Constructed

NOTES
GENERAL

- Levels are in terms of LINZ Datum 1946.
- Coordinates are in terms of NZTM.
- All infrastructure is public unless otherwise shown.

STORMWATER

- All pipes are Class 4 reinforced concrete rubber ring jointed (RCRRJ), unless otherwise shown.
- All manholes are 1050mmØ concrete flange base and riser, unless otherwise shown.
- Bedding is H2 type unless otherwise stated.
- All catchpits are 675mm x 450mm cycle friendly grate lids semi recessed unless otherwise shown.
- For house connection boundary offsets, see Sheet 9303.
- House connections 100Ø uPVC SN16
- All Private retaining wall outlets are 100uPVC SN16 unless otherwise shown.

I certify that these As-Built Plans are an accurate record of the works undertaken and that:

- The Coordinates (X, Y) are in terms of NZTM on NZGD(2000), and are within ± 50mm.
- The levels (Z) are in terms of the Auckland 1946 (MSL) LINZ datum (DOSLI datum), and are within ± 10mm.

Signed: Registered Professional Surveyor

Date: 31/05/2021

Name: Tom Lemon

Phone: (09) 427 0072
Email: catobolam@catobolam.co.nz

ENG60068582 / SUB60035794



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ARCHITECTS | ENVIRONMENTAL



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Cabra Developments Ltd
45 Station Road,
Huapai

Stormwater As Built Plan
Stage 1B
(Sheet 2 of 3)

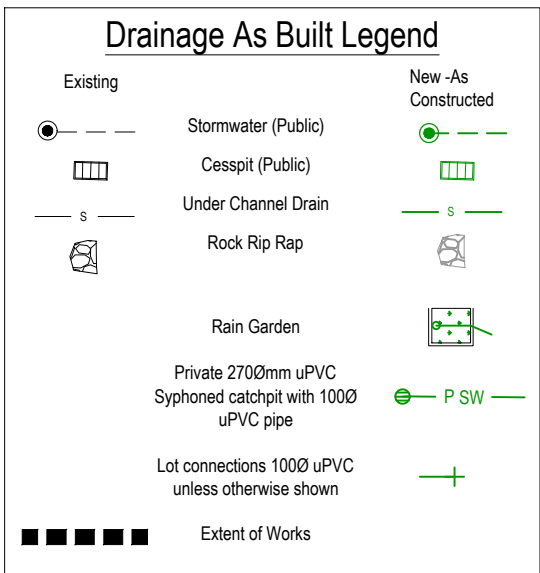
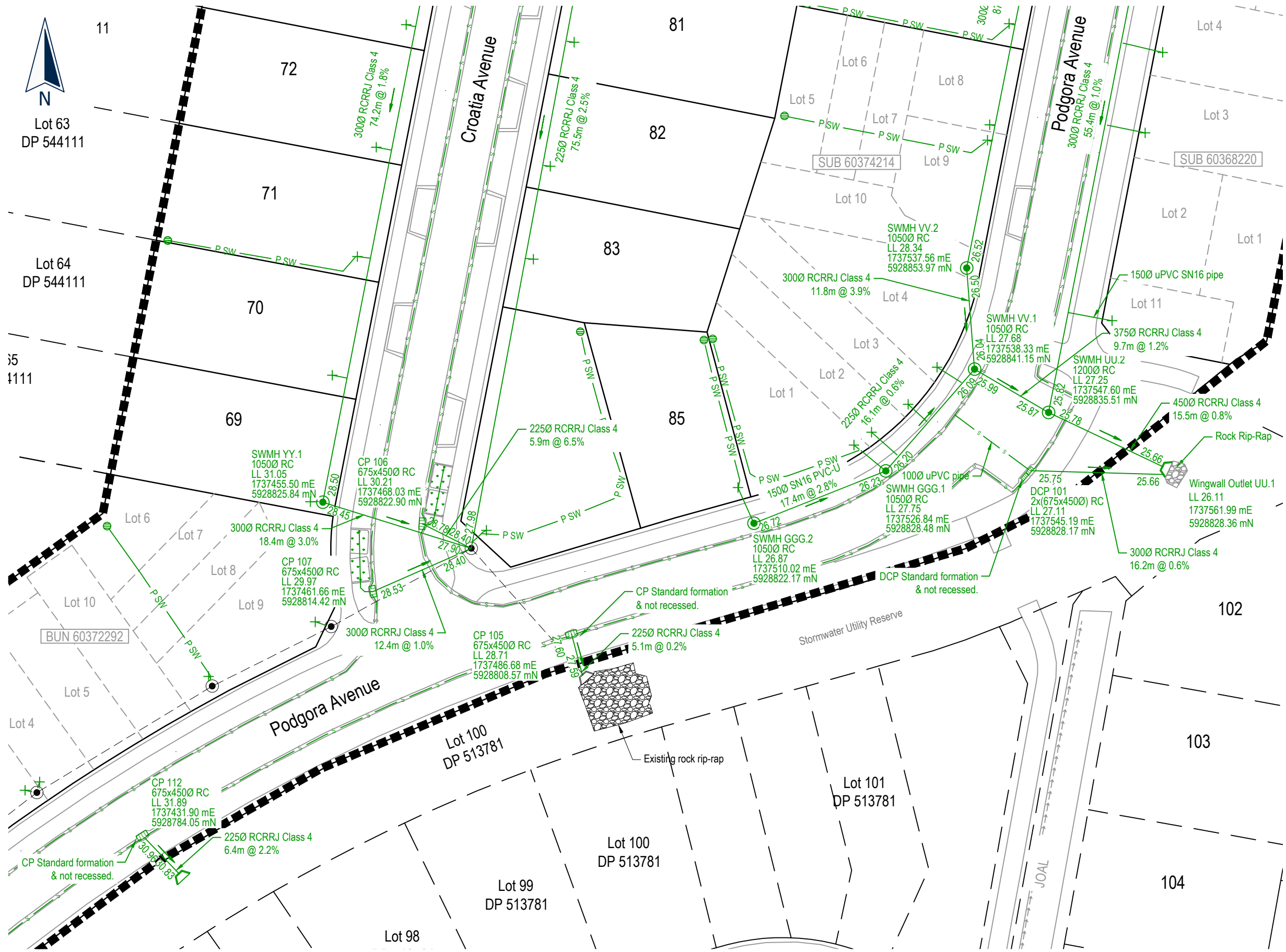
No.	REVISION (DESCRIPTIONS)	NAME	DATE
0	Issued for completion	TL	24/05/2021

FOR COMPLETION

	NAME	DATE
SURVEYED	HB	01/03/21
DESIGNED	KM	09/2016
DRAWN	KJM	18/05/2021

DATE	ORIGINAL SCALE	ORIGINAL SIZE
18/05/2021	1:500	A3

DRAWING NO.	REVISION
42358-DR-SU-9301	0



- ### NOTES
- #### GENERAL
- Levels are in terms of LINZ Datum 1946.
 - Coordinates are in terms of NZTM.
 - All infrastructure is public unless otherwise shown.
- #### STORMWATER
- All pipes are Class 4 reinforced concrete rubber ring jointed (RCRRJ), unless otherwise shown.
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 - Bedding is H2 type unless otherwise stated.
 - All catchpits are 675mm x 450mm cycle friendly grate lids semi recessed unless otherwise shown.
 - For house connection boundary offsets, see Sheet 9303.
 - House connections 1000 uPVC SN16
 - All Private retaining wall outlets are 100uPVC SN16 unless otherwise shown.

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- * The levels (Z) are in terms of the Auckland 1946 (MSL) LINZ datum (DOSLI datum), and are within ± 10mm.

Signed: Registered Professional Surveyor

Date: 31/05/2021

Name: Tom Lemon

Phone: (09) 427 0072
Email: catobolam@catobolam.co.nz

ENG60068582 / SUB60035794



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Cabra Developments Ltd
45 Station Road,
Huapai

Stormwater As Built Plan
Stage 1B
(Sheet 3 of 3)

No.	REVISION (DESCRIPTIONS)	NAME	DATE
0	Issued for completion	TL	24/05/2021

FOR COMPLETION

SURVEYED	DESIGNED	DRAWN	DATE	ORIGINAL SCALE	ORIGINAL SIZE
HB	KM	KJM	18/05/2021	1:500	A3

DRAWING NO. 42358-DR-SU-9302 REVISION 0

I certify that these As-Built Plans are an accurate record of the works undertaken and that:

- * The Coordinates (X, Y) are in terms of NZTM on NZGD(2000), and are within ± 50mm.
- * The levels (Z) are in terms of the Auckland 1946 (MSL) LINZ datum (DOSLI datum), and are within ± 10mm.

Signed:  Registered Professional Surveyor

Date: 31/05/2021

Name: Tom Lemon

Phone : (09) 427 0072
Email : catobolam@catobolam.co.nz

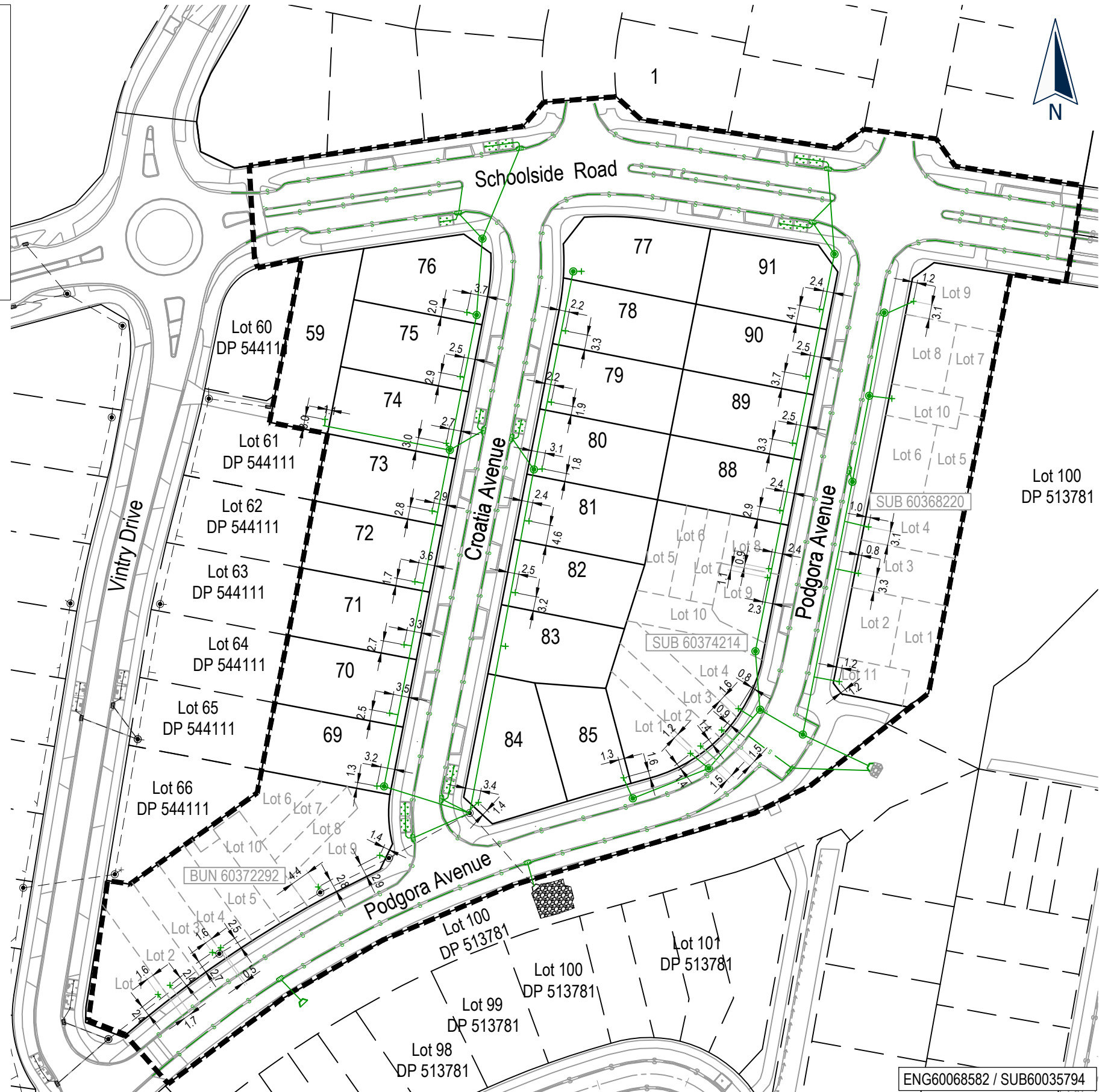
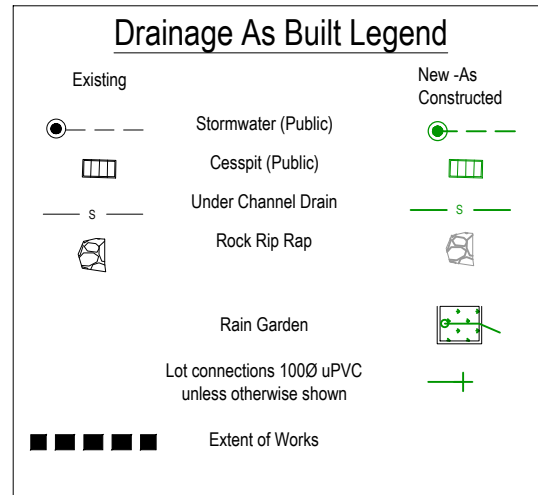
NOTES

GENERAL

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- Coordinates are in terms of NZTM.
- All infrastructure is public unless otherwise shown.

STORMWATER

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- House connections 100Ø uPVC SN16
- All Private retaining wall outlets are 100uPVC SN16 unless otherwise shown.



