RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD
Search Copy

R.W. Muir
Registrar-General
of Land

Identifier	**SA12A/1083**
Land Registration District	**South Auckland**
Date Issued	13 January 1971

Prior References
SA660/11

Estate	Fee Simple
Area	20.7718 hectares more or less
Legal Description	Part Lot 1 Deposited Plan 25471

Registered Owners
David Lucien Marshall

Interests

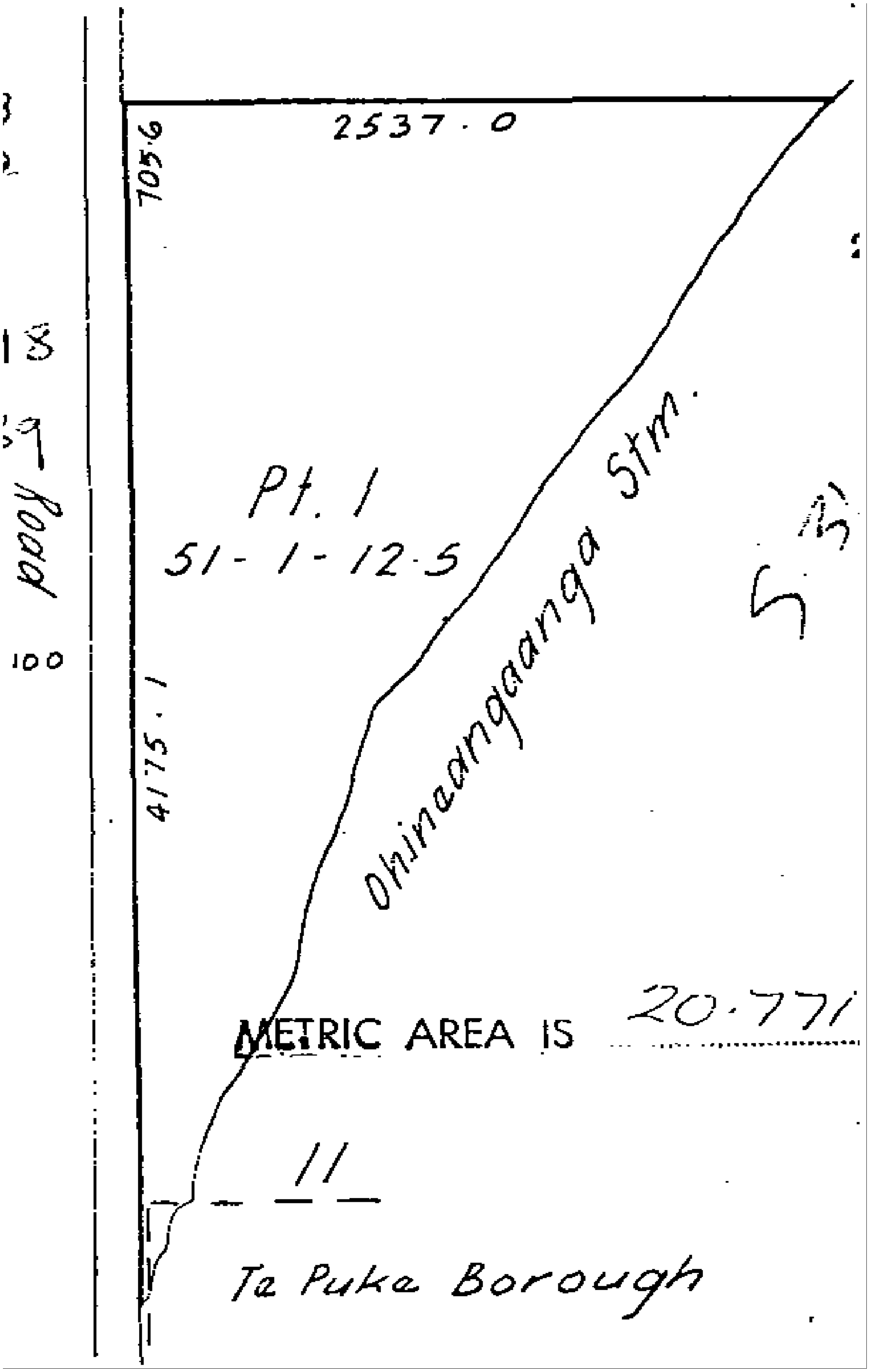
Subject to a gas pipeline right (in gross) over part marked C and D on DPS 31925 in favour of Natural Gas Corporation of New Zealand Limited created by Transfer H472484 - 29.6.1983 at 11.50 am

Subject to a sewage right (in gross) over part marked A on Plan S31758 in favour of Bay of Plenty Fruitpackers Limited and Cold Storage (Bay of Plenty) Limited created by Transfer H475399 - 15.7.1983 at 9.07 am

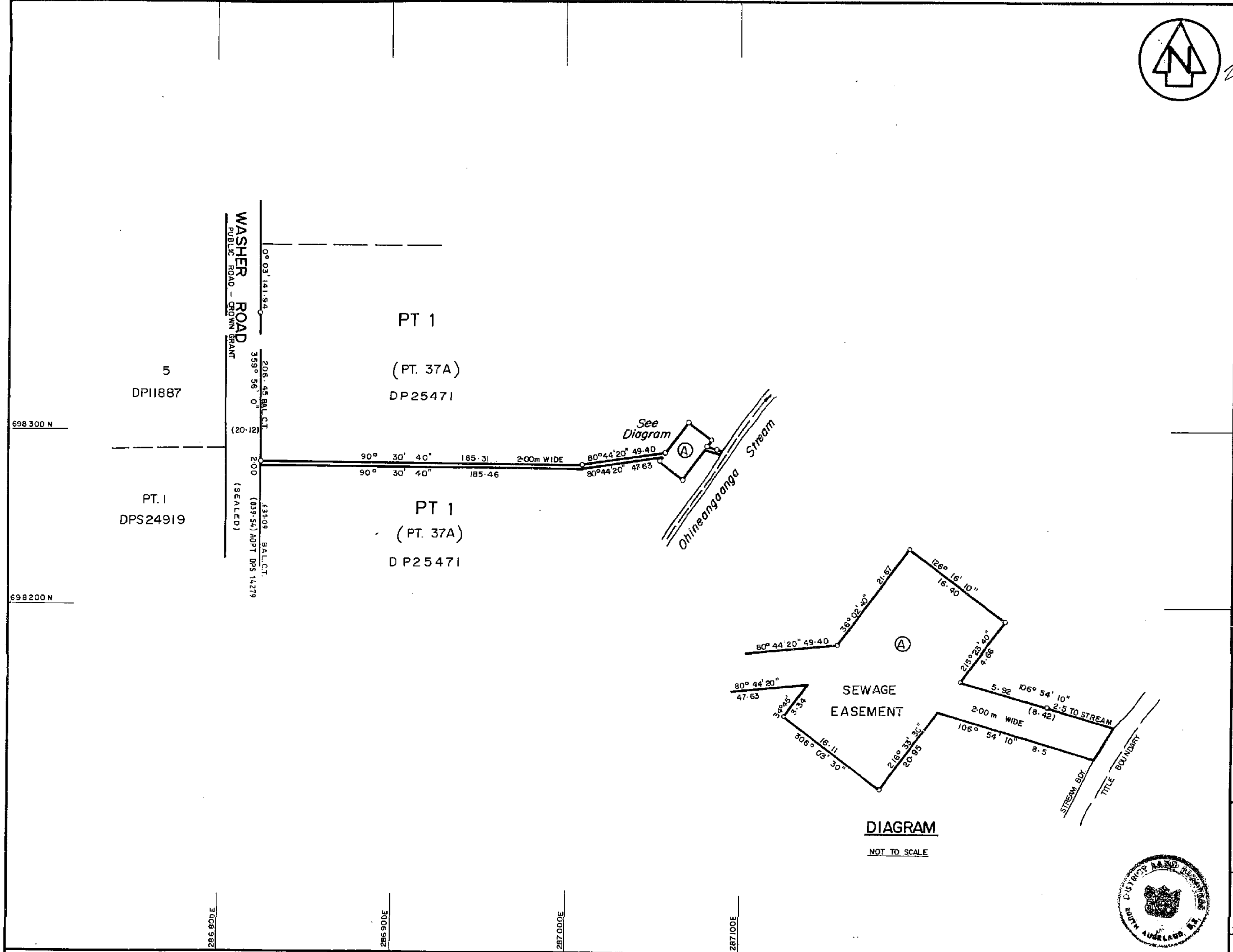
Subject to a drainage right (in gross) over part marked A, B, C, D, E, F, I and J on DPS 52298 in favour of Industrial Park Te Puke Limited created by Transfer B059102 - 18.12.1991 at 10.56 am

8123925.2 Mortgage to Rabobank New Zealand Limited - 14.4.2009 at 2:11 pm

11384642.1 Notification that a building consent issued pursuant to Section 72 Building Act 2004 identifies inundation as a natural hazard - 19.3.2019 at 3:08 pm


2537·0
705·6
4175·1
Road
100
Pt. 1
51-1-12·5
Ohinaangaanga Stm.
METRIC AREA IS 20·771
11
Te Puke Borough

2/9/1986



Approvals.

Gordon Spratt J.P. Director

P. C. Hav.. Secretary

BAY OF PLENTY COOPERATIVE DAIRY ASSOCIATION LTD

SCHEDULE OF EASEMENTS

Re SEWAGE EASEMENT IN GROSS

SERVIENT TENEMENT	SHOWN	GRANTEE
Pt. 1 D.P. 25471	A	BAY OF PLENTY FRUITPACKERS LTD.

Total Area ....

Comprised in C.T. 12A/1083 (PT)

I ALAN WILLIAM REX McCAULAY of ROTORUA
Registered Surveyor and holder of an annual practising certificate hereby certify that this plan has been made from Surveys executed by me or under my direction; that both plan and Survey are correct and have been made in accordance with the regulations under the Surveyors Act 1966
Dated at ROTORUA this 10th day of MARCH 1982 Signature

Field Book 3331 p62-64 Traverse Book 533 p.65
Reference Plans DP25471 DPS8377 DPS24919 DPS 28725
Examined Correct

Approved as to Survey
4.3.1983 Chief Surveyor

Deposited this 7th day of March 1983
District Land Registrar

File
Received 10.3.82
Instructions

DPS31758

LAND DISTRICT SOUTH AUCKLAND
SURVEY BLK.& DIST. II MAKETU
NZMS .... SHEET No. ....

SEWAGE EASEMENT OVER PT. LOT I DP25471
BEING PT. SEC. 37A BLK. II MAKETU S.D

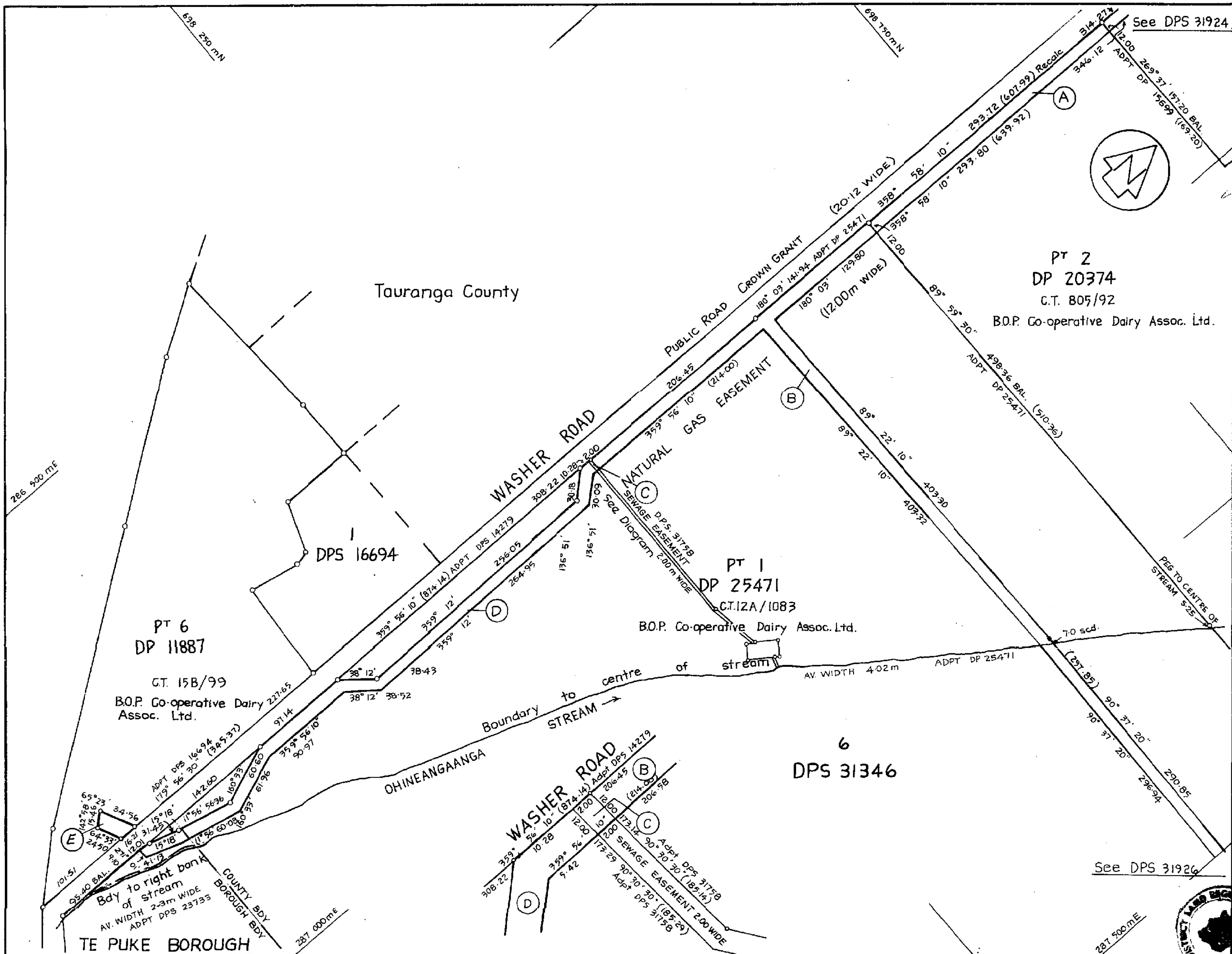
LOCAL AUTHORITY TAURANGA COUNTY
Surveyed by MARTIN, McCAULAY & MORTON F449
Scale 1 : 1500 Date SEPT. 1981

Printed by Littlejohns Instruments Ltd Wellington, New Zealand

I.F. Stirling, Surveyor-General, Department of Lands and Survey, Wellington

[redacted]

2/9/1986



APPROVED

Director

Secretary

SCHEDULE OF PROPOSED EASEMENTS IN GROSS			
Purpose	Shown	Serv. Ten.	Grantee
Natural Gas	A	Pt 2 DP 20374	Natural Gas Corporation of N.Z.
	B	Pt 1 DP 25471	
	C	Pt 1 DP 25471	
	D	Pt 1 DP 25471	
	E	Pt 6 DP 11887	

SCHEDULE OF EXISTING EASEMENT IN GROSS				
PURPOSE	SHOWN	SERV. TEN.	GRANTEE	DOC No
Sewage	C	Pt 1 DP 25471	Bay of Plenty Fruit Packers Ltd	

NOTE:- The pipeline generally follows the ℄ of the easement and is nowhere greater than 4 Metres from the ℄.

Total Area ....

Comprised in C's of T. 805/92 (Pt) 12A/1083 (Pt) & 15B/99 (Pt)

I, BRIAN HAROLD ASKIN of TAURANGA Registered Surveyor and holder of an annual practising certificate hereby certify that this plan has been made from Surveys executed by me or under my direction; that both plan and Survey are correct and have been made in accordance with the regulations under the Surveyors Act 1966

Dated at TAURANGA this 2nd day of APRIL 1982 Signature

Field Book .... p. .... Traverse Book 550 p.79-102
Reference Plans DP 20374, DP 25471, DPS 16694, DPS 31758, DPS 8377, DPS 24919, SO 48471, DP 11887, DPS 14279, DPS 11017, DPS 23733
Examined C. Tauller Correct

Approved as to Survey
2/10/1982 Chief Surveyor

Deposited this 20th day of October 1982
Assistant ~~District~~ Land Registrar

File ....
Received 8.4.82
Instructions .... TePuke 2

DPS 31925

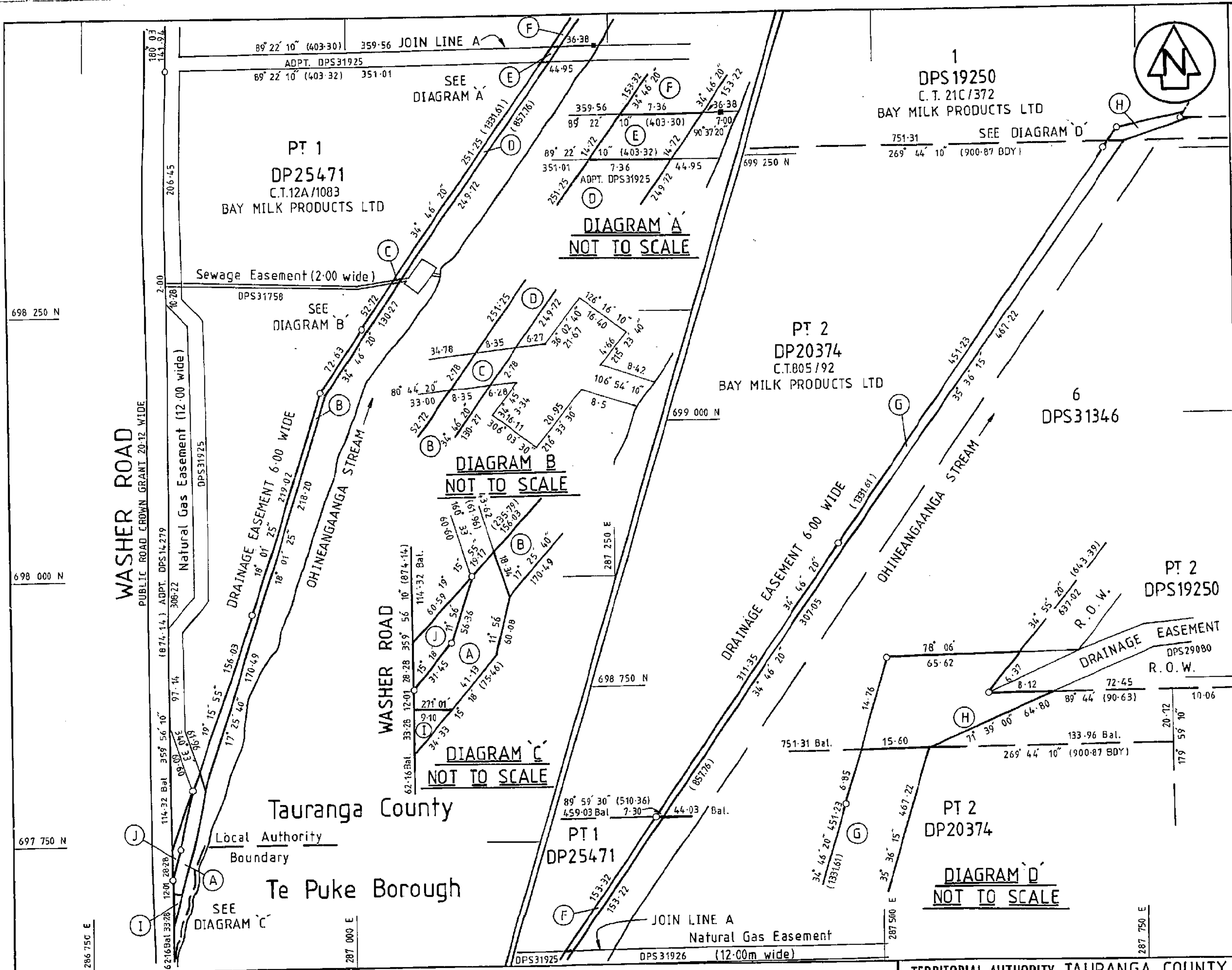
LAND DISTRICT SOUTH AUCKLAND SURVEY BLK. & DIST. II MAKETU NZMS .... SHEET No. U14/74	EASEMENT OVER PART LOT 6 DP 11887 (BEING SEC. 70 & Pt SECS 56, 61 & 62 BLK II), Pt LOT 1 DP 25471 (BEING Pt SECS 31 & 37A BLK II), Pt LOT 2 DP 20374 (BEING Pt SEC 37 BLK II, MAKETU S.D).	LOCAL AUTHORITY TAURANGA COUNTY Surveyed by BRUCE HENDERSON & ASSOC. (613) Scale 1:2500 Date FEB. 1982

Printed by Littlejohns Instruments Ltd. Wellington, New Zealand

I.F. Stirling, Surveyor-General, Department of Lands and Survey, Wellington

[redacted]

L&S FORM N 93



Approvals

THE COMMON SEAL OF BAY MILK PRODUCTS LIMITED WAS HEREUNTO AFFIXED IN THE PRESENCE OF

DIRECTOR

SECRETARY

Registered Owners

SCHEDULE OF EXISTING EASEMENTS IN GROSS

Purpose	Shown	Serv. Ten.	Grantee	Doc.
Natural Gas	A E	PT1 DP25471	Natural Gas Corp of N.Z.	H. 472484
Sewage	C	PT1 DP25471	B.O.P. Fruit Packers	H. 475399

SCHEDULE OF PROPOSED EASEMENTS IN GROSS

Purpose	Shown	Serv. Ten.	Grantee
Drainage	A B C D E F I J	PT 1 DP25471	BAY MILK PRODUCTS LTD
Drainage	G	PT 2 DP20374	
Drainage	H	Lot 1 DPS19250	

Total Area.........

