



# Residential Subdivision Stage J1C at 1161 Coatesville-Riverhead Highway, Riverhead

Prepared for  
Cabra Developments Limited  
C/- Cato Bolam Consultants Limited  
PO Box 157  
Orewa 0946

Attention: Mr T Lemon

Prepared by  
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23 November 2015

## Document authorisation

Our ref: GENZAUCK15847AB

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

It has been prepared in accordance with instructions received from Cato Bolam Consultants Limited and forms part of the documentation required by Auckland Council to achieve certification under Section 224(c) of the Resource Management Act.

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

For and on behalf of Coffey



**Chris Edwards**  
Senior Engineering Geologist

## Quality information

### Revision history

Revision	Description	Date	Author	Reviewer	Signatory
1.0	Final	23/11/2015	JRF	KH	KH

### Distribution

Report Status	No. of copies	Format	Distributed to	Date
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Final	1	Original	Coffey Geotechnics (NZ) Limited	23/11/2015

# Table of contents

1. Introduction and Description of Subdivision .....	1
2. Related Reports.....	1
3. Earthworks Operations .....	2
3.1. Plant .....	2
3.2. Construction Programme .....	2
4. Quality Assurance and Controls.....	3
4.1. Inspections .....	3
4.2. Quality Control Criteria.....	3
4.2.1. Compaction .....	3
4.2.2. Compaction .....	3
5. Project Evaluation.....	4
5.1. Bearing Capacity and Settlement of Building Foundations.....	4
5.2. Expansive Soils .....	4
5.3. Fill Induced Settlement.....	4
5.4. Service Trenches .....	5
5.5. Subsoil Drains .....	5
5.6. Road Subgrades .....	5
5.7. Retaining Walls .....	5
5.8. Topsoil.....	5
5.9. Contractor's Work .....	5
6. Statement of Professional Opinion as to the Suitability of Land for Building Development.....	6

## Tables

Table 1 - Cato Bolam Consultants Limited As-Built Plans

Table 2 - Minimum Shear Strength and Maximum Air Voids Method

Table 3 - Suitability Statement Summary

## **Appendices**

Appendix A - Cato Bolam Consultants Limited As-Built Plan Set

Appendix B - Laboratory Test Results

Appendix C - Field Density Test Summary Sheets

Appendix D - Coffey Producer Statement – Construction Review (PS4)

Appendix E - Gideon Contractors Limited Producer Statement – Construction (PS3)

## 1. Introduction and Description of Subdivision

This Geotechnical Completion Report (GCR) has been prepared for Cabra Developments Limited as part of the documentation required to be submitted to Auckland Council following residential subdivisional development.

It contains our Suitability Statement, relevant test data and the Cato Bolam Consultants Limited as-built plan set relating to Stage J1C of the residential subdivision at 1161 Coatesville-Riverhead Highway, Riverhead, as follows:

Table 1: Cato Bolam Consultants Limited As-Built Plans

Title	Job No.	Sheet No.	Rev No.	Date
Water Reticulation As Built	33100	E606	-	15/10/15
PWC Sewer As Built Plan	33100	E607	-	15/10/15
Stormwater Drainage As Built Plan	33100	E608	-	15/10/15
Stormwater Pipeline Zone of Influence Plan	33100	E609	-	29/10/15
Final Contour Level As Built Plan	33100	E610	-	21/10/15
Cut and Fill Contour Level As Built Plan	33100	E611	-	15/10/15
Road As Built Plan	33100	E612	-	20/10/15

This report covers the construction period March to June 2015. It is intended to be used for certification purposes as follows:

- Three residential lots numbered 1, 4 and 5; and
- An extension of Pohutukawa Parade

Stage J1C is located off the southern side of Kaipara Portage Road, Riverhead. All three lots have been partly affected by filling, to a maximum depth of approximately 1.0 metres.

## 2. Related Reports

A Geotechnical Investigation Report (GIR) on the subject land was prepared by this consultancy, reference GENZAUCK15395, dated 22 May 2012. In addition to this, six Geotechnical Completion Reports (GCR's) have also been prepared within the vicinity of Stage J1C by this consultancy as detailed below:

- Stages J4 and JB5 (dated 30 October 2013, reference GENZAUCK15847AA);
- Stage J2, J5C and J7 (dated 4 March 2014, reference GENZAUCK15847AA);
- Stage J5D (dated 15 October 2014, reference GENZAUCK15847AA);
- Stage J1A (dated 12 January 2015, reference GENZAUCK15847AA);
- Stage P3 (dated 26 February 2015, reference GENZAUCK15395AA);
- Stage J1B (dated 10 June 2015, reference GENZAUCK15847AB).

The conclusions and recommendations of these reports have been reviewed during the preparation of this document.

## **3. Earthworks Operations**

### **3.1. Plant**

The main items of plant used by Gideon Contractors Limited (Gideon) were:

- 1 x 20 tonne excavator;
- 1 x 4.5 tonne excavator;
- 1 x 12 tonne single drum pad foot compactor;
- 1 x tractor.

### **3.2. Construction Programme**

Earthworks were conducted in Lot 4 by Hick Bros Civil Construction Limited throughout mid to late 2014 and were captured within the aforementioned GCR's in section 2 above and will not be reiterated herein.

Earthworks operations for stage J1C commenced in late June 2015 with the stripping of topsoil for Lots 1 and 5, Lot 4 did not require any change in level therefore the topsoil was stockpiled here for the duration of the stage works.

A 5 metre wide strip of certified fill was placed along the eastern boundary of Lot 1 and was subsequently topsoiled, thus completing earthworks for lot 1.

Throughout late June/early July 2015, Gideons began to place and compact certified fill in Lot 5 up to approximately 0.5 metres. A retaining wall face was excavated along the southern boundary of Lot 4 around this time which exposed minor surface seepages of spring water along the western portion of the wall.

Subsoil drains were installed in the areas shown on the Stormwater Drainage as-built plan to tap these surface seepages. The drains consisted 150mm diameter perforated highway grade nova coil within a 20/7 scoria drainage media. We were then advised by the contractor they were connected into the stormwater reticulation system.

By late July 2015, the contractors had installed the retaining wall piles which had a maximum retained height of 0.7 metres. Construction of the wall and associated drainage was complete by mid-August 2015.

By the end of August 2015, Lot's 4 and 5 had been topsoiled and the extension to Pohutukawa Parade had been sealed and metalled completing Coffey's involvement with geotechnical construction observation on this stage of the subdivision.

## 4. Quality Assurance and Controls

### 4.1. Inspections

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

- topsoil stripping prior to fill placement;
- installation of underfill/subsoil drains; and
- construction of a cantilever timber pole retaining wall on Lots 4 and 5 boundary.

### 4.2. Quality Control Criteria

#### 4.2.1. Compaction

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

Specification details were as follows:

Table 2: Minimum Shear Strength and Maximum Air Voids Method

(a)	<u>Air Voids Percentage</u>	
	(As defined in NZS 4402)	
	General Fill	
	Average value less than	10%
	Maximum single value	12%
(b)	<u>Undrained Shear Strength</u>	
	(Measured by Pilcon shear vane - calibrated using NZGS 2001 method)	
	General fill	
	Average value not less than	140 kPa
	Minimum single value	110 kPa

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

#### 4.2.2. Compaction

- (i) Insitu density monitoring was carried out on the general fill areas and a series of hand auger boreholes were also drilled at selected locations as an added quality control check.
- (ii) Regular insitu density, strength and water content tests were carried out on all areas of the filling at or in excess of the frequency recommended by NZS 4431.
- (iii) Control tests carried out on the filling showed that on all occasions the required compaction standards were being achieved.

## **5. Project Evaluation**

### **5.1. Bearing Capacity and Settlement of Building Foundations**

Following the completion of earthworks operations, we returned to the site on 29 September 2015 and drilled a hand auger borehole in the approximate centre of each lot in order to assess representative finished ground conditions and hence evaluate likely foundation options for future building development. Our resulting bearing capacity recommendations are presented in the appended Suitability Statement.