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Cabra Developments Ltd
45 Station Road,
Huapai

Stormwater Connections
As Built Plan
Stage 1B

No.	REVISION (DESCRIPTIONS)	NAME	DATE
0	Issued for completion	TL	24/05/2021

FOR COMPLETION


	NAME	DATE
SURVEYED	HB	01/03/21
DESIGNED	KM	09/2016
DRAWN	KJM	18/05/2021

DATE	ORIGINAL SCALE	ORIGINAL SIZE
18/05/2021	1:1000	A3

DRAWING NO.	REVISION
42358-DR-SU-9303	0

I certify that these As-Built Plans are an accurate record of the works undertaken and that:

- * The Coordinates (X, Y) are in terms of NZTM on NZGD(2000), and are within ± 50mm.
- * The levels (Z) are in terms of the Auckland 1946 (MSL) LINZ datum (DOSLI datum), and are within ± 10mm.

Signed: 
Registered Professional Surveyor

Date: 31/05/2021

Name: Tom Lemon

Phone: (09) 427 0072
Email: catobolam@catobolam.co.nz

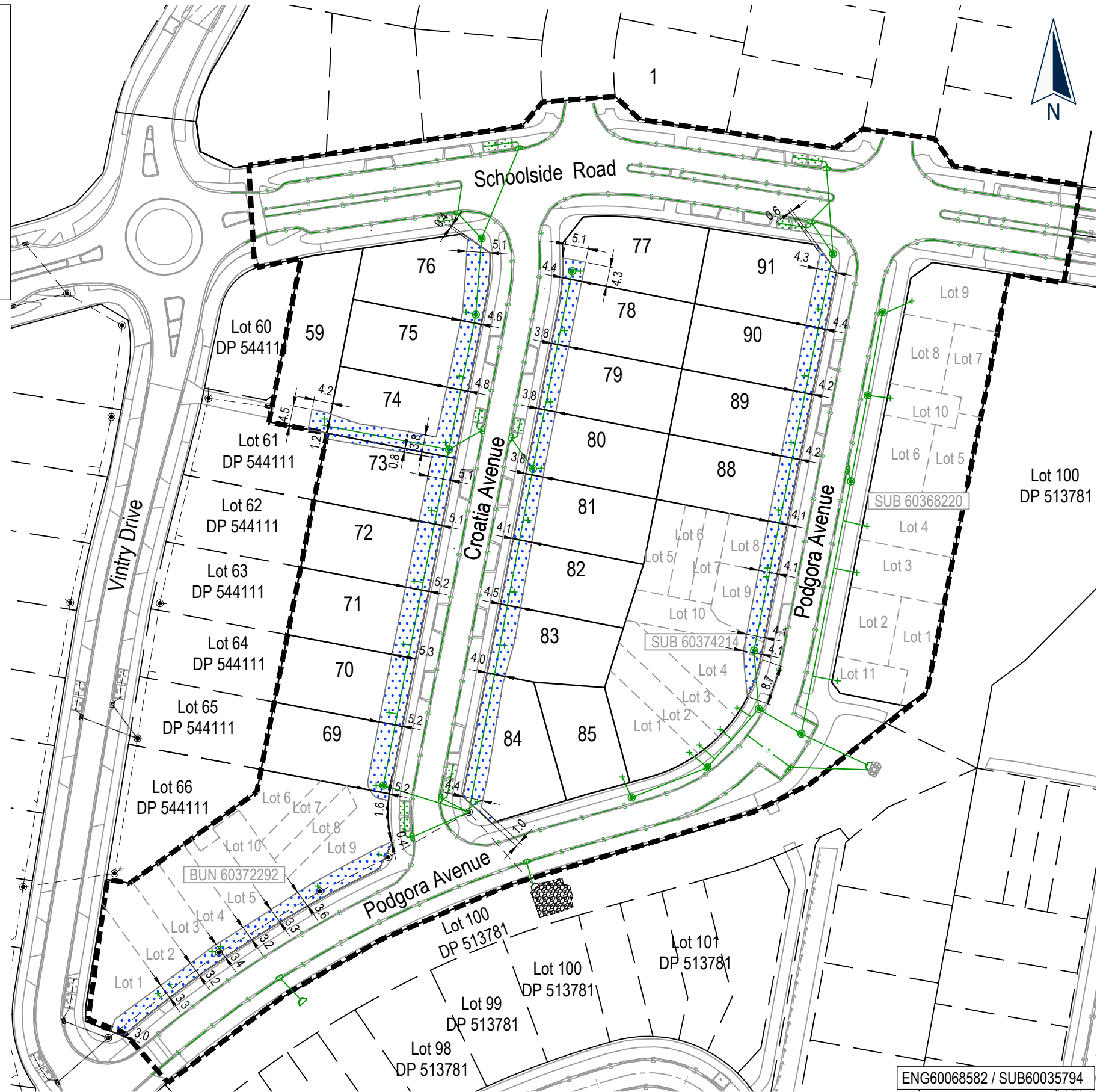
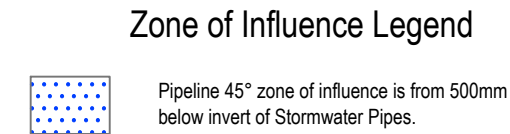
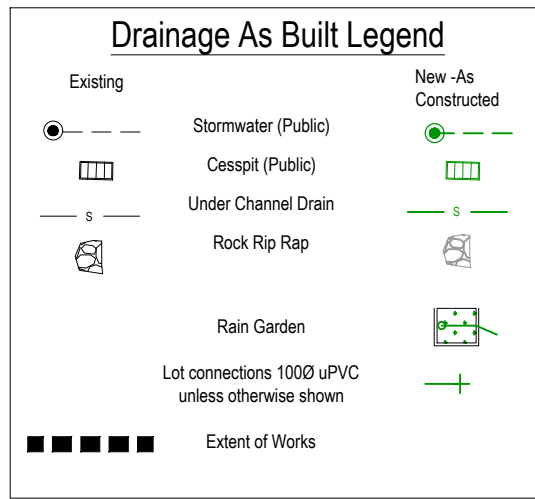
NOTES

GENERAL

- Levels are in terms of LINZ Datum 1946.
- Coordinates are in terms of NZTM.
- All infrastructure is public unless otherwise shown.

STORMWATER

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- All manholes are 1050mmØ concrete flange base and riser, unless otherwise shown.
- Bedding is H2 type unless otherwise stated.
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- All Private retaining wall outlets are 100uPVC SN16 unless otherwise shown.



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Cabra Developments Ltd
45 Station Road,
Huapai

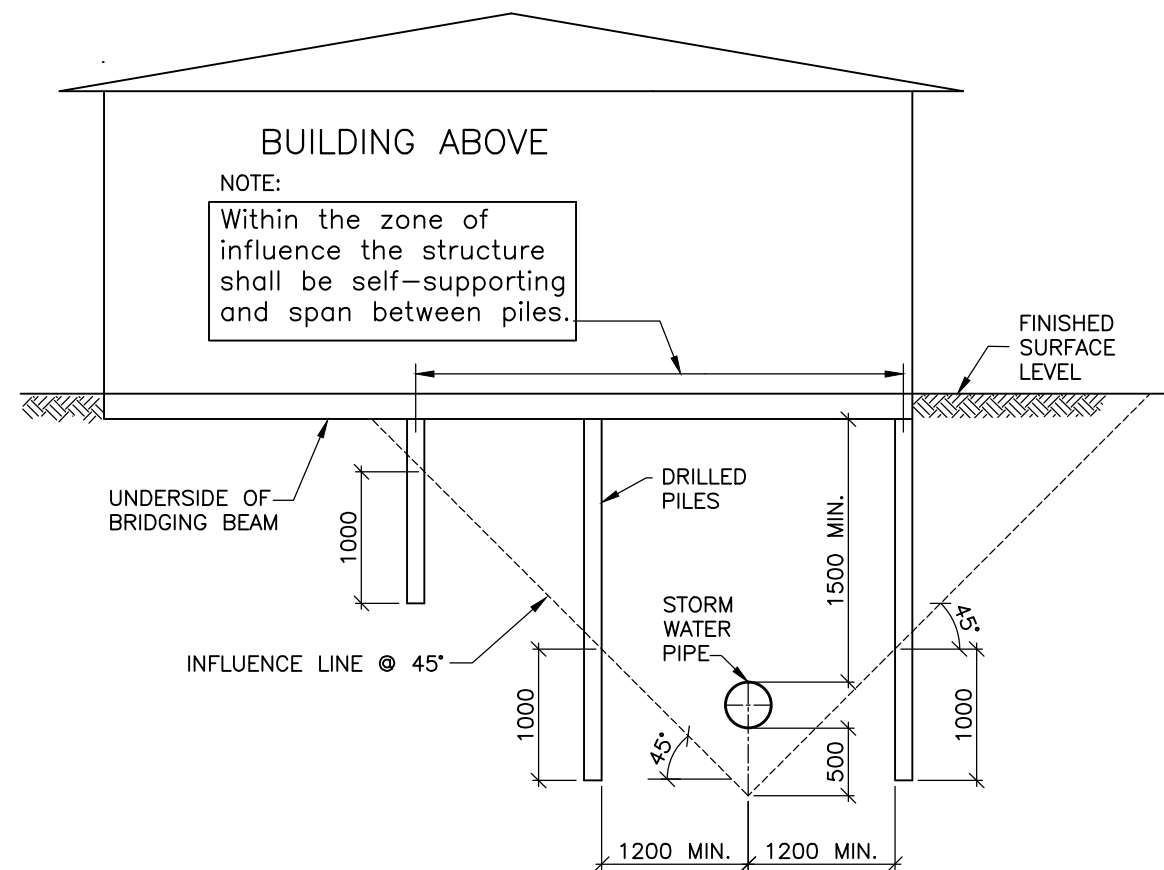
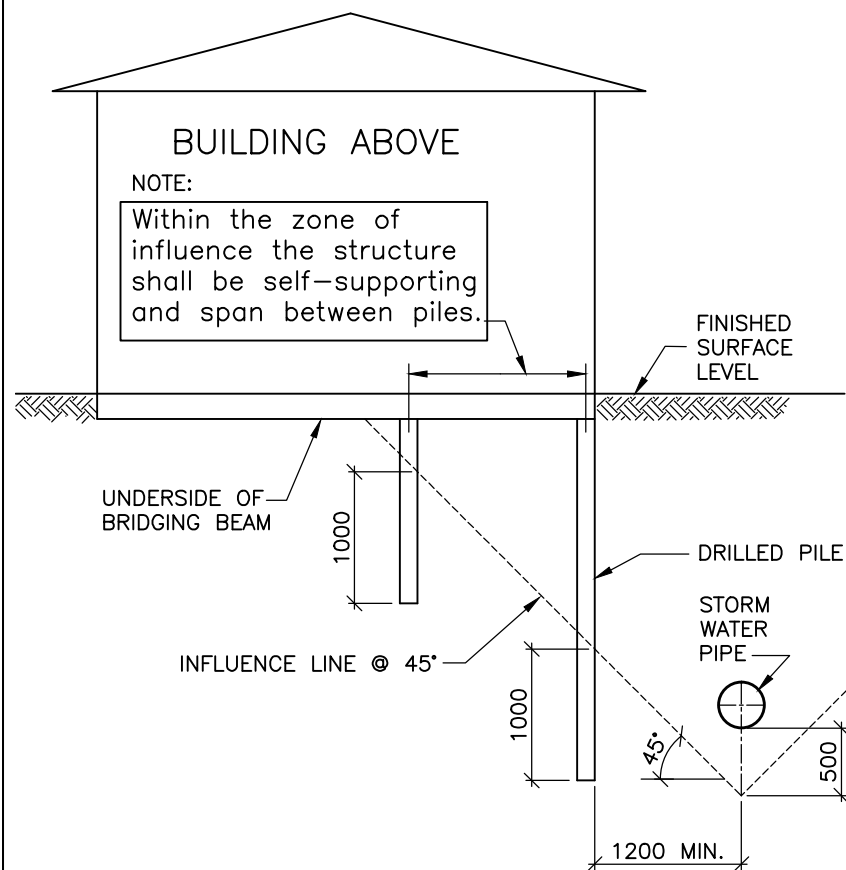
Stormwater Zone of Influence
As Built Plan
Stage 1B

No.	REVISION (DESCRIPTIONS)	NAME	DATE
0	Issued for completion	TL	24/05/2021

FOR COMPLETION

	NAME	DATE
SURVEYED	HB	01/03/21
DESIGNED	KM	09/2016
DRAWN	KJM	18/05/2021
DATE	ORIGINAL SCALE	ORIGINAL SIZE
18/05/2021	1:1000	A3

DRAWING NO.	REVISION
42358-DR-SU-9304	0



NOTES

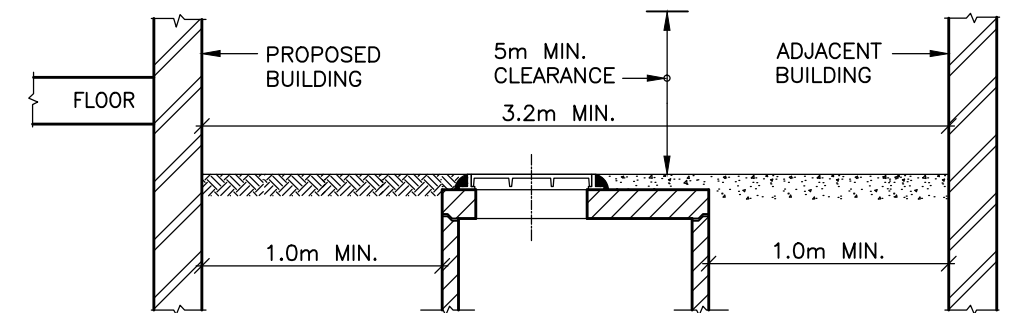
1. The information on this page is intended to show examples of typical scenarios and should be used for general guidance purposes only. Significant variations on a site by site basis are to be expected and it is in no way implied that meeting any of the above will guarantee approval.
2. Requirements for foundation design etc apply to both sides of pipe.
3. No driven piles are permitted within 10m of brick Stormwater Structures, or within 5m of all other Stormwater Structures.
4. Specific approval is required from Auckland Council for driven piles in partially drilled holes, within the 5m/10m zone.
5. Piles that may be required to resist horizontal forces will require specific design.
6. Pile/Footing location point must be below 45° "Zone of Influence".
7. All Manholes shall have 24 hours unobstructed access.
8. Manholes in basements, or where sufficient clearance is unavailable, are not permitted.
9. All pipe buildovers will require approval by Auckland Council.
10. Refer to section 4.3.21 for pipe buildover requirements.