Comprised in C.s.T. 21C/372, 805/92, 12A/1083

I, Vernon Ian Pickett, Registered Surveyor and holder of an annual practising certificate (or who may act as a registered surveyor pursuant to the proviso to section 33(2) of the Surveyors Act 1966) hereby certify that this plan has been made from surveys executed by me or under my directions, that both plan and survey are correct and have been made in accordance with the Survey Regulations 1972.

Dated at TAURANGA this 6th day of April 1989 Signature

Field Book .... p. .... Traverse Book ..... p. ....

Reference Plans ....

Examined — Correct — IW.

Approved as to Survey 14.7.89 Chief Surveyor

Deposited this 18th day of July 1989

Assistant [redacted] Land Registrar

Received 4.4.89

Instructions

DPS 52298

LAND DISTRICT SOUTH AUCKLAND

SURVEY BLK. & DIST. II MAKETU

NZMS 261 SHT .... RECORD MAP No ....

DRAINAGE EASEMENT OVER PT 1 DP25471, PT 2 DP20374 & LOT 1 DPS19250

TERRITORIAL AUTHORITY TAURANGA COUNTY

Surveyed by Murray-North Ltd (OP.165205)

Scale 1:2500 Date APRIL 1989

W.N. HAWKEY, SURVEYOR GENERAL, DEPARTMENT OF LANDS AND SURVEY WELLINGTON NEW ZEALAND

L & S FORM N93

Printed by Littlejohns Wellington, New Zealand.

MICROBOX

MICROFILM RECORDS (WAIKATO) LTD HAMILTON

21JL86 7029 DTY ###..$10.00
NEW ZEALAND STAMP DUTY TAG

Approved by the District Land Registrar, South Auckland. H.310733
New Zealand

MEMORANDUM OF TRANSFER

H475399 TE

WHEREAS the BAY OF PLENTY CO-OPERATIVE DAIRY ASSOCIATION LIMITED a duly incorporated company having its registered office at Te Puke (hereinafter together with its successors and assigns called "the Grantor") registered as the proprietor of an estate in fee-simple

subject however, to such encumbrances, liens, and interests as are notified by memoranda underwritten or endorsed hereon, in all that piece of land situate in the Land Registration District of South Auckland containing 20.7717 hectares

be the same a little more or less being Part Lot 1 Deposited Plan 25471 being part Section 31 and 37A Block II Maketu Survey District being all the land comprised and described in Certificate of Title Volume 12A Folio 1083 (South Auckland Registry) SUBJECT TO: Mortgage H.239025 (Hereinafter called "the said land")

AND WHEREAS the BAY OF PLENTY FRUITPACKERS LIMITED a duly incorporated company having its registered office at Te Puke and COLD STORAGE (BAY OF PLENTY) LIMITED a duly incorporated company having its registered office at Te Puke (the two companies together being hereinafter referred to as "the Grantees") have constructed a sewage pipeline and sewage treatment plant on parts of the said land hereinafter described for the purposes of conveying and treating sewage derived from the factory operations of the Grantees on adjoining land
AND WHEREAS the Grantees have obtained from the Regional Water Board for the Bay of Plenty Catchment area a right to discharge waste pursuant to the Water and Soil Conservation Act 1967
AND WHEREAS the Grantor has agreed for the consideration hereinafter appearing to

~~IN CONSIDERATION of the sum of~~

(which sum includes $ for chattels)

paid to

(the receipt of which sum is hereby acknowledged) DO HEREBY TRANSFER to the said

all estate and interest in the said piece

~~of land above described~~

transfer and grant unto the Grantees an easement in gross for the conveyance and treatment of sewage on and over those parts of the said land marked "A" and referred to as "sewage easement" on Deposited Plan S31758 (South Auckland Land Registry) for disposal beyond in such a manner as the Grantees shall determine SUBJECT ALWAYS to the terms and conditions hereinafter set out.

NOW THIS MEMORANDUM OF TRANSFER WITNESSETH:

THAT pursuant to the premises and in consideration of the sum of FIVE HUNDRED DOLLARS ($500.00) payable by the Grantees to the Grantor on the 1st day of August in every year of the term of this easement (the receipt of which payment due the 1st day of August 1981 is hereby acknowledged) the GRANTOR DOTH HEREBY TRANSFER AND GRANT unto the Grantees as an easement in gross full and free right liberty and licence to convey carry lead drain and treat sewage in such quantities capable of being conveyed and treated by the means hereinafter set out through along and under the said land by an existing pipe and through the treatment plant now constructed on parts of the said land marked "A" and referred to as sewage easement on Deposited Plan No. S.31758. AND for such purposes from time to time maintain alter, (but not extend) repair renew and cleanse, the said pipe, drains, conduits, treatment plants and incidental works through along and under those parts of the said land so described AND ALSO full power and authority for the Grantees and their surveyors engineers workmen contractors agents and servants with or without vehicles plant machinery and equipment from time to time and at all times during the continuance of this easement to enter and remain upon the said land or any part or parts thereof as shall be necessary for such purposes and generally to do and perform such acts and things in or upon the said land as may be necessary or proper for or in relation to any of the purposes aforesaid SUBJECT ALWAYS to compliance of the conditions hereinbefore and hereinafter set out.

AND THE PARTIES HEREBY COVENANT AND AGREE EACH WITH THE OTHER OR OTHERS OF THEM as follows:

1. THAT throughout the term of this grant of easement the Grantees shall pay to the Grantor as aforesaid an annual payment of FIVE HUNDRED DOLLARS ($500.00) the first payment to commence on the 1st day of August 1981 and thereafter annually on the 1st day of August in every year of the said term PROVIDED HOWEVER that the grantor shall have the right to review the amount of the said annual payment on the 1st day of August in every third year of the said term and any dispute arising between the parties as to the amount payable under such review shall be determined by arbitration under the Arbitration Act 1908.

2. THAT the term of this grant of easement shall be the length of the term of the Grantees' right to discharge sewage into Ohineangaanga stream situated on the boundary of the said land and any subsequent renewals of that right as granted by the Regional Water Board for the Bay of Plenty Catchment area pursuant to the Water and Soil Conservation Act 1967.

A N D the Grantor shall have the right to apply to the Land Registrar at the expense of the Grantees to determine this grant of easement at any time that the said discharge right or renewal thereof shall be terminated by the said Regional Water Board or relevant authority

3. THAT the Grantees shall and will at all times repair maintain and operate the said pipe and treatment plant as may be laid down constructed or erected in or under the said land in pursuance of these presents in a good and efficient state of repair and operation for the purposes for which the same are designed and prevent the same from becoming a nuisance.

4. THAT all works authorised to be carried out hereunder shall be carried out by the Grantees in a proper and workmanlike manner to the satisfaction of the Grantor and so as to cause no hindrance to the working of the said land or the adjoining properties by the Grantor and such work shall be performed as expeditiously as possible and with as little disturbance to the surface of the said land as is possible and immediately upon the completion of any such works the surface of the said land shall be restored as nearly as possible to its original condition to the reasonable satisfaction of the Grantor.

5. THE Grantees will from time to time forthwith repair and make good all damage to roadways, fences, gates and drains on the said land occasioned by the exercise by the Grantees of any of its rights liberties and licence hereunder.

6. THE Grantor will not at any time during the continuance of this Grant of easement do or permit or suffer any act whereby the rights powers licences and liberties hereby granted to the grantees may be interfered with or adversely effected

7. THAT this grant of easement shall in no way restrict the right of

the Grantor or its authorised servants agents contractors invitees and licences to full and free ingress egress and regress to all parts of the said land for all purposes in connection with the Grantor's farming operations PROVIDED THAT in exercising such rights the Grantor will exercise due care not to interfere with or damage the pipe treatment plant or equipment installed by the Grantees in the exercise of their rights hereunder WITH THE QUALIFICATION HOWEVER that having exercised such due care the Grantor shall have no liability to the Grantees for damage arising from their farming operations. The parties will at all times co-operate to insure that their respective operations on the said land from time to time are planned to minimise interference by anyone with another or inconvenience to any of them.

8. THE exercise by the Grantees of their rights hereunder are conditional upon the Grantees obtaining and maintaining in force at its sole expense all and any consents, licences or other authorisations which shall from time to time be obtained from or issued by any statutory or other authority to enable the Grantees to lawfully exercise such rights.

9. THE Grantees shall be jointly and severally as between themselves answerable for all accidents claims or pecuniary damages caused by or arising in connection with the carrying out of the works and/or the exercise of the Grantee's rights hereunder and shall indemnify the Grantors fully in respect thereof. The Grantees shall be responsible to the Grantor for all loss or damage suffered by the Grantor because of any breach of the Grantees of their obligations under this grant of easement including damage by escape of sewage from the said pipe or treatment plant on to other parts of the said land or on to any adjoining land.

10. THE Grantees will comply with the requirements of all relevant authorities as to the discharge of sewage beyond the said land not only as to quantity and quality but also as to location time and in all other respects and will indemnify the Grantor against all claims expenses or liability whatsoever in respect of or arising out of the pipe, treatment plant, or other incidental works or discharge on or emerging from the said land of the Grantor.

11. AT the expiration of the term of the said easement or on the determination by the grantor of the said easement pursuant to clause 2 hereof the Grantee shall have the right to remove all the pipe, treatment plant, fencing and incidental works constructed by the Grantees in reliance on the within written grant of easement PROVIDED HOWEVER that such removal shall be carried out in such a manner as to restore the land as nearly as possible to its original condition including the sowing of pasture to the reasonable satisfaction of the Grantor and that all costs of such removal shall be paid by the Grantees.

12. THE rights hereby agreed to be granted are expressly declared to be an easement in gross exclusive to the Grantees who shall not assign or otherwise dispose of the same or allow any other party joint or separate use of the facility hereby granted unless the Grantor shall first consent in writing which consent the Grantor may arbitrarily and without giving any reason withhold.

13. THE Grantees shall bear all costs of and incidental to the preparation execution and registration of these premises including the stamping of sameand obtaining of any necessary consents.

IN WITNESS WHEREOF these presents have been executed this 20th

day of July One thousand nine hundred and eighty-two (1982)

THE COMMON SEAL of THE BAY OF PLENTY ~~SIGNED by the abovenamed~~
CO-OPERATIVE DAIRY ASSOCIATION LIMITED was ~~in the presence of~~ hereunto affixed

THE SEAL OF THE BAY OF PLENTY CO-OPERATIVE DAIRY ASSOCIATION LIMITED

....Director

~~Witness:~~ .... Secretary ~~Director~~

THE COMMON SEAL of THE BAY OF PLENTY FRUIT-)
~~Occupation~~ PACKERS LIMITED was hereunto)
affixed in the presence of:)
~~Address:~~

....Director

Secretary
....~~Director~~

BAY OF PLENTY FRUITPACKERS LIMITED The Common Seal of

THE COMMON SEAL of COLD STORAGE (BAY OF)
PLENTY) LIMITED was hereunto affixed in)
the presence of:)

.... Director

Secretary
.... ~~Director~~

COLD STORAGE (BAY OF PLENTY) LIMITED The Common Seal of

THE RURAL BANKING AND FINANCE CORPORATION OF NEW ZEALAND, Mortgagee by virtue of Memorandum of Mortgage registered No.H239025 of the land of the BAY OF PLENTY CO-OPERATIVE DAIRY ASSOCIATION LIMITED within described DOTH HEREBY CONSENT to the foregoing Memorandum of Transfer by way of Grant of Easement.

DATED this 20th day of July 1982

SIGNED for and on behalf of the RURAL BANKING)
AND FINANCE CORPORATION OF NEW ZEALAND by)
)
JOHN HENRY COEY in the presence of:)

Legal Administration Officer
Rural Banking and Finance
Corporation NZ
Rotorua

The Rural Banking and Finance Corporation of New Zealand by

acting for the said Corporation pursuant to Section 16 of the Rural Banking and Finance Corporation Act 1974.

No.

TRANSFER

OF GRANT OF EASEMENT (limited as to duration)

BAY OF PLENTY CO-OPERATIVE DAIRY ASSOCIATION LIMITED GRANTOR ~~Transferor~~

BAY OF PLENTY FRUITPACKERS LIMITED GRANTEE ~~Transferee~~
and COLD STORAGE (BAY OF PLENTY) LIMITED

Correct for the purposes of the Land Transfer Act.

Solicitor for Transferee/s.

I HEREBY CERTIFY THAT THIS TRANSACTION DOES NOT CONTRAVENE THE PROVISIONS OF PART IIA OF THE LAND SETTLEMENT PROMOTION AND LAND ACQUISITION ACT 1952.

Solicitor for the Purchaser or Lessee

Particulars entered in the Register as shown in the Schedule of Land herein on the date and at the time stamped below.

Williams.

Assistant Land Registrar of the District of South Auckland

(1F)

SOUTH AUCKLAND No 1 DISTRICT LAND REGISTRAR

475399

District Land Registry Hamilton No.2

12/1083

JUL 15 9 07 AM '83

FENTON McFADDEN & PATERSON
Solicitors,
TE PUKE.

HAMILTON DISTRICT LAW SOCIETY

1

RICE PRINT

BOP

Approved by the Registrar-General of Land, Wellington, No. 367635.80
Approved by the District Land Registrar, North Auckland, No. 4363/80

B059102 TE Under the Land Transfer Act 1952

Memorandum of Transfer

PHILLIP PATRICK CASEY of Kerepehi Farmer and **BEVERLEY LYNNE CASEY** his wife

being registered as proprietor

of an estate in fee simple
as tenants in common in equal shares (The Grantors)

subject however to such encumbrances, liens and interests as are notified by memoranda underwritten or endorsed hereon in that piece of land situated in the Land District of South Auckland
FIRST containing 20.7717 hectares

more or less being part Lot 1 Deposited Plan 25471 being part Sections 31 and 37A Block II Maketu Survey District and being all the land comprised and described in Certificate of Title 12A/1083 South Auckland Registry

NEW ZEALAND STAMP DUTY PAID
06/12/91 ... NOT LIABLE

SUBJECT TO:

1. Gas pipeline easement in gross created by Transfer H.472484
2. Sewage Easement in gross created by Transfer H.475399
3. Mortgages H.881978.4 and H.881978.5

AND SECONDLY 40.7973 hectares more or less being part Lot 2 Deposited Plan 20374 and being portion of Section 37 of Block II of the Maketu Survey District and being all the land comprised and described in Certificate of Title Volume 805 Folio 92 South Auckland Registry TOGETHER WITH water easement created by Transfer S.130066

SUBJECT TO:

1. The right to discharge waste liquids created by Transfer S.130066
2. Gas pipeline easement in gross created by Transfer H.472484
3. Mortgages H.881978.4 and H.881978.5

AND THIRDLY 81.0000 hectares more or less being Lot 1 on Deposited Plan S.19250 and being part Sections 36 and 37 Block II Maketu Survey District and being all the land comprised and described in Certificate of Title 21C/372 South Auckland Registry TOGETHER WITH water easement created by Transfer S.130066 and TOGETHER WITH AND SUBJECT TO rights of way created pursuant to Easement Certificate H.107957.4

SUBJECT TO:

1. A right to discharge waste liquids created by Transfers S.128570 and S.130066
2. Right of way created by Transfer H.107957.5
3. Mortgages H.881978.4 and H.881978.5

AND WHEREAS the Grantors have agreed to transfer and grant unto BAY MILK PRODUCTS LIMITED (hereinafter with its successors and assigns referred to as and included in the term "the Grantee") an easement by and over the above described land for the conveyance of factory waste liquids in pipes now laid under the said land for disposal beyond thereof in such a manner as the Grantee shall determine.

AND WHEREAS in so far as to give effect to the intention of the parties it is necessary that waste be discharged into natural water the Regional Water Board of the Bay of Plenty Catchment area has granted to the Grantee the right to discharge waste pursuant to the Water and Soil Conservation Act 1967.

NOW THIS MEMORANDUM WITNESSETH that IN CONSIDERATION of these premises the Grantors DO HEREBY TRANSFER AND GRANT unto the Grantee as an easement in gross, full, free and perpetual right, liberty and licence to convey factory waste at such times as the Grantee shall determine by means of pipes through, under and across such portions of the said land shown as drainage easement on Deposited Plan S.52298 (South Auckland Registry) and marked "A,B,C,D,E,F,I,J,G and H" on the said Deposited Plan (such said portions of land having the dimensions shown on the aforesaid plan) AND for such purposes from time to time to dig up any depth and again fill in the soil of the said portions of the said land marked "A,B,C,D,E,F,I,J,G and H" on the said Deposited Plan as aforesaid and to alter, repair and maintain the pipes and to lay down, construct, correct and make in or under such portion of the said land pipes for carrying and conveying the said waste water with manholes, valves and surface boxes as the Grantee shall think fit and from time to time to inspect, maintain, cleanse, repair, extend, remove and enlarge such pipes, manholes, valves and surface boxes and to have to the same for any such purpose access to and from the said land except as hereinafter provided and from time to time repair and maintain all works in connection therewith and also full power and authority for the Grantee its engineers, workmen, agents and servants with or without machinery, tools and other vehicles from time to time and at all times to enter and remain for any of the purposes aforesaid upon such portion of the said land as shall be necessary for such purposes and generally to do and perform such acts and things in or upon the said land as may be necessary or proper for or in relation to any of the purposes aforesaid AND IT IS HEREBY DECLARED that (subject to the possession hereof) the burden of the easement hereby granted shall be binding on the Grantors, their executors, administrators and assigns the registered proprietors for the time being of said land and that (subject to the provisions hereof) the benefits of the licence and easement hereby granted shall pass to the Grantee and its assigns AND for the consideration aforesaid the Grantee DOTH COVENANT AND AGREE with the Grantors as follows:

1. THAT the Grantee shall and will at all times repair and maintain all such pipes as may be laid down, constructed or erected in or under the said land in pursuance of these presents in a good and efficient state of repair for the purposes for which the same are designed and will prevent the same from becoming a nuisance.

2. THAT in the event of the Grantee entering into and upon the said land for the purpose of repairing the pipes or concrete conduits or of laying down, constructing or erection of any such pipes or for repairing and effectively maintaining such pipes or concrete conduits and for any of the purposes aforesaid the Grantee shall and will:

RPB AC

JW DB

(a) Confine its presence and activities to the part of the said land shown as Drainage Easement on the said Deposited Plan.

(b) Carry out and complete the said works and repair with as little disturbance to the surface of the said land as possible and shall immediately upon completion of any such work thereon restore the surface of the said land as nearly as possible to its original condition and will sow in pasture grasses to be approved by the Grantors such part thereof as shall require the same by reason of disturbance thereof excepting the farm track constructed by and at the expense of the Grantee which track shall if disturbed by the Grantee be restored to the original condition as originally constructed by the Grantee.

(c) Ensure that in entering upon the said land for any of the aforesaid purposes all gates which were closed are not left open and that all gates which were open are left open.

(d) Compensate the Grantors fully for all damage caused to any cultivation crop of any kind for the time being sown or growing or in the course of harvesting upon the said land.

(e) Repair from time to time and make good all damage to fences, gates and drains on or around the said land caused by the carrying out by the Grantee of the works hereinbefore mentioned.

3. THAT the Grantee will indemnify the Grantors from and against all damage, loss, expense, costs, claims, charges and proceedings which are caused by the acts or omissions of the Grantee in the carrying out of the works, repair and maintenance hereinbefore referred to.

4. THAT the Grantee shall meet all the legal costs incurred by the Grantors in connection with this grant of easement and in the event of this easement being surrendered, extinguished or discharged the Grantee shall meet all the Grantors legal costs associated therewith.

5. THAT nothing herein contained or implied shall be deemed to compel the Grantee to convey factory waste water or other factory waste products through the said pipe or concrete conduit and the Grantee may discontinue such conveyance at will.

6. THAT the Grantors HEREBY CONVENANT with the Grantee that the Grantors will not without the consent of the Grantee place any buildings on the portion of the said land marked "A,B,C,D,E,F,I,J,G, and H" on the said plan and will not at any time hereafter permit or suffer any act whereby the rights, powers, licences or liberties hereby granted to the Grantee are interferred with or affected BUT this provision shall not

(a) Affect any fences already erected upon the said portion of land

(b) Prevent the Grantors from erecting new fences along or across the said portion of land in which case the Grantee at its expense shall supply the Grantors with such gates as are reasonably required to be mounted in the fences for purposes of ensuring ease of access along the length of the said portion of land.

7. THAT the provisions of Clause 6 hereof shall not prevent the Grantors from using the farm track which presently runs generally along the line of the said drainage easement (and such use may comprise the use of agricultural machinery) and the Grantors shall not be liable to the Grantee for any damage caused to the Grantee's pipes through the Grantors use of the said track unless such damage be the result of negligence on the part of the Grantors or failure by the Grantors to maintain the track as hereinafter provided.

8. THAT in consideration of the Grantee having at its own expense constructed the farm track referred to in Clause 7 hereof for the mutual benefit of both parties the Grantor HEREBY COVENANTS with the Grantee that the Grantor will at the Grantor's expense maintain and keep repaired the said track in the same order and condition as it existed at the time of construction subject to the reservation expressed in the following Clause 9 hereof.

9. THAT there is reserved to the Grantors the right to be exercised at any time, to form a roadway whether sealed or metalled generally along the line of the said drainage easement BUT the Grantors covenant with the Grantee that no part of any such roadway shall come within 1.5 metres lateral distance of any existing pipes used by the Grantee at the time of the formation or sealing of the said roadway.

IN WITNESS WHEREOF these presents have been executed this 31st day of October One Thousand Nine Hundred and Eighty Nine (1989).