At current subgrade levels all filled and undisturbed inorganic natural ground has a geotechnical ultimate bearing capacity of 300 kPa within the zone of influence of conventional shallow residential building foundation loads in accordance with NZS3604:2011.

At these bearing pressures differential settlements due to building loads should be within Building Code limits.

Where any building platforms have been rutted by heavy machinery, or softened due to ponded rainwater, they should be trimmed back to competent ground and reinstated with compacted hardfill to design subgrade level prior to the commencement of building construction.

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

### **5.2. Expansive Soils**

One set of expansive soil tests was carried out on a sample recovered from Lot 4 within the zone of likely influence of shallow building foundations and produced a liquid limit of 100 and a linear shrinkage of 25%. The high cone penetration limit results correlate with the preliminary results of our GIR and are caused by the presence of Allophane within the samples, likely as a result of a volcanic origin.

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

All test results are IANZ (International Accreditation New Zealand) endorsed and full details are appended.

The assessed AS 2870 Site Class for this subdivision is M (moderate), which is consistent with our experience on the adjacent recent land developments. Specific design alternatives for this Site Class are presented in the Suitability Statement.

### **5.3. Fill Induced Settlement**

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

## **5.4. Service Trenches**

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 attached Cato Bolam Plan (Sheet no. E609) depicts the areas affected by the stormwater lines within the lots.

## **5.5. Subsoil Drains**

The appended Stormwater Drainage as-built plan (Sheet no. E608) shows the positions of perforated subsoil drains that were placed in areas where wet natural ground was noted to tap groundwater seepages. These drains are shown to extend through Lots 4 and 5, and the subdivision roads.

As these drains were installed to intercept groundwater seepages, it is important that their long term function is not adversely affected. For the most part these drains are buried sufficiently deep and fall beyond the influence of foreseeable shallow foundation systems, however, if any drains are exposed by foundation excavations and/or future earthworks to create level building platforms, then they will need to be reinstated under the guidance and observation of Coffey.

## **5.6. Road Subgrades**

Penetration resistance tests were undertaken at regular intervals on the road subgrades and the results were subsequently forwarded to Cato Bolam Consultants Limited for pavement design purposes. Coffey were only involved with providing factual results from penetration resistance testing on the road subgrades.

## **5.7. Retaining Walls**

The southern boundary of Lot 4 is supported by a cantilever timber pole retaining wall. This wall reaches a maximum height of approximately 0.7 metres and was designed and inspected by this Consultancy. A copy of the Contractor's Producer Statement – Construction (PS3) and our Producer Statement - Construction Review (PS4) are attached in Appendices D and E respectively.

Building setbacks from this wall are specified in the Suitability Statement.

## **5.8. Topsoil**

Topsoil depths in likely building platform areas were checked by the drilling of a borehole in the approximate centre of each lot. Our findings, which are indicative only and subject to variation at other locations, show that likely topsoil depths are between approximately 200 and 300mm.

Site specific findings are presented in the Suitability Statement Summary.

## **5.9. Contractor's Work**

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

- (i) The approved Contract drawings and design details,
- (ii) The approved Contract specifications,
- (iii) Authorised Variations during the execution of the works,
- (iv) The conditions of Resource, Earthworks and Building Consents where applicable,

(v) The relevant Coffey Geotechnics reports, recommendations and site instructions, and that all as-built information and other details provided to the Client and/or Coffey Geotechnics are accurate and correct in all respects.

## 6. Statement of Professional Opinion as to the Suitability of Land for Building Development

I, Kah-Weng Ho, of Coffey Geotechnics (NZ) Limited, Auckland, hereby confirm that:

1. I am a Chartered Professional Engineer experienced in the field of geotechnical engineering as defined in section 1.2.3 of NZS 4404 and was retained by the Owner/Developer as the Geotechnical Engineer on Stage J1C of the 1161 Coatesville-Riverhead Highway, Riverhead residential subdivision.
2. The extent of preliminary investigations carried out to date are described in Geotechnical Investigation Report number GENZAUCK15395, dated 22 May 2012, and the conclusions and recommendations of that document have been re-evaluated in the preparation of this report.
3. In my professional opinion, not to be construed as a guarantee, I consider that:
  - (a) The earth fills shown on the appended Cut and Fill Contour as-built plan have been placed in compliance with NZS 4431, Auckland Council's Code of Practice for Land Development and Subdivision (Section 2 – Earthworks and Geotechnical Requirements) and related documents.
  - (b) The completed earthworks give due regard to land slope and foundation stability considerations within the residential lots.
  - (c) A geotechnical ultimate bearing capacity of 300 kPa may be assumed for shallow foundation design on all lots.
  - (d) The backfilling and compaction of the stormwater and common services trenches on this subdivision has where possible been carried out to appropriate standards having regard for the prevailing ground conditions and associated compaction induced pipe loadings.

Despite the above, no building development should take place within the 45 degree zone of influence of drain inverts unless endorsed by specific site investigations, foundation designs 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 beyond the extent of the trench backfill.
  - (d) The cantilever timber pole retaining wall situated along the northern boundary of Lots 4 and 5 has a retained height ranging between approximately 0.7 metres and 1.6 metres. No building development or earthworks are permitted within a horizontal distance equal to the retained height of the walls without specific site investigation and specific engineering design to ensure that the stability of the wall is not compromised.
  - (e) Subject to the geotechnical limitations, restrictions and recommendations associated with 3(b), 3(c), 3(d) and 3(e) above:
    - (i) The cut, filled and undisturbed original ground within residential lot boundaries is generally suitable for residential buildings constructed in accordance with NZS 3604 and related documents.
    - (ii) On all lots foundation design may be carried out in accordance with AS 2870 (Class M) or in accordance with NZS 3604 provided that in this latter case the minimum foundation depth below cleared ground level following topsoil removal and benching of building platform areas is 600mm.

4. The Pohutukawa Parade extension subgrade has been formed having due regard for stability and settlement.

The professional opinion contained within this report is furnished to 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. Prospective purchasers should still satisfy themselves as to any specific conditions pertaining to their particular land interest.

Table 3 below summarises the status of each residential lot covered by this Suitability Statement.

Table 3: Suitability Statement Summary

Lot No.	Comments	Topsoil Depth (mm)	Ultimate Bearing (kPa)	AS2870:2011 Class
1	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	200	300	M
4	No construction or earthworks permitted within a horizontal distance equal to the retained height of the retaining walls along the northern and southern boundaries without specific investigation and engineering design. Function of subsoil drains to be preserved. Elsewhere AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	300	300	M
5	No construction or earthworks permitted within a horizontal distance equal to the retained height of the retaining wall along the northern boundary without specific investigation and engineering design. Function of subsoil drains to be preserved. Elsewhere AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	200	300	M

For and on behalf of Coffey

Prepared By:



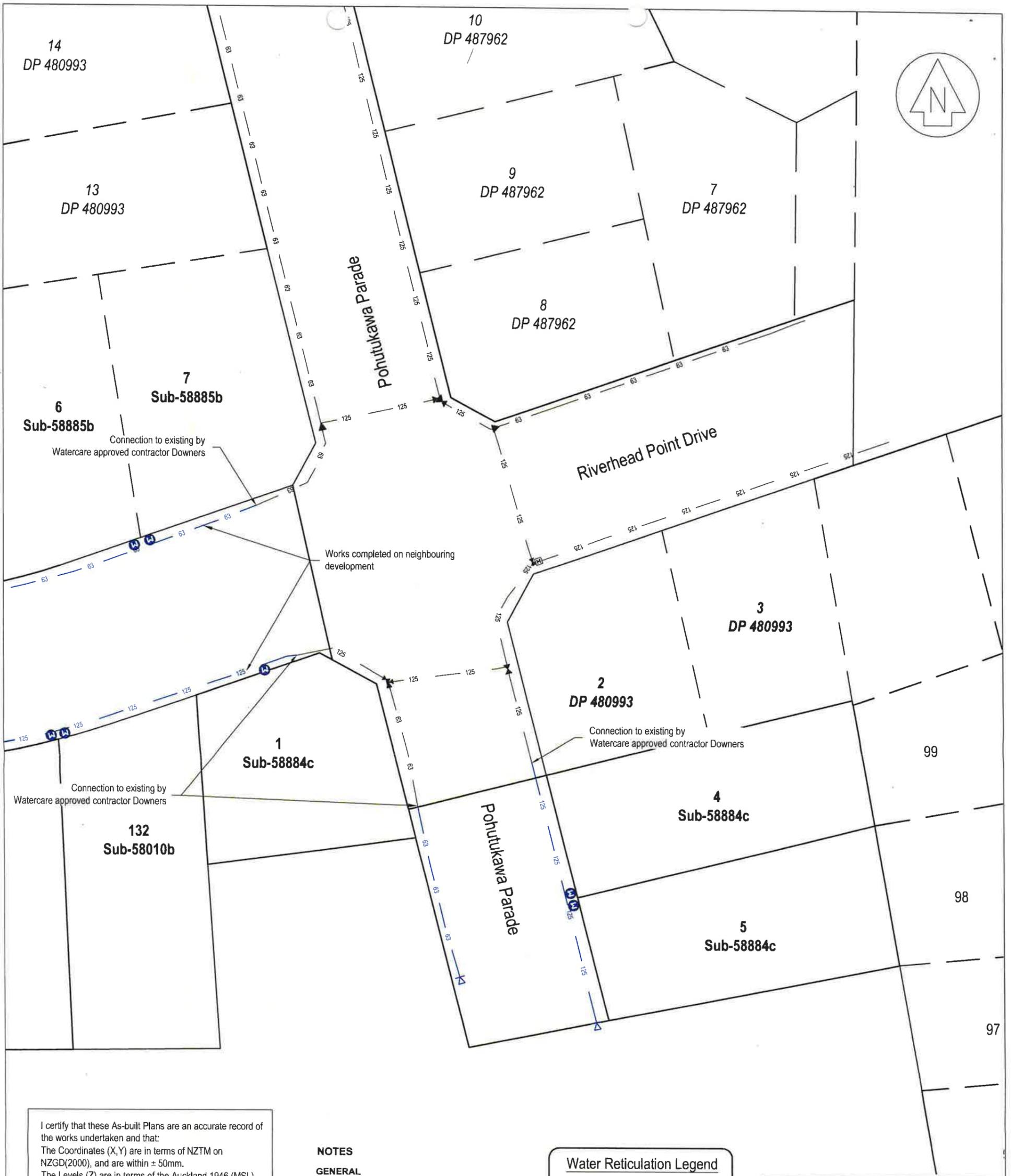
**Joshua Fisher**  
Engineering Geologist

Reviewed / Authorised By:



**Kah-Weng Ho**  
Senior Principal Geotechnical Engineer  
MIPENZ, CPEng.

**Appendix A - Cato Bolam Consultants Limited  
As-Built Plans**



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 ± 25mm.

Signed:   
 Licensed Cadastral Surveyor  
 Date: 06/11/15  
 Name: Bradley Mowat  
 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.

**WATER RETICULATION**

1. Cover for water reticulation.
  - a) Mains under grass berms and footpaths 600mm
  - b) Mains under road carriageway 900mm
2. Watermain 125 OD - PE100 PN12.5 SDR11
3. All ridermains 63OD - PE80 PN12.5 SDR11
4. Stainless Steel bolts and nuts used for flanged connections.
5. Metallic Detector Tape provided above all watermains and ridermains

**Water Reticulation Legend**

- New Watermain (Ø) — 125 —
- Existing Watermain (Ø) — 63 —
- Existing Fire Hydrant 
- Existing Sluice Valve 
- Existing Peet Valve 
- Blank Cap 
- Water Meter Location (Tapping Band Installed) 

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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.



**SURVEYORS PLANNERS ENGINEERS**

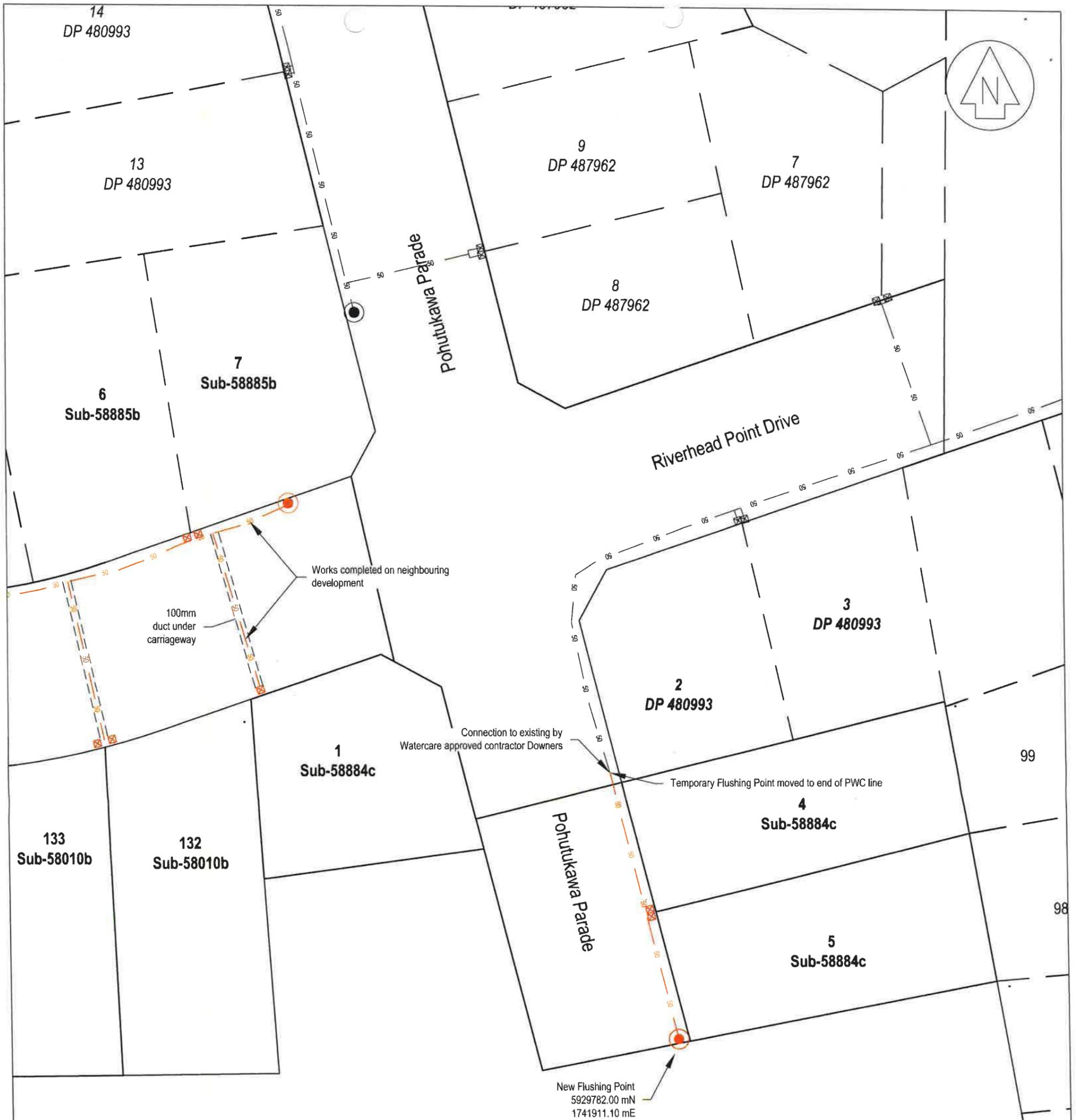
CATO BOLAM CONSULTANTS LTD  
 19 Tamariki Avenue  
 PO Box 157  
 Orewa 0946  
 phone 09-427 0072  
 fax 09-426 7331  
 email catobolam@catobolam.co.nz

REVISION (DESCRIPTIONS)	NAME	DATE
SURVEYED	JC	10/15
DESIGNED	PH	06/15
DRAWN	SF	10/15
CHECKED		
APPROVED		

**CLIENT**  
**Cabra Developments Ltd**  
 Kaipara Portage Road  
 Riverhead

**DRAWING TITLE**  
**Stage J1C**  
**Water Reticulation As Built**

ORIGINAL SCALE	ORIGINAL SIZE	REVISION NO
1:500	A3	
DATE	CAD REFERENCE	SHEET NO
15/10/15	33100 E606 Water	<b>E606</b>
DIRECTORY		JOB NO
A\33100\ACAD\Stage J1C		<b>33100</b>



Works completed on neighbouring development

100mm duct under carriageway

Connection to existing by Watercare approved contractor Downers

Temporary Flushing Point moved to end of PWC line

New Flushing Point  
5929782.00 mN  
1741911.10 mE

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**CATO BOLAM CONSULTANTS**  
SURVEYORS PLANNERS ENGINEERS

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

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 ± 25mm.