"BUILD CLOSE" NOTES:

1. Specific approval is required from Auckland Council if building adjacent to pipes, larger than 375mm internal diameter, or greater than 3.0m of depth.
2. Building to be outside all overland flow paths and floodplains.
3. Pile constructed to a depth of 1.0m below influence line.
4. Outside zone of influence, normal foundation requirements apply.

"BUILD OVER" NOTES:

1. Applies to stormwater pipes 375mm nominal diameter or less.
2. Bridging over pipes larger than 375mm nominal diameter is NOT allowed under any circumstances.
3. Pile constructed to a depth of 1.0m below influence line.
4. Outside zone of influence, normal foundation requirements apply.
5. Bridging is NOT allowed over pipes where clear vertical separation distance from top of pipe to underside of bridging beam is less than 1.5m



MANHOLE CONSTRUCTION CLEARANCE

STORMWATER ENGINEERING
STANDARD DETAILS
ISSUE/REVISION: 1
DATE: 30 September 2013
CAD FILE: AC-STD-SW22

AUCKLAND COUNCIL

STORMWATER PIPE AND MANHOLE CONSTRUCTION CLEARANCE REQUIREMENTS
MANHOLES NEAR BUILDINGS AND BUILDING CLOSE OR OVER PIPES



ENVIRONMENTAL-SW	ORIGINAL SCALE: AS NOTED
Sht 1 OF 1	DRAWING No. ACSD
Shts	SW22
	REV A3

Appendix C: Laboratory Test Data

**DETERMINATION OF THE WATER CONTENT, LIQUID LIMIT & LINEAR SHRINKAGE
TEST METHOD NZS 4402 : 1986 TEST 2.1, 2.2 & 2.6**Project Name : **45 Station Road, Huapai**Client : CMW Geosciences Ltd
Address : PO Box 300206
Albany, Auckland 0754Project No : 20 0322 03
Page : 1 of 1
Date of Order : 25.11.20

Attention : Jasmine Walden

Sample Method : Hand auger
Sample Date : 25.11.20
Sampled By : CMW Geosciences Ltd**Test Details :**Test performed on :
History :Whole Sample
Natural

Sample No.	Location	Depth (m)	Liquid Limit	Linear Shrinkage	Natural Water Content (%)
915L	Lot 67	0.4 to 0.8	91	17	39.1
916L	Lot 71	0.4 to 0.9	78	18	36.9
917L	Lot 74	0.4 to 0.10	76	18	34.9
918L	Lot 77	0.4 to 0.11	132	26	54.4
919L	Lot 82	0.4 to 0.12	101	16	39.9
920L	Lot 86	0.4 to 0.13	123	28	35.4
921L	Lot 90	0.4 to 0.14	79	20	42.7
922L	Lot 92	0.4 to 0.15	62	15	33.6

Comments :Tested By: HC Date : 27.11.20 to 04.12.20
Calculated By : ZH Date : 09.12.20
Checked By : ZH Date : 10.12.20

Appendix D: Field Test Data



LF11 Rev 4 Soil Field Density NDM Direct Transmission with VSS Report

Auckland Laboratory
 CMW Geosciences (NZ) Limited
 Building C, 9 Piermark Drive, Rosedale, NZ 0632
 PO Box 300206, Albany, Auckland, NZ 0752
 Phone: +64 (09) 4144 632

Project: 45 Station Road, Huapai
 Project No: AKL2016_0634
 Location: Huapai
 Report No: AKL2016_0634LAA Rev.0
 Report Date: 25/01/2017
 Client: Cabra Developments Limited
 Client Address:
 Client Reference:

Test Methods: Notes:
 NZS 4402.2.1:1986 Solid Density: Assumed
 NZS 4407.4.2.2:2015 Testing Locations Selected By: CMW Field Staff
 NZGS: August 2001



Tests indicated as not accredited are outside the scope of the laboratory's accreditation

Measurements marked * are not accredited and are outside the scope of the laboratories accreditation

Date Sampled	Sample No.	Test Location	Soil Description	In-situ Vane Shear Strengths					Field and Laboratory Testing Data								Comments	
				Test 1 (kPa)	Test 2 (kPa)	Test 3 (kPa)	Test 4 (kPa)	Ave.	Gauge Wet Density (t/m ³)	Gauge Dry Density (t/m ³)	Gauge Water Content (%)	Gauge Air Voids (%)	Gauge Probe Depth	Oven Water Content (%)	Solid Density (t/m ³) *	Oven Dry Density (t/m ³)		Calculated Air Voids (%) *
7/12/2016	N1	Lot 97	CLAY	189	189	>189	>189	>189	1.8543	1.3865	33.7	1.76	300	29.3	2.7	1.44	4.9	
	N2	Lot 99	CLAY	>189	>189	>189	>189	>189	1.8482	1.3592	36.0	0.65	300	37.4	2.7	1.34	-0.1	
14/12/2016	N3	Refer to site plan	CLAY	UTP	UTP	UTP	UTP	UTP	1.7574	1.3213	33.0	7.35	300	29.6	2.7	1.36	9.6	
	N4	Refer to site plan	CLAY	173	178	189	189	182	1.8379	1.3691	34.2	2.31	300	35.0	2.7	1.36	1.9	
16/12/2016	N5	Lot 93	CLAY	175	173	189	189	182	1.7953	1.2722	41.1	0.45	250	31.0	2.7	1.38	6.8	
	N6	Lot 97	CLAY	UTP	UTP	UTP	UTP	UTP	1.7946	1.3099	37.0	2.91	300	33.4	2.7	1.34	5.2	
	N7	Refer to site plan	CLAY	>189	>189	UTP	UTP	>189	1.8157	1.3169	37.9	1.24	250	30.8	2.7	1.38	5.9	
	N8	Lot 86	CLAY	UTP	UTP	UTP	UTP	UTP	1.8583	1.3689	35.7	0.25	300	38.6	2.7	1.34	-1.4	
20/12/2016	N9	Lot 93	CLAY	UTP	UTP	>189	>189	>189	1.8210	1.3141	38.6	0.52	300	34.9	2.7	1.34	2.9	
	N10	Lot 95	CLAY	UTP	UTP	>189	>189	>189	1.8331	1.3237	38.5	-0.08	300	33.5	2.7	1.38	3.2	
22/12/2016	N11	Road	CLAY	189	186	183	159	179	1.7840	1.3012	37.7	2.30	300	36.3	2.7	1.30	4.0	
30/12/2016	N12	Lot 44	Silty CLAY	>194	>194	193	141	>181	1.7770	1.2843	38.4	3.05	300	48.3	2.7	1.20	-2.2	Failed
	N13	Lot 45	Clayey SILT	UTP	151	158	148	>162	1.7915	1.3219	35.5	3.98	300	38.7	2.7	1.30	2.2	
	N14	Lot 47	Silty CLAY	>194	>194	>194	>194	>194	1.8021	1.3070	37.9	1.97	300	39.5	2.7	1.30	1.1	
	N15	Lot 46	Silty CLAY	>194	>194	>194	>194	>194	1.7969	1.3130	36.8	2.88	300	40.3	2.7	1.28	1.0	
	N16	Lot 62	Silty CLAY	UTP	UTP	UTP	UTP	UTP	1.8617	1.3590	37.0	-0.72	300	31.6	2.7	1.42	2.9	
4/01/2017	N17	Lot 63	Silty CLAY	UTP	UTP	UTP	UTP	UTP	1.8246	1.3219	38.0	0.66	300	36.7	2.7	1.34	1.6	
	N18	Lot 44	Silty CLAY	UTP	UTP	UTP	UTP	UTP	1.8530	1.3908	33.2	2.17	300	37.4	2.7	1.34	-0.4	Retest of N12
	N19	Lot 64	Silty CLAY	188	151	154	157	163	1.7956	1.2963	38.5	1.95	300	54.4	2.7	1.16	-6.3	Failed
6/01/2017	N20	Road	Silty CLAY	>194	>194	>194	148	>182	1.7699	1.2558	40.9	1.96	300	28.7	2.7	1.38	9.6	
	N21	Lot 44	CLAY	UTP	UTP	UTP	UTP	UTP	1.8059	1.3199	36.8	2.44	300	44.8	2.7	1.24	-2.0	
	N22	Lot 42	CLAY	>194	>194	191	>194	>193	1.8125	1.3097	38.7	1.09	300	32.9	2.7	1.36	4.6	
10/01/2017	N23	Lot 64	CLAY	UTP	UTP	UTP	UTP	UTP	1.8148	1.3314	36.3	2.25	300	43.2	2.7	1.26	-1.7	Retest of N19
	N24	Lot 43	CLAY	189	189	>189	>189	>189	1.7905	1.3118	36.5	3.44	300	36.3	2.7	1.32	3.6	
	N25	Lot 19	CLAY	178	189	189	>189	>186	1.7855	1.2864	38.8	2.33	300	38.5	2.7	1.28	2.6	
12/01/2017	N26	Lot 14	CLAY	>189	>189	UTP	UTP	>189	1.7964	1.2794	40.4	0.80	300	41.3	2.7	1.28	0.4	
	N27	Lot 17	CLAY	>189	>189	UTP	UTP	>189	1.7357	1.2292	41.2	3.71	300	36.9	2.7	1.26	6.3	

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Created By: TG Date: 8/12/2016
 Checked By: TG Date: 25/01/2017
 Authorised Signatory: *Jack Mitchell* Date: 25/01/2017



Cut to Fill Legend

- 0 Contour
- Cut Contours & Area
- Fill Contours & Area
- Extent of Works

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CATO BOLAM CONSULTANTS

SURVEYORS PLANNERS ENGINEERS

CATO BOLAM CONSULTANTS LTD
 19 Temsiki Avenue
 PO Box 157
 Oruwa 0946
 phone 07-427 0372
 fax 09-476 7331
 email cato@cmw@catobolam.co.nz

REVISION (DESCRIPTIONS)	KM NAME	DATE
R1 REVISED FOR AMENDED DESIGN		05/12/2016
SURVEYED		
DESIGNED	KM	15/11/2016
DRAWN	KM	15/11/2016
CHECKED		
APPROVED		

CABRA DEVELOPMENTS LTD
 45 STATION ROAD,
 HUAPAI

DRAWING TITLE

CUT AND FILL DEPTH
 CONTOURS PLAN

ORIGINAL SCALE	ORIGINAL SIZE	REVISION NO
1 : 2000	A3	R1
DATE	CAD REFERENCE	SHEET NO
15/11/2016	30745 E112 cut/fill.p	E112
DIRECTORY	JOB NO	
Z:\31745\ACAD\	34745	



LF11 Rev 5 Soil Field Density NDM Direct Transmission with VSS Report

Auckland Laboratory
 CMW Geosciences
 Building C, 9 Piermark Drive, Rosedale, NZ 0632
 PO Box 300206, Albany, Auckland, NZ 0752
 Phone: +64 (09) 4144 632

Project: 45 Station Road, Huapai
Project No: AKL2016_0634
Location: Huapai
Report No: AKL2016_0634LAF Rev.0
Report Date: 17/07/2018
Client: Cabra Developments Limited
Client Address:
Client Reference:

Test Methods: NZS 4402.2.1:1986
 NZS 4407.4.2.2:2015
 NZGS:August 2001

Notes: Solid Density: Assumed
 Testing Locations Selected By: CMW Field Staff



Tests indicated as not accredited are outside the scope of the laboratory's accreditation

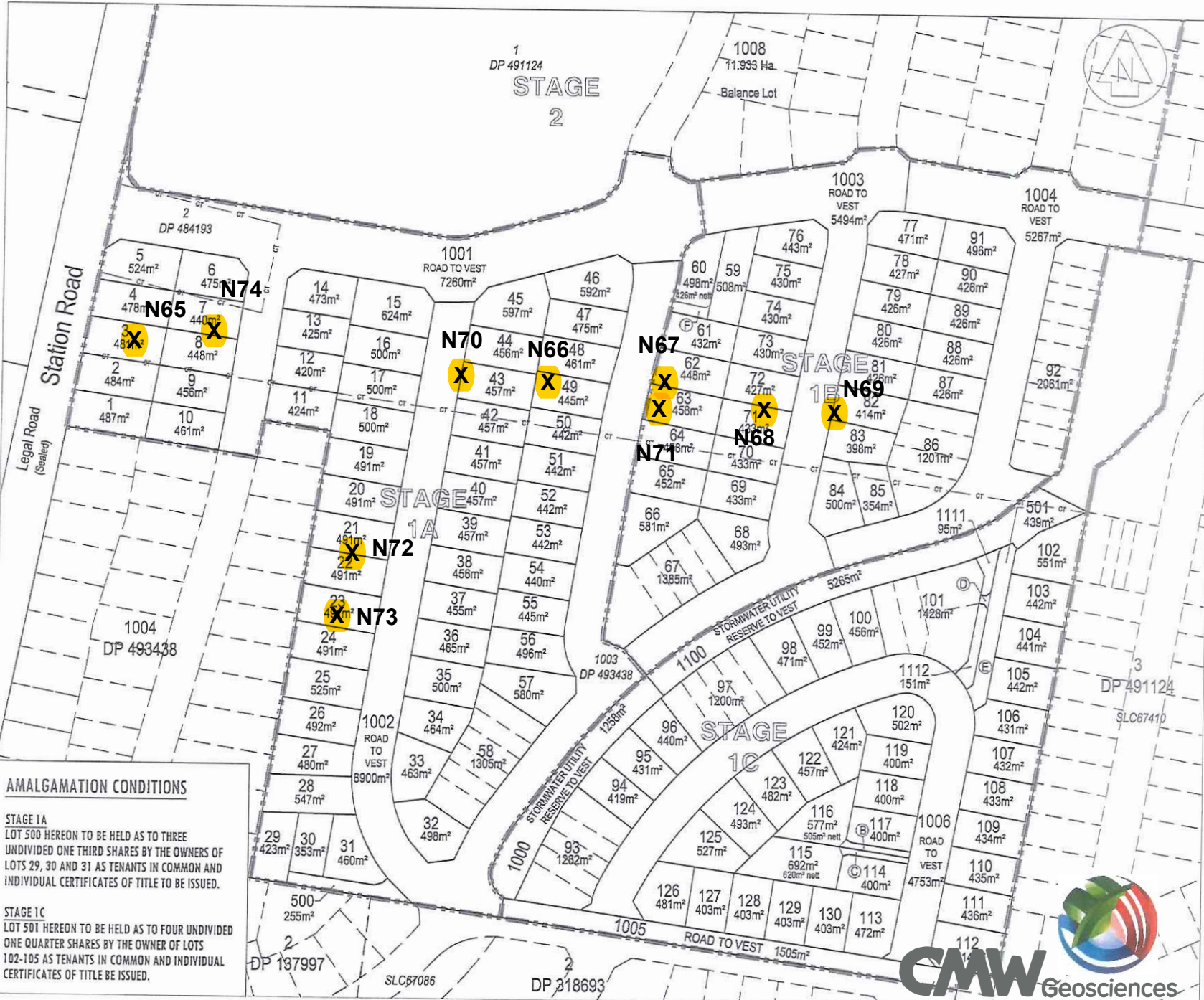
Measurements marked * are not accredited and are outside the scope of the laboratories accreditation