SIGNED by the said **PHILLIP PATRICK CASEY** and **BEVERLEY LYNNE CASEY** as Grantors in the presence of:) P.P. Casey. B Casey

T C Broadbent
Solicitor
Paeroa

THE COMMON SEAL of **BAY MILK PRODUCTS LIMITED** was hereunto affixed as Grantee in thee presence of:)

BAY MILK PRODUCTS LIMITED
The Common Seal of

DIRECTOR

SECRETARY

The National Bank
of New Zealand Limited

CERTIFICATE OF NON-REVOCATION OF POWER OF ATTORNEY

I, JOHN ARTHUR BROWN of Tauranga in New Zealand a Deputy Senior Manager Branch Lending of The National Bank of New Zealand Limited hereby certify:-

1. That by Deed dated the 21st day of July 1988 deposited in the Lands and Deeds Registry Office at Wellington as No. 940072.1 and whereof a copy is deposited in the Lands and Deeds Registry Office at:

Auckland	as No.	B881593.1	Hokitika	as No.	079957
Blenheim	as No.	142597	Invercargill	as No.	154676.1
Christchurch	as No.	760060	Napier	as No.	497340.1
Dunedin	as No.	709926	Nelson	as No.	281208.1
Gisborne	as No.	171633.1	New Plymouth	as No.	352961
Hamilton	as No.	817208			

The National Bank of New Zealand Limited (hereinafter called "the Bank") did constitute and appoint such person as may for the time being be appointed by the Bank to act as the Chief Executive of the Bank to be the Attorney of the Bank with the powers and authorities set out in clauses 1 to 15 of the Deed.

2. THAT by the same Deed the Bank constituted and appointed each and every person for the time being appointed by the Bank to act as:

(i) a Deputy Chief Executive of the Bank;
(ii) a General Manager of the Bank;
(iii) a Deputy General Manager of the Bank;
(iv) a Regional Manager of the Bank;
(v) an Assistant General Manager of the Bank;
(vi) the Chief Manager Lending of the Bank;
(vii) a Senior Manager Corporate Banking of the Bank;
(viii) a Senior Manager Branch Lending of the Bank;
(ix) a Deputy Senior Manager Branch Lending of the Bank;
(x) the Manager Lending Administration of the Bank;
(xi) the Company Secretary of the Bank;
(xii) the Chief Financial Officer of the Bank;

to be the Attorney of the Bank with the powers and authorities specified in clause 12 of the Deed (which relates, among other things, to the execution of documents).

3. THAT I am a Deputy Senior Manager Branch Lending of the Bank and as such am a person for the time being entitled to exercise the powers and authorities specified in clause 12 of the said Deed.

4. THAT at the date hereof I have not received any notice of the winding-up of the Bank or other revocation of the said Deed.

Dated at Tauranga this 31st day of October 1991

....

HO 084B 7 89

In Consideration of

(the receipt of which sum is hereby acknowledged)

Do **hereby Transfer** to the said

all estate and interest in the

said land above described

In witness whereof these presents have been executed this day

of 19

Signed by the above named

in the presence of:—

No.

TRANSFER OF

B.182815.2 Transfer of easement created by the within Transfer to Te Puke Industrial Park Limited - 24.1.1994 at 2.35 o'c

A.L.R.

....Transferor

....Transferee

Particulars entered in the Register as shown herein on the date and at the time endorsed below.

....

Assistant / District Land Registrar

of the District of.................................

805/92
21C/372
12A/1083

PARTICULARS ENTERED IN REGISTER
LAND REGISTRY SOUTH AUCKLAND
ASST. LAND REGISTRAR

10.56 18.DEC91 B 059102

DISTRICT LAND REG. SOUTH AUCKLAND

Solicitors for the Transferee

AUCKLAND DISTRICT LAW SOCIETY

Correct for the purposes of the Land Transfer Act.

Solicitor for the Transferee.

I HEREBY CERTIFY THAT THIS TRANSACTION DOES NOT CONTRAVENE THE PROVISIONS OF PART IIA OF THE LAND SETTLEMENT PROMOTION AND LAND ACQUISITION ACT 1952.

SOLICITOR FOR THE TRANSFEREE

THE NATIONAL BANK OF NEW ZEALAND LIMITED the mortgagee of Mortgage H.881978.4 hereby consents to registration of the within transfer.

Signed by
The National Bank of New Zealand Ltd
By its attorney JOHN ARTHUR BROWN
In the presence of
Dated the 31st day of October 1991.

The National Bank of New Zealand Limited By its Attorney

Bank Officer
Tauranga

MICHAEL BERNARD CASEY the mortgagee in Mortgage Number H.881978.5 hereby consents to registration of the within transfer.

Dated the 9 day of December 1991

SIGNED by the said MICHAEL BERNARD CASEY in the presence of:

B059102

B.

(Approved by the D.L.R.
Wellington, No. 334901.1)

898 · 00

28JN83 20235 DTY * $58.00

MEMORANDUM OF TRANSFER

ZEALAND STAMP DUTY UNI

6.86 FP

(GRANT OF EASEMENT) H472484 TE

28JN83 20236 F.P.* $6.86
NEW ZEALAND STAMP DUTY

BAY OF PLENTY CO-OPERATIVE DAIRY ASSOCIATION LIMITED a duly incorporated company having its registered office at Te Puke (hereinafter called "the Grantor") being registered as the proprietor of an estate in fee simple

subject however to such encumbrances liens and interests as are notified by memorandum underwritten or endorsed hereon in all that piece of land situated in the LAND REGISTRATION DISTRICT OF SOUTH AUCKLAND

as is more particularly described in the schedule attached hereto (hereinafter referred to as "the hereinafter described land".).

IN CONSIDERATION of the covenants hereinafter contained DOTH HEREBY TRANSFER AND GRANT unto NATURAL GAS CORPORATION OF NEW ZEALAND LIMITED a duly incorporated company having its registered office at Wellington (hereinafter called "the Grantee") the following rights and interests as an easement in gross:

1. The right from time to time and at all times to lay construct operate inspect maintain repair renew change the size of and remove pipelines (hereinafter referred to as "the said pipelines") and all appurtenances thereto in over or through those parts of the hereinafter described land marked ~~A, B, C, D, E~~ A B C D E on Deposited Plan DPS 31925 (which said parts marked ~~A, B, C, D, E~~ A B C D E are hereinafter referred to as "the said strip of land") the said pipelines to remain the property of the Grantee and to pump move convey and transport through or within the said pipelines natural gas products.
2. The right within the boundaries of the said strip of land to remove all cultivated or natural vegetation including trees and shrubs.
3. The right of ingress and egress together with its engineers surveyors workmen contractors with or without any vehicles implements tools pipes and materials of any kind in and over and through the hereinafter described land for any and all purposes necessary or convenient to the exercise by the Grantee of its rights and interests herein granted.
4. The right within the boundaries of the said strip of land to construct operate inspect maintain repair renew change and remove such above ground devices as the Grantee may consider necessary or convenient for the said pipelines or any one or more of them. The expression "above ground devices" shall include (inter alia) valves, surface marker posts test pipes and points aerial crossing bridges and bridge abutments metering devices booster station bridges and fences around these devices.

A B C D E

AND IT IS HEREBY COVENANTED AND AGREED by and between the parties hereto as follows:

(a) The Grantor shall have the right to use the hereinafter described land except as such use may unreasonably interfere with the enjoyment of the rights and easements granted herein but shall not erect any building construction or fence or plant any tree or shrub within the boundaries of the said strip of land disturb the soil of the said strip of land below a depth of 0.4 metres from the surface or do anything which would or could damage or endanger the pipeline without the written consent of the Grantee and such consent shall not be unreasonably withheld.

(b) The Grantee shall bury the said pipelines so that they will not interfere with the ordinary cultivation of the hereinafter described land and in so doing or in maintaining repairing renewing changing or removing the said pipelines or any one or more of them shall cause as little damage as possible to the surface of the hereinafter described land.

(c) The Grantee shall pay to the Grantor the sum of $9,713.54 as consideration for the grant of this easement and for the laying of a pipeline (having a nominal bore of 200 mm) authorised hereunder. In respect of the laying of subsequent pipelines the Grantee shall pay to the Grantor as a consideration therefor a sum to be mutually agreed upon or failing agreement to be fixed by arbitration in accordance with the provisions of the Arbitration Act 1908 or any statutory amendment or modification thereof.

(d) The Grantee shall pay the costs of restoring all damaged fences and the said surface as nearly as possible to their former condition or state excluding any trees or shrubs removed so often as the same shall be necessary hereunder and in addition shall in accordance with the provisions of the Petroleum Act 1937 and its amendments pay to the Grantor compensation for all other loss injury or damage suffered by the Grantor in respect of the rights acquired by the Grantee under this easement.

This grant and the covenants and conditions herein set forth shall be binding upon the executors administrators successors and assigns of the parties hereto and the Grantee may grant any license or right in respect of any estate or interest conferred by this instrument or may assign any such estate or interest.

IN WITNESS WHEREOF these presents have been executed the 30th.

day of August 1982.

SIGNED by the abovenamed ....
as Grantor
in the presence of:

The Common Seal of the Bay of Plenty Co-operative Dairy Association Limited was hereto affixed in the presence of

....

.... Director

Secretary

THE BAY OF PLENTY CO-OPERATIVE DAIRY ASSOCIATION LIMITED THE SEAL OF

THE COMMON SEAL OF NATURAL GAS CORPORATION NEW ZEALAND LIMITED as Grantee was hereunto affixed in the presence of:)

NATURAL GAS CORPORATION OF NEW ZEALAND LIMITED The Common Seal of

.... DIRECTOR

....

DIRECTOR

COMPANY SECRETARY

CERTIFICATE OF ATTESTATION

APPEARED before me this 12th day of May 1983 at Tauranga

....

....

a person known to me and of good repute and attesting witness to the signature of the Grantor on this Transfer, who acknowledged his signature as witness to the signature of the Grantor and did further declare that the Grantor was personally known to him and that the signature of the Grantor is in the handwriting of the Grantor.

....

A Solicitor of the High Court of New Zealand

107

IN THE MATTER of the Land Transfer Act 1952

AND

IN THE MATTER of the Registration of Easements under the provisions of Section 73 (1) of the Petroleum Act 1937

I KEITH VICTOR MEAD of Wellington Company Secretary to NATURAL GAS CORPORATION OF NEW ZEALAND LIMITED a duly incorporated Company having its registered office at Wellington ("the Grantee") HEREBY CERTIFY on behalf of the Grantee as follows:

1. I am authorised to give this Certificate on behalf of the Grantee.

2. THE Grantee is the holder of an authorisation issued under the provisions of Part II of the Petroleum Act 1937 in respect of a pipeline affecting the land described in the attached Memorandum of Transfer (Grant of Easement).

3. THE Grantee is unable to produce the Certificate of Title to the land affected by the said Memorandum of Transfer.

4. I hereby apply on behalf of the Grantee for registration of the said Memorandum of Transfer without production of the Certificate of Title in manner authorised by Section 73 (1) of the Petroleum Act 1937.

SIGNED by the said KEITH VICTOR MEAD as Company Secretary for and on behalf of the Grantee.

NATURAL GAS CORPORATION OF NEW ZEALAND LIMITED

By Its Secretary: K V Mead

....

K.V. Mead

Date: 27/6/93

SCHEDULE

* All that parcel of land situated in the South Auckland Land District containing 40.7973 hectares being Lot 2 on Deposited Plan 20374 being Part Section 37 Block II Maketu Survey District, being all of the land comprised and described in Certificate of Title 805/92.

** All that parcel of land situated in the South Auckland Land Distruct containing 20.7717 hectares being Part Lot 1 on Deposited Plan 25471 being part Sections 31 and 37A Block II Maketu Survey District, being all of the land comprised and described in Certificate of Title 12A/1083.

*** All those parcels of land situated in the South Auckland Land District containing 7.7049 hectares being Part Lot 6 on Deposited Plan 11887 being Section 70 and part Section 56, 61 and 62 Block II Maketu Survey District being all of the land comprised and described in Certificate of Title 15B/99.

* Subject to:
(i) Mortgage No. H 239025

** Subject to:
(i) Mortgage No. H 239025

*** Subject to:
(i) Right of Way created by Transfer S 212940

TRANSFER of Grant of Easement

Correct for the purposes of the Land Transfer Act 1952.

....

Solicitor for Grantee.

Situated in the Land Registration District of SOUTH AUCKLAND

BAY OF PLENTY CO-OPERATIVE DAIRY ASSOC LTD .... Grantor

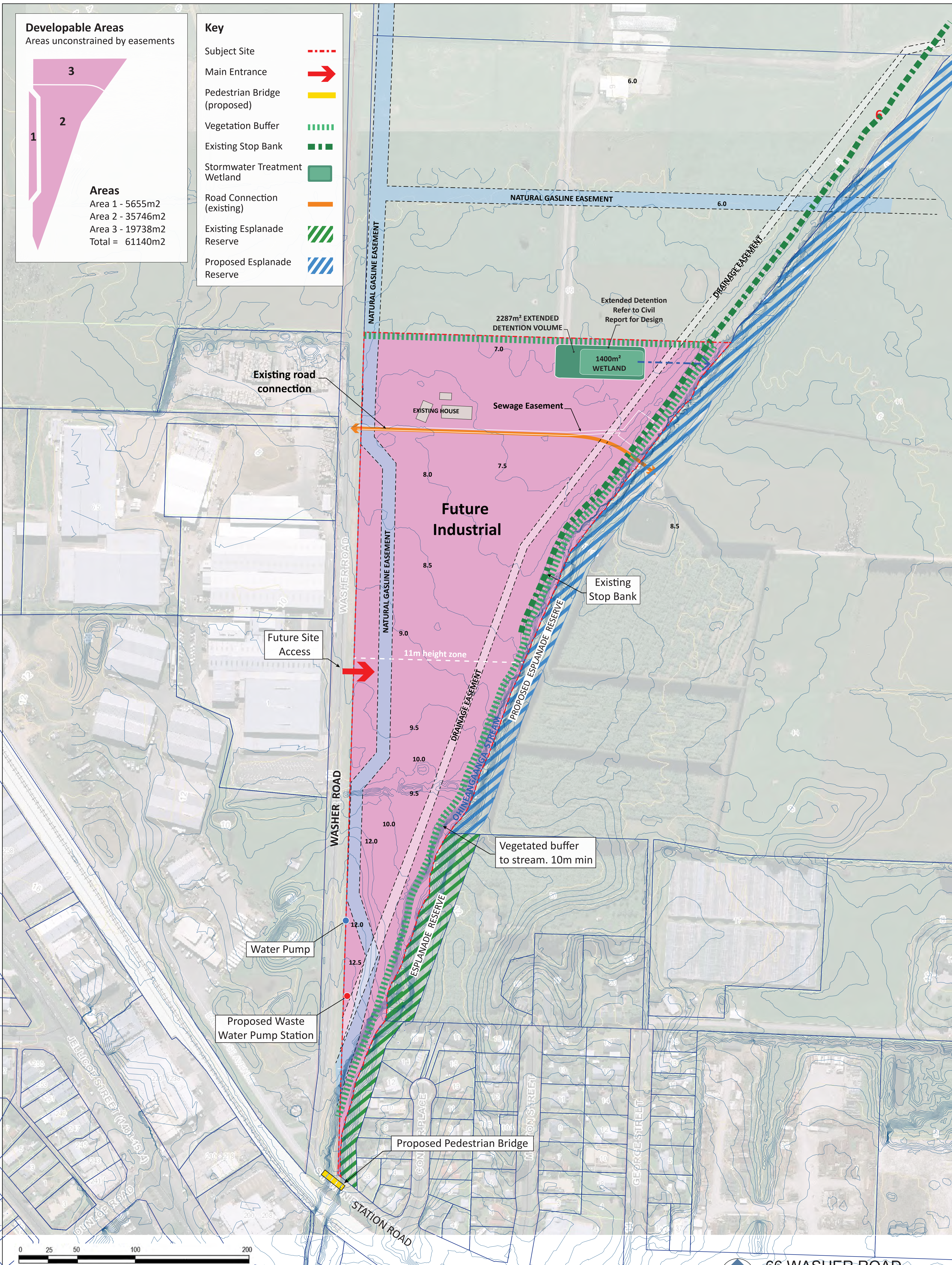
Natural Gas Corporation of New Zealand Limited .... Grantee

Particulars entered in the Register on the date and at the time recorded below.

District/Assistant Land Registrar
of the District of

H 724384
805/92
124/1083
150/99
District Land Registry
Hamilton
Jun 23 11

YOUNG, SWAN, McKAY & CO.
SOLICITORS,
WELLINGTON, N.Z.



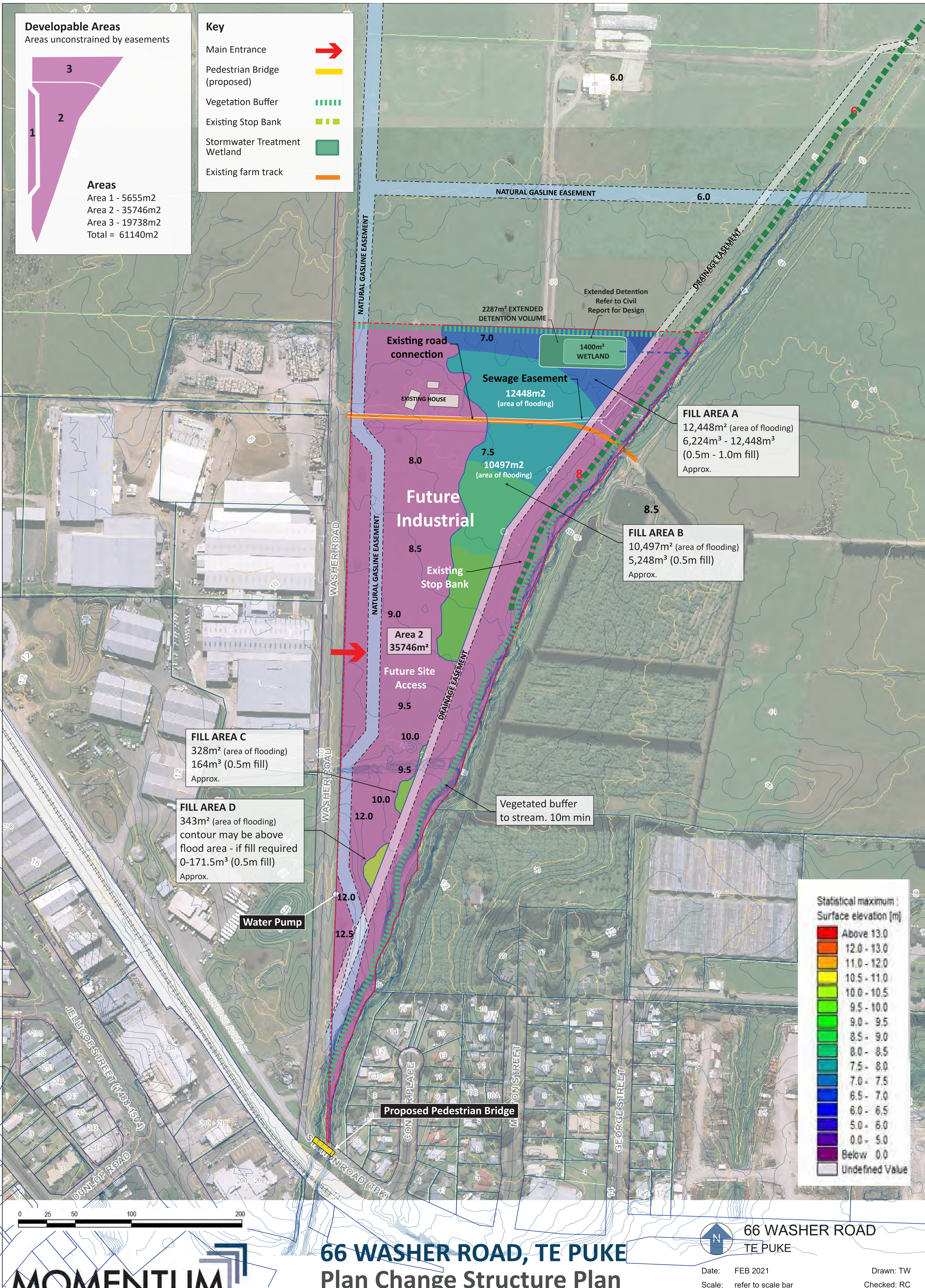
MOMENTUM
PLANNING AND DESIGN

WASHER ROAD BUSINESS PARK
Plan Change Structure Plan

N

66 WASHER ROAD
TE PUKE

Date: APRIL 2021 Drawn: TW
Scale: refer to scale bar Checked: RC
Drawing No. 66 WASHER ROAD



MOMENTUM
PLANNING AND DESIGN

66 WASHER ROAD, TE PUKE
Plan Change Structure Plan
flood data provided by Regional Council (overlayed)

N
66 WASHER ROAD
TE PUKE

Date: FEB 2021 Drawn: TW
Scale: refer to scale bar Checked: RC
Drawing No. 66 WASHER ROAD

LYSAGHT

DAVID MARSHALL
PROPOSED PRIVATE PLAN CHANGE
ENGINEERING SERVICING REPORT
66 WASHER ROAD, TE PUKE
LCL REFERENCE: 194210
DATE: 25/03/2021
REVISION: 4

Document Control			
Report Title	Engineering Servicing Report – Proposed Private Plan Change		
Project	Industrial Development – 66 Washer Rd		
Client	David Marshall		
Project ID	194210		
Author	Peter Moodie	**Approved**	Daniel Hight
Signature		**Signature**	
Title	Director – CPENG - CMENGNZ	**Title**	Senior Engineer – CPENG - CMENGNZ

Revision Schedule			
Revision	**Date**	**Details**	**Author**
0	19/06/19	For RC	PM
1	29/07/19	For RC	PM
2	08/11/19	For RC	PM
3	16/03/20	Wastewater storage updated	PM
4	25/03/21	Revised development area	PM

TABLE OF CONTENTS

APPENDICES

1.0 INTRODUCTION

Lysaght Consultants Ltd (LCL) was engaged by David Marshall to provide a high-level engineering servicing review for a Private Plan Change consent application for a proposed Industrial Development at 66 Washer Road, Te Puke. The scope of the review included;

- Flood Levels
- Stormwater Discharge
- Wastewater Reticulation
- Potable and Fire Fighting Water Provisions

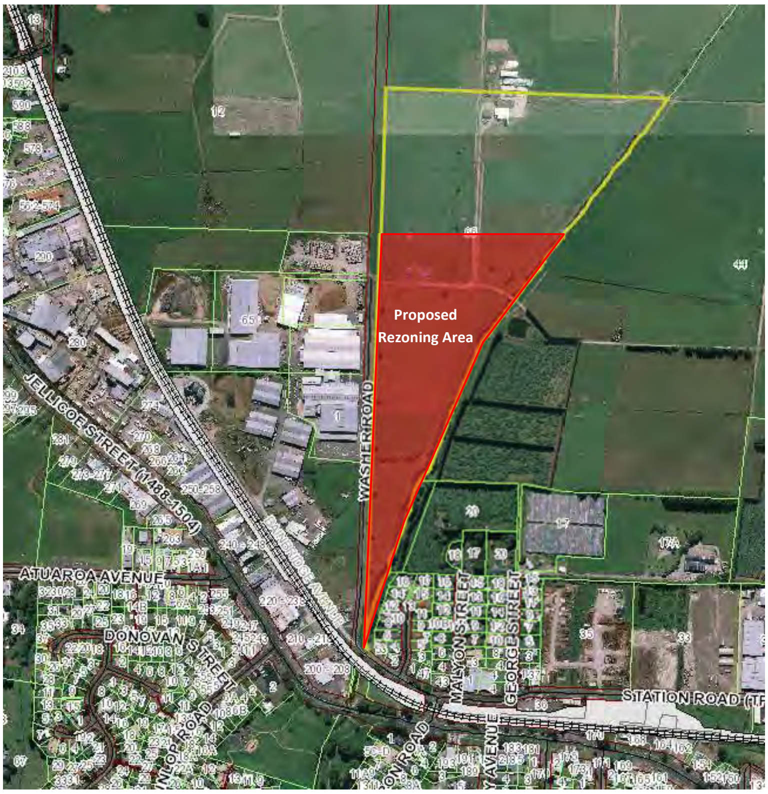
The review was undertaken in general accordance with the requirements of Western Bay of Plenty District Council's (WBOPDCs) Development Code (DC), NZS 4404:2012, relevant NZ Standards and standard engineering practice.