Signed: *[Signature]*  
Licensed Cadastral Surveyor  
Date: 6/11/15  
Name: Bradley Mowat  
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.
  3. All infrastructure is public unless otherwise shown.
  4. All pipes are PE100 PN16, unless otherwise shown

**Drainage Legend**

Existing	New
— 50 —	— 50 —
●	●
⊠	⊠
⊞	⊞

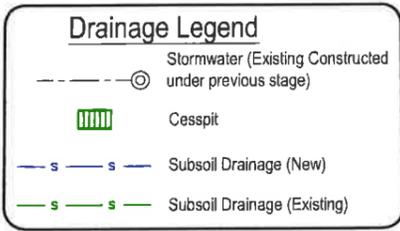
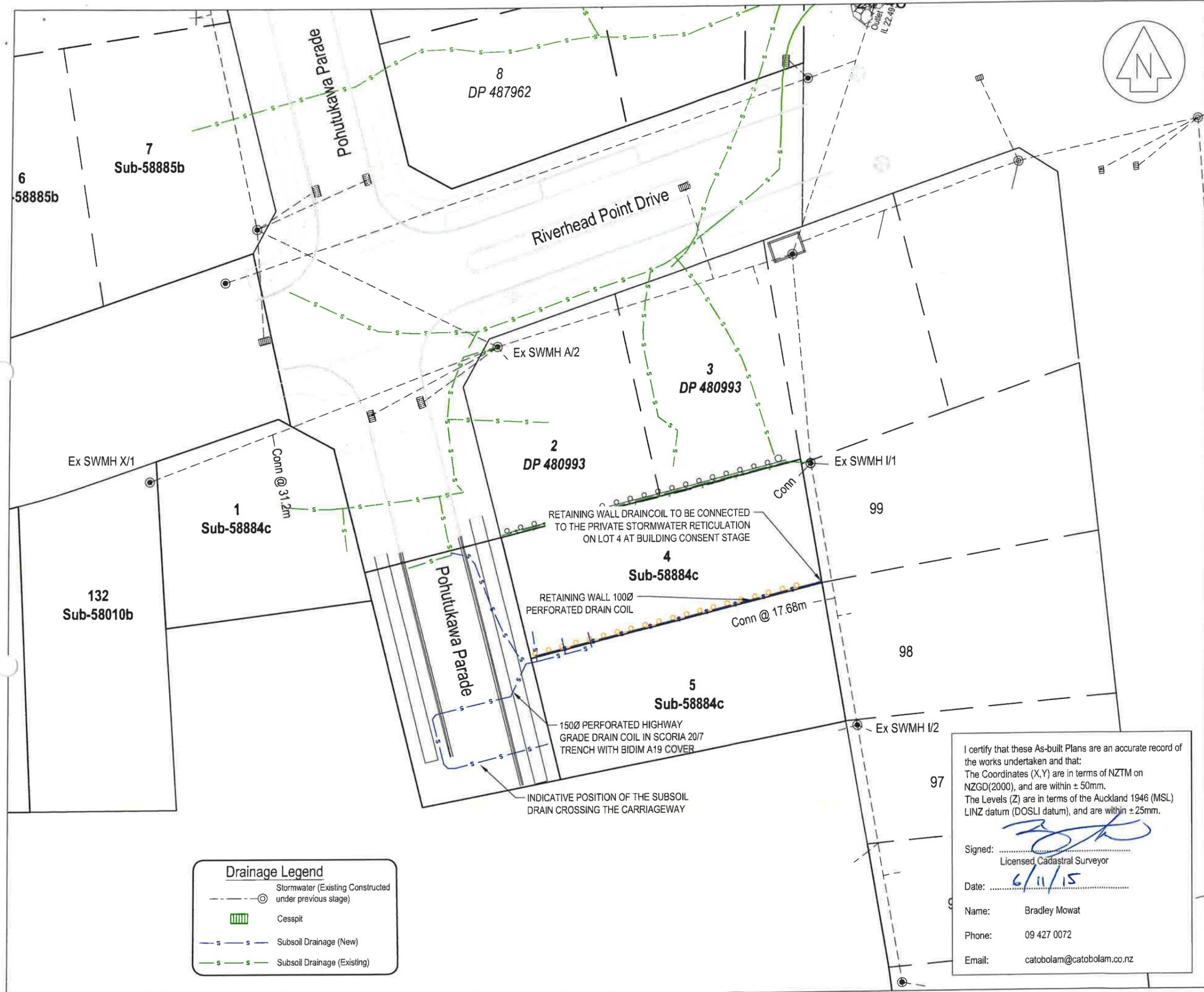
PWC Sewer  
Flushing Point  
Boundary Kit  
Valve

ORIGINAL SCALE 1:500	ORIGINAL SIZE A3	REVISION NO
DATE 15/10/15	CAD REFERENCE 33100 E607 J1 C PWC Sewer	SHEET NO E607
DIRECTORY J:\33100\J1C		JOB NO 33100

REVISION (DESCRIPTIONS)	NAME	DATE
SURVEYED	JC	10/15
DESIGNED		
DRAWN	SF	10/15
CHECKED		
APPROVED		

CLIENT  
**Cabra Developments Ltd**  
Kaipara Portage Road  
Riverhead

DRAWING TITLE  
**Stage J1C  
PWC Sewer As Built**



I certify that these As-built Plans are an accurate record of the works undertaken and that:  
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Signed:   
 Licensed Cadastral Surveyor

Date: 6/11/15

Name: Bradley Mowat  
 Phone: 09 427 0072  
 Email: catobolam@catobolam.co.nz

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**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.
  2. Bedding is H2 type unless otherwise stated.
  3. All catchpits are 675mm x 450mm steel grate lids unless otherwise shown.
  4. All lot connections are 100Ø uPVC SEH-C unless otherwise stated.