Date Sampled	Sample No.	Test Location	Soil Description	In-situ Vane Shear Strengths					Field and Laboratory Testing Data									Comments
				Test 1 (kPa)	Test 2 (kPa)	Test 3 (kPa)	Test 4 (kPa)	Ave.	Gauge Wet Density (t/m ³) **	Gauge Dry Density (t/m ³)	Gauge Water Content (%)	Gauge Air Voids (%)	Gauge Probe Depth	Oven Water Content (%)	Solid Density (t/m ³) *	Oven Dry Density (t/m ³)	Calculated Air Voids (%) *	
8/02/2018	N65	Refer to site plan	CLAY	155	155	UTP	UTP	155+	1.8720	1.3980	30.0	7.5	300	28.9	2.7	1.46	4.2	No Sample taken Retest of N68
26/02/2018	N66	Refer to site plan	CLAY	UTP	UTP	UTP	120	120+	1.8590	1.3508	34.0	1.0	300	31.8	2.7	1.42	2.9	
	N67	Refer to site plan	CLAY	UTP	180	140	180	167+	1.8680	1.3681	36.0	2.6	300	31.3	2.7	1.42	2.8	
	N68	Refer to site plan	CLAY	90	109	180	168	137	1.8010	1.2510	38.0	9.0	300					
	N69	Refer to site plan	CLAY	180	140	180	190	173	1.8460	1.3480	36.0	3.4	300	20.9	2.7	1.52	12	
5/03/2018	N70	Refer to site plan	CLAY	137	171	155	218+	170+	1.8410	1.3420	35.7	2.3	300	32.5	2.7	1.38	3.4	
	N71	Refer to site plan	CLAY	171	218	218	155	191	1.8520	1.3501	35.1	2.1	300	30.4	2.7	1.42	4.2	
6/03/2018	N72	Refer to site plan	CLAY	UTP	UTP	UTP	UTP	UTP	1.8920	1.4590	29.1	2.8	300	28.3	2.7	1.48	3.6	
	N73	Refer to site plan	CLAY	UTP	UTP	215	UTP	215+	1.8290	1.3750	32.0	3.0	300	32.4	2.7	1.38	4.1	
15/03/2018	N74	Refer to site plan	CLAY	UTP	UTP	UTP	UTP	UTP	1.8755	1.4444	29.8	3.3	300	27.6	2.7	1.48	5.0	

This report should only be reproduced in full.

** Gauge Wet Densities outside of the calibrated range of 1.728 to 2.756 t/m³ are not accredited and are outside the laboratories scope of accreditation.

Created By: JLM Date: 09/02/2018
 Checked By: JLM Date: 17/07/2018
 Authorised Signatory: CS Date: 19/07/2018



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AUCKLAND COUNCIL Rodney Section
 COMPRISED IN CT 710969 16.0204ha
 CT 719628 6.4566ha
 CT 691216 0.2469ha

TOTAL AREA 22.7239ha
 AREAS AND MEASUREMENTS ARE SUBJECT TO SURVEY.

MEMORANDUM OF EASEMENTS

PURPOSE	SHOWN	SERVIENT TENEMENT	DOMINANT TENEMENT
RIGHT OF WAY, RIGHT TO DRAIN STORMWATER AND WASTEWATER, RIGHT TO CONVEY WATER, ELECTRICITY, TELECOMMUNICATIONS AND COMPUTER MEDIA	(B)	LOT 116 HEREON	LOT 115 HEREON
	(C)	LOT 115 HEREON	LOT 116 HEREON
	(D/E)	LOT 501 HEREON	LOT 101 HEREON
	(F)	LOT 60 HEREON	LOT 59 HEREON

SCHEDULE OF EASEMENTS GROSS

PURPOSE	SHOWN	SERVIENT TENEMENT	GRANTEE
PEDESTRIAN RIGHT OF WAY	(D)	LOT 501	AUCKLAND COUNCIL

REVISION (DESCRIPTIONS)	NAME	DATE
SURVEYED		
DESIGNED	SKA	09/16
DRAWN	SL	09/16
CHECKED		
APPROVED		

CATO BOLAM CONSULTANTS

SURVEYORS PLANNERS ENGINEERS

CATO BOLAM CONSULTANTS LTD
 19 Tamekiri Avenue phone 09-427 3072
 PO Box 157 fax 09-426 7231
 Druva 0946 email cato@catobolam.co.nz

CLIENT
 CABRA DEVELOPMENTS LTD
 SUB PRECINCT A
 45 STATION ROAD, HUAPAI

TITLE
 LOTS 1 - 130, 500-501, 1000-1006,
 1100, 1111 & 1112 BEING
 SUBDIVISION OF LOT 1 DP 491124,
 LOT 2 DP 484193 & LOT 1003 DP
 493438 (Sheet 2 of 5)

ORIGINAL SCALE	ORIGINAL SIZE	REVISION NO
1:1500	A3	
DATE	CAD REFERENCE	SHEET NO
OCTOBER 2016	34745 S1.dwg	S2
DIRECTORY		JOB NO
Z:\34745\ACAD\		34745

AMALGAMATION CONDITIONS

STAGE 1A
 LOT 500 HEREON TO BE HELD AS TO THREE UNDIVIDED ONE THIRD SHARES BY THE OWNERS OF LOTS 29, 30 AND 31 AS TENANTS IN COMMON AND INDIVIDUAL CERTIFICATES OF TITLE TO BE ISSUED.

STAGE 1C
 LOT 501 HEREON TO BE HELD AS TO FOUR UNDIVIDED ONE QUARTER SHARES BY THE OWNER OF LOTS 102-105 AS TENANTS IN COMMON AND INDIVIDUAL CERTIFICATES OF TITLE TO BE ISSUED.





LF11 Rev.13 Soil Field Density NDM Direct Transmission with VSS Report (Cohesive Soils)

Auckland Laboratory
 CMW Geosciences (NZ) Ltd Partnership
 Building C, 9 Piermark Drive, Rosedale, NZ 0632
 PO Box 300206, Albany, Auckland, NZ 0752
 Phone: +64 (09) 4144 632

Project: 45 Station Road
Project No: AKL2016-0634
Location: Huapai
Report No: AKL2016-0634LAL Rev.0
Report Date: 3/12/2020
Client: Cabra Developments Limited
Client Address:

Test Methods: NZS 4407 2015 Test 3.1 \diamond
 NZS 4407 2015 Test 4.2
 NZS 4407 2015 Test 4.3
 NZGS: August 2001

Notes: Solid Density: Assumed
 Solid Density Data Source: N/A
 Testing Locations Selected By: CMW Field Staff
 \diamond Only samples <2.0mm will be considered for endorsed testing
 ① Blade size of 19mm used.



Test results indicated as not accredited are outside the scope of the laboratory's accreditation

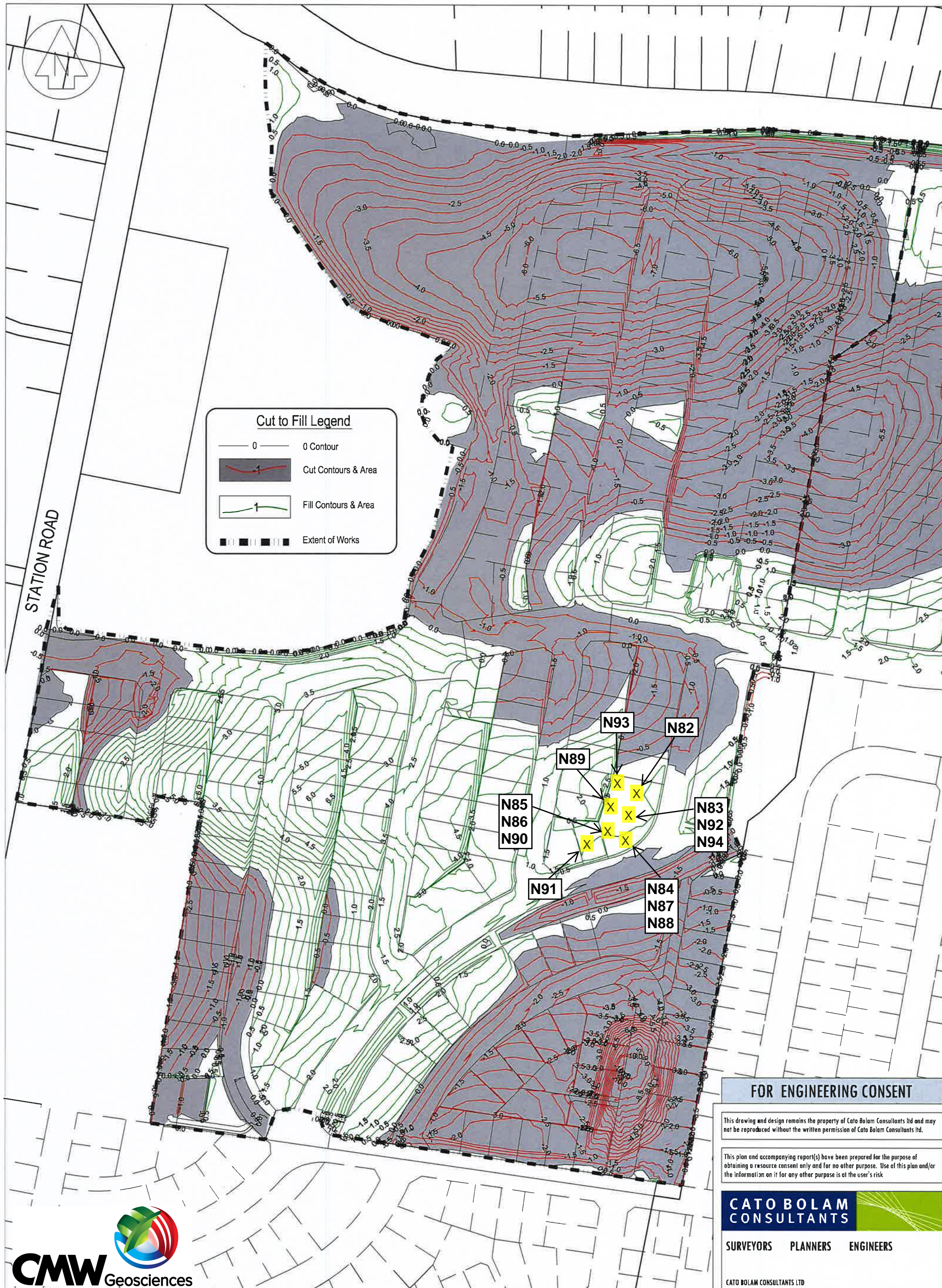
Measurements marked * are not accredited and are outside the scope of the laboratories accreditation

Date Sampled	Sample No.	Test Location*	Soil Description*	Solid Density (t/m ³)*	Vane ID		In-situ Vane Shear Strengths					Field and Laboratory Testing Data							Comments		
					Head #	Blade # ①	Test 1 (kPa)	Test 2 (kPa)	Test 3 (kPa)	Test 4 (kPa)	Ave.	Gauge Wet Density (t/m ³)**	Gauge Dry Density (t/m ³)	Gauge Water Content (%)	Gauge Air Voids (%)	Gauge Probe Depth (mm)	Oven Water Content (%)	Oven Dry Density (t/m ³)		Oven Calculated Air Voids (%)*	
5/10/2020	N82	Refer to site plan	Limed CLAY	2.70	1589	1589	155	UTP	210	UTP	183+	1.67	1.24	34.7	11	300					No sample taken
	N83	Refer to site plan	Limed CLAY	2.70	1589	1589	UTP	UTP	UTP	UTP	UTP	1.81	1.29	40.2	1	300	36.1	1.33		3	
	N84	Refer to site plan	Limed CLAY	2.70	1589	1589	UTP	UTP	UTP	UTP	UTP	1.85	1.37	34.3	2	300	53.9	1.20		-9	
	N85	Refer to site plan	Limed CLAY	2.70	1589	1589	UTP	UTP	UTP	UTP	UTP	1.84	1.36	35.4	1	300	13.3	1.63		18	
	N86	Refer to site plan	Limed CLAY	2.70	1589	1589	UTP	UTP	UTP	UTP	UTP	1.84	1.36	35.4	1	300	32.3	1.39		3	Redry of N85
	N87	Refer to site plan	Limed CLAY	2.70	1589	1589	UTP	UTP	UTP	UTP	UTP	1.85	1.37	34.3	2	300	22.8	1.50		10	Redry of N84
	20/10/2020	N88	Old pond infill	Limed CLAY	2.70	1195	1195	196	196	168	UTP	187+	1.85	1.42	30.6	4	300	28.4	1.44		6
N89		Old pond infill	Limed CLAY	2.70	1195	1195	182	193	154	196	181	1.93	1.49	28.9	1	300	27.5	1.51		3	
N90		Old pond infill	Limed CLAY	2.70	1195	1195	182	182	196	UTP	187+	1.90	1.47	29.3	2	300	26.8	1.50		4	
N91		Old pond infill	Limed CLAY	2.70	1195	1195	98	126	140	140	126	1.81	1.30	38.9	1	300	32.0	1.37		6	
21/10/2020	N92	Old Pond	Limed CLAY	2.70	1195	1195	140	154	121	196	153	1.90	1.44	32.1	0	300	29.7	1.47		2	
22/10/2020	N93	Old Pond	Limed CLAY	2.70	1195	1195	154	168	196	140	165	1.91	1.43	33.3	-1	300	36.4	1.40		-3	
23/10/2020	N94	Old Pond outlet	CLAY	2.70	1195	1195	196	196	UTP	196	196+	1.86	1.41	31.6	3	300	26.4	1.47		7	

This report should only be reproduced in full.

** Gauge Wet Densities outside of the calibrated range of 1.728 to 2.756 t/m³ are not accredited and are outside the laboratories scope of accreditation.

Created By: JLM Date: 7/10/2020
 Checked By: JW Date: 3/12/2020
 Authorised Signatory: JW Date: 3/12/2020



FOR ENGINEERING CONSENT

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SURVEYORS PLANNERS ENGINEERS

CATO BOLAM CONSULTANTS LTD
 19 Tamarii Avenue phone 09-427 0072
 PO Box 157 fax 09-426 7331
 Orewa 0946 email catobolam@catobolam.co.nz

ORIGINAL SCALE 1 : 2000	ORIGINAL SIZE A3	REVISION NO R1
DATE 15/11/2016	CAD REFERENCE 34745 E112 Cut/Fill.p	SHEET NO E112
DIRECTORY Z:\34745\ACAD\		JOB NO 34745



REVISION (DESCRIPTIONS)	NAME	DATE
R1 REVISED FOR AMENDED DESIGN	KM	05/12/2016
SURVEYED		
DESIGNED	KM	15/11/2016
DRAWN	KM	15/11/2016
CHECKED		
APPROVED		

CLIENT
CABRA DEVELOPMENTS LTD
 45 STATION ROAD,
 HUAPAI

DRAWING TITLE
**CUT AND FILL DEPTH
 CONTOURS PLAN**



LF14 Rev.12 Dynamic Cone Penetration (DCP) Test Report

NZS 4402: 1988 Test 6.5.2

Project:	45 Station Road	Auckland Laboratory CMW Geosciences (NZ) Ltd Partnership Building C, 9 Piermark Drive, Rosedale, NZ 0632 PO Box 300206, Albany, Auckland, NZ 0752 Phone: +64 (09) 4144 632
Project No:	AKL2016-0634	
Location:	Huapai	
Report No:	AKL2016-0634LAN Rev.0	
Test Date:	20/10/2020	Testing Locations Selected By: CMW Field Staff
Tested By:	JW/HN	
Client:	Cabra Developments Limited	
Client Address:		



Test results indicated as not accredited are outside the scope of the laboratory's accreditation

* Equivalent CBR Values are not accredited and are outside the scope of the laboratory's accreditation

Test No	1		2		3		4		5	
Test Location	Road 10 - (Road 1 End)		Road 10		Road 10		Road 10		Road 10	
Chainage & Offset	CH10R		CH20L		CH30R		CH40L		CH50R	
Material & Layer	CLAY/SG		CLAY/SG		CLAY/SG		CLAY/SG		CLAY/SG	
Depth (mm)	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*
0 - 100	2	4	6	13	3	6	4	8	3	6
100 - 200	2	4	4	8	3	6	4	8	3	6
200 - 300	3	6	4	8	2	4	3	6	3	6
300 - 400	4	8	4	8	3	6	4	8	3	6
400 - 500	4	8	4	8	4	8	2	4	4	8
500 - 600	4	8	4	8	4	8	5	10	4	8
600 - 700	4	8	5	10	5	10	5	10	5	10
700 - 800	5	10	4	8	6	13	6	13	5	10
800 - 900	5	10	5	10	6	13	5	10	6	13
900 - 1000										


Test No	6		7		8		9		10	
Test Location	Road 10		Road 10		Road 10		Road 10		Road 10	
Chainage & Offset	CH60L		CH70R		CH80L		CH90R		CH100L	
Material & Layer	CLAY/SG		CLAY/SG		CLAY/SG		CLAY/SG		CLAY/SG	
Depth	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*
0 - 100	8	18	5	10	7	15	3	6	4	8
100 - 200	3	6	3	6	4	8	3	6	3	6
200 - 300	3	6	3	6	3	6	3	6	3	6
300 - 400	4	8	3	6	4	8	3	6	3	6
400 - 500	5	10	3	6	4	8	3	6	3	6
500 - 600	7	15	4	8	5	10	4	8	3	6
600 - 700	5	10	5	10	6	13	3	6	3	6
700 - 800	9	20	5	10	7	15	4	8	3	6
800 - 900	8	18	5	10	6	13	5	10	4	8
900 - 1000										

Created by: JLM	Date: 20/10/2020	<p>This report should only be reproduced in full</p> <p>*Equivalent CBR values calculated using AUSTRROADS (2010) Guide to Pavement Technology Part 2, Figure 5.3, For Fine Grained Cohesive Soils, and are relevant to fine grained cohesive soils only.</p> <p style="text-align: right;">Page 1 of 4</p>
Checked by: JW	Date: 3/12/2020	
Authorised Signatory: JW	Date: 3/12/2020	



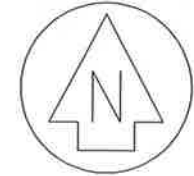
LF14 Rev.12 Dynamic Cone Penetration (DCP) Test Report

NZS 4402: 1988 Test 6.5.2

Project:	45 Station Road	Auckland Laboratory
Project No:	AKL2016-0634	CMW Geosciences (NZ) Ltd Partnership
Location:	Huapai	Building C, 9 Piermark Drive, Rosedale, NZ 0632
Report No:	AKL2016-0634LAN Rev.0	PO Box 300206, Albany, Auckland, NZ 0752
Test Date:	20/10/2020	Phone: +64 (09) 4144 632
Tested By:	JW/HN	Testing Locations Selected By: CMW Field Staff
Client:	Cabra Developments Limited	 <p style="font-size: small;">Test results indicated as not accredited are outside the scope of the laboratory's accreditation</p> <p style="font-size: small;">* Equivalent CBR Values are not accredited and are outside the scope of the laboratory's accreditation</p>
Client Address:		

Test No	11									
Test Location	Road 10 (Road 11 End)									
Chainage & Offset	CH110R									
Material & Layer	CLAY/SG									
Depth (mm)	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*
0 - 100	4	8								
100 - 200	2	4								
200 - 300	3	6								
300 - 400	2	4								
400 - 500	3	6								
500 - 600	4	8								
600 - 700	4	8								
700 - 800	5	10								
800 - 900	5	10								
900 - 1000										
Test No										
Test Location										
Chainage & Offset										
Material & Layer										
Depth	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*
0 - 100										
100 - 200										
200 - 300										
300 - 400										
400 - 500										
500 - 600										
600 - 700										
700 - 800										
800 - 900										
900 - 1000										

Created by: JLM	Date: 20/10/2020	<p style="font-size: small;">This report should only be reproduced in full</p> <p style="font-size: x-small;">*Equivalent CBR values calculated using AUSTRROADS (2010) Guide to Pavement Technology Part 2, Figure 5.3, For Fine Grained Cohesive Soils, and are relevant to fine grained cohesive soils only.</p> <p style="font-size: x-small;">Page 2 of 4</p>
Checked by: JW	Date: 3/12/2020	
Authorised Signatory: JW	Date: 3/12/2020	



See Plan 34745 E269
for Roundabout Details

TGSI Pavers (yellow 300mm
x300mm concrete type)
on all pram crossings on roundabout installed
as per ATCOP SD FP009

Pavers (yellow
x300mm
type) installed
ATCOP SD FP009

TGSI Pavers
(yellow 300mm
x300mm concrete
type) installed as
per ATCOP SD
FP009

76
Road name as per Auckland Transport
Standard details SM004 & SM005

STAGES 1A, 1B
& 1D

Road Layout Legend

- Footpath
- Indicative Vehicle Crossing Locations
- Parking Bays/Driveways
- Raingardens and ID
- Street Lights
- Street Trees
- Road Name Sign
- Job Boundary
- Cycleway
- 0.5m Buffer Zone
- TGSI

FOR ENGINEERING CONSENT
SEE PLAN E240 FOR GENERAL
AND ROADING NOTES



CATOBOLAM CONSULTANTS
SURVEYORS PLANNERS ENGINEERS

CATO BOLAM CONSULTANTS LTD
19 Tamariki Avenue
PO Box 157
Drewa 0946

phone 09-427 0072
fax 09-426 7331
email catobolam@catobolam.co.nz

REVISION (DESCRIPTIONS)	NAME	DATE
SURVEYED		
DESIGNED	DL	09/16
DRAWN	SL	09/16
CHECKED		
APPROVED		

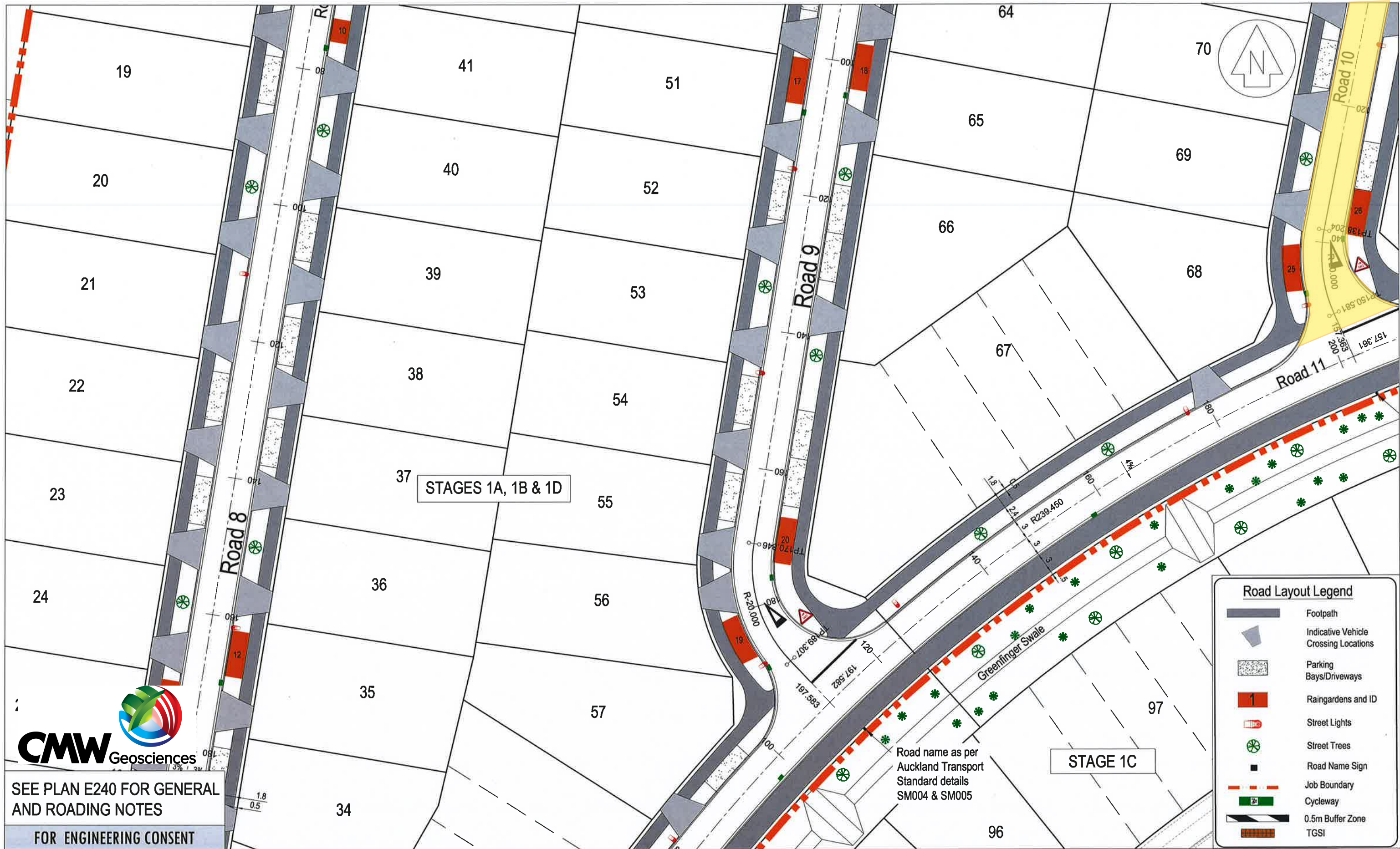
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CLIENT
CABRA DEVELOPMENTS LTD
45 STATION ROAD,
HUAPAI

DRAWING TITLE
ROADING LAYOUT
STAGE 1A, 1B & 1D
SHEET 3 OF 6

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ORIGINAL SCALE	ORIGINAL SIZE	REVISION NO
1 : 500	A3	
DATE	CAD REFERENCE	SHEET NO
11/01/2017	34745 E240 ROAD LAYOUT	E242
DIRECTORY	IMAGE FILE	JOB NO
Z:\34745\Acad\Stage 1A & B		34745



Road Layout Legend

- Footpath
- Indicative Vehicle Crossing Locations
- Parking Bays/Driveways
- Raingardens and ID
- Street Lights
- Street Trees
- Road Name Sign
- Job Boundary
- Cycleway
- 0.5m Buffer Zone
- TGSi

CMW Geosciences

SEE PLAN E240 FOR GENERAL AND ROADING NOTES

FOR ENGINEERING CONSENT

CATO BOLAM CONSULTANTS

SURVEYORS PLANNERS ENGINEERS

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19 Tamariki Avenue
PO Box 157
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phone 09-427 0072
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REVISION (DESCRIPTIONS)	NAME	DATE
SURVEYED		
DESIGNED	KM	09/16
DRAWN	SL	09/16
CHECKED		
APPROVED		

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CLIENT

CABRA DEVELOPMENTS LTD
45 STATION ROAD,
HUAPAI

DRAWING TITLE

ROADING LAYOUT
STAGE 1A, 1B & 1D
SHEET 5 OF 6


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ORIGINAL SCALE 1 : 500	ORIGINAL SIZE A3	REVISION NO
DATE 11/01/2017	CAD REFERENCE 34745 E240 ROAD LAYOUT	SHEET NO E244
DIRECTORY Z:\34745\Acad\Stage 1A & B	IMAGE FILE	JOB NO 34745



LF14 Rev.12 Dynamic Cone Penetration (DCP) Test Report

NZS 4402: 1988 Test 6.5.2

Project:	45 Station Road	Auckland Laboratory
Project No:	AKL2016-0634	CMW Geosciences (NZ) Ltd Partnership
Location:	Huapai	Building C, 9 Piermark Drive, Rosedale, NZ 0632
Report No:	AKL2016-0634LAM Rev.0	PO Box 300206, Albany, Auckland, NZ 0752
Test Date:	19/10/2020	Phone: +64 (09) 4144 632
Tested By:	JW/HN	Testing Locations Selected By: CMW Field Staff
Client:	Cabra Developments Limited	 <p>Test results indicated as not accredited are outside the scope of the laboratory's accreditation</p> <p>* Equivalent CBR Values are not accredited and are outside the scope of the laboratory's accreditation</p>
Client Address:		

Test No	1		2		3		4		5	
Test Location	Road 11		Road 11		Road 11		Road 11		Road 11	
Chainage & Offset	CH200R		CH210L		CH220R		CH230L		CH240R	
Material & Layer	SG		SG		SG		SG		SG	
Depth (mm)	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*
0 - 100	6	13	4	8	5	10	3	6	8	18
100 - 200	4	8	3	6	4	8	3	6	4	8
200 - 300	3	6	3	6	3	6	4	8	3	6
300 - 400	3	6	2	4	3	6	4	8	2	4
400 - 500	4	8	3	6	3	6	3	6	4	8
500 - 600	3	6	2	4	3	6	4	8	5	10
600 - 700	4	8	3	6	3	6	5	10	6	13
700 - 800	5	10	3	6	4	8	5	10	10	20+
800 - 900	5	10	3	6	3	6	4	8		
900 - 1000										


Test No	6		7		8		9		10	
Test Location	Road 11		Road 11		Road 11		Road 11		Road 11	
Chainage & Offset	CH250L		CH260R		CH270L		CH280R		CH290L	
Material & Layer	SG		SG		SG		SG		SG	
Depth	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*
0 - 100	3	6	5	10	5	10	1	2	5	10
100 - 200	3	6	3	6	3	6	2	4	2	4
200 - 300	3	6	2	4	3	6	2	4	3	6
300 - 400	3	6	3	6	2	4	4	8	3	6
400 - 500	4	8	3	6	2	4	4	8	2	4
500 - 600	3	6	4	8	3	6	3	6	3	6
600 - 700	2	4	9	20	4	8	3	6	3	6
700 - 800	2	4	10	20+	3	6	3	6	3	6
800 - 900	1	2	7	15	3	6	2	4	5	10
900 - 1000										

Created by: JLM Checked by: JW Authorised Signatory: JW	Date: 20/10/2020 Date: 3/12/2020 Date: 3/12/2020	This report should only be reproduced in full *Equivalent CBR values calculated using AUSTRROADS (2010) Guide to Pavement Technology Part 2, Figure 5.3, For Fine Grained Cohesive Soils, and are relevant to fine grained cohesive soils only. Page 1 of 7
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LF14 Rev.12 Dynamic Cone Penetration (DCP) Test Report

NZS 4402: 1988 Test 6.5.2

Project:	45 Station Road	Auckland Laboratory
Project No:	AKL2016-0634	CMW Geosciences (NZ) Ltd Partnership
Location:	Huapai	Building C, 9 Piermark Drive, Rosedale, NZ 0632
Report No:	AKL2016-0634LAM Rev.0	PO Box 300206, Albany, Auckland, NZ 0752
Test Date:	19/10/2020	Phone: +64 (09) 4144 632
Tested By:	JW/HN	Testing Locations Selected By: CMW Field Staff
Client:	Cabra Developments Limited	 <p>Test results indicated as not accredited are outside the scope of the laboratory's accreditation</p> <p>* Equivalent CBR Values are not accredited and are outside the scope of the laboratory's accreditation</p>
Client Address:		

Test No	11		12		13		14		15	
Test Location	Road 11		Road 11		Road 11		Road 11		Road 11	
Chainage & Offset	CH300R		CH310L		CH320R		CH330L		CH340R	
Material & Layer	SG		SG		SG		SG		SG	
Depth (mm)	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*
0 - 100	4	8	4	8	2	4	3	6	5	10
100 - 200	2	4	3	6	4	8	3	6	3	6
200 - 300	3	6	3	6	2	4	3	6	2	4
300 - 400	3	6	4	8	2	4	2	4	3	6
400 - 500	4	8	4	8	3	6	2	4	3	6
500 - 600	3	6	6	13	3	6	3	6	2	4
600 - 700	4	8	4	8	3	6	3	6	3	6
700 - 800	3	6	5	10	5	10	3	6	3	6
800 - 900	3	6	6	13	3	6	3	6	3	6
900 - 1000										

Test No	16		17		18		19		20	
Test Location	Road 11		Road 11		Road 11		Road 11		Road 1	
Chainage & Offset	CH350L		CH360R		CH370L		CH380R		CH410R	
Material & Layer	SG		SG		SG		SG		SG	
Depth	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*
0 - 100	6	13	3	6	2	4	5	10	3	6
100 - 200	3	6	2	4	2	4	2	4	3	6
200 - 300	4	8	2	4	2	4	2	4	3	6
300 - 400	4	8	2	4	3	6	2	4	3	6
400 - 500	3	6	2	4	4	8	3	6	3	6
500 - 600	3	6	2	4	5	10	2	4	3	6
600 - 700	4	8	3	6	6	13	4	8	3	6
700 - 800	3	6	2	4	6	13	3	6	4	8
800 - 900	5	10	3	6	5	10	3	6	3	6
900 - 1000										

Created by: JLM	Date: 20/10/2020	<p>This report should only be reproduced in full</p> <p>*Equivalent CBR values calculated using AUSTRROADS (2010) Guide to Pavement Technology Part 2, Figure 5.3, For Fine Grained Cohesive Soils, and are relevant to fine grained cohesive soils only.</p> <p>Page 2 of 7</p>
Checked by: JW	Date: 3/12/2020	
Authorised Signatory: JW	Date: 3/12/2020	



LF14 Rev.12 Dynamic Cone Penetration (DCP) Test Report

NZS 4402: 1988 Test 6.5.2

Project:	45 Station Road	Auckland Laboratory
Project No:	AKL2016-0634	CMW Geosciences (NZ) Ltd Partnership
Location:	Huapai	Building C, 9 Piermark Drive, Rosedale, NZ 0632
Report No:	AKL2016-0634LAM Rev.0	PO Box 300206, Albany, Auckland, NZ 0752
Test Date:	19/10/2020	Phone: +64 (09) 4144 632
Tested By:	JW/HN	Testing Locations Selected By: CMW Field Staff
Client:	Cabra Developments Limited	 <p>Test results indicated as not accredited are outside the scope of the laboratory's accreditation</p> <p>* Equivalent CBR Values are not accredited and are outside the scope of the laboratory's accreditation</p>
Client Address:		

Test No	21		22		23		24		25	
Test Location	Road 1		Road 1		Road 1		Road 1		Road 1	
Chainage & Offset	CH390L		CH380R		CH370L		CH360R		CH350L	
Material & Layer	SG		SG		SG		SG		SG	
Depth (mm)	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*
0 - 100	9	20	6	13	4	8	4	8	3	6
100 - 200	7	15	8	18	4	8	3	6	2	4
200 - 300	6	13	10	20+	3	6	3	6	2	4
300 - 400	4	8	8	18	4	8	2	4	4	8
400 - 500	4	8	4	8	4	8	3	6	3	6
500 - 600	3	6	3	6	3	6	4	8	3	6
600 - 700	3	6	3	6	3	6	4	8	2	4
700 - 800	3	6	3	6	3	6	2	4	2	4
800 - 900	3	6	3	6	3	6	3	6	2	4
900 - 1000										

Test No	26		27		28		29		30	
Test Location	Road 1		Road 1		Road 1		Road 1		Road 1	
Chainage & Offset	CH340R		CH330L		CH320R		CH300L		CH290R	
Material & Layer	SG		SG		SG		SG		SG	
Depth	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*
0 - 100	4	8	13	20+	9	20	5	10	5	10
100 - 200	4	8	7	15	5	10	4	8	4	8
200 - 300	3	6	4	8	3	6	5	10	3	6
300 - 400	4	8	5	10	3	6	4	8	3	6
400 - 500	4	8	3	6	2	4	3	6	3	6
500 - 600	5	10	4	8	3	6	2	4	3	6
600 - 700	6	13	2	4	3	6	4	8	3	6
700 - 800	7	15	3	6	3	6	5	10	3	6
800 - 900	6	13	3	6	3	6	4	8	3	6
900 - 1000										

Created by: JLM Checked by: JW Authorised Signatory: JW	Date: 20/10/2020 Date: 3/12/2020 Date: 3/12/2020	<p>This report should only be reproduced in full</p> <p>*Equivalent CBR values calculated using AUSTRROADS (2010) Guide to Pavement Technology Part 2, Figure 5.3, For Fine Grained Cohesive Soils, and are relevant to fine grained cohesive soils only.</p> <p>Page 3 of 7</p>
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LF14 Rev.12 Dynamic Cone Penetration (DCP) Test Report

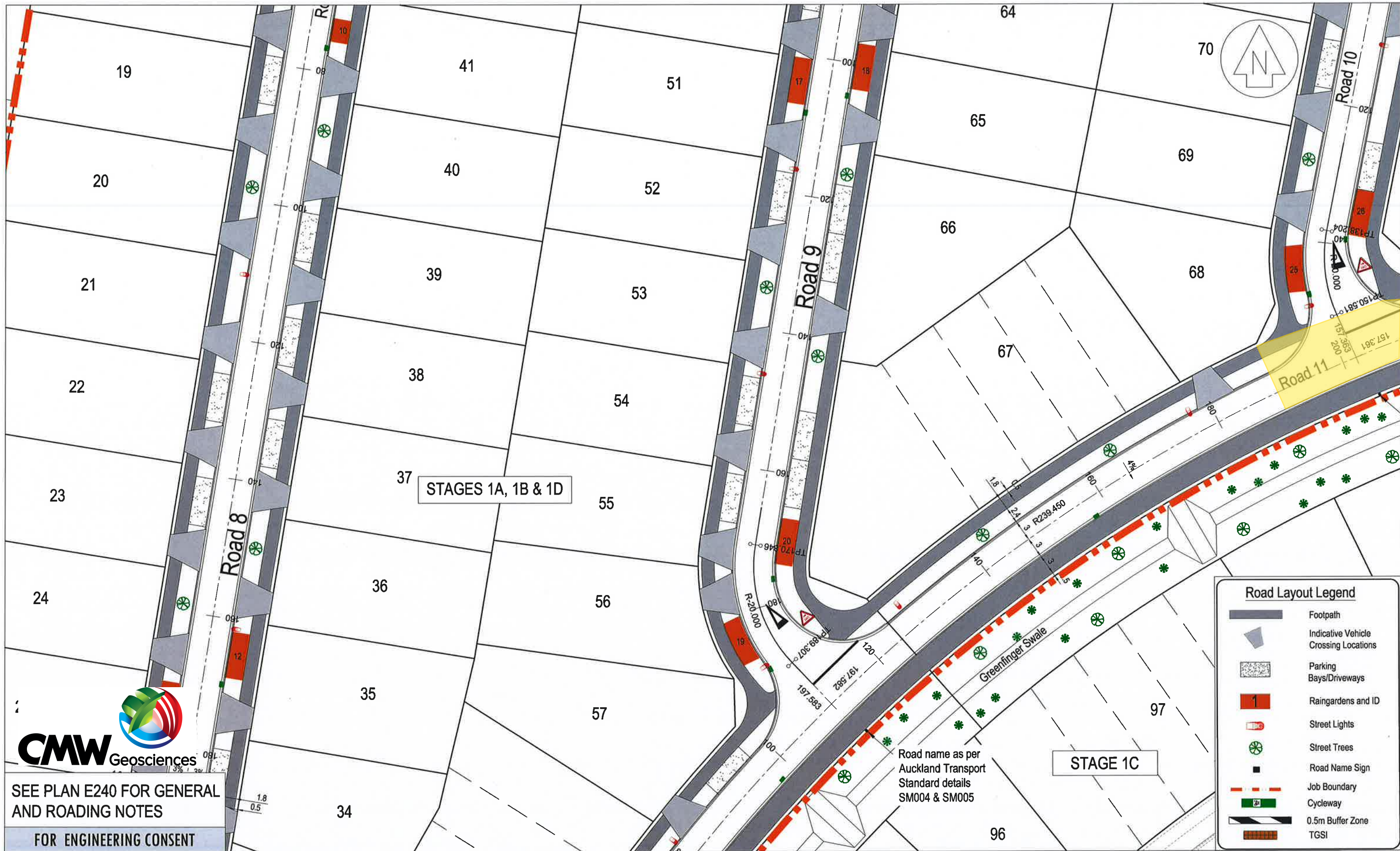
NZS 4402: 1988 Test 6.5.2

Project:	45 Station Road	Auckland Laboratory
Project No:	AKL2016-0634	CMW Geosciences (NZ) Ltd Partnership
Location:	Huapai	Building C, 9 Piermark Drive, Rosedale, NZ 0632
Report No:	AKL2016-0634LAM Rev.0	PO Box 300206, Albany, Auckland, NZ 0752
Test Date:	19/10/2020	Phone: +64 (09) 4144 632
Tested By:	JW/HN	Testing Locations Selected By: CMW Field Staff
Client:	Cabra Developments Limited	<p style="font-size: small;">Test results indicated as not accredited are outside the scope of the laboratory's accreditation</p> <p style="font-size: x-small;">* Equivalent CBR Values are not accredited and are outside the scope of the laboratory's accreditation</p>
Client Address:		

Test No	31		32							
Test Location	Road 1		Road 1							
Chainage & Offset	CH280L		CH270R							
Material & Layer	SG		SG							
Depth (mm)	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*
0 - 100	3	6	5	10						
100 - 200	4	8	4	8						
200 - 300	3	6	4	8						
300 - 400	3	6	4	8						
400 - 500	3	6	5	10						
500 - 600	4	8	5	10						
600 - 700	4	8	6	13						
700 - 800	6	13	7	15						
800 - 900	6	13	7	15						
900 - 1000										

Test No										
Test Location										
Chainage & Offset										
Material & Layer										
Depth	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*
0 - 100										
100 - 200										
200 - 300										
300 - 400										
400 - 500										
500 - 600										
600 - 700										
700 - 800										
800 - 900										
900 - 1000										

Created by: JLM	Date: 20/10/2020	<p style="font-size: x-small;">This report should only be reproduced in full</p> <p style="font-size: x-small;">*Equivalent CBR values calculated using AUSTRROADS (2010) Guide to Pavement Technology Part 2, Figure 5.3, For Fine Grained Cohesive Soils, and are relevant to fine grained cohesive soils only.</p> <p style="font-size: x-small;">Page 4 of 7</p>
Checked by: JW	Date: 3/12/2020	
Authorised Signatory: JW	Date: 3/12/2020	



Road Layout Legend

- Footpath
- Indicative Vehicle Crossing Locations
- Parking Bays/Driveways
- Raingardens and ID
- Street Lights
- Street Trees
- Road Name Sign
- Job Boundary
- Cycleway
- 0.5m Buffer Zone
- TGSI

CMW Geosciences

SEE PLAN E240 FOR GENERAL AND ROADING NOTES

FOR ENGINEERING CONSENT

CATO BOLAM CONSULTANTS

SURVEYORS PLANNERS ENGINEERS

CATO BOLAM CONSULTANTS LTD
19 Tamariki Avenue
PO Box 157
Orawa 0946

phone 09-427 0072
fax 09-426 7331
email catobolam@catobolam.co.nz

REVISION (DESCRIPTIONS)	NAME	DATE
SURVEYED		
DESIGNED	KM	09/16
DRAWN	SL	09/16
CHECKED		
APPROVED		

This plan and accompanying report(s) have been prepared for the purpose of obtaining a resource consent only and for no other purpose. Use of this plan and/or the information on it for any other purpose is at the user's risk

CLIENT

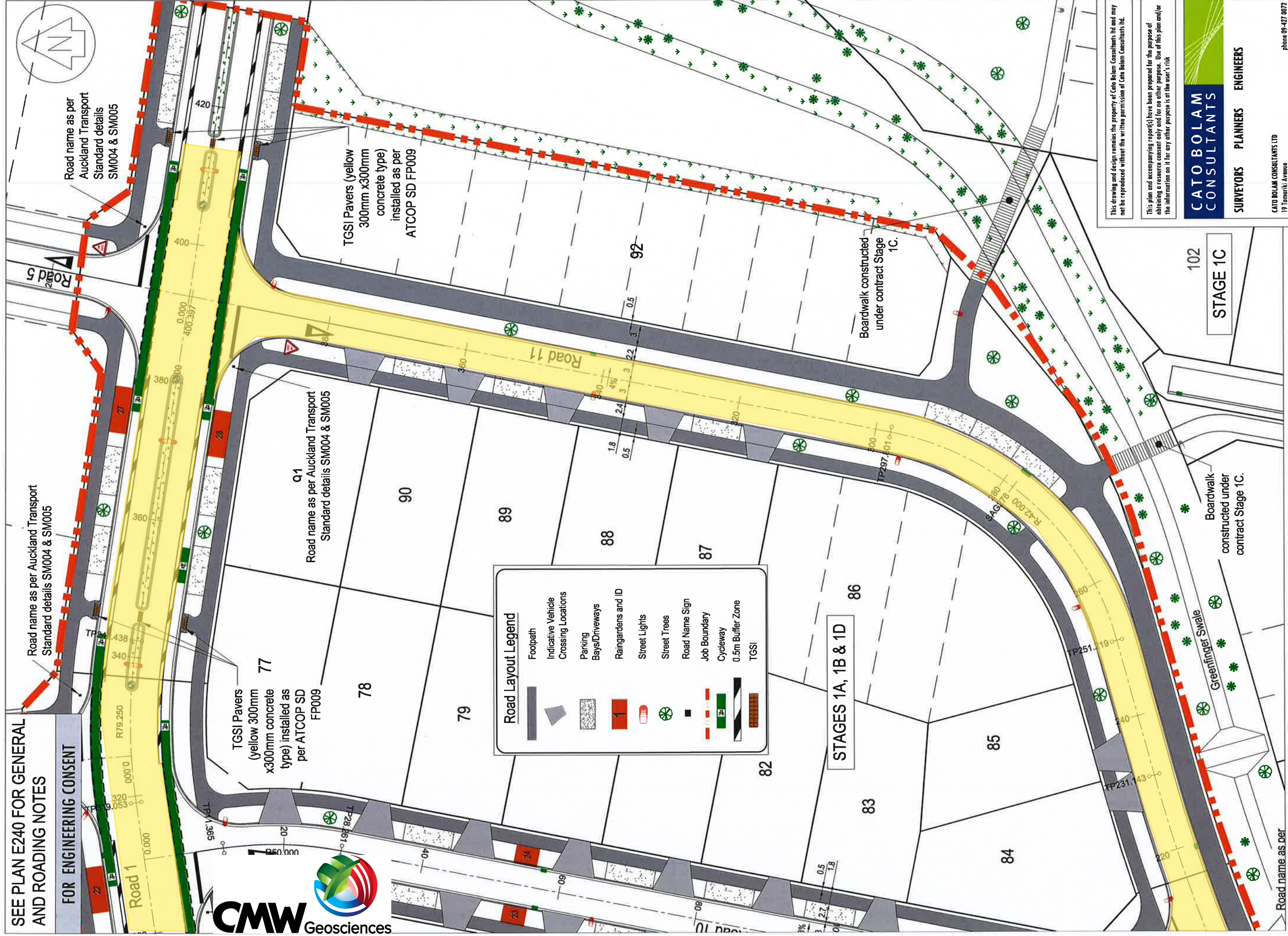
CABRA DEVELOPMENTS LTD
45 STATION ROAD,
HUAPAI

DRAWING TITLE

ROADING LAYOUT
STAGE 1A, 1B & 1D
SHEET 5 OF 6

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ORIGINAL SCALE 1 : 500	ORIGINAL SIZE A3	REVISION NO
DATE 11/01/2017	CAD REFERENCE 34745 E240 ROAD LAYOUT	SHEET NO E244
DIRECTORY Z:\34745\Acad\Stage 1A & B	IMAGE FILE	JOB NO 34745



SEE PLAN E240 FOR GENERAL AND ROADING NOTES FOR ENGINEERING CONSENT



Road Layout Legend

- Footpath
- Indicative Vehicle Crossing Locations
- Parking Bays/Driveways
- Raingardens and ID
- Street Lights
- Street Trees
- Road Name Sign
- Job Boundary
- Cycleway
- 0.5m Buffer Zone
- TGSI

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CATOBOLAM CONSULTANTS
SURVEYORS PLANNERS ENGINEERS

CATO BOLAM CONSULTANTS LTD
19 Tamuriki Avenue
PO Box 157
Dunedin 9046
phone 09-427 0072
fax 09-426 7331
email cato@catobolam.co.nz

ORIGINAL SCALE	1 : 500	ORIGINAL SIZE	A3	REVISION NO	
DATE	11/01/2017	CAD REFERENCE	34745 E240 ROAD LAYOUT	SHEET NO	E243
DIRECTORY	23/34745/Asst/Stage 1A & B			JOB NO	34745

ROADING LAYOUT
STAGE 1A, 1B & 1D
SHEET 4 OF 6

CABRA DEVELOPMENTS LTD
45 STATION ROAD,
HUAPAI

REVISION (DESCRIPTIONS)	NAME	DATE
SURVEYED		
DESIGNED	KM	09/16
DRAWN	SL	09/16
CHECKED		
APPROVED		

See Plan 34745 E269
for Roundabout Details

TGSI Pavers (yellow 300mm
x300mm concrete type)
on all pram
crossings on roundabout installed
as per ATCOP SD FP009

Pavers (yellow
x300mm
type) installed
ATCOP SD FP009

TGSI Pavers
(yellow 300mm
x300mm concrete
type) installed as
per ATCOP SD
FP009

76
Road name as per Auckland Transport
Standard details SM004 & SM005

STAGES 1A, 1B
& 1D

Road Layout Legend

- Footpath
- Indicative Vehicle Crossing Locations
- Parking Bays/Driveways
- Raingardens and ID
- Street Lights
- Street Trees
- Road Name Sign
- Job Boundary
- Cycleway
- 0.5m Buffer Zone
- TGSI

FOR ENGINEERING CONSENT
SEE PLAN E240 FOR GENERAL
AND ROADING NOTES



CATOBOLAM CONSULTANTS
SURVEYORS PLANNERS ENGINEERS

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Drewa 0946

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REVISION (DESCRIPTIONS)	NAME	DATE
SURVEYED		
DESIGNED	DL	09/16
DRAWN	SL	09/16
CHECKED		
APPROVED		

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CLIENT
CABRA DEVELOPMENTS LTD
45 STATION ROAD,
HUAPAI

DRAWING TITLE
ROADING LAYOUT
STAGE 1A, 1B & 1D
SHEET 3 OF 6

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ORIGINAL SCALE	ORIGINAL SIZE	REVISION NO
1 : 500	A3	
DATE	CAD REFERENCE	SHEET NO
11/01/2017	34745 E240 ROAD LAYOUT	E242
DIRECTORY	IMAGE FILE	JOB NO
Z:\34745\Acad\Stage 1A & B		34745



LF11 Rev.13 Soil Field Density NDM Direct Transmission with VSS Report (Cohesive Soils)

Auckland Laboratory
 CMW Geosciences (NZ) Ltd Partnership
 Building C, 9 Piermark Drive, Rosedale, NZ 0632
 PO Box 300206, Albany, Auckland, NZ 0752
 Phone: +64 (09) 4144 632

Project: 45 Station Road
Project No: AKL2016-0634
Location: Huapai
Report No: AKL2016-0634LAO Rev.0
Report Date: 20/04/2021
Client: Cabra Developments Limited
Client Address:

Test Methods: NZS 4407 2015 Test 3.1 ◊
 NZS 4407 2015 Test 4.2
 NZS 4407 2015 Test 4.3
 NZGS: August 2001

Notes: Solid Density: Assumed
 Solid Density Data Source: N/A
 Testing Locations Selected By: CMW Field Staff/Contractor
 ◊ Only samples <2.0mm will be considered for endorsed testing
 ① Blade size of 19mm used.



Test results indicated as not accredited are outside the scope of the laboratory's accreditation

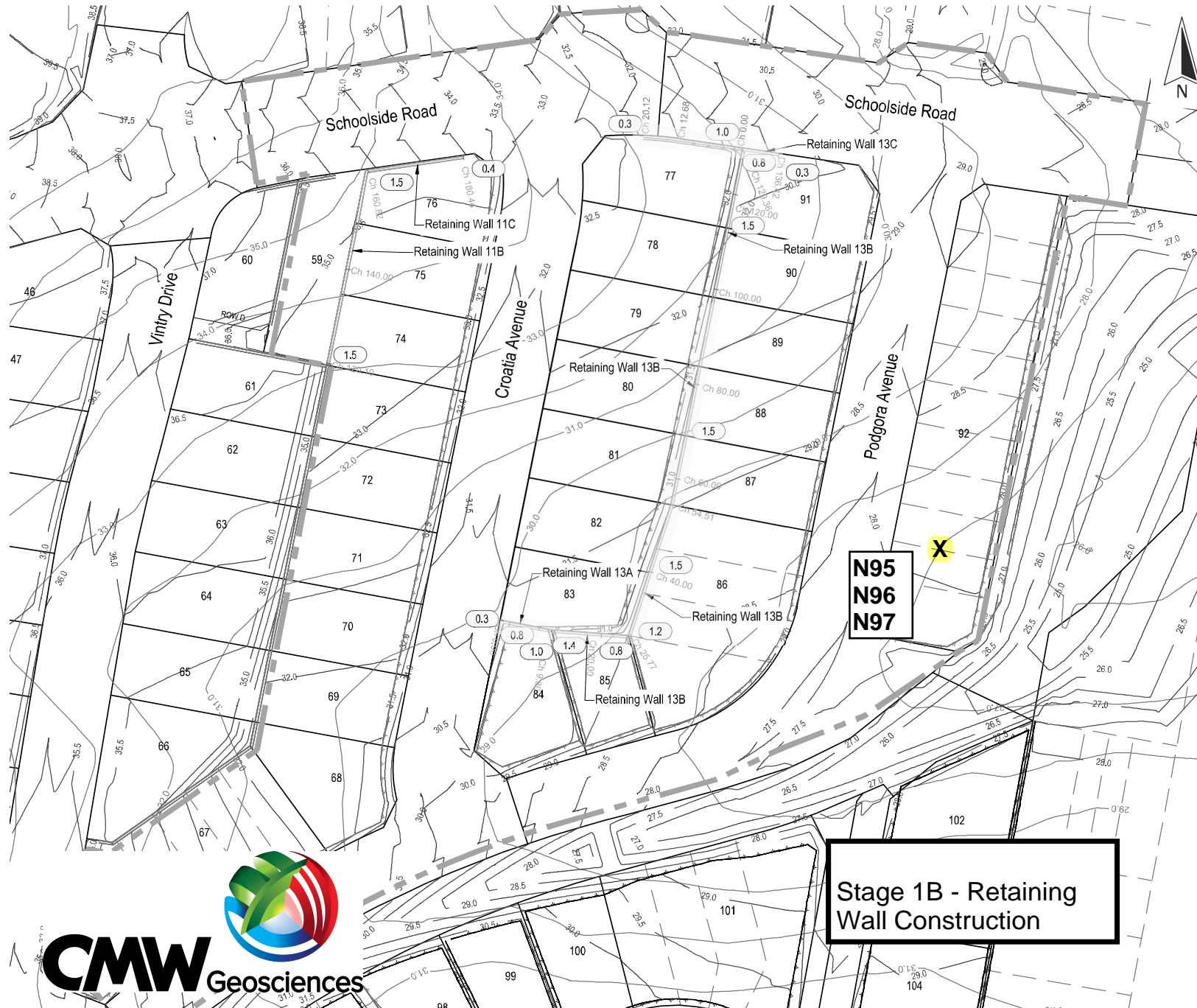
Measurements marked * are not accredited and are outside the scope of the laboratories accreditation

Date Sampled	Sample No.	Test Location*	Soil Description*	Solid Density (t/m ³) *	Vane ID		In-situ Vane Shear Strengths					Field and Laboratory Testing Data							Comments	
					Head #	Blade # ①	Test 1 (kPa)	Test 2 (kPa)	Test 3 (kPa)	Test 4 (kPa)	Ave.	Gauge Wet Density (t/m ³) **	Gauge Dry Density (t/m ³)	Gauge Water Content (%)	Gauge Air Voids (%)	Gauge Probe Depth (mm)	Oven Water Content (%)	Oven Dry Density (t/m ³)		Oven Calculated Air Voids (%) *
25/03/2021	N95	Refer to site plan	CLAY	2.70	1195	1195	UTP	UTP	UTP	UTP	UTP	1.81	1.36	33.6	4	300	31.0	1.38	6	
26/03/2021	N96	Old Pond	CLAY	2.70	1195	1195	159	196	UTP	UTP	178+	1.90	1.43	32.9	0	300	33.2	1.43	0	
7/04/2021	N97	Station Road	CLAY	2.70	1195	1195	196	182	140	196	179	1.86	1.42	31.3	3	300	27.3	1.46	6	

This report should only be reproduced in full.

** Gauge Wet Densities outside of the calibrated range of 1.728 to 2.756 t/m³ are not accredited and are outside the laboratories scope of accreditation.

Created By: JLM Date: 29/03/2021
 Checked By: JLM Date: 20/04/2021
 Authorised Signatory: JW Date: 20/04/2021



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- Legend**
- 38.0 — Existing Contours
 - 38.0 — Proposed Contours Major
 - 38.0 — Proposed Contours Minor
 - Top or Bottom of Batter
 - Proposed Timber Retaining Walls
 - Proposed Segmented Block Retaining Wall
 - (1.2) Wall heights
 - Existing Retaining Walls constructed in previous stage and signed off under BCO100392414-1-B
 - Stage Boundary



Cabra Developments Ltd
45 Station Road
Huapai

Proposed Contours
and Retaining Walls
Stage 1B

FOR CONSTRUCTION

No.	REVISION (DESCRIPTIONS)	NAME	DATE
0	Issued for Construction	DL	05/02/2020
1	Adjusted Scale	KJM	06/04/2020

SURVEYED			
DESIGNED		KJM	02/26/17
DRAWN		KJM	05/02/2020
DATE	ORIGINAL SCALE	ORIGINAL SIZE	
05/02/2020	1:750	A3	
DRAWING NO.	42358-DR-C-2000	REVISION	1

**Stage 1B - Retaining
Wall Construction**



Appendix E: Producer Statements

26 March 2021

Document Ref: AKL2016_0634AQ Rev.0

Cabra Developments Limited
PO Box 197
Orewa 0946

Attention: Duncan Unsworth

Dear Sir

RE: CONSTRUCTION REVIEW FOR TIMBER POLE CANTILEVER RETAINING WALLS 11A, 11B, 11C, 13B, 13C AND KEYSTONE RETAINING WALL 12 – BCO10306103
19 PODGORA AVENUE, HUAPAI (45 STATION ROAD)

CMW Geosciences (CMW) has visited the site at 19 Podgora Avenue, Huapai (45 Station Road) legally described as Lot 32 DP 544111 on several occasions between October 2020 and March 2021 to observe the site works for the construction of timber pole retaining walls 11A, 11B, 11C, 13B, 13C and keystone retaining wall 12.

Our work has included review of the following documents and drawings:

- Conditions of Auckland Council Building Consent referenced BCO10306103 issued 3 July 2020;
- Consented construction drawings, prepared by CMW Geosciences, referenced Stage 1A & 1B Keystone Wall 1-3 and Stage 1A & 1B Timber Pole Retaining Wall 1-3, figures 201 to 206 dated 23 March 2017;
- Geotechnical report for Stage 1A & 1B Retaining Wall Design prepared by CMW Geosciences, referenced AKL2016_0634AD Rev.0, dated 23 March 2017.

The site works observed and/or tested by CMW staff for the Timber Pole Cantilever Retaining Walls incorporated:

- Measurement of pile hole depth, spacing and diameter;
- Assessment of soil strengths in the pile holes;
- Measurement of timber pile and rail sizes;
- Drainage placement and outlets;
- Confirmation of timber treatment levels.

Inspections for timber pole retaining walls 11A, 11B, 11C, 13B and 13C were carried out between October 2020 and November 2020. Vane shear strengths met the design specifications in the bases and sides of the pile holes and averaged over 60kPa. No groundwater was encountered in any of the pile holes.

The measurements, dimensions and drainage placement and outlets across the timber pole cantilever retaining walls were observed and met design specifications.

The site works observed and/or tested by CMW staff for the Keystone Retaining Wall incorporated:

- Assessment of soil strengths at subgrade and In the retained ground;
- Drainage placement and outlets,
- Backfill aggregate quality and placement;
- Geogrid type, orientation and placement.

In March 2021 CMW inspected the construction of keystone wall 12. Vane shear strengths within the subgrade and retained ground met designed specifications and were in excess of 100kPa.

The compaction of the hardfill between geogrid layers was tested using an impact hammer and observed values ranged from 18 to 20 CIV. The hardfill was observed to be generally well compacted.

Geogrid type, orientation, placement, drainage and outlets were all observed to be as per design specifications.

On the basis of our observations and testing, we consider that the works have been undertaken in accordance with the approved Building Consent and related approved documentation described above, are in accordance with the requirements and/or recommendations of the geotechnical design report and provide the basis for our attached PS4 Construction Review producer statement.

CMW's site presence during construction for this project included periodic observations of specific elements of work as described herein. As we were not on site at all times during construction, we have relied on the Contractor's diligence, construction observations and their attached PS3 certification to ensure that the works have been carried out in accordance with:

- a) The approved Contract drawings and design details;
- b) The approved Contract specifications;
- c) Authorised Variations to (a) and (b) during the execution of the works;
- d) The conditions of Resource and Building Consents where applicable;
- e) The relevant Geotechnical Investigation reports, recommendations and site instructions;

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

For and on behalf of CMW Geosciences



Richard Knowles

Principal Geotechnical Engineer + CPEng

Distribution: 1 electronic copy to Cabra Developments Limited via email
Original held at CMW Geosciences

Attachments: Producer Statement - Construction Review



17 March 2020

Document Ref: AKL2016_0634AL Rev.0

Cabra Developments Limited
PO Box 197
Orewa 0946

Attention: Duncan Unsworth

Dear Sir

RE: CONSTRUCTION REVIEW FOR TIMBER POLE CANTILEVER AND KEYSTONE RETAINING WALLS– CONSENT BCO10092414-1-B
45 STATION ROAD, HUAPAI (53 STATION ROAD, HUAPAI)

CMW Geosciences (CMW) has visited the site at 45 Station Road, Huapai now legally described as 53 Station Road, Huapai Lot 2 DP 533552 on several occasions between April 2017 and February 2020 to observe the site works for the construction of timber pole cantilever retaining walls 4A (beyond chainage 170m), 7A, 7B, 7C, 9, 10, 11A and keystone retaining walls 3, 8 and 27.

Our work has included review of the following documents and drawings:

- Conditions of Auckland Council Building Consent referenced BCO10092414-1-B issued 5 May 2017;
- Consented construction drawings, prepared by CMW Geosciences, referenced AKL2016_0634 Stage 1A & 1B Keystone Wall figures 201 to 203 and Stage 1A & 1B Timber Pole Wall figures 204-206 dated 23 March 2017;
- Geotechnical Report for Stage 1A & 1B Retaining Wall Designs 45 Station Road, Huapai prepared by CMW Geosciences, referenced AKL2016_0634AD Rev.0, dated 23 March 2017.

The site works observed and/or tested by CMW staff for the Keystone Retaining Walls incorporated:

- Assessment of soil strengths at subgrade and retained ground;
- Drainage placement and outlets;
- Backfill aggregate quality and placement;
- Geogrid type, orientation and placement.

Our testing demonstrated vane shear strengths in the subgrade and retained ground that met design specifications. Drainage placement and outlets were observed by CMW.

During February 2020 a few layers of wall 27 were removed and sleeves for fence posts were installed. Grids and compacted hardfill was then re-installed. The orientation and placement of grids were inspected by CMW

and met design specifications. Hardfill compaction was inspected using impact hammer tests; CIV values met design specifications ranging between 228 and 35.

The site works observed and/or tested by CMW staff for the Timber Pole Cantilever Retaining Walls incorporated:

- Measurement of pile hole depth, spacing and diameter;
- Assessment of soil strengths in the pile holes;
- Measurement of timber pole and rail sizes;
- Drainage placement and outlets;
- Confirmation of timber treatment levels.

Between April 2017 and February 2020 CMW inspected the construction of the timber pole cantilever retaining walls. Vane shear strengths in the bases and sides of the pile holes met design specifications, exceeding 70kPa in the 2 metre crust and in excess of 50kPa below 2 metres depth. Groundwater was encountered in some of the piles holes during construction and the contractors were advised to pump this out before concrete was poured.

During December 2019 it was observed that the bridging detail piles at the wall 11A and 11B connections had been drilled too close together. Two piles were subsequently pulled out and redrilled to the correct spacing and depth. Bridging details across the remaining pipe crossings were inspected and met design specifications.

The measurements, dimensions and drainage placement and outlets across the timber pole cantilever retaining walls were observed and met design specifications.

On the basis of our observations and testing, we consider that the site works have been undertaken in accordance with the approved Building Consent and related approved documentation described above, are in accordance with the requirements and/or recommendations of the geotechnical design report and provide the basis for our attached PS4 Construction Review producer statement.

CMW's site presence during construction for this project included periodic observations of specific elements of work as described herein. As we were not on site at all times during construction, we have relied on the Contractor's diligence, construction observations and their attached PS3 certification to ensure that the works have been carried out in accordance with:

- a) The approved Contract drawings and design details;
- b) The approved Contract specifications;
- c) Authorised Variations to (a) and (b) during the execution of the works;
- d) The conditions of Resource and Building Consents where applicable;
- e) The relevant Geotechnical Investigation reports, recommendations and site instructions;

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

For and on behalf of CMW Geosciences



Richard Knowles
Principal Geotechnical Engineer

Distribution: 1 electronic copy to Cabra Developments Limited via email
Original held at CMW Geosciences

Attachments: Producer Statement - Construction Review





Building Code Clause(s) B1

PRODUCER STATEMENT – PS4 – CONSTRUCTION REVIEW

(Guidance on use of Producer Statements (formerly page 2) is available at www.engineeringnz.org)

ISSUED BY: CMW Geosciences (NZ) Limited Partnership
(Construction Review Firm)

TO: Cabra Developments Limited
(Owner/Developer)

TO BE SUPPLIED TO: Auckland Council
(Building Consent Authority)

IN RESPECT OF: The Construction of Timber Cantilever Retaining Walls 4A (part), 7A, 7B, 7C, 9, 10, 11 and
(Description of Building Work)

AT: Segmental Block Retaining Walls 3, 8 and 27 at 45 Station Road, Huapai (53 Station Road, Huapai)
(Address)

Town/City: Auckland LOT 2 DP 533552 SO
(Address)

We CMW Geosciences (NZ) Limited Partnership have been engaged by Cabra Developments Limited
(Construction Review Firm)

To provide CM1 CM2 CM3 CM4 CM5 (Engineering Categories) or observation as per agreement with
owner/developer Cabra Developments Limited

or other as described in CMW letter referenced AKL2016_0634AL Rev.0, dated 17 March 2020 services
(Extent of Engagement)

in respect of clause(s) B1 of the Building Code for the building work described in
documents relating to Building Consent No. BCO10092414-1 and those relating to

Building Consent Amendment(s) Nos. BCO10092414-1-B issued during the
course of the works. We have sighted these Building Consents and the conditions of attached to them.

Authorised instructions/variation(s) No. _____ (copies attached)
or by the attached Schedule have been issued during the course of the works.


On the basis of this review these review(s) and information supplied by the contractor during the course of the works
and **on behalf of the firm** undertaking this Construction Review, **I believe on reasonable grounds** that
 All or Part only of the building works have been completed in accordance with the relevant requirements of the

Building Consent and Building Consent Amendments identified above, with respect to Clause(s) B1
of the Building Code. I also believe on reasonable grounds that the persons who have undertaken this construction review have
the necessary competency to do so.

I, Richard Knowles (AC Author #2342) am: CPEng 160049 # Reg Arch _____ #
(Name of Construction Review Professional)

I am a member of: Engineering New Zealand NZIA and hold the following qualifications BE (civil), CMEngNZ, CPEng
The Construction Review Firm issuing this statement holds a current policy of Professional Indemnity Insurance no less than
\$200,000*.

The Construction Review Firm is a member of ACENZ:

SIGNED BY Richard Knowles (AC Author #2342) (Signature) 
(Name of Construction Review Professional)

ON BEHALF OF CMW Geosciences (NZ) Limited Partnership Date 18/3/20
(Construction Review Firm)

Note: This statement shall only be relied upon by the Building Consent Authority named above. Liability under this statement accrues to the
Design Firm only. The total maximum amount of damages payable arising from this statement and all other statements provided to the Building
Consent Authority in relation to this building work, whether in contract, tort or otherwise (including negligence), is limited to the sum of \$200,000*.

This form is to accompany **Forms 6 or 8 of the Building (Form) Regulations 2004** for the issue of a Code Compliance
Certificate.

THIS FORM AND ITS CONDITIONS ARE COPYRIGHT TO ACENZ, ENGINEERING NEW ZEALAND AND NZIA