Revision 4 includes increasing the rezoning area from 4.8ha to 7.0ha and provides updates to all servicing sections of the previous report in line with increased development area.

2.0 SITE DESCRIPTION

Table 1 Site Description

Site Location:	66 Washer Road, Te Puke PT Lot 1 DP25471



Description & Topography:	The site is bounded by the Ohineangaanga Stream along its Eastern Boundary, Washer Rd along to the west, pasture land to the north. The site narrows to a point on to Bainbridge Ave/Station Rd. The site consists of a relatively gentle contour, falling from a maximum RL 12.0m in the southern corner to RL 7.0 at the northern extent of the proposed rezoning area. Access from Washer Rd is flat, however the site falls steeply into the Ohineangaanga Stream along the Eastern boundary.
Existing Structures:	The site is pasture with no buildings/structures
Proposed Development:	It is proposed to submit a Private Plan to rezone the property from Rural to Industrial land.
Surrounding Properties:	Residential dwellings to the east, industrial land to the south and west, and pasture to the north.

3.0 FLOODING

LCL was provided updated flood levels for the site from the latest DHI flood modelling (Email 18/07/2019), the levels are provisional, and have not been reviewed/accepted by BOPRC, however they are significantly more detailed than the AECOM results provided to LCL for their initial Rev 0 and Rev 1 reports provided 12/06/2019, where a conservative level of RL 10.5 was adopted across the entire site.

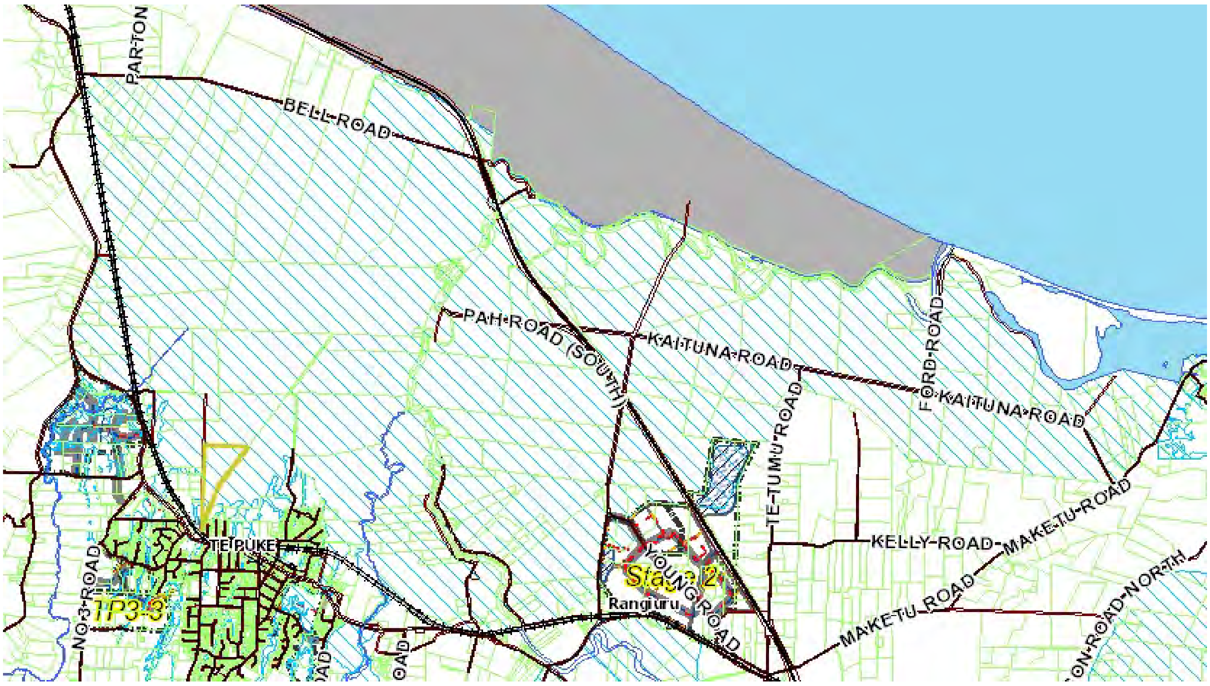
We note that the DHI results did not align with the LIDAR information provided to LCL, and therefore a conservative approach was adopted utilising the DHI flood levels and spreading each flood level RL across the corresponding site contour, which in all cases created a larger flood impact on the site than that shown in the modelling. A 3D volume model was prepared with a site platform level of RL 10.5m to provide a preliminary freeboard allowance. The fill extends from the western side of the drainage easement to Washer Road (Refer to Drawing 194210-100-SCH). We note that agreement will need to be gained from gas service providers before any works over the Natural Gas easement adjacent to Washer Rd (as well as several other small easements across the site). The flood levels provided were increased by 0.5m to provide some conservancy to the calculations given the provisional nature of the DHI model.

Table 2 - Flood Impact Calculation

Fill required to meet RL 10.5m across site	148,000m^3
Displaced flood volume based on DHI levels + 0.5m factor of safety	39,039m^3
Downstream flood plain based on District Plan	42.8 km^2
Indicative Increase in downstream flood depth due to site filling	0.9mm

It is clear, based on this very conservative flood estimate, that the downstream effects of filling the site will be less than the +15mm allowance generally accepted by Bay of Plenty Regional Council (BOPRC) as the trigger for a “More than Minor” effect. The filling is highly unlikely to increase the risk of flooding of existing downstream buildings. It is noted however that there is potentially a constriction to overbank flow in the Ohineangaanga Stream at the southern corner of the site between Washer Rd/Station Rd and the residential houses along Conifer Place. Detailed stream/flood analysis will need to be undertaken at the preliminary design phase to determine the width of floodway opening adjacent to the stream required at this corner of the site.

Figure 1 - WBOPDC District Plan Flood Map Extents (Blue Hatch)



Management of flood hazard is not considered a significant constraint for development of the site given the existing site elevation and location adjacent to very large flood plain.

4.0 STORMWATER

There is no reticulated stormwater network available to the site. A new discharge point will need to be created into the Ohineangaanga Stream adjacent to the site boundary. This will most likely consist of a culvert with headwall and stabilised discharge channel. The existing site is pastural, with discharge dispersed relatively evenly across the eastern boundary into the Ohineangaanga Stream. Existing site flows are in the order of 0.4-0.5m^3/s, hence any new concentrated discharge point is likely to exceed BOPRC's 125 L/s permitted discharge rate, requiring BOPRC consents for the culvert structure and discharge rate.

The industrial nature of any future development will significantly increase site impervious area, resulting in increased runoff and generating contaminants such as sediment, metals and hydrocarbons. It is proposed to manage runoff treatment by utilising stormwater wetlands, swales, raingardens or other approved treatment devices. Indicative wetland calculations based on the BOPRC sizing requirement of 2% of catchment area (7 ha) equates to a 1400m^2 wetland.

The discharge to the Ohineangaanga Stream will require provision of extended detention (ED) to ensure frequent flows are attenuated to minimise downstream scour. Preliminary calculations indicate an ED volume of 2287m³ will be required for the site based on a water quality volume of 1906m³ and water quality storm of 33mm (to be confirmed at preliminary design).

New developments generally require the inclusion of onsite stormwater detention to attenuate flows in larger storm events (up to and including the 50-year event), however Section 7.1.3 of BOPRC's *Stormwater Management Guidelines for the Bay of Plenty Region 2012/01* states that this is only required in the top half of a catchment where coincidence of hydrograph peaks can occur. The subject site is located within the bottom half of the catchment within the low-lying flood plain. Flooding in the location of the site is likely to be of a long duration, probably measured in days. Therefore, provision of detention storage, measured in hours, is unlikely to provide any significant downstream benefits. Our initial recommendation is that the provision of detention storage, other than ED, is not required for the site.

The site is likely to be reticulated for events up to and including the 10-year Annual Return Interval (ARI) using a standard pipe and pit network directing flows to a wetland/ED pond located at the north eastern corner (to utilise existing site grade), prior to discharge into the Ohineangaanga Stream. Overland flow in events greater than the 10-year ARI is likely to surcharge the pipe network and be directed to the stream in overland flow paths (roads/reserves).

Stormwater management is not considered a significant constraint for development the site area available to construct treatment and storage ponds. All stormwater mains reticulation will be vested with WBOPDC.

5.0 WASTEWATER

It has been assumed at this stage that the development will consist of light to medium water usage industrial development. WBOPDC's Development Code recommends adopting a peak wet weather wastewater generation rate of 0.7 L/s/ha. Typical development flows are presented below for the 7-ha catchment.

Table 3 - Wastewater Flows

Peak Wet Weather Flow	4.90 L/s
Average Dry Weather Flow	0.98 Ls
Ave Daily Volume	85 m³/day
Peak Daily Volume	423 m³/day

WBOPDC's GIS system indicates that there is a Council owned 100ø uPVC sewer line running down Washer Rd, however it does not show any manholes or invert levels. LCL contacted WBOPDC's Development Engineering department for further information. They were unable to confirm any further details, advising that it may actually be a private rising main from the East Pack site that has been incorrectly shown on the GIS. LCL undertook a site inspection which confirmed that there are no manholes in Washer Rd over the pipeline, and that the manhole shown adjacent to Station Rd

(SSMH1149) is less than 1m deep and has no inlet or outlet. It is therefore highly likely that the Washer Rd line is a rising main. Further investigation with Council and discussion with East Pack may shed more light on this in the future and may open up potential for interconnection from the subject site. For the purposes of this investigation it is assumed connection to the existing rising main is not possible and a new reticulation system would be required for the development. This could consist of a public gravity system within Washer Rd, or a private internal gravity system protected by easements. Both options are likely to require a pump station at the southern end of the site to pump wastewater in a 300m long rising main under Station Road, the Ohineangaanga Stream, the railway line and Jellicoe St to SSMH1084 where wastewater will enter the existing 450ø trunk main. Preliminary pump station calculations indicate a 1.8mø pump station, emergency storage tanks and 90mm ø rising main will be required for the proposed development. WBOPDC have completed a wastewater capacity model for the existing network in September 2019. The results confirm that there is a pipe capacity issue with the last 367m of 450ø pipe connecting to WBOPDC pump station. WBOPDC have proposed to upgrade the trunk main and have finalised a FINCO arrangement with the developer (Andrew Pellew email 23/09/20). Andrew Pellew's (Infrastructure Engineer) email 04/03/2020 confirms that while Council plans to upgrade the trunk main as soon as possible, in the interim the development can connect to the wastewater network but will be required to store wastewater during the peak trunk main flow periods of 8am – 11am and 6pm – 10pm. LCL proposes that the future pump station emergency storage tank be utilised for this on -peak storage as follows;

Table 4 – Full Development Wastewater Storage

Average Dry Weather Flow	0.7 L/s/ha
Total Future Site Area	4.8 ha
9hrs Emergency Storage Volume	32 m^3

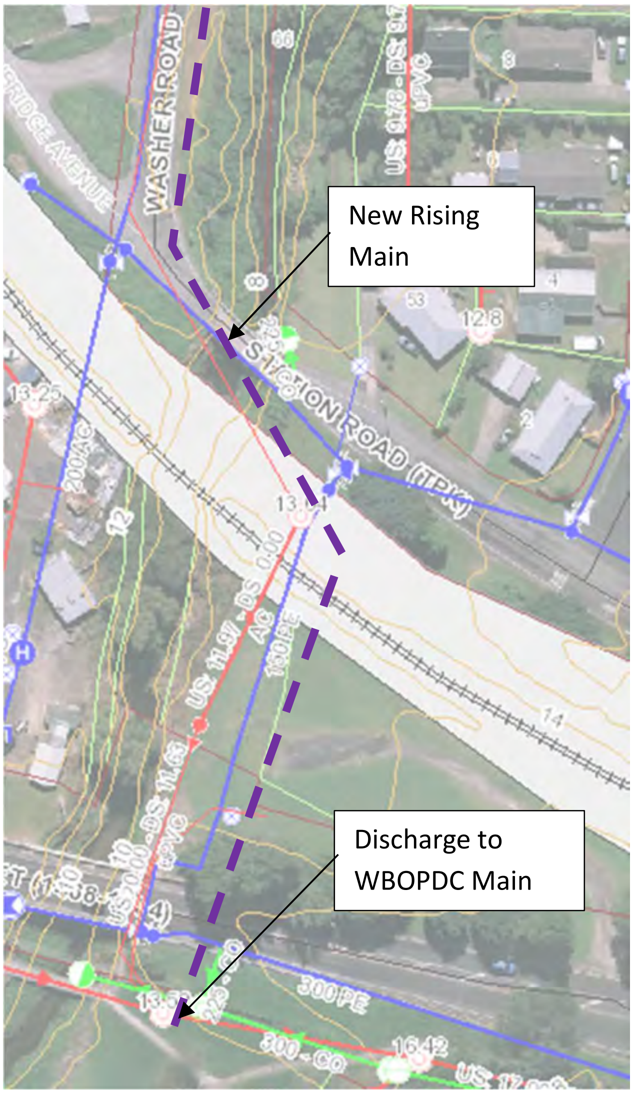
Table 5 – Staged Development Wastewater Storage

Average Dry Weather Flow	0.7 L/s/ha
Stage 1 (Until 450ø is upgraded)	4.9 ha
9hrs Emergency Storage Volume	22 m^3
4hrs Peak Times Storage (6-10pm = 4hrs)	10 m^3
Total Storage	32 m^3

Hence 4.9 ha of the site can be occupied as part of Stage 1 utilising the full developments 32 m^3 emergency storage tank, providing 4 hours of peak time storage capacity and 9-hours of emergency storage on the basis of Average Dry Weather Flow (ADWF). Once the 450ø has been upgraded the remaining 2.1 ha can be occupied as part of Stage 2 of the development.

All wastewater mains reticulation and the proposed pump station and storage tank will be vested with WBOPDC.

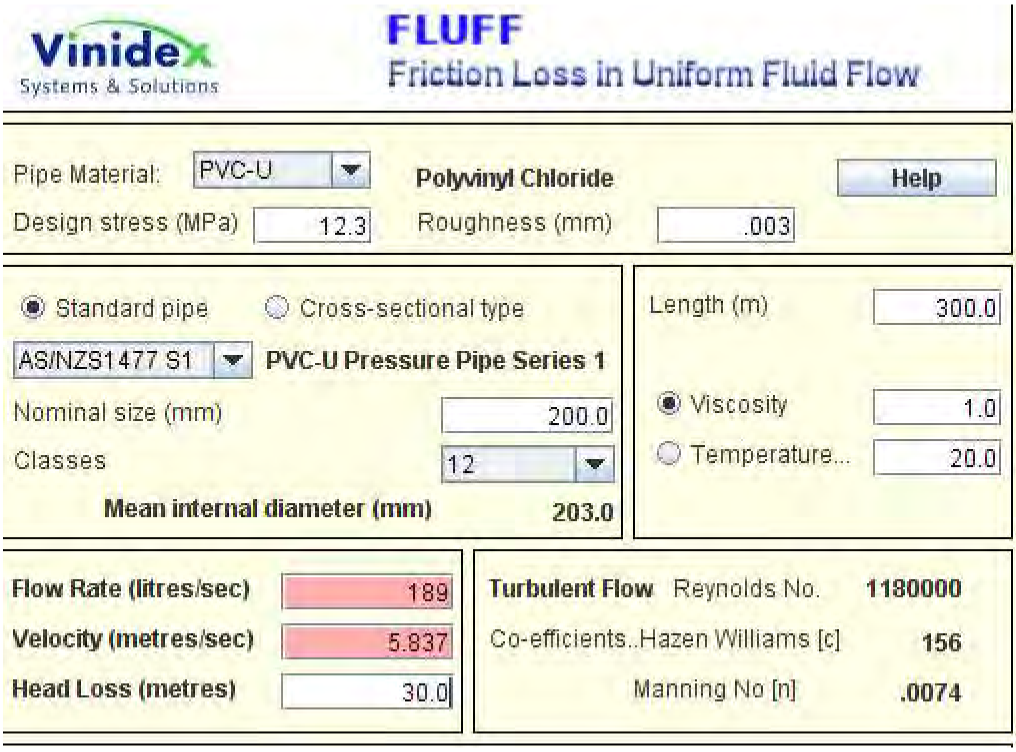
Figure 2 - Wastewater Discharge



6.0 WATER SUPPLY

Section 7.4.1 of WBOPDC's Development Code requires a design water allowance of 2 l/s/ha for large industrial/commercial developments, equating to an average demand of 14 L/s and peak demand of 70 L/s. WBOPDC's GIS confirms that a 200ø AC water main is located the full length of Washer Road. Capacity calculations indicate a 200ø pipeline has 190 L/s at 30m head. WBOPDC have advised that the Pressure Reducing Valve readings by the intersection of Station Road and Washer Road indicate a pressure of 600kPa at this location, however, this will likely increase by approximately 100kPa once network operations and a mains upgrade is complete in this area.

Figure 3 - Water Supply Capacity



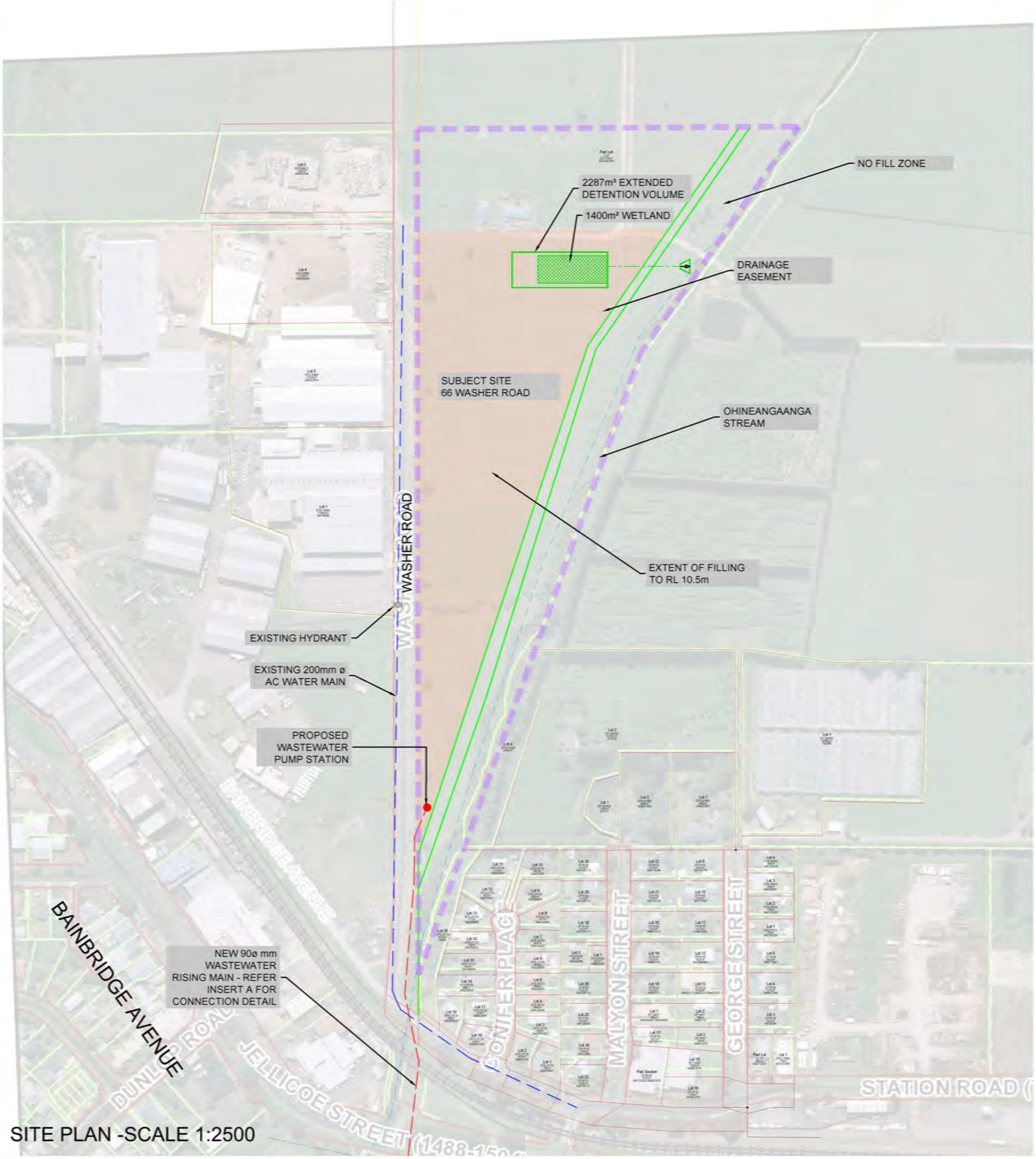
Fire fighting supply will be designed to comply with SNZ PAS 4509, with hydrants located at 90m maximum spacing (WBOPDC DC for Industrial areas).

Water supply is not considered a significant constraint for development. All water mains reticulation will be vested with WBOPDC.

7.0 POWER & TELECOMMUNICATIONS

MPAD are undertaking a review of power, telecommunication and gas services availability.

APPENDIX 1 – DESIGN DRAWINGS



SITE PLAN -SCALE 1:2500

INSERT A - SCALE 1:2000

N W E S

LEGEND

- PROPOSED SITE EXTENTS
- EXISTING LOT BOUNDARIES
- EXISTING STORMWATER
- EXISTING WASTEWATER
- EXISTING WW MANHOLE
- PROPOSED CHANNEL FLOW
- PROPOSED STORMWATER
- PROPOSED WASTEWATER
- PROPOSED WW MANHOLE
- EXISTING WATER
- PROPOSED HEADWALL OUTLET
- PROPOSED PLATFORM FILL EXTENTS

GENERAL NOTES

1. ALL DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.
2. BOUNDARIES AND AREAS ARE APPROXIMATE ONLY AND ARE SUBJECT TO CHANGE. FINAL BOUNDARIES WILL BE IN ACCORDANCE WITH CITY PLAN AND LINZ REQUIREMENTS.
3. BOUNDARIES NOT FOR BUILDING DESIGN PURPOSES.
4. EXISTING SERVICE POSITIONS AND ALIGNMENTS MAY HAVE BEEN OBTAINED FROM THIRD PARTY RECORDS AND SHOULD BE REVIEWED AT DESIGN STAGE. LYSAGHT CONSULTANTS DOES NOT IN ANY WAY GUARANTEE THE ACCURACY OF ANY UNDERGROUND SERVICE SHOWN ON THIS PLAN.
5. AERIAL PHOTO IS APPROXIMATE ONLY.
6. CONCEPT SERVICING IS INDICATIVE ONLY AND IS SUBJECT TO DETAILED DESIGN AND ENGINEERING APPROVAL.
7. ASSUMED FLOOD LEVEL = RL 10.00m
8. ASSUMED PLATFORM LEVEL = RL 10.50m
9. DEVELOPMENT AREA = 70,000m²
10. FILL TO REACH PLATFORM LEVEL = 148,000m³

DRAFT ONLY

REV.	DATE	REVISION DETAILS	DRN	CHKD	APRVD
B	05/08/20	PROPOSED DEV AREA INCREASED FROM 4.8HA TO 7HA			
A	20.06.19	FOR PRIVATE PLAN CHANGE	JJN	-	-

	SIGNED	DATE
ORIGINAL DESIGNER JJN	-	20.06.19
ORIGINAL DRAWN JJN	-	20.06.19
ORIGINAL CHECKED PM	-	20/06/19
ORIGINAL APPROVED PM	-	20/06/19

LYSAGHT

SURVEYING, ENGINEERING, PLANNING & LAND DEVELOPMENT

19 TOTARA ST, MT MAUNGANUI 3116 PH 07 578 8798 www.lysaght.net.nz

CLIENT: DAVID MARSHALL

PROJECT & DRAWING TITLE: 66 WASHER ROAD SCHEME AND SERVICING SKETCH TE PUKE

DRAWING STATUS: FOR INFORMATION

PROJECT NO.: 194210

DRG NO.: 194210-100-SCH

SCALE (A3): AS SHOWN

REV.: B

DRG LOCATION: X:\Projects 1119 Jobs\194210 David Marshall, 66 Washer Road\CAD\Drawings\1. Survey & scheme\194210-100-SCH - Rev B
DRG PLOT DATE: 2020-08-06 05:52:21

APPENDIX 2 – CORRESPONDENCE WITH WBOPDC

Peter Moodie

From: Nik Kumar <Nik.Kumar@westernbay.govt.nz>
Sent: Friday, 26 July 2019 4:40 pm
To: Janelle Baker
Subject: RE: 66 Washer Road - Wastewater and water supply queries

Hi Janelle,

We have looked at PRV (pressure reducing valve) readings by the station road and washer road intersection. The water pressure in these mains at this intersection is 600kPa.

However, this will likely increase by approximately 100kPa once network operations and a mains upgrade is completed in this area. We will inform you once these works completed and confirm the new operating pressure.

I hope it helps.

Kind Regards

Nik Kumar
Graduate Water Services Engineer
Kaipūkaha Wai Tauira

P 07 571 8008 • **DD** 07 579 6548
M 02108230331
Barkes Corner, Greerton, Tauranga
Private Bag 12803, Tauranga Mail Centre, Tauranga 3143
E Nik.kumar@westernbay.govt.nz
www.westernbay.govt.nz

Western Bay of Plenty District Council
Te Kaunihera a rohe mai i nga Kuri-a-Wharei ki Otamarakau ki te Uru

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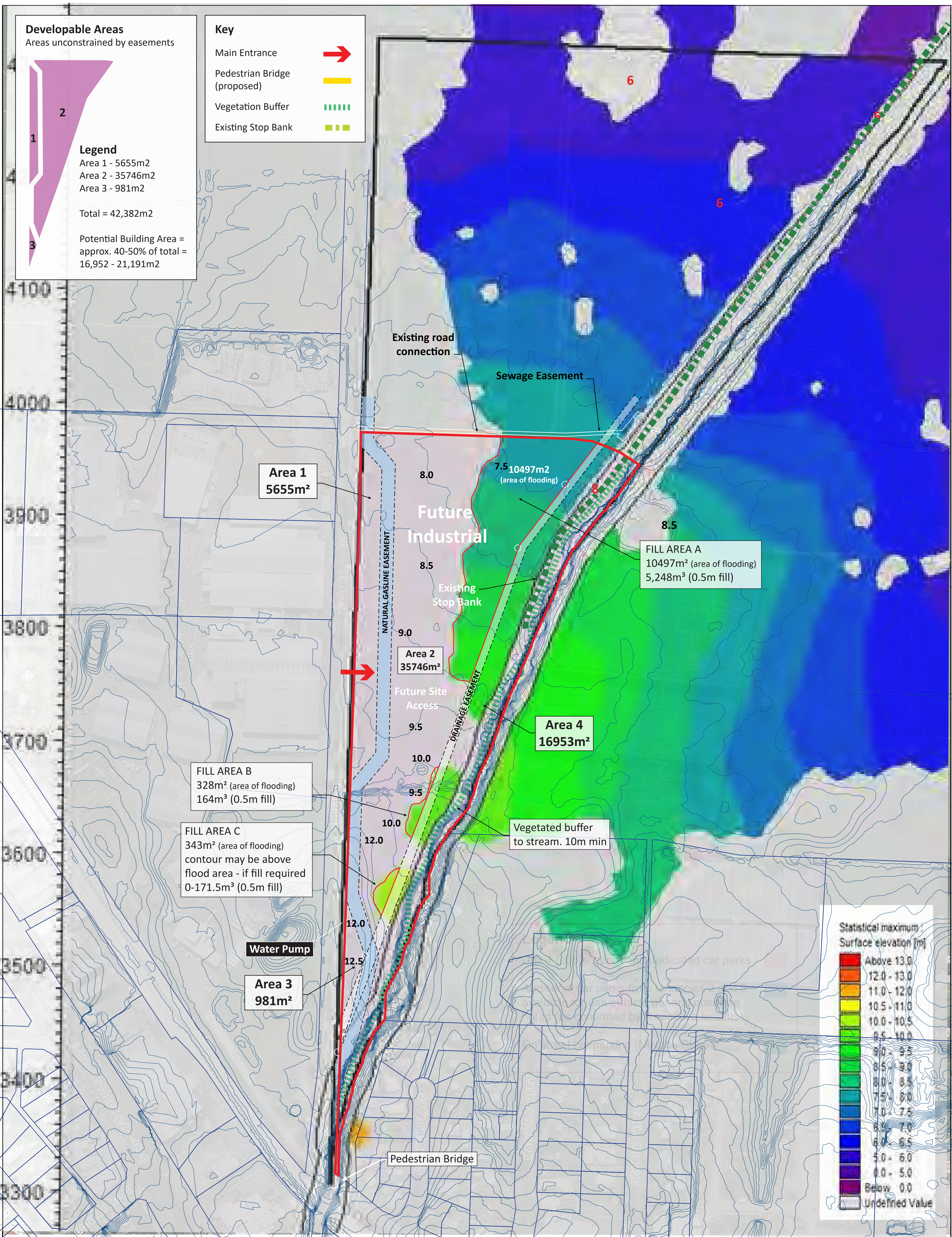
From: Janelle Baker <janelle@lysaght.net.nz>
Sent: Thursday, 25 July 2019 8:28 AM
To: Nik Kumar <Nik.Kumar@westernbay.govt.nz>
Cc: Coral-Lee Ertel <Coral-Lee.Ertel@westernbay.govt.nz>
Subject: RE: 66 Washer Road - Wastewater and water supply queries

Thanks, Nik.

If you are able to let us know the water pressure that would be great.

Cheers

Janelle



MOMENTUM
PLANNING AND DESIGN

66 WASHER ROAD, TE PUKE
Flooding Map Overlayed
flood data provided by Regional Council

66 WASHER ROAD
TE PUKE

Date:	JULY 2019	Drawn:	TW
Scale:	NTS	Checked:	RC
Drawing No.	66 WASHER ROAD		

Peter Moodie

From:	Richard Coles <richard@mpad.co.nz>
Sent:	Monday, 22 July 2019 9:26 am
To:	Tom Watts
Subject:	FW: 2019-05-28 Peter Blackwood-Richard Coles-66 Washer Road Te Puke

Tom,

I think this is the elevation level of the 100 year food. Any chance you could overlay onto the contours of the site to determine flood depth? This would only be approximate as their flood elvation is 0.5m intervals.

Cheers
Richard

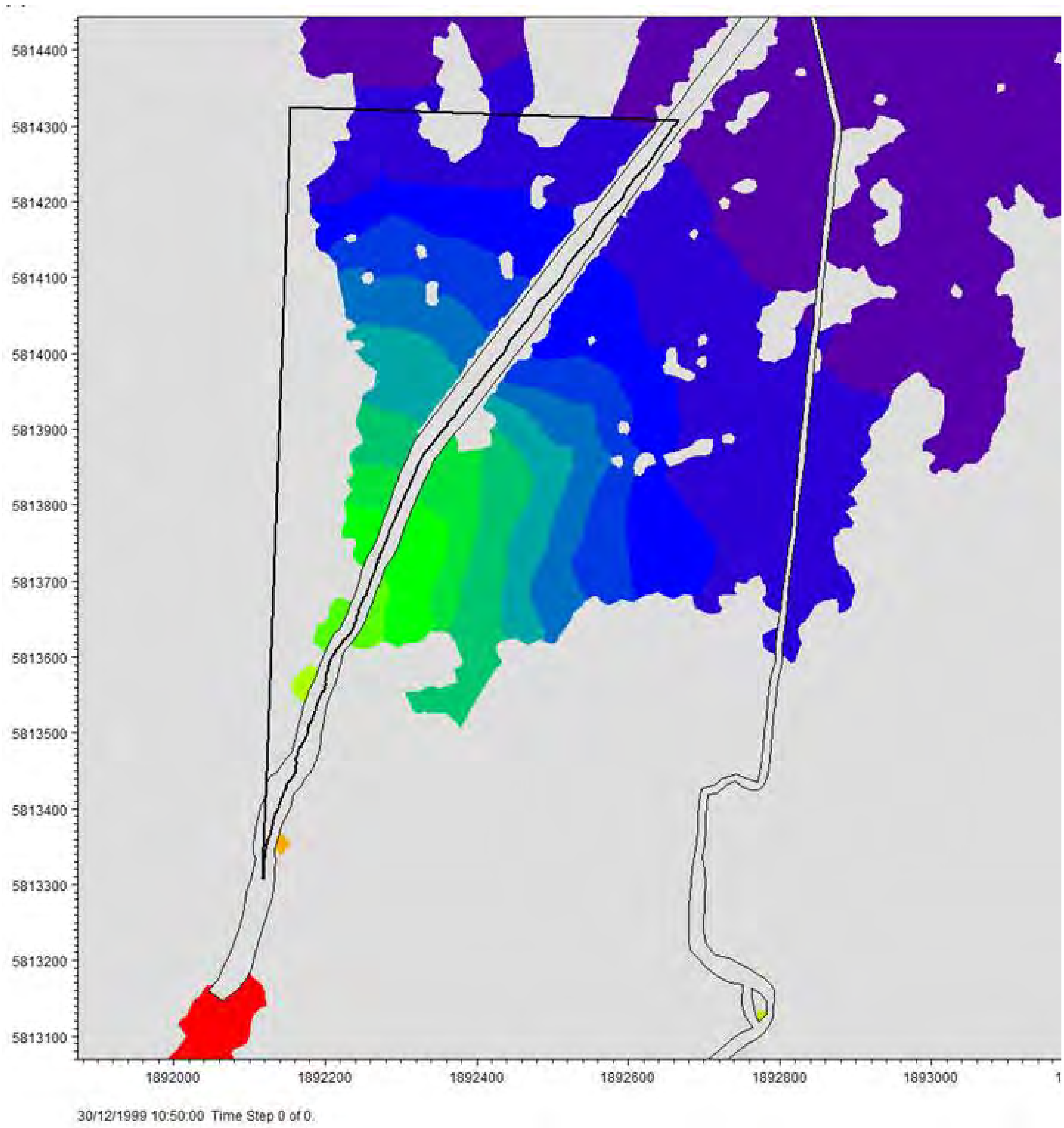
From: Philip Wallace <plw@dhigroup.com>
Sent: Thursday, 18 July 2019 6:23 PM
To: Peter Blackwood <Peter.Blackwood@boprc.govt.nz>
Cc: Richard Coles <richard@mpad.co.nz>
Subject: RE: 2019-05-28 Peter Blackwood-Richard Coles-66 Washer Road Te Puke

Hi Peter, Richard

I have taken a look at the model for the existing situation, with a 1% AEP flood and climate change to 2130. Below is a plot of peak water levels (Moturiki Datum) for that scenario – Without any freeboard allowance. You can see that flood levels over the site vary from 10m to 5m. (Property boundary shown by heavy black line)

(Pete – this is for a storm centred over the Raparapahoe. In the case of a storm centred on the Mangorewa, levels are marginally less).

Please note that the model has yet to be accepted or reviewed by BOPRC, and so results are best regarded as provisional. One thing in particular that I want to check is that the stopbank crest in the Ohineangaanga is properly represented



I hope this is useful Richard. Get back to me if you require any further information. We could for instance model the filled site and estimate the flood impacts off-site.

Regards

Philip Wallace
Principal Engineer, Wellington Branch Manager

Tel: +64 9 912 9638
Direct: +64 4 974 5543
Mob: +64 21 238 7515

Level 6, EMC2 House, 5 Willeston St
PO Box 6321
Wellington
plw@dhigroup.com
www.dhigroup.com

From: Peter Blackwood <Peter.Blackwood@boprc.govt.nz>
Sent: Thursday, 27 June 2019 3:03 PM
To: Richard Coles <richard@mpad.co.nz>; Philip Wallace <plw@dhigroup.com>
Subject: RE: 2019-05-28 Peter Blackwood-Richard Coles-66 Washer Road Te Puke

Hi Richard I will catch up with Phil. The level will change up the floodplain we will bear your comments in mind.

Pete

Peter Blackwood
Principal Technical Engineer
Bay of Plenty Regional Council Toi Moana

P: 0800 884 880 **DD:** 0800 884 881 x9527
E: Peter.Blackwood@boprc.govt.nz
W: www.boprc.govt.nz
A: PO Box 364, Whakatāne 3158, New Zealand

Thriving together – mō te taiao, mō ngā tāngata

From: Richard Coles [mailto:richard@mpad.co.nz]
Sent: Thursday, 27 June 2019 2:33 p.m.
To: Peter Blackwood; Philip Wallace
Subject: RE: 2019-05-28 Peter Blackwood-Richard Coles-66 Washer Road Te Puke

Thanks Peter,

There are no fill areas over the gas easement and also the drainage reserve that runs through the property. Filling would be limited to between these two easements. The land adjacent to Washer Road and between the road and the gas easement my be filled but this needn't necessarily be the whole area as individual foundation platforms could be raised with 1:8 grade or less into the buildings.

The land adjacent to the Ohineanganga Stream is likely to consist of yard space and buffer planting as may be necessary.

We have had a very high level flood displacement assessment completed by Lysaghts, but this is highly conservative on the level necessary to avoid the flood hazard – something like RL 10.5, which would mean the whole of Te Tumu would be flooded.

A flood level RL m would be highly beneficial as a starting point.

Happy to discuss.

Kind Regards

Richard Coles
Director/Planner MNZPI
0274 325 154 richard@mpad.co.nz
www.mpad.co.nz

MOMENTUM
PLANNING AND DESIGN

From: Peter Blackwood <Peter.Blackwood@boprc.govt.nz>
Sent: Thursday, 27 June 2019 2:19 PM
To: Philip Wallace <plw@dhigroup.com>
Cc: Richard Coles <richard@mpad.co.nz>
Subject: 2019-05-28 Peter Blackwood-Richard Coles-66 Washer Road Te Puke

Hi Phil,

I haven't had the chance to discuss this with you fully. I told Richard this was in our Kaituna model and maybe you could look at it mid-July??

It is Marshall land – where the development and infilling effect are.

Pete

Peter Blackwood
Principal Technical Engineer
Bay of Plenty Regional Council Toi Moana

P: 0800 884 880 **DD:** 0800 884 881 x9527
E: Peter.Blackwood@boprc.govt.nz
W: www.boprc.govt.nz
A: PO Box 364, Whakatāne 3158, New Zealand

Thriving together – mō te taiao, mō ngā tāngata

From: Richard Coles [mailto:richard@mpad.co.nz]
Sent: Tuesday, 28 May 2019 2:02 p.m.
To: Peter Blackwood

Cc: Nassah Steed
Subject: 2019-05-28 Richard coles-66 Washer Road Te Puke

Hi Peter,

Thanks for chatting last week. Very helpful.

We are pleased you may be able to assist with the modelling. It would be good to know what your consultants require in terms of information.

As the site is constrained with drainage easements and also a gas main, these areas will not be filled therefore maintaining overland flows through these areas.

The plan attached shows a total developable area of around 6ha, with the constrained areas possible able to be used for car parking or storage of materials.

Maximum Building coverage is likely to be around 3ha.

It would be good if we could book in your modeller, understand the information inputs and maybe have a discussion with your and relevant staff. We have been talking with Nassah and others to date.

Kind Regards

Richard Coles
Director/Planner MNZPI
0274 325 154 richard@mpad.co.nz
www.mpad.co.nz
MOMENTUM
PLANNING AND DESIGN

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Original Message-----
From: Andy Pellew <Andy.Pellew@westernbay.govt.nz>
Sent: Wednesday, 4 March 2020 3:48 PM
To: Richard Coles <richard@mpad.co.nz>
Subject: 2020-03-04 66 Washer Rd WW connection Te Puke - Utilities Response

Hi Richard,

Apologies for the delay in getting back to you. Please see my initial responses below regarding the proposed 66 Washer Rd subdivision

Stormwater
Proposal for civil works to displace approx. 25,000m3 of water, raising the surrounding water level 0.6mm - It is unlikely to be an issue however I have requested advice from Regional Council because I know they are doing a study of how subdivision is affecting the Te Puke lower drainage system they are responsible for.
Council hold data for a 1 in 50year flood event. The proposed flood modelling supplied for the 100 yr event may be the latest information and may well be acceptable, but will wait for comment from Regional.

Vesting assets with Council
I would expect the following assets to be vested with Council - Wastewater pump stn, Wastewater pipes, Stormwater pond.

Wastewater connection
As you are aware the current wastewater network is under capacity and requires upgrading. I have a rough replacement cost for 367m of 450PE ww pipe to the WWTP of $342,000. Your client would not be expected to meet the full cost. I am currently working on a fair cost for the portion of additional capacity required. In the meantime Council would allow the property to connect to the network. Arrangements are being made to upgrade the line as soon as possible.
Given the current pipe is under capacity, Council would require you to pump to the network outside the peak periods 8-11am and 6-10pm

Thanks

Andy Pellew
Infrastructure Engineer - Drainage

LYSAGHT

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Email: peter@lysaght.net.nz
www.lysaght.co.nz

WASHER ROAD INDUSTRIAL PLAN CHANGE TRANSPORTATION ASSESSMENT

PREPARED FOR DAVID MARSHALL

September 2019

Stantec

This document has been prepared for the benefit of David Marshall. No liability is accepted by this company or any employee or sub-consultant of this company with respect to its use by any other person.

This disclaimer shall apply notwithstanding that the report may be made available to other persons for an application for permission or approval to fulfil a legal requirement.

QUALITY STATEMENT

PROJECT MANAGER	PROJECT TECHNICAL LEAD
Ian Carlisle	Ian Carlisle

PREPARED BY		
Will Hyde	....	04/09/2019
CHECKED BY		
Ian Carlisle		
REVIEWED BY		
Ian Carlisle		
APPROVED FOR ISSUE BY		
Ian Carlisle	....	04/09/2019

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David Marshall

Transportation Assessment

CONTENTS

1. Introduction

David Marshall is proposing a plan change to re-zone approximately 6 ha of land on Washer Road, Te Puke, from Rural to Industrial.

This report describes the potential changes to the transport environment resulting from the plan change and assesses the resulting traffic effects.

The key issues that have been identified are congestion around the Cameron Road/Station Road/Jellicoe Street intersections and pedestrian safety on the single-lane bridge. It is noted that these are existing issues which already warrant mitigation however are likely to be exacerbated by the additional traffic demands from the plan change.

Overall it is concluded that the proposed plan change, together with the recommended mitigation measures and rules, is able to be managed within the existing transport network.

2. Existing Environment

2.1 Site Location and Description

The "site" proposed to be part of the plan change is described as part of 66 Washer Road in Te Puke. The plan change area is approximately 7 ha and is bounded by Washer Road on the west, a stream to the east, and an existing farm access track to the north. The approximate site location is shown highlighted in yellow on Figure 2-1. A more detailed plan is included later in this report.

Figure 2-1: Site Location

The site is presently zoned *Rural* in the Western Bay of Plenty (WBoP) District Plan and is currently used for pastoral farming. A small stream runs east-west across the site approximately 300 m from its southern corner.

The site currently has three vehicle access points onto Washer Road. Two are paddock access gates, one either side of the small stream which crosses the site. One is a farm access track which defines the northern edge of the site.

2.2 Surrounding Road Environment

The key elements of the surrounding road network are described in the following sections and depicted on the aerial photograph in Figure 2-2.

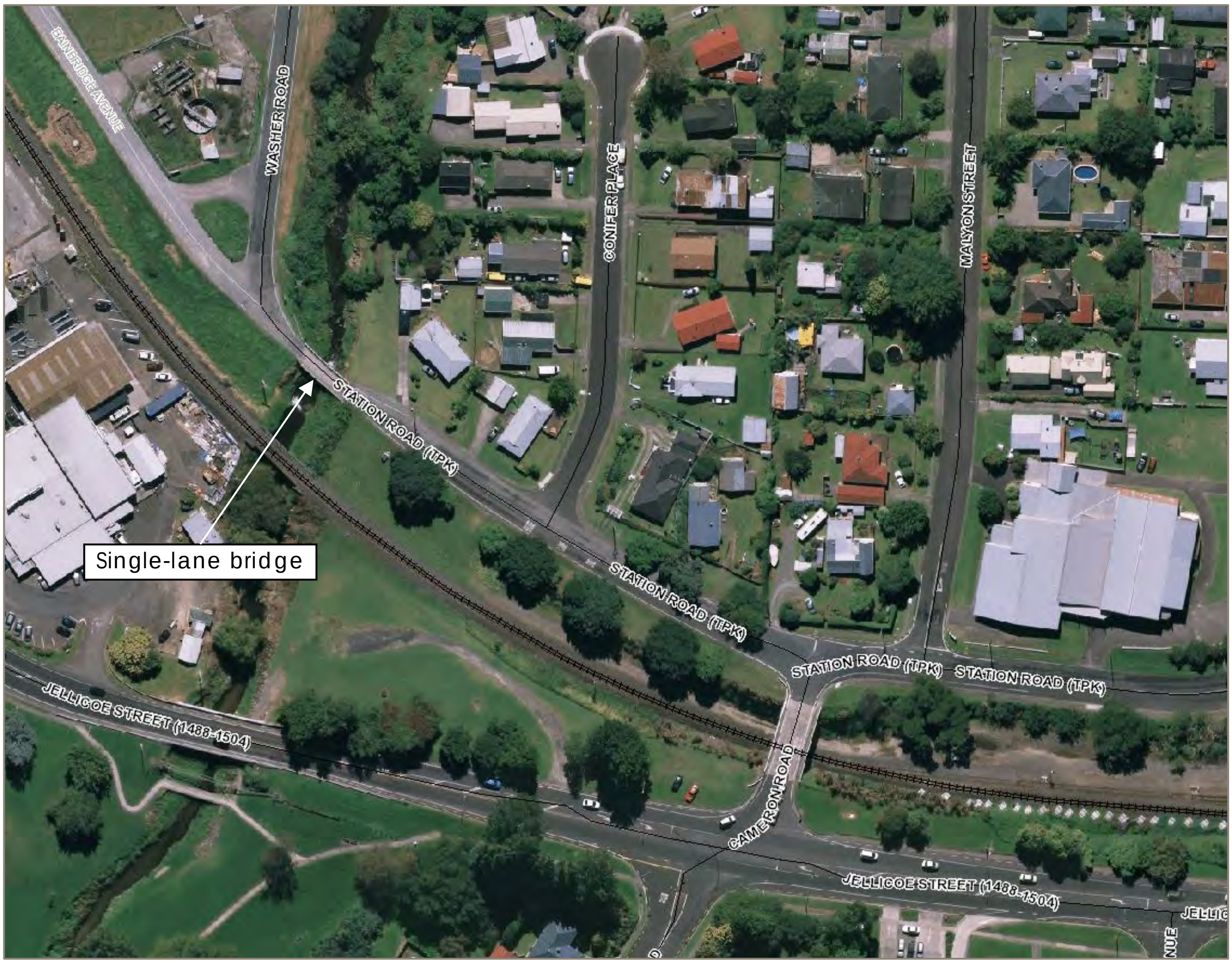

Figure 2-2: Key Roading Intersections

2.2.1 Washer Road

Washer Road is classified as a *Local Road* in the District Plan. It is straight and level and runs approximately north-south. At its southern end the carriageway curves and continues as Station Road.

Washer Road is currently formed for approximately 650 m, however the District Plan maps show that it extends northwards as a paper road for a further 1 km.

The road is generally formed as a rural road and has an open road speed limit apart from at its southern end, where a 50 km/h limit is posted over the southern length of approximately 110 m. The open road limit covers much of the site frontage albeit actual operating vehicle speeds are more likely to be closer to the urban limits.

Based on the District Plan maps Washer Road has a legal width of 20 m. Along the southern part of the site frontage Washer Road has one traffic lane of approximately 3.3 m width in each direction, within a total sealed width of 6.9 m. The seal edge is feathered onto grass berms on both sides.

Towards the northern end of the site frontage Washer Road has traffic lanes with a width of 6.5 m to 6.6 m within a total sealed width of 7.5 m. Between these points the carriageway widens to an 8.4 m seal with traffic lanes totalling 6.5 m. The centreline is marked such that the southbound lane is generally slightly wider than the northbound lane. The seal edge is feathered onto a grass berm on the eastern side, and a metalled shoulder on the western side adjacent to the Eastpack site.

A concrete footpath is provided along the eastern side of Washer Road from its southern end to the main entrance to the Eastpack site. It is noted that the footpath does not connect to the footpath on Station Road due to the lack of a pedestrian route across the single-lane bridge.

Land on the west side of Washer Road is zoned Industrial at the southern end and Rural at the northern end, as shown on the District Plan zoning map at Figure 2-3 (the approximately site boundary is indicated in black). Within the industrial zone activities include post-harvest facilities and a small area of pastoral farm land at the southern end of the industrial zone.

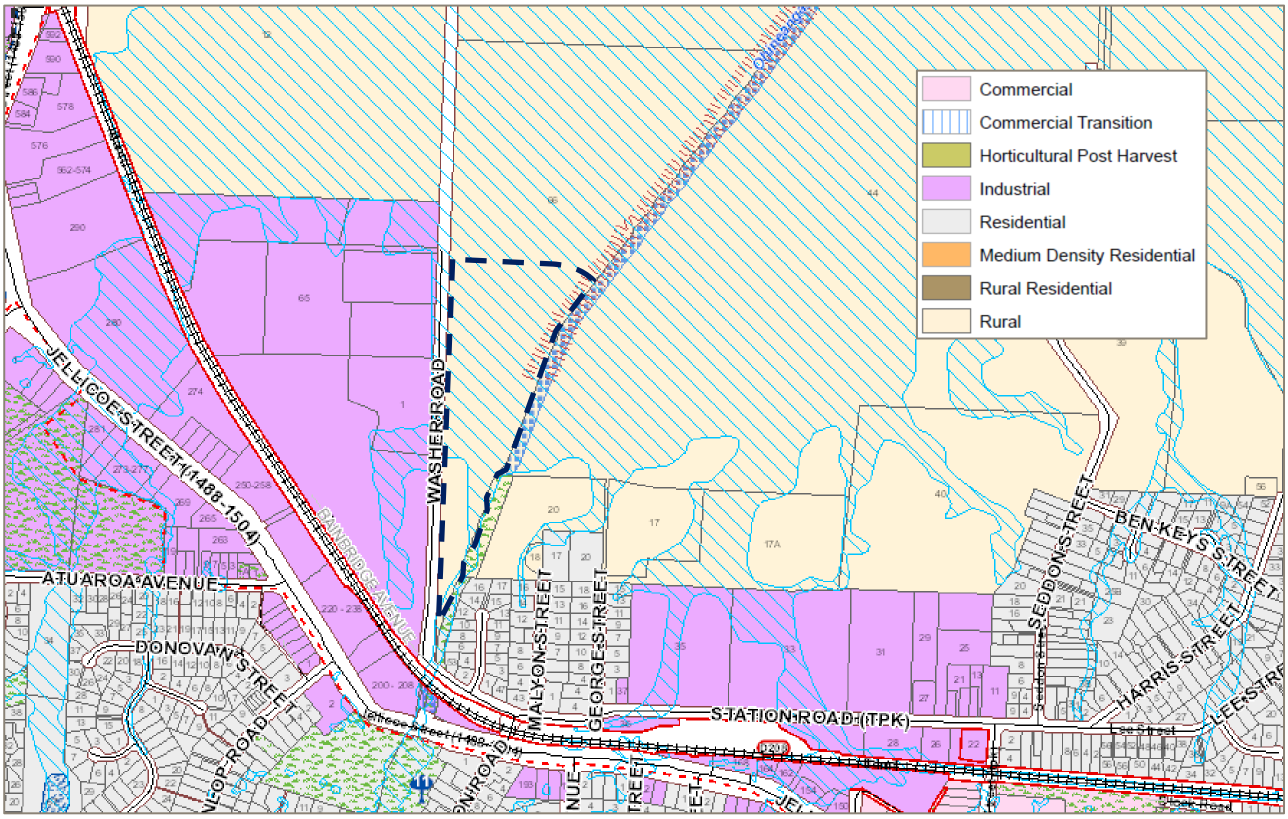

Figure 2-3: Land Zoning Adjacent to the Site – Excerpt from District Plan

2.2.2 Bainbridge Avenue

Bainbridge Avenue does not appear on District Plan maps and is assumed to be a private road. It is a metalled access road which runs parallel to the adjacent rail corridor and intersects with Washer Road on the outside of a curve at the point where Washer Road continues as Station Road. Bainbridge Avenue provides access to the western part of the Washer Road industrial zone, with several light-industrial activities established.

2.2.3 Station Road

Station Road is classified as a *Local Road* in the District Plan. It has a sealed width of approximately 9.5 m and runs approximately east-west from the southern end of Washer Road to an intersection with Lee Street and Harris Street. As can be seen on Figure 2-3, land use on Station Road is a mixture of residential and industrial zoning, as well as abutting the adjacent rail corridor in places.

There is a single-lane bridge over the Ohineangaanga Stream at the western end of Station Road, immediately before the curve where it joins Washer Road. Between the stream bridge and the Cameron Road intersection Station Road has kerb and channelling, and a footpath on its north side, adjacent to residential activity, and a feathered seal edge and grass berm on the south side adjacent to the rail corridor.

East of Cameron Road there is kerb and channelling on both sides of Station Road. A footpath is provided on the south side of the road east of Cameron Road for approximately 170 m, and on the north side between the single-lane bridge and Malyon Street (which is located immediately east of Cameron Road). The footpath does not continue across the single-lane bridge. There is no specific formed kerb crossing to connect the footpaths on each side of Station Road.

2.2.4 Cameron Road

Unless otherwise noted, references to Cameron Road in this report refer to the short section of Cameron Road on the north side of Jellicoe Street, which connects to Station Road.

The section of Cameron Road north of Jellicoe Street is approximately 40 m long. The carriageway passes over the East Coast Main Trunk rail line on a bridge. On the north side of the bridge the carriageway curves around to the east and continues as Station Road. The western part of Station road forms the minor leg of a T-intersection, meeting Cameron Rd and the eastern part of Station Road on the outside of this curve (refer to Figure 2-2).

The bridge deck has lanes marked at 3.2 m northbound and 3.6 m southbound within a sealed width of approximately 8.0 m. An approximately 0.7 m wide pedestrian route is provided on the east side of the bridge. This connects to the footpath on the south side of Station Road and to the footpath on the north side of Jellicoe Street.

2.2.5 Jellicoe Street

Jellicoe Street is classified as a Secondary Arterial route in the District Plan. It was formerly designated as State Highway 2 and still has a role as a key arterial route in the district. In the vicinity of Cameron Road it has a single lane in each direction with a flush median, within a road corridor of approximately 40 m[1]. Right turn lanes are provided within the median at intersections, including Cameron Road. It is noted that there is no separate turn lanes for left-turning vehicles but there is a tapered shoulder.

Cameron Road continues on the south side of Jellicoe Street forming an off-set cross-roads, with a centre-line offset distance of approximately 20 m.

There is a footpath in the berm on both sides of Jellicoe Street providing a pedestrian connection to Te Puke CBD.

2.2.6 Jocelyn Street

Jocelyn Street is classified in the District Plan as a Local Road and provides a link between Jellicoe Street and Station Road. North of Jellicoe Street the land on both sides is zoned Commercial. Jocelyn Street has a single lane in each direction and is generally marked with a centre line only. Between Jellicoe Street and Commerce Lane it also has edge lines and a flush median, with a right-turn bay for traffic turning into Commerce Lane.

2.3 Public Transport

The Route 221 bus service runs between Te Puke and Tauranga hourly, Monday to Friday. It runs along the Te Puke Highway (Jellicoe Street within Te Puke), turning at Commerce Lane. The approximate centre of the site is about 800 m from Jellicoe Street, and this distance is assessed to be on the periphery of acceptable walking distance for bus travel.

3. Traffic Patterns

3.1 Traffic Volumes

Daily and peak hour traffic volumes have been provided by WBoP District Council. The available count data for the minor local roads is generally 17 years old or more and this data has been supplemented by current Council estimates of traffic volumes (dated December 2018).

[1] Estimated using WBoP District Council's online mapping service http://mapi.westernbay.govt.nz/HTML/

Table 3-1: Daily Traffic Volumes and Estimated Peak Hour Flows

Road	Location	Date[2]	ADT (veh/d)	Peak Flow (veh/h)
Washer Road	160 m north of Station Rd	17/06/2002	620	112
		Current estimate	378	-
	South end	Survey	-	290
Station Road	One-way bridge	08/12/1995	525	-
		Current estimate	750	-
		Survey	-	290
	Conifer Place to Cameron Rd	14/12/1995	853	
		Current estimate	962	-
	Cameron Rd to Jocelyn St	08/12/1995	905 - 961	-
		Current estimate	1070 – 1241	-
Cameron Road	Between Jellicoe St and Station Rd	10/02/1994	1786	-
		Current estimate	2054	-
Jocelyn Street	Station Rd to Commerce Lane	08/12/1995	2414	-
		Current estimate	3273	-
	Commerce Lane to Jellicoe St	08/12/1995	4479	-
		Current estimate	5098	-

The current estimates are generally higher than the old count data by some 10 to 30 percent. The exception is the estimate for Washer Road, which is approximately two-thirds of the 2002 count.

Data for Jellicoe Street has been sourced from the MobileRoad website. It indicates that immediately west of Cameron Rd the average daily traffic (ADT) volume is 14,420 vehicles. Peak hour data at this location is not available, however an estimate of peak flow of 1,442 veh/h has been derived based on 10% of the ADT.

Peak hour traffic counts were undertaken at the intersection of Jellicoe Street with Boucher Avenue, some 550 m east of Cameron Road, on Tuesday 16th February 2016. This count identified peak hour flows as follows on Jellicoe Street east of Boucher Avenue:

Table 3-2: Jellicoe Street Traffic Flows

Direction	AM Peak (07:40 – 08:40)	PM Peak (16:10 – 17:10)
Eastbound	646	596
Westbound	689	1,072
Total	1335	1,668

The 2016 survey data indicates that the evening peak is significantly busier than the morning peak, and that flows of up to 1,668 veh/h were recorded. Allowing for annual growth of 2%, current flows could be expected to be approximately 1,770 veh/h during the evening peak.

The practical capacity for a good level of service with interrupted flow conditions in urban areas (i.e. with side roads, property access etc.) is generally considered to be approximately 900 veh/h per lane. On that basis it appears that the westbound flow on Jellicoe Street is already operating near to capacity at peak times and on this basis traffic flows would be expected to be unstable at times, with some delays.

3.2 Intersection Counts

A short survey of traffic movements at the intersections of Cameron Road with Station Road and Jellicoe Street was undertaken, timed to occur at the end of a shift at the Eastpack facility on Washer Road. The Eastpac carpark was full prior to the survey signifying that operations were at, or close to, their peak. The survey was undertaken on Wednesday 22 May 2019 between 17:40 and 18:25.

[2] Where the date is given as 2018 this is an estimate dated 31/12/2018. Other data is from actual traffic counts.

3.2.1 Station Rd / Cameron Road

Through volumes on the Cameron Road to Station Road main alignment were consistently low throughout the survey period, at a rate of 70 – 80 vehicle movements per hour (veh/h).

The volume of traffic turning from the main alignment into Station Road west increased steadily from approximately 70 veh/h to 128 veh/h during the survey coinciding with the worker shift change.

The volume of traffic exiting the Station Road west leg increased significantly, from approximately 50 veh/h prior to 18:00, to 340 veh/h by 18:20. This spike in flow rate was of a short duration and had decreased to a flow of 256 veh/h by 18:25.

It was noted that the exit flow from Station Road west was at times throttled by the queue from the Cameron Road approach to Jellicoe Street extending back and blocking the exit for drivers exiting Station Road west.

Approximately 58% of light vehicles and 50% of heavy vehicles turned right from Station Road towards Jellicoe Street. Overall approximately 38% of vehicle movements to and from the minor leg were to and from Station Road, with the majority being to and from Cameron Road.

During the survey 80% of all vehicles passing through this intersection turned into or out of the minor Station Road leg, with only 20% being through traffic on the main alignment.

3.2.2 Cameron Road / Jellicoe Street

Of the traffic entering Cameron Road from Jellicoe Street and Cameron Road (south), 36% turned left in, 2% crossed from the south, and 62% turned right in.

During the survey 52% of traffic exiting Cameron Road turned left, with 5% crossing over to Cameron Road (south) and 43% turning right. Right-turning exit traffic was observed to frequently block the left-turn exit movement and stop-line delays of over a minute were observed.

3.2.3 Survey Observations

During the survey of intersection movements, considerable congestion was noted. Two factors appeared to contribute significantly to the congestion: a relatively large number of vehicles arriving in a short period due to the shift change at the nearby Eastpack site and the short stacking distance on the Cameron Road approach to Jellicoe Street.

Traffic on Jellicoe Street at the time of the survey was moderately busy, and drivers were observed to have difficulty finding gaps, particularly for the right-turn out of Cameron Road. The resulting queue on this approach frequently extended back to the intersection with Station Road, preventing vehicles from turning right out of the minor Station Road leg. Once approximately three light vehicles were queued to turn right out of the minor Station Road approach left-turn traffic was blocked from proceeding. The queue on this approach was observed to extend back to the single-lane bridge twice during the survey.

It was also apparent that the queue on the approach to Jellicoe Street did not have to extend far in order to create congestion. When long vehicles are attempting to turn right out of Station Road towards Jellicoe Street, the over-tracking of the rear of the vehicle means that a sufficient length of clear road is required on the exit leg (Cameron Road) to ensure that the rear of the vehicle is not blocking the northbound Cameron Road lane once the truck has joined the queue on the approach to Jellicoe Street. Drivers of heavy vehicles often had to wait for significant periods for a sufficiently length of exit lane to become available, as occasional vehicles from the eastern Station Road approach would take up some of that space. As a result of the difficulty in making a right turn out of Cameron Road, some drivers were observed to undertake a left turn onto Jellicoe Street followed by a right turn into one of the side streets in order to return to Jellicoe Street northbound.

It is clear that the close proximity of the two intersections, and the resulting limited stacking space, means that this part of the network is operating at saturation during peak periods, albeit it is acknowledged that the change of shift and number of workers at Eastpac is likely to be highly seasonal.

It was further noted that despite a relative lack of traffic on Cameron Road at approximately 17:30, turning right out of Cameron Road was very difficult, with heavy traffic on both Jellicoe Street approaches as well as occasional right-turning vehicles from Cameron Road (south) to contend with.

4. Road Safety

A search has been undertaken of the NZ Transport Agency's Crash Analysis Database to identify any crashes recorded on roads around the site which may be relevant to the proposed plan change. The search covered the five-year period 2014 to 2018 inclusive, with 2019 to date also included, on the following roads:

- Washer Road
- Bainbridge Road
- Station Road between Washer Road and Jocelyn Street
- Cameron Road between Station Road and Jellicoe Street
- Jocelyn Street between Station Road and Jellicoe Street
- Jellicoe Street within 50 m of the Cameron Road intersections

A total of 26 crashes were recorded within the search area and distributed as shown on Figure 4-1. The crashes are summarised as follows.

There were no fatal, two serious-injury and four minor-injury crashes; the rest were non-injury crashes.

As shown on Figure 4-1 the crashes are generally clustered around two areas: the closely-spaced intersections of Jellicoe Street/Cameron Road/Station Road, and along Jocelyn Street.

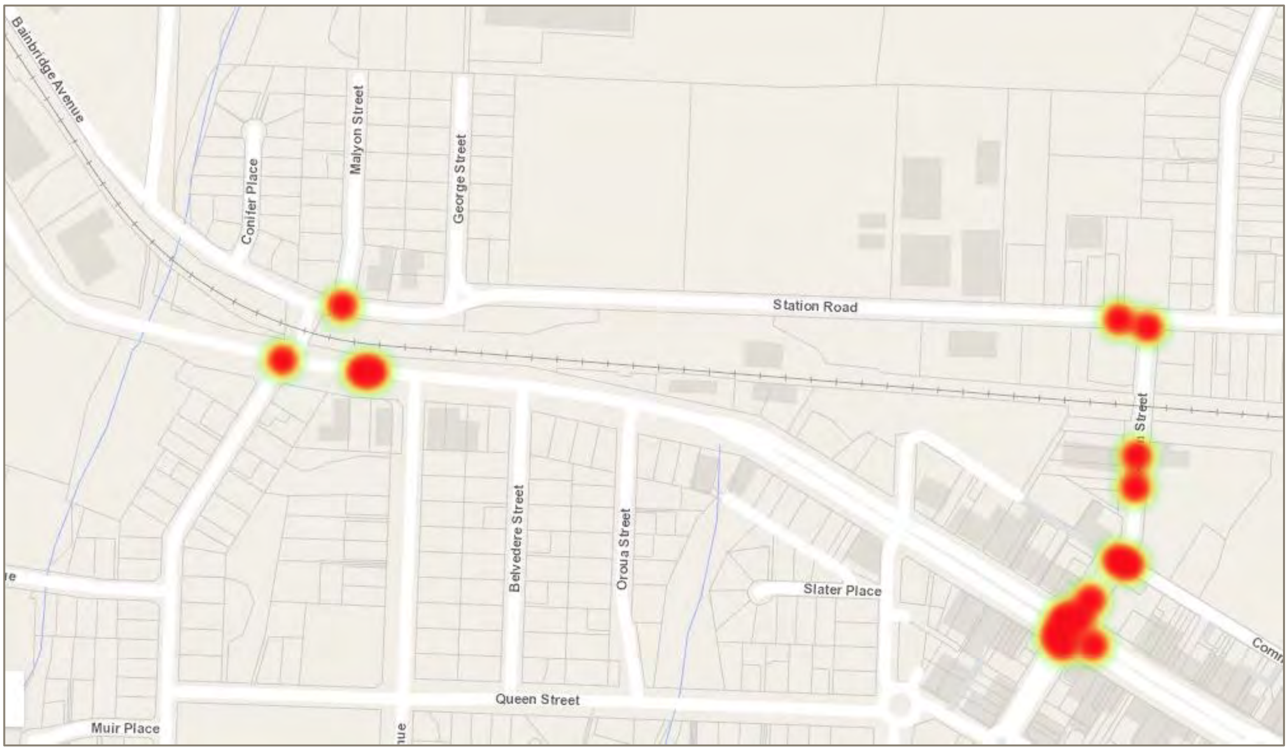

Figure 4-1: Recorded Crash Locations (Clustered)

Two crashes occurred on Jellicoe Street between Cameron Road and Beatty Avenue (which is east of Cameron Road): one non-injury crash occurred when a driver failed to notice slow traffic ahead; one minor-injury crash occurred when a child ran into the road.

Six crashes occurred at the intersection of Jellicoe Street with Cameron Road:

- Three non-injury and one serious-injury crashes resulted from failure to give way when exiting from Cameron Road. The serious crash occurred when the driver exiting Cameron Road failed to see an oncoming vehicle behind a truck which was turning left into Cameron Road. Two crashes occurred between drivers turning right from opposite sides of Cameron Road;

- One was a non-injury crash resulting from failure to give way when exiting from Cameron Road (south); and
- One was a non-injury crash on Jellicoe Street when a driver failed to notice slow-moving traffic ahead.

Two crashes occurred on Station Road:

- A minor-injury crash occurred when an inexperienced driver lost control turning left out of Malyon Street; and
- A non-injury crash occurred 30 m west of Jocelyn Street when a driver under the influence of alcohol lost control.

Nine non-injury, one minor-injury and one serious-injury crashes occurred at the intersection of Jocelyn Street with Jellicoe Street.

- Three resulted from drivers failing to give way at the roundabout;
- Three were loss-of-control type crashes involving single vehicles;
- Two drivers hit the rear end of the vehicle ahead on the approaches to the roundabout.
- Two crashes occurred when trucks turning right out of Jocelyn Rd south clipped cars in the left approach lane; and
- A serious-injury crash occurred when a person on a bike, described as 'very drunk', crossed in front of a motorhome on the south approach to the roundabout.

Four non-injury and one minor-injury crashes occurred along Jocelyn Street

- Two were single-vehicle loss-of-control type crashes;
- One related to a vehicle manoeuvring out of a parking space;
- One related to failing to give way during a lane change; and
- One related to driver inattention at the intersection with Commerce Lane.

A slight trend is noted at the Cameron Road intersection with Jellicoe Street, with four crashes related to turning right onto Cameron Road, one of these resulting in serious injury. Sight distances at the intersection appear to be appropriate, and this suggests that congestion may be a factor since drivers have a tendency to take more risks in gap selection as their delay increases.

Other than that, the types of crashes are consistent with the urban environment and the volumes of traffic using these roads.

5. Proposed Activity

It is proposed to re-zone the subject site totalling 5.93 ha as *Industrial*. The site is shown on Figure 5-1, which also shows the two easements over the site. Access is proposed by way of a single crossing located around the middle of the proposed zone as shown in Figure 5-1.

Permitted activities in industrial zones, as set out in the District Plan, are listed below.

(a) *Industry (except within the Omokoroa Light Industrial Zone).*

(b) Storage, warehousing, coolstores and packhouses.

(c) Retailing which is accessory and secondary to (a) and (b) above and which has:

> *(i) Rangiuru Business Park – a maximum of 250m² indoor/outdoor retail or a maximum of 25% of the gross floor area of the primary activity whichever is the lesser;*
>
> *(ii) All other areas – a maximum gross floor area of 100m².*

(d) Building and construction wholesalers and retailers.

(e) Commercial services.

(f) Takeaway food outlets with a maximum gross floor area of 100m² (excluding Te Puna Business Park).

(g) Service stations and garages (excluding the Te Puna Business Park).

(h) Medical or scientific facilities.

(i) Veterinary rooms and pet crematoriums.

(j) Activities on reserves as provided for in the Reserves Act 1977.

(k) Police stations, fire stations and St Johns Ambulance stations.

(l) Depots (except transport and rural contractors depots within the Omokoroa Light Industrial Zone).

(m) Vehicle, machinery and automotive parts sales (excluding Te Puna Business Park).

(n) Works and network utilities as provided for in Section 10.

(o) Commercial sexual services.

(p) Offices and buildings accessory to the foregoing on the same site.

(q) Green waste and waste recycling facilities where these occur within buildings (i.e. are enclosed).

(r) Aquaculture

Specific activities for the site have not yet been identified, and the plan change would enable permitted activities as listed above to develop.

A structure plan for the site has not been developed yet, and the site could potentially be developed as an industrial subdivision with internal roading, or as larger lots with direct access to Washer Road, or a combination of these.

Based on initial discussions with the plan change applicant it has been indicated that he may wish to establish a large storage building as an anchor for the Industrial development. It is likely the industrial area will take several years to develop and as a result the traffic effects can be managed on a progressive basis. It is understood it is likely that the development will be implemented over a 5- to 10-year development horizon.

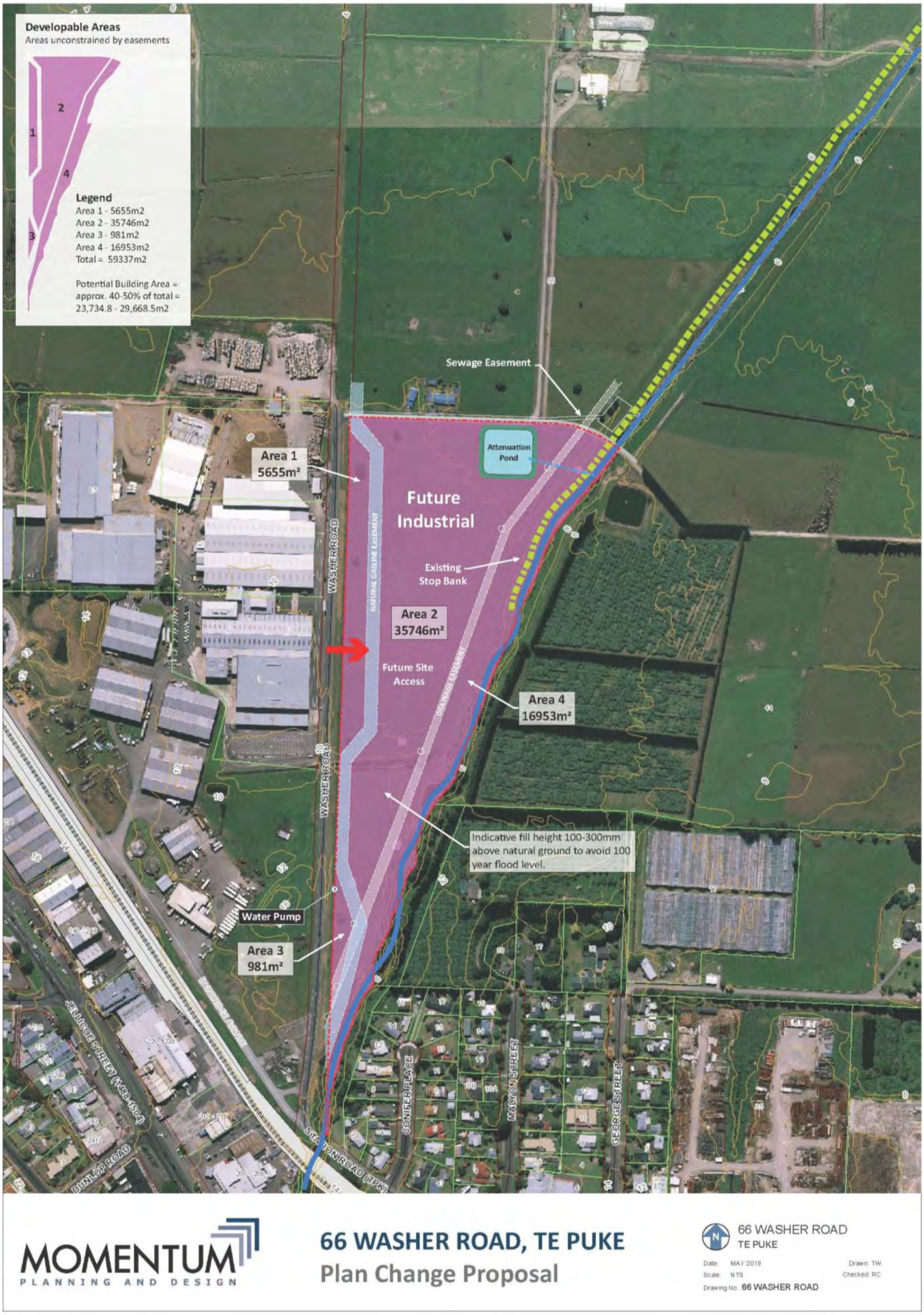

Figure 5-1: Proposed Plan Change Area and Access

6. Trip Generation

6.1 Existing Trip Generation

The site is currently occupied by pastoral agricultural activity. While occasional vehicle movements associated with this activity are expected, e.g. workers at the associated farm, stock trucks, tractors, etc, for the purposes of this assessment it has been assumed that existing trip generation associated with activity at the site is typically very low.

6.2 Permitted Trip Generation

Section 13.3.1 of the District Plan identifies permitted activities within the Rural zone.

(a) *Farming.*

(b) Production forestry.

(c) Conservation forestry.

(d) One dwelling per lot, except as per 18.3.2 (b), and except Smithstown (map reference D03) where individual titles do not qualify for the erection of dwellings.

(e) Buildings (except dwellings) accessory to the foregoing subject to 18.4.1 (q).

(f) Home enterprises.

(g) Stalls.

(h) Accommodation or education facilities for a combined maximum of four persons (excluding staff).

(i) Works and network utilities as provided for in Section 10.

(j) Activities on reserves as provided for in the Reserves Act 1977;

(k) Minerals prospecting.

(l) Existing urupa and new urupa adjoining existing urupa.

(m) Frost protection fans, subject to performance standards specified in 4C.1.3.6.

(n) Audible bird scaring devices, subject to performance standards in 4C.1.3.5.

(o) Artificial crop protection subject to performance standards specified in 18.4.1(k).

(p) Community facilities on Maori land up to a cumulative maximum gross floor area of 200m² when associated with a Controlled Activity of five dwellings on multiple owned Maori land accessed from an unsealed road maintained by Council.

(q) Community facilities on Maori land up to a cumulative maximum gross floor area of 400m² when associated with a Controlled Activity of 10 dwellings on multiple owned Maori land accessed from a sealed road maintained by Council.

(r) Private burials as provided for under Clause 47 (1) of the Burial and Cremation Act 1964.

(s) Rural Contractors Depots, excluding within a dwelling cluster on the Matakana Island forested sand barrier.

A review of these activities has concluded that of the potential activities a Contractor's Depot would likely generate more traffic than the current rural use although for the purpose of this assessment the baseline traffic generation has assumed a low volume of traffic as for the existing activity.

6.3 Expected Trip Generation

The potential trip generation for activities within the proposed industrial zone has been based on surveys of existing industrial areas undertaken in June 2015. The areas surveyed were:

- Kaimiro Street, Hamilton- serving a gross area of 15.8 ha of mixed industrial and large format commercial sites. The businesses in Kaimiro Street include industrial and manufacturing activities, professional service offices, courier, transport and distribution centres, automotive sales and service, lighting and electrical design and hire.

- The Boulevard, Hamilton - serving a gross area of 27.8 ha of mixed industrial and large format commercial sites. Businesses accessed from The Boulevard include large format retail, wholesale retail, automotive and marine sales and service, café, child care, manufacturing, warehousing, and professional offices.

These areas generally fit the description of industrial park with some elements of more intense industrial, particularly in The Boulevard. They were selected due to their cul-de-sac nature, their Industrial zoning, and relatively large catchments which enable accurate traffic surveying of a large land area. However, it should be noted that these areas include high traffic generating activities such as child care centres and professional offices which cannot occur in the proposed zone without a specific resource consent.

The surveys identified a gross area maximum trip rate of 22 vehicles per hour (veh/h) per hectare. On the basis of the proposed 5.93 ha site, a total of 130 veh/h is therefore expected to be generated in the peak hour periods.

The peak traffic demand periods at Kaimiro Street were identified as 07:45 to 08:45 and 16:15 to 17:15 and at The Boulevard the peak hours were 07:30 to 08:30 and 16:30 to 17:30.

6.4 Trip Distribution

The ITE[3] Trip Generation Manual identifies inbound and outbound proportions for traffic generated by *Light Industrial* and *Industrial Park* activities, as follows:

Table 6-1: Expected Trip Distribuution Proportions

Activity	Inbound (AM)	Outbound (AM)	Inbound (PM)	Outbound (PM)
Light Industrial	83%	17%	21%	79%
Industrial Park	82%	18%	21%	79%

The data for the two activity types is almost identical. For the purposes of this assessment the data for Light Industrial activity has been used to assess the distribution for the proposed plan change area.

The resulting expected inbound/outbound distribution of trips is summarised in Error! Reference source not found..

Table 6-2: Expected Trip Distribuution

Time Period	Inbound	Outbound
AM Peak Hour	108	22
PM Peak Hour	27	103

It is expected that the directional distribution of this traffic would be similar to that described for the existing peak traffic in Section 3.2.

The timing of the peak traffic generation would be dependent on the activities which are ultimately developed in the new zone. Peak times associated with potential industrial activity would typically be 07:30 to 08:30 and 16:30 to 17:30, as demonstrated in the survey data previously described.

7. Traffic Effects

7.1 Access Effects

Access to the site is proposed by way of a single access point as indicated on Figure 5-1. It is noted that while the District Plan specifies separation requirements from road intersections for accesses in Industrial zones (minimum 25 m), it does not include requirements for separation from other accesses.

Notwithstanding that there are no specific requirements the proposed access location is approximately 135 m from the nearest existing vehicle access on the opposite side of Washer Road and this location is considered appropriate for the intended use. Moreover the proposed access is located north of the main carpark to Eastpack and therefore it is estimated that the traffic volumes on Washer Road at this location are significantly lower.

[3] Institute of Transportation Engineers

The proposed design and construction is recommended to comply with the Council's Development Code 2009 (or subsequent revisions) and appropriate to the design vehicle (and in this respect the design will need to consider the tracked path of the design vehicle).

Based on observed traffic conditions, and the available traffic count data, it is assessed that site access onto Washer Road, subject to appropriate access design and separation, can be safely accommodated.

7.2 Single Lane Bridge

An analysis of the surveyed traffic volumes (based on the single evening peak period for Eastpack) using a single-lane restriction such as the bridge on Station Road shows that it is expected that approximately 1 in 6 eastbound vehicles (which have priority over westbound traffic) are currently required to stop and the average delay is approximately 1.1 seconds. For westbound traffic approximately 1 in 3 vehicles is expected to be stopped, with an average delay of 4.3 seconds.

With the addition of the traffic assessed at Section 6.3 – and assuming concurrent peaks – it is assessed that approximately 1 in 5 eastbound vehicles will be required to stop, with an average delay of 1.3 seconds (an increase of 0.2 s). For westbound traffic approximately 1 in 2 vehicles would be expected to be stopped, with a typical wait time of 5 seconds (an increase of 0.7s).

While the frequency of vehicles stopping at the bridge is expected to increase slightly for both directions of travel, with small increases in the average delay, it is acknowledged that for very short periods in the existing traffic peaks there will continue to be queuing on the approaches to the bridge albeit not necessarily associated with the bridge itself. The addition of traffic associated with the plan change is not expected to unduly exacerbate these existing issues in peak times.

Correspondence from WestLink has noted the following in relation to the loading capacity for both the single lane bridge and the rail bridges on Cameron Road and Jocelyn Street: "*The bridges on Station Road, Cameron Road and Jocelyn St are currently unrestricted for Class 1 loads (up to 50 tonnes) provided the correct documentation has been received for each truck proposed (e.g. HPMV)*".

In addition, several overweight permits have been issued by WBoPDC recently including 79, 85 tonne and higher loads subject to special conditions, special configurations, operating processes and additional fees.

On this basis, there are no concerns with the load carrying capacity of any of the bridges expected to service the proposed plan change area.

7.3 Cameron Road Intersections

On the basis of observed traffic conditions, it appears that the intersection of Cameron Road and Jellicoe Street is currently operating beyond practical capacity at peak times, with long delays to both side roads, particularly the right turn movements. This was observed to result in drivers making poor choices when selecting gaps. Outside of the survey period it is expected that while side road demands may be lower, the volume of through traffic would be higher – 2016 survey data indicating a peak between 16:10 and 17:10. It appears that remedial work to improve the operation of this intersection is warranted based on existing conditions. This would likely involve some form of transformational change.

It was observed that the current congestion at the Station Road/Cameron Road intersection is predominantly a result of the downstream congestion and queuing on the approach to the Cameron Rd/Jellicoe Street intersection. Hence improvements at the Jellicoe Street intersection would be expected to also result in tangible benefits at the Station Road/Cameron Road intersection.

It is assessed that the main effects of the plan change would be experienced at the western end of Station Road, and on the adjacent Cameron Road approach to Jellicoe Street. Queue lengths and delays would increase on these approaches.

An increase in delay resulting from the plan change may cause a shift in route choice for some drivers. An alternative route to Jellicoe Street via Station Road and Jocelyn Street, albeit adding up to 2 km to the route, could be considered preferable to some drivers (indeed, this appears to be already be the case).

Options which have been considered to improve the safety and efficiency of the intersection include a change in the form of the intersection such as a roundabout or traffic signals. An alternative measure which is likely to have a lower cost would be to consider closure of the intersection of Cameron Road with Jellicoe Street to all but left turn movements although this would require consideration of the other network wide implications.

The applicant proposes a roundabout at the intersection, and a concept which is subject to a road safety audit is shown in Figure 7-1. The concept design is similar in size to the two roundabouts which have recently been installed on Jellicoe Street at the intersections with Quarry Road and No3 Road, with a 25 m diameter and a traversable centre island to accommodate longer vehicles. At a pre-application meeting with Council, Council's roading engineer noted that while these two roundabouts have introduced a small amount of delay to through traffic, access to and from the side roads at these intersections is markedly improved. Overall the roundabouts were considered to have a net positive effect on the network. It is assessed that the proposed roundabout would have similar effects on the network, i.e. delays to through traffic offset against improved side-road access. Given that the intersection performance is a current network deficiency, it would be appropriate that the funding for any long-term solution should be shared between all current and future users on a proportionate basis. However, it is noted that this solution is subject to agreement from Council. If accepted, the timing for implementation of the solution may lag behind the development of the plan change area and so it is likely that the proposed zoning will require management controls (to avoid additional traffic pressure on the intersection) to be included in the plan.

7.4 Network Capacity

Washer Road has an existing peak hour flow of up to 290 veh/h at its southern end (based on the survey). The additional flow associated with the plan change area, if it occurred concurrently with existing peaks, would increase the total flow to approximately 422 veh/h. While this is well within the capacity of the road, a relatively high proportion of heavy vehicle traffic is expected.

Washer Road has been constructed to a rural standard varying in sealed width with the majority of the length south of the proposed site access point being around 6.9 m in width. The WBoP Development Code 2009 recommends a 13 m sealed width for local roads in industrial urban zones where the ADT (PCE) is greater than 1,000 veh/d. The additional width recommended for an urban standard road would typically cater for shoulder parking and additional space for turning traffic. However, providing there is sufficient space provided on site for parking there should be no reason to require widening for the provision of on-street parking. In this respect development of the site will be required to meet the parking requirements of the District Plan.

However, it is recommended that, as a minimum, a seal width of 8.5 m is provided on Washer Road up to the proposed access location to meet the Development Code rural standard for greater than 1000 veh/d. This width is also appropriate for a high proportion of heavy vehicles resulting in a 4.25 m lane (including shoulder) in each direction and minimising any long-term maintenance issues. As this work is an existing deficiency it is expected that Council would have the work prioritised within its seal widening programme and the work will be completed as and when the need is identified. Development contributions that are collected by Council are calculated based on Councils road improvement programme which includes seal widening and therefore it is recommended that development contributions collected at the time of development are similarly partially used for this purpose.

Station Road has an existing seal width of nominally 9.5 m with peak traffic flows of 124 to 290 veh/h. Jocelyn Street has a typical sealed width of 10 m and is wider in several places. It carries an estimated 510 veh/h at peak times. The additional traffic on these two roads associated with the plan change area is expected to be approximately half of the total 132 veh/h (depending on the treatment of the Cameron Road intersections as noted above). It is assessed that this volume of additional traffic can be readily accommodated on Station Road and Jocelyn Street and, if necessary, parking restrictions could be imposed should parking on these streets become an issue in the future.

With the mitigation described and recommended above, it is assessed that the volume of traffic expected to be generated by the proposed plan change can be safely and efficiently accommodated on the wider road network.

7.5 Pedestrians and Cyclists

As described in Section 2.2.3, there is an existing footpath on the eastern side of Washer Road from the Eastpack entrance Bainbridge Avenue but no connection across the single lane bridge to the east. There is no current provision for cyclists on Washer Road or the adjacent street network.

Pedestrians and cyclists would need to share the single carriageway with any traffic (see Figure 7-2). Pedestrians were observed using this bridge during the shift change at the Eastpack site, and more would be expected to walk to and from activity at the subject site.

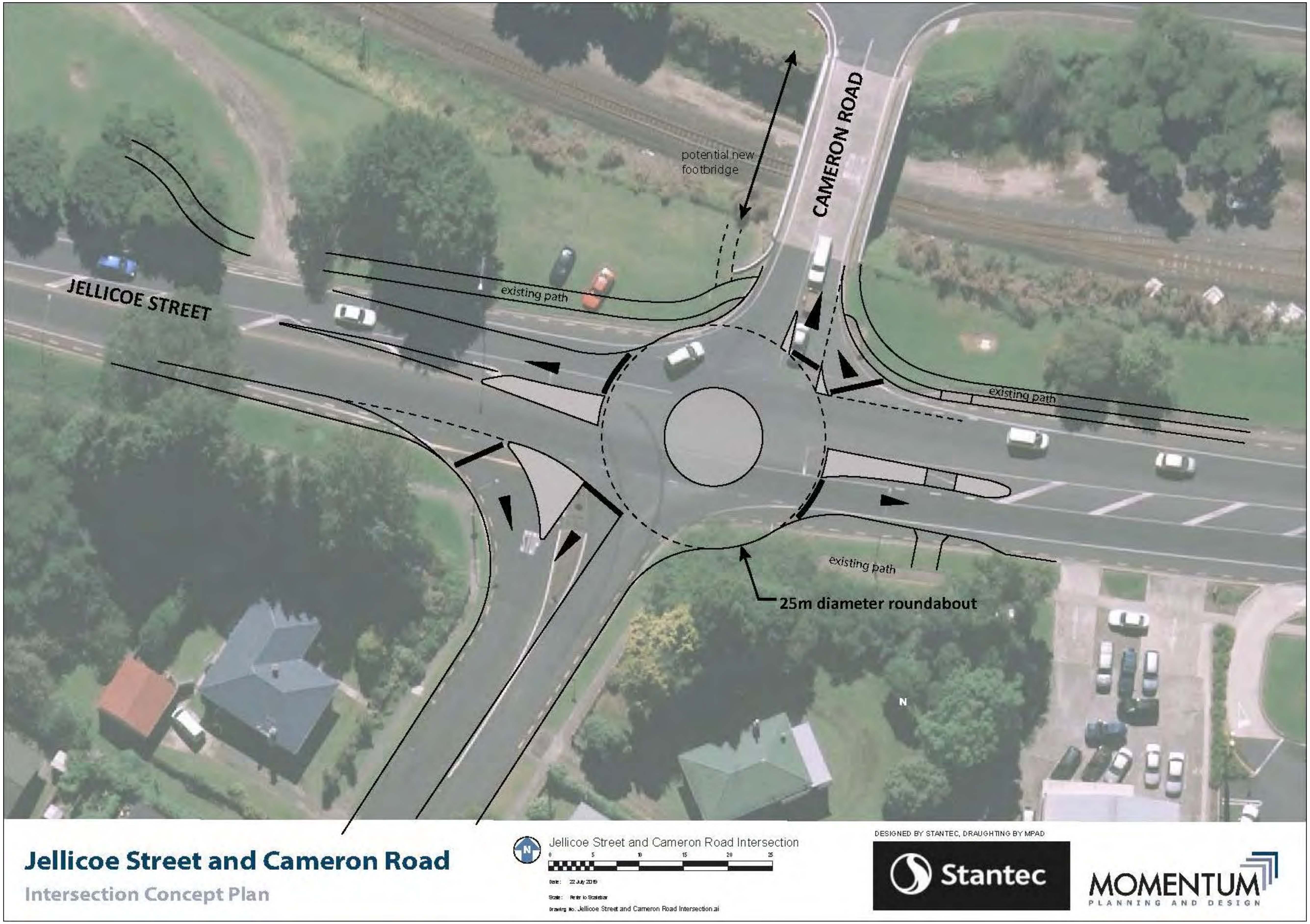

Figure 7-1: Concept design for a roundabout at the intersection of Jellicoe Street and Cameron Road

The applicant has indicated that a pedestrian and cycle connection will be provided to connect the proposed plan change area with the Te Puke township, with linkages to existing facilities on both sides of the bridge. The proposed solution (noting that it will require further discussion with the road controlling authority) is the provision of a separate pedestrian bridge (or clip-on facility to the existing bridge).

The existing shared pedestrian facility on Washer Road will be extended between the bridge and a site entrance (which may be south of the main vehicle access). The existing footpath may, subject to detailed investigation and consultation, be able to be used as a shared facility based on the low numbers of pedestrians and cyclists expected.

It is noted that this is an existing deficiency which would ideally be addressed regardless of the proposed plan change for the benefit of the wider community as well as the potential future activity within the plan change area. In this manner it would be appropriate for Council to collect development contributions and implement the improvements on behalf of the community of benefit.

If a shared responsibility (and affordable) approach is not able to be agreed then an alternative may be to implement activity management controls (for example on pedestrians, cyclists and vehicle movements as noted for above) which eliminates the need for these recommended works.

Figure 7-2: Single-Lane Bridge with No Pedestrian Facility

8. Parking, Loading and Servicing

The proposed re-zoned area will be subject to the District Plan rules for transportation including parking.

While details of any subdivision of the site are yet to be developed as are any internal layouts, the site is of a scale and shape such that it is assessed that all parking, loading and servicing requirements can be adequately provided on-site. Assessment of individual lots or activities will be appropriate at the time of development to demonstrate compliance with the District Plan or alternatively a resource consent sought.

9. District Plan Policies and Rules

The following tables summarise the relevant transportation policies and rules of the District Plan, with commentary where appropriate on the level of compliance which can be achieved for the proposed plan change area:

Table 9-1: District Plan Transportation Policies

Policy	Comment
To recognise and provide for the existing and future transport network including the linkages to other districts and regions.	The plan change is assessed to be able to be managed within the existing road network subject to the implementation of identified mitigation measures. These have been assessed and described in the body of this report. Some localised congestion effects could be expected, based on the current road layout around Cameron Road and Jellicoe Street, however mitigation has been identified which would address any such effects. It is noted that this congestion is an existing issue which should be addressed irrespective of the implementation of this plan change. The mitigation would not only address effects generated by the plan change but would also mitigate existing issues and would therefore be a benefit to the wider community. It is recommended that a contribution towards the provision of mitigation would be an appropriate response. It is assessed that with mitigation in place the proposed plan change will enable safe and efficient access and will not conflict with the operation of the adjacent roads.
To avoid, remedy or mitigate the adverse effects of land use, development and subdivision on the safety, efficiency, sustainability and capacity of the transportation network	
To manage the land use, development and subdivision of areas to achieve compatibility with the roads they front and the wider transportation network, with particular regard to the potential effects on that network, including, but not limited to, the safe and efficient provision of site access at the local level and intersections within the wider network and the effects of reverse sensitivity experienced between the operation and use of the transportation network and the establishment of adjacent land uses.	
To ensure the integrated management of road, rail, sea and air transport networks to facilitate the long-term efficient and sustainable management of the wider transportation network.	
To recognise and provide for network wide effects of land use change on transport networks by assessing the effects of land use change across the networks affected.	
To recognise and provide for the function of each road as described in the road hierarchy and provide for the efficient use of that road type, by managing the intensity and form of land use, development and subdivision that impact on these roads.	
To encourage the efficient use of land particularly in identified land use zones to reduce the potential impacts on the transportation network	
To ensure land use, development and subdivision planning provides for the implementation of multi-modal transport activities including public transport, walking and cycling facilities that address the identified need for new facilities/networks or enhance existing facilities/networks.	
To maintain or enhance the sustainable and efficient use of arterial and collector roads through the use of transport optimisation methods and techniques (for example traffic demand management) that encourage adjacent land uses to provide access in keeping with the function of the road in the roading hierarchy and support alternative modes of transport.	
The access, parking and loading effects of activities on the transportation network shall be avoided, remedied or mitigated with particular regard given to the level of service the road provides within the District's roading hierarchy.	The access, parking and loading is expected to be subject to the rules of the District Plan and in this way shall align with the objective and policies of the plan. A recommendation has been made for mitigation relating to pedestrian and cycle connectivity between the site and the Te Puke township.
Activities should be established and operate in a manner which ensures safe and effective on-site and off-site vehicle parking, manoeuvring and access and pedestrian access	
Provide safe, usable and attractive networks and associated linkages for pedestrians, cyclists and motor vehicles.	
To ensure that the amenity value and public safety in town centres are not affected by vehicle movements across footpaths to and from on-site parking areas.	
That Council be the preferred provider of parking facilities in the town centre	NA

Table 9-2: District Plan Transportation Rules

Rule	Comment
4B.4.2 Access to Strategic Roads	Not Applicable - No access to a strategic road is proposed.
(a) No crossing place shall be permitted to serve any proposed new activity that requires resource consent and increases the traffic movements to the site unless: *(i) It is impractical for the activity to have alternative legal access to some other road, and* *(ii) An assessment of the effects of such access on the road including written consent from the New Zealand Transport Agency (where relevant) is submitted with the application. The assessment shall address traffic safety, the traffic efficiency of the road, the impracticality of achieving alternative access, the potential for adverse effects on adjacent land owners and adverse effects on the transportation network.* *Explanatory Note:* *Where any new crossing is proposed onto a State Highway, approval for that crossing needs to be obtained from the New Zealand Transport Agency pursuant to the Government Roading Powers Act 1939.*	
New Zealand Transport Agency retains control over the design and construction standards of crossing places and road intersections with State Highways.	
(b) All properties with legal access to a strategic road shall provide all parking and manoeuvring on site.	
4B.4.3 Access to Rural Roads (Rural, Lifestyle and Future Urban Zones) other than Strategic Roads	
(a) No vehicle entrance shall be constructed within: *(i) 30m of a rural road intersection,* *(ii) 45m of a State Highway intersection where the posted speed limit on the rural road is 70km/hr or less,* *(iii) 60m of a State Highway intersection where the posted speed limit on the rural road is greater than 70 km/hr as measured from the intersection of the legal road boundaries, or the edge of the road formation, whichever is closer to the entrance.*	Will Comply
(b) Each entrance shall be located in such a position as to provide complying visibility for motorists entering and leaving the property in accordance with Council's minimum standards.	Will Comply
(c) All new rural entrances and entrances which are in a „fixed location" at subdivision consent stage on District roads shall be designed and constructed so that heavy vehicles can enter and leave the property in a safe and convenient manner without damaging the edge of seal. *Explanatory note: For the purpose of this rule, „fixed location "shall be defined as an entrance serving a right of way, access leg or a property limited to complying and practical road frontage for entrance construction of 30m or less.*	Will Comply
(d) Where a building consent is issued for a building on any site that does not already have a complying entrance the owner will be required to construct an entrance to Council's current minimum standard.	Can comply
(e) Activities, including any Controlled, Restricted Discretionary, Discretionary or Non-Complying activities, that require new access, or increase the use of existing accesses, to rural roads shall ensure that the access and the existing road is formed and	Will comply

Rule	Comment
constructed to the current standard necessary to accommodate the increased use of the road (see Section 11.3).	
(f) In any subdivision (including boundary adjustments), all lots available for independent use shall be demonstrated as capable of being provided with an entrance that complies with Council access standards.	Will comply
Except that this rule shall not apply to:	
Existing entrances used intermittently only and which do not provide access to an existing or proposed dwelling. For the purpose of this rule "intermittent use" includes farm accesses used occasionally, but excludes dairy tanker accesses and the main working entrance of properties.	
Existing entrances to properties being subdivided by way of boundary adjustment where no additional lots are created and the ability to create a complying entranceway for each lot in the future is not compromised.	
Explanatory note: Non-compliance with this rule shall be a Restricted Discretionary Activity in respect of the particular non-compliance.	
4B.4.4 Access to Urban Roads (Residential, Rural-Residential, Commercial, and Industrial Zones) other than Strategic Roads	NA – however it is likely that the existing rural road should be changes to an urban road following the plan change
(a) Subdividers shall normally be required to provide only those crossings where the location is fixed at the time of subdivision, such as Private ways. In all other cases, the crossings shall be constructed at the time of building.	
(b) Distance from Road Intersections - No vehicular access shall be located nearer than 8m in a Residential, Rural-Residential or nearer than 25m in a Commercial, or Industrial Zone from the road intersection, measured from the intersection of the legal road boundaries or any part of a road on which the Council has resolved that no vehicle may stop in accordance with the provisions of the Transport Act and any Regulations pursuant to that Act.	
4B.4.5 Loading Path and Space Dimensions	
Activities requiring loading facilities or servicing from heavy vehicles shall comply with the 90 percentile design two axled truck swept path and minimum loading space dimensions or a greater dimension of design where articulated vehicles or trucks and trailers are anticipated.	Can Comply: Sufficient site area is available for the required on-site loading, manoeuvring and parking to be provided.
4B.4.6 On-site Manoeuvring	
All activities shall provide manoeuvring space on-site so that all vehicles can enter and exit without reversing on to or off the road. Such manoeuvring shall be able to be executed in no more than a three-point turn. *Except that:* *Dwellings in the Residential Zone with direct access off a District Road are not required to provide for on-site manoeuvring.*	Can Comply: Sufficient site area is available for the required on-site loading, manoeuvring and parking to be provided.
4B.4.7 On-site Parking and Loading	
Every person who proposes to erect, re-erect, construct or substantially reconstruct, alter or add to a building on any site or who changes the use of any land or building, shall provide suitable areas for the parking of vehicles and loading as required below: [table omitted for brevity]	Can Comply: It is assessed that sufficient site area is available for all on-site parking and loading to be provided in accordance with the required rates.

Rule	Comment
4B.4.8 Alternative means of Provision of Parking and Loading	
Council shall consider as a Discretionary Activity the following alternative means of parking and loading.	Not applicable: It is assessed that alternative means for the provision of parking and loading will not be required.
(a) Joint provisions of parking and loading for several activities … *Or*	
(b) Cash in lieu … *Or*	
(c) On-street parking … *Or*	
(d) Additional land areas ….	
(e) On site parking within the Katikati and Waihi beach town centres	
4B.4.9 Location of Parking and Loading areas	
The provision for parking and loading in respect of any site shall not be on: *(a) Part of any manoeuvring area or access lane, or road;* *(b) Any screening required by this Plan;* *(c) Any solid waste storage area required by this Plan.* *Provided that:* *In Commercial and Industrial Zones manoeuvring may be on service lanes where land for service lane is given by the applicant.* *(d)Parking spaces shall not occupy loading spaces nor loading spaces occupy parking spaces.* *(e)Parking and loading spaces are to be either visible from the public road or clearly signposted at the road frontage.*	Can Comply: It is assessed that sufficient site area is available to be able to comply with these requirements.
4B.4.10 Formation of Parking and Loading areas	
Parking and loading areas shall be sealed in Residential, Commercial and Industrial zones and metalled as a minimum in Rural-Residential, Future Urban, Rural and Lifestyle Zones so as not to create a dust nuisance to adjoining properties, except in respect of the 3m of any car park immediately adjoining Strategic Roads that shall be paved in all zones.	Can Comply: It is recommended that these requirements be enforced as part of the Building Consent process.
4B.4.11 Stack Parking	
Council shall accept stacked parking only in the case of dwellings provided that the stacking area is exclusive of all those matters listed in 4B.4.9 above.	Can Comply: It is assessed that sufficient site area is available such that stack parking will not be required.
4B.4.12 Service Lanes	
All new activities shall provide Council with the land for a service lane at the rear or at the side of the site as required in accordance with the Planning Maps. The service lane widths and dimensions required from each site shall be in accordance with dimensions set down on the Planning Maps.	Not Applicable.

10. Summary and Conclusions

A plan change by David Marshall proposes to rezone approximately 7 ha of land on the east side of Washer Road, Te Puke, from rural to industrial zoning. The establishment of additional Industrial land on Washer road will complement the existing industrial activities opposite. There are benefits in co-siting service activities adjacent to larger processing activities as it provides opportunity for trips "internal" to the wider catchment of Washer Road in general potentially reducing what would otherwise be travel to other areas in Te Puke. It is likely the industrial area will take several years to develop and as a result the traffic effects can be managed with mitigation implemented as and when it is required. A network management approach will be necessary to ensure traffic is managed appropriately, taking on board the recommendations of this report and other network improvements of the wider network.

A review of the current transportation environment in the vicinity of the site has identified a number of existing issues relating to intersection capacity and road safety for which some mitigation would be appropriate irrespective of the implementation of the proposed plan change. The identified areas for which some form of improvement is desirable, even for the existing environment, include:

- the width of Washer Road between the proposed access and the single lane bridge;
- congestion and safety concerns at the intersection of Cameron Road (north) with Jellicoe Street; and
- the lack of existing pedestrian and cycle linkages.

It is noted that the identified existing network deficiencies should ideally be addressed regardless of the proposed plan change for the benefit of the wider community as well as the potential future activity within the plan change area.

The applicant has proposed mitigation measures in the form of pedestrian connections on Washer Road, a new pedestrian facility at the single-lane bridge on Station Road, and a roundabout at the intersection of Cameron Road and Jellicoe Street. It is recommended the development contribute to the solutions to address these existing deficiencies in the same way that development contributions are collected from all development in the district (using a traffic equivalency calculation).

If a shared responsibility (and affordable) approach is not able to be agreed, then an alternative may be to implement activity management controls which enables the plan change to proceed in advance of any future improvements by Council. Such management controls could be set and included as a Travel Plan that is required as part of a zone rule which would require management of movements of pedestrians and cyclists at all times and restrictions on timing and routes for all vehicle movements.

The proposed re-zoned area will be subject to the District Plan rules for transportation including on-site parking, loading and manoeuvring and no additional rules are considered necessary in this respect.

In summary, on the basis of this assessment, together with the appropriate zone management controls to address recommended mitigation measures, it is concluded that the proposal to zone change of land from rural to industrial is able to be managed in an appropriate way to ensure any effects on the adjacent road network are acceptable.

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20 January 2021

PROPOSED INDUSTRIAL DEVELOPMENT
66 WASHER ROAD, TE PUKE

GEOTECHNICAL INVESTIGATION REPORT

D.L. Marshall

TGA2019-0228AC Rev0

TGA2019-0228AC		
Date	**Revision**	**Comments**
25 November 2020	A	Internal Draft Report
14 January 2021	B	Internal Draft Report
20 January 2020	0	Final Report for Client

	Name	Signature	Position
Prepared by	Elizabeth Cook		Engineering Geologist
	Greg Snook		Senior Engineering Geologist
Reviewed & Authorised by	Dave Morton		Principal Geotechnical Engineer CMEngNZ, CPEng, TCC Category 1 Geo-professional

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1 INTRODUCTION

1.1 Project Brief

CMW Geosciences (CMW) was engaged by D.L Marshall to carry out a geotechnical investigation of a site located at 66 Washer Road, Te Puke, to support a plan change from rural to industrial land use with Western Bay of Plenty District Council.

This report provides the basis for the Statement of Professional Opinion attached in ***Appendix A.***

1.2 Scope of Work

The scope of work and associated terms and conditions of our engagement were detailed in our services proposal referenced TGA2019-0228AB Rev.0 dated 22 October 2020, which was defined as follows:

- Advance 10 cone penetrometer tests (CPTs) to 20m depth (or refusal);
- Compile all investigation data and develop a representative ground model;
- Undertake analyses