REVISION (DESCRIPTIONS)	NAME	DATE

	NAME	DATE
SURVEYED	JC	10/15
DESIGNED		
DRAWN	SF	10/15
CHECKED		
APPROVED		

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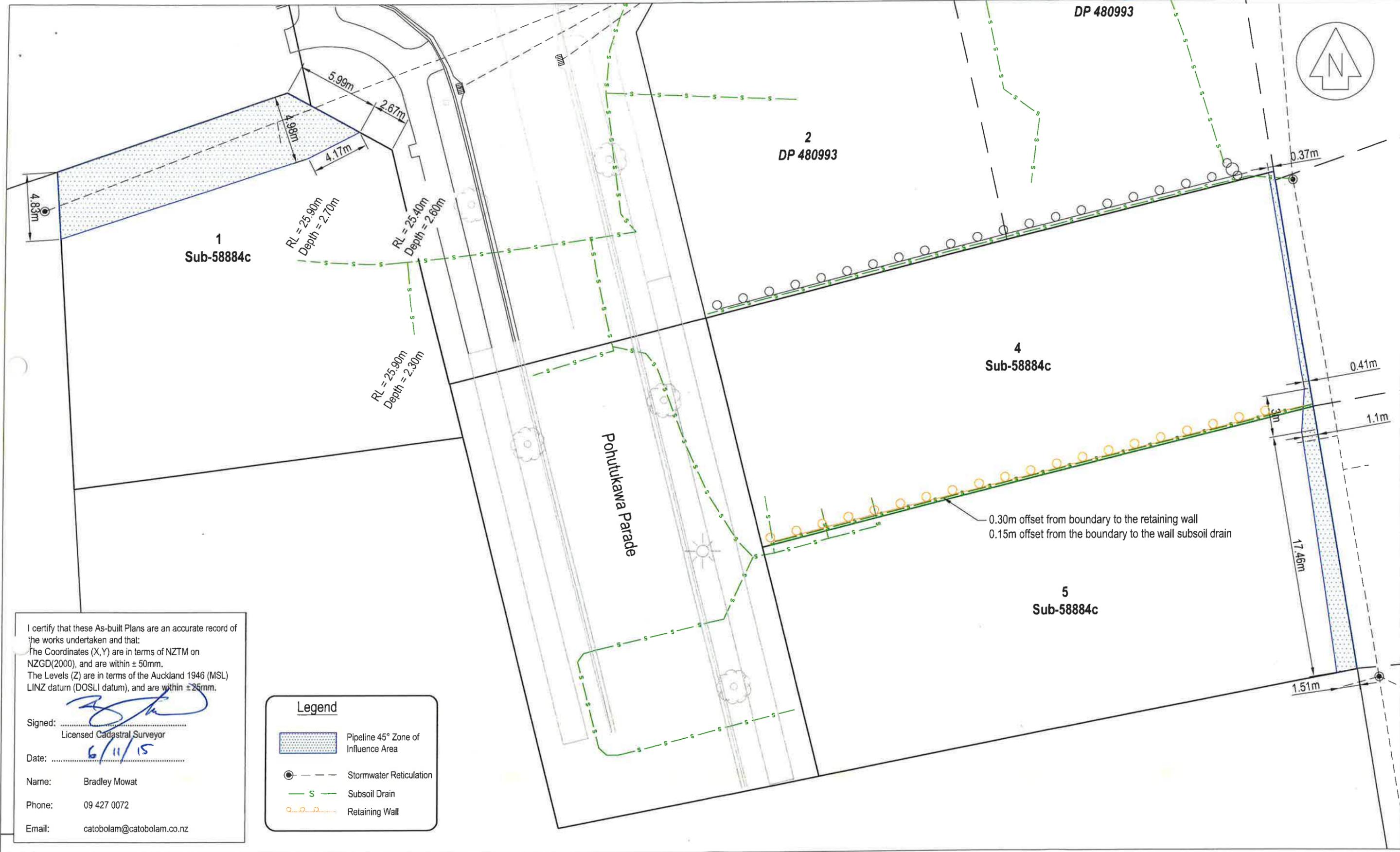
CLIENT

**Cabra Developments Ltd**  
 Kaipara Portage Road  
 Riverhead

DRAWING TITLE

**Stages J1C  
 Stormwater Drainage  
 As Built Plan**

ORIGINAL SCALE 1:500	ORIGINAL SIZE A3	REVISION NO
DATE 15/10/15	CAD REFERENCE 33100 E608 J1C SW	SHEET NO <b>E608</b>
DIRECTORY J:\33100\Stage J1C		JOB NO <b>33100</b>



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Signed: *[Signature]*  
 Licensed Cadastral Surveyor  
 Date: 6/11/15  
 Name: Bradley Mowat  
 Phone: 09 427 0072  
 Email: catobolam@catobolam.co.nz

**Legend**

- Pipeline 45° Zone of Influence Area
- Stormwater Reticulation
- Subsoil Drain
- Retaining Wall

**CATO BOLAM CONSULTANTS**  
 SURVEYORS PLANNERS ENGINEERS  
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SURVEYED	JC	10/15
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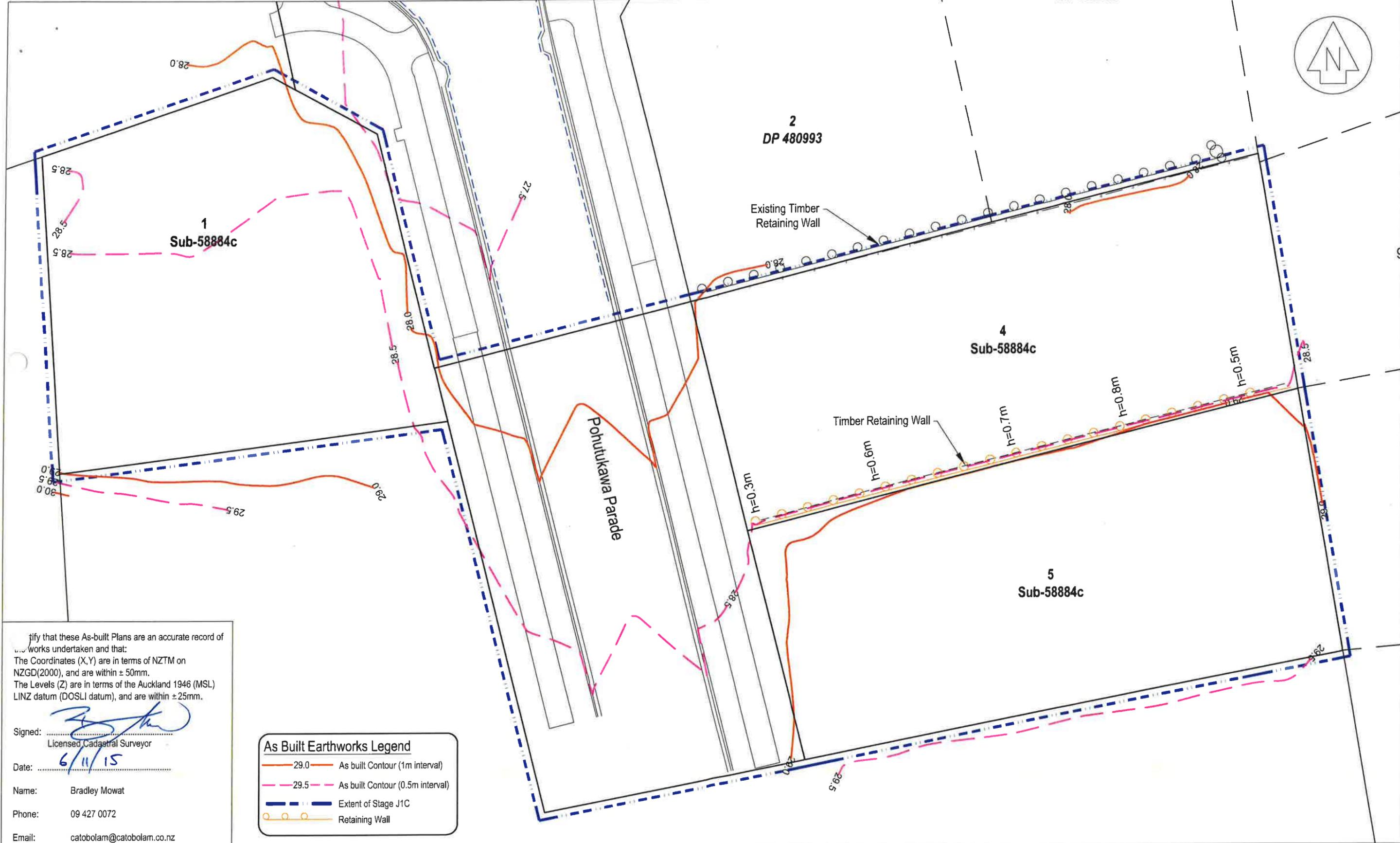
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CLIENT  
**Cabra Developments Ltd**  
 Kaipara Portage Road  
 Riverhead

DRAWING TITLE  
**Stages J1C  
 Stormwater Pipeline  
 Zone of Influence Plan**

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ORIGINAL SCALE 1:250	ORIGINAL SIZE A3	REVISION NO
DATE 29/10/15	CAD REFERENCE 33100 E609 J1C Zone	SHEET NO <b>E609</b>
DIRECTORY JA33100:ACAD:J1C	IMAGE FILE	JOB NO <b>33100</b>



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 The Levels (Z) are in terms of the Auckland 1946 (MSL) LINZ datum (DOSLI datum), and are within ± 25mm.

Signed:   
 Licensed Cadastral Surveyor

Date: 6/11/15

Name: Bradley Mowat  
 Phone: 09 427 0072  
 Email: catobolam@catobolam.co.nz

**As Built Earthworks Legend**

-  29.0 As built Contour (1m interval)
-  29.5 As built Contour (0.5m interval)
-  Extent of Stage J1C
-  Retaining Wall

**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	JC	10/15
DESIGNED	PH	06/15
DRAWN	SF	10/15
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**  
 Kaipara Portage Road  
 Riverhead

DRAWING TITLE  
**Stage J1C**  
**Final Contour Level**  
**As Built Plan**

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ORIGINAL SCALE	ORIGINAL SIZE	REVISION NO
1:250	A3	
DATE	CAD REFERENCE	SHEET NO
21/10/15	33100 E610 FCP.dwg	<b>E610</b>
DIRECTORY		JOB NO
J:\33100\ACAD		<b>33100</b>



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- NOTES**
- GENERAL**
1. Cut/fill contours are from original ground levels, to finished ground levels as surveyed at 15/10/2015. Contour interval of 0.5m.
  2. Levels are in terms of LINZ Datum 1946.
  3. Coordinates are in terms of NZTM.
  4. Unless otherwise shown, subsoil drainage is 150mm diameter perforated hiway grade draincoil with SAP50 metal surround.

REVISION (DESCRIPTIONS)	NAME	DATE

	NAME	DATE
SURVEYED	JC	10/15
DESIGNED		
DRAWN	SF	11/15
CHECKED		
APPROVED		

**CATO BOLAM CONSULTANTS**

**SURVEYORS PLANNERS ENGINEERS**

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 Orewa 0946

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 fax 09-426 7331  
 email catobolam@catobolam.co.nz

**CLIENT**

**Cabra Developments Ltd**  
 Kaipara Portage Road  
 Riverhead

**DRAWING TITLE**

**Stages J1C  
 Cut and Fill Contour Level  
 As Built Plan**

ORIGINAL SCALE	ORIGINAL SIZE	REVISION NO
1:500	A3	
DATE	CAD REFERENCE	SHEET NO
15/10/15	33100 E611	611
DIRECTORY		JOB NO
J:\33100\ACAD		33100

**Cut to Fill Legend**

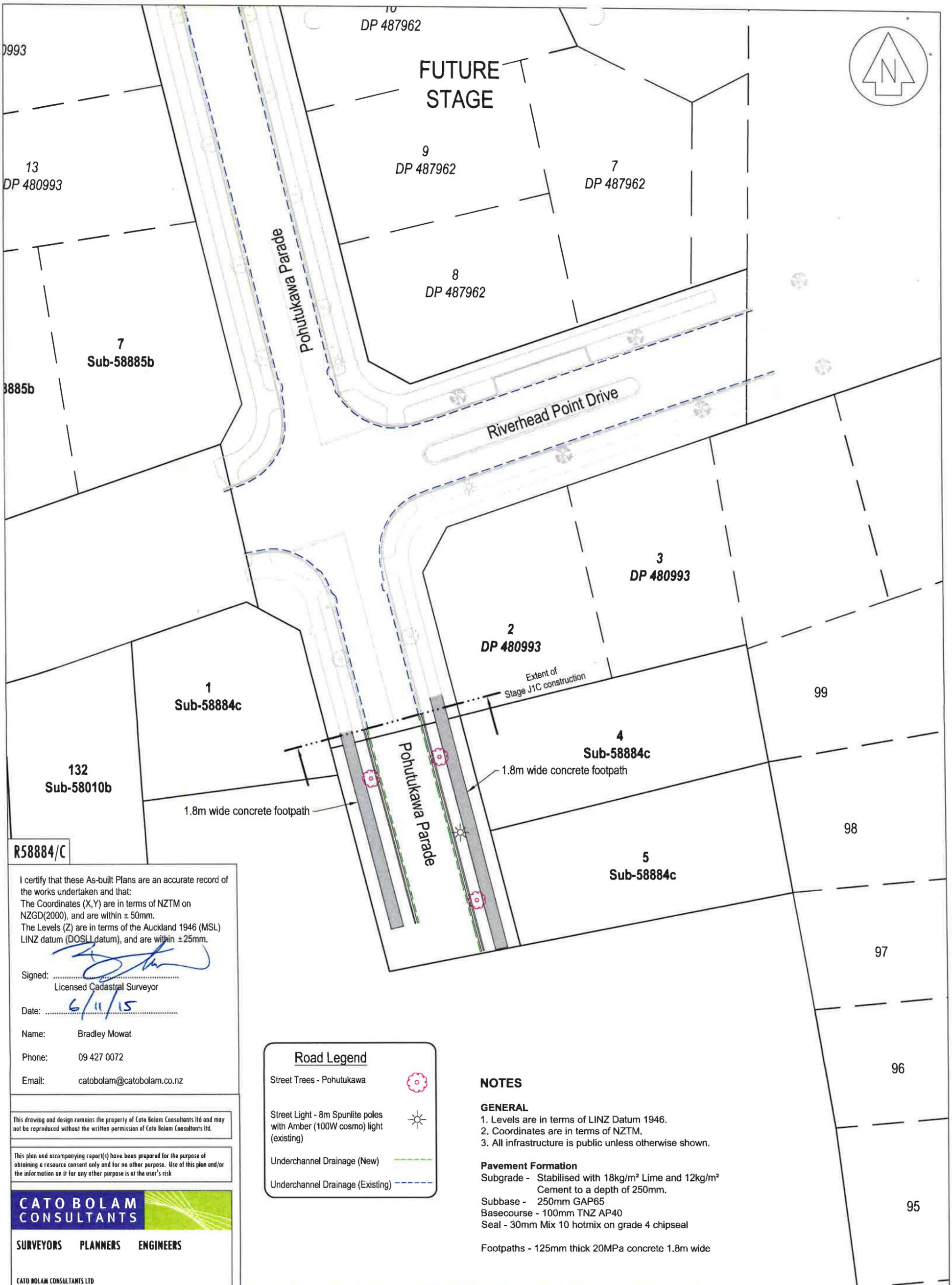
- 0 Contour
- Cut Contours & Area
- Fill Contours & Area
- Extent of Stage J1C
- Subsoil Drainage
- Stormwater Pipe Network
- Retaining Wall
- Retaining Wall height from Ground Level

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 ± 25mm.

Signed: *[Signature]*  
 Licensed Cadastral Surveyor

Date: 6/11/15

Name: Bradley Mowat  
 Phone: 09 427 0072  
 Email: catobolam@catobolam.co.nz



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 ± 25mm.

Signed:   
 Licensed Cadastral Surveyor  
 Date: 6/11/15  
 Name: Bradley Mowat  
 Phone: 09 427 0072  
 Email: catobolam@catobolam.co.nz

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**SURVEYORS PLANNERS ENGINEERS**

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

Road Legend	
Street Trees - Pohutukawa	
Street Light - 8m Spunlite poles with Amber (100W cosmo) light (existing)	
Underchannel Drainage (New)	
Underchannel Drainage (Existing)	

**NOTES**

- GENERAL**
- Levels are in terms of LINZ Datum 1946.
  - Coordinates are in terms of NZTM.
  - All infrastructure is public unless otherwise shown.
- Pavement Formation**
- Subgrade - Stabilised with 18kg/m<sup>2</sup> Lime and 12kg/m<sup>2</sup> Cement to a depth of 250mm.
  - Subbase - 250mm GAP65
  - Basecourse - 100mm TNZ AP40
  - Seal - 30mm Mix 10 hotmix on grade 4 chipseal
- Footpaths - 125mm thick 20MPa concrete 1.8m wide

ORIGINAL SCALE 1:500	ORIGINAL SIZE A3	REVISION NO
DATE 20/10/15	CAD REFERENCE 33100 E612 Roading	SHEET NO E612
DIRECTORY Z:\33100\ACAD		JOB NO 33100

REVISION (DESCRIPTIONS)	NAME	DATE
SURVEYED	JC	10-15
DESIGNED	--	--
DRAWN	SF	10-15
CHECKED		
APPROVED		

CLIENT  
**Cabra Developments Ltd**  
 Kaipara Portage Road  
 Riverhead

DRAWING TITLE  
**Stages J1C  
 Road As Built Plan**

## **Appendix B - Laboratory Test Results**

# CLASSIFICATION TEST RESULTS

Test Methods: NZS 4402:1986 Tests 2.1, 2.2 & 2.6



James McKelvey Approved Signatory

JOB NO GENZETAM01042AA  
 PROJECT GENZAUCK15847AB - Stage J1B+ 1161  
 Coatesville Riverhead Highway, Riverhead  
 CLIENT Coffey Geotechnics NZ Ltd, Auckland

Lot No / Borehole No

Lot 4 / HA02

Sample No

ETAM15S-09494

Depth

0.4 - 0.7 m

Water Content

%

62

Samples prepared from 'As Received' Natural Water Content

Soil fraction used

< 0.425mm

Liquid Limit

100

Linear Shrinkage

%

24

\*Sampling is not IANZ endorsed as part of this report.



East Tamaki Laboratory  
 Coffey Geotechnics NZ Limited  
 144A Cryers Road, East Tamaki, Auckland NZ 2013  
 PO Box 58877, Botany, Auckland NZ 2163  
 Phone: +64 9 272 3375, Fax: +64 9 272 3378  
 www.coffey.com

DATE 2.10.15

CHECKED JM

## **Appendix C - Field Density Test Summary Sheets**

### EARTHWORKS FILL REPORT

Test Methods : Shear Strength (using field Shear vane in accordance with NZGS 2001); Nuclear Densometer Testing (in accordance with NZS 4407:1991 Test 4.2.1); Water Content Testing (in accordance with NZS 4402:1986 Test 2.1); Density Calculations (in accordance with NZS 4402:1986 Tests 4.1.1.5(b))

**Project No:** GENZETAM01042AA  
**Page:** 1 of 2

**Client:** Coffey Geotechnics NZ Ltd  
 PO Box 8261 Symonds Street,  
 Auckland 1150

**Principal:** Joshua Fisher

**c.c. to:** Chris Edwards

**Project:** GENZAUCK15847AB - STAGE J1B 1161 COATESVILLE-RIVERHEAD HIGHWAY RIVERHEAD

**Project Location:** Riverhead



**IANZ**  
ACCREDITED LABORATORY

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

Approved Signatory: Eric Paton  
 Approved Signatory Signature: *Eric Paton*  
 Date of Issue: 27/06/2015  
 IANZ Accredited Laboratory Number: 105

Date	Work Order :	Tested By	Test No.	Wet Density (t/m <sup>3</sup> )	Oven Water Content (%)	Dry Density (t/m <sup>3</sup> )	Solid Density (t/m <sup>3</sup> )	Air Voids %	Field Shear Strength in kPa				Test Location	Easting	Northing	RL (m)	Material Tested	Comments
									(UTP = Unable to penetrate)									
25/06/2015	ETAM15W02272	AB	16	1.61	46.7	1.10	2.7	8.0	191	175	172	150	Stage J1A LOT 1	1741878	5929819	-	Clay	FL

(Please note that Air Void calculations are not IANZ endorsed as part of this report)

# SITE PLAN

NOT TO SCALE

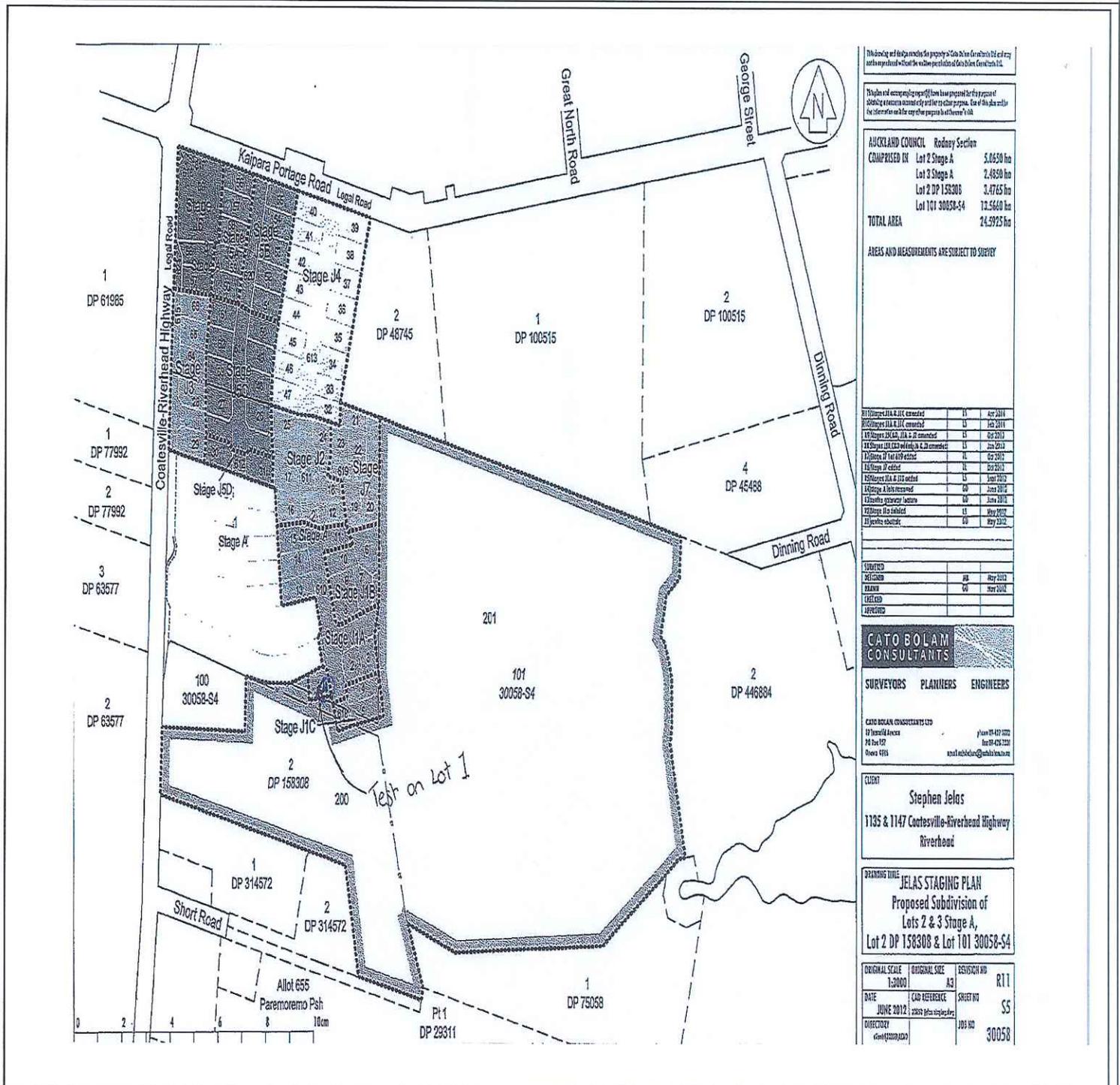
**Project No:** GENZETAM01042AA

**Work Order No:** ETAM15W02272

**Page:** 2 of 2

**Project:** GENZAUCK15847AB - STAGE J1B+ 1161 COATESVILLE-RIVERHEAD HIGHWAY RIVERHEAD

**Location:** Stage J1A



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AUCKLAND COUNCIL	Roadway Section	Area (ha)
COMPRISED IN	Lot 2 Stage A	5.0650 ha
	Lot 3 Stage A	2.4850 ha
	Lot 2 DP 158308	3.4745 ha
	Lot 101 30058-S4	12.5660 ha
<b>TOTAL AREA</b>		<b>24.5925 ha</b>

AREAS AND MEASUREMENTS ARE SUBJECT TO SURVEY

NO.	DESCRIPTION	DATE
01	Initial Design	10/01/2015
02	Resource Consent	13/02/2015
03	Final Design	02/03/2015
04	Final Design	15/03/2015
05	Final Design	15/03/2015
06	Final Design	15/03/2015
07	Final Design	15/03/2015
08	Final Design	15/03/2015
09	Final Design	15/03/2015
10	Final Design	15/03/2015

STATUS	DATE
DESIGNED	10/01/2015
REVISED	13/02/2015
APPROVED	15/03/2015
AS BUILT	

**CATO BOLAN CONSULTANTS**  
 SURVEYORS PLANNERS ENGINEERS  
 CATO BOLAN CONSULTANTS LTD  
 19 Tenth Avenue  
 PO Box 157  
 Otawa 4116  
 Phone: 07 437 1000  
 Fax: 07 425 1200  
 Email: info@catobolan.co.nz

**CLIENT**  
 Stephen Jelas  
 1185 & 1147 Coatesville-Riverhead Highway  
 Riverhead

**DRAWING TITLE**  
 JELAS STAGING PLAN  
 Proposed Subdivision of  
 Lots 2 & 3 Stage A,  
 Lot 2 DP 158308 & Lot 101 30058-S4

ORIGINAL SCALE	ORIGINAL SIZE	REVISION NO	RIT
1:3000	A3		R11
DATE	CAD REFERENCE	SHEET NO	SS
JUNE 2012	2012 0101 0101 0101		
DIRECTORY		JOB NO	30058

Tested By : AB Date : 25/06/2015  
 Checked By : EP Date : 27/06/2015

### EARTHWORKS FILL REPORT

Test Methods : Shear Strength (using field Shear vane in accordance with NZGS 2001); Nuclear Densometer Testing (in accordance with NZS 4407:1991 Test 4.2.1); Water Content Testing (in accordance with NZS 4402:1986 Test 2.1); Density Calculations (in accordance with NZS 4402:1986 Tests 4.1.1.5(b))

Project No:

GENZETAM01042AA

Page:

1 of 2

**Client:** Coffey Geotechnics NZ Ltd  
 PO Box 8261 Symonds Street,  
 Auckland 1150

**Principal:** Joshua Fisher

**c.c. to:** Chris Edwards

**Project:** GENZAUCK15847AB - STAGE J1B 1161 COATESVILLE-RIVERHEAD HIGHWAY RIVERHEAD

**Project Location:** Riverhead



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

Approved Signatory: Hng Huang

Approved Signatory Signature:

Date of Issue: 10/08/2015

IANZ Accredited Laboratory Number:105

Date	Work Order :	Tested By	Test No.	Wet Density (t/m <sup>3</sup> )	Oven Water Content (%)	Dry Density (t/m <sup>3</sup> )	Solid Density (t/m <sup>3</sup> )	Air Voids %	Field Shear Strength in kPa (UTP = Unable to penetrate)				Test Location	Easting	Northing	RL (m)	Material Tested	Comments
									184	191	197+	197+						
3/08/2015	ETAM15W02595	AB	17	1.61	90.4	0.84	2.7	0.0	184	191	197+	197+	LOT 5	1741923	5929798	-	Clay	FL
3/08/2015	ETAM15W02595	AB	18	1.58	92.7	0.82	2.7	0.0	UTP	UTP	UTP	197+	LOT 5	1741932	5929801	-	Clay	FL



**Appendix D – Coffey  
Producer Statement – Construction Review (PS4)**



Level 11, 7 City Road, Grafton  
Auckland 1010  
PO Box 8261, Symonds Street  
Auckland 1150  
New Zealand

t: +64 9 379 9463  
f: +64 9 307 2654

coffey.com

17 November 2015

Our ref: GENZAUCK15847AB

Cabra Developments Limited  
C/- Cato Bolam Consultants Limited  
PO Box 157  
Orewa 0946

Attention: Mr T Lemon

Dear Tom

**Cantilever Timber Pole Retaining Wall Observations at Stage J1C (Southern Boundary of Lot 4), Kaipara Portage Road, Riverhead**

This is to confirm we were engaged by Cabra Developments Limited to undertake observations of ground conditions within the pile holes and also observe and certify the general construction of the retaining wall at the above location in relation to the Coffey retaining wall design report and details (reference 15847AB-AA and dated 10 April 2015).

We initially visited the above site on 21 July 2015, during which we observed the drilling of the pile holes, consisting of 300mm diameter holes drilled to 1 metre depth. Two of the pile holes were drilled through subsoil drainage backfill and were subsequently deepened to 2 metres.

Ground conditions within the pile holes comprised predominately of stiff to very stiff, inorganic, moderately plastic, orange/brown, silty clays and clayey silts. Shear strengths within the sides and bases of the holes ranged between 97 and 147kPa.

During our second visit on 27 July 2015 we observed and inspected the wall which had been completed. The timber poles consisted of H5 treated 150mm diameter SED's and the rails were H4 treated and 150mm by 50mm thick as specified.

During this visit we also observed that a 110mm diameter perforated Nova Coil had been installed at the base of the retaining wall and the backfill behind the wall consisted of SAP20 drainage aggregate.

Construction Inspection for Cantilever Timber Pole Retaining Wall

We understand that the retaining wall drainage has been outleted into the reticulated stormwater system as recommended in our design report.

For and on behalf of Coffey

Prepared By:



**Joshua Fisher**  
Project Engineering Geologist

Reviewed / Authorised By:



**Kah-Weng Ho**  
Senior Principal Geotechnical Engineer  
MIPENZ, CPEng.

Attachments - Producer Statement – Construction Review (PS4)

**PRODUCER STATEMENT – PS4 – CONSTRUCTION REVIEW**

ISSUED BY: COFFEY GEOTECHNICS (NZ) LIMITED  
(Construction Review Firm)

TO: CABRA DEVELOPMENTS LIMITED  
(Developer)

TO BE SUPPLIED TO: AUCKLAND COUNCIL  
(Building Consent Authority)

IN RESPECT OF: CANTILEVER TIMBER POLE RETAINING WALL  
(Description of Building Work)

AT: STAGE J1C (PROPOSED LOT 4) KAIPARA PORTAGE ROAD, RIVERHEAD  
(Address)

LOT 1 DP 487962 SO -

COFFEY GEOTECHNICS (NZ) LIMITED has been engaged by CABRA DEVELOPMENTS LIMITED  
(Construction Review Firm) (Developer)

To provide CM1 CM2 CM3 CM4 CM5 (Engineering Categories) or  observation as per agreement with owner/developer  
or  other PILE HOLES INSPECTION AND RETAINING WALL CONSTRUCTION SERVICES AS PER COFFEY  
DESIGN REPORT DATED 10 APRIL 2015, REFERENCE GENZAUCK15847AB-AA  
(Extent of Engagement)

in respect of clause(s) B1 STRUCTURE of the Building Code for the building work described in  
documents relating to Resource Consent No. RMA 58884C and those relating to  
Building Consent Amendment(s) Nos. N/A issued during the  
course of the works. We have sighted these Building Consents and the conditions attached to them.

Authorised instructions / variation(s) No. N/A (copies attached)

or by the attached Schedule  have been issued during the course of works.  
On the basis of this 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 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 STRUCTURE 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, Kah-Weng HO am: CPEng No. 45290  
(Name of Construction Review Professional) Auckland Council Author No: 2967

I am a Member of: IPENZ NZIA and hold the following qualifications: Reg Arch No. \_\_\_\_\_  
BE (Hons) Civil

The Construction Review Firm issuing this statement hold a current policy of Professional Indemnity Insurance no less  
than \$200,000\*.

The Construction Review Firm is a member of ACENZ :

SIGNED BY: Kah-Weng Ho ON BEHALF OF COFFEY GEOTECHNICS (NZ) LIMITED

Date: 17 NOVEMBER 2015 Signature: 

Note: This statement shall only be relied upon by the Building Consent Authority names 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\*.

**Appendix E - Gideon Contractors Limited  
Producer Statement – Construction (PS3)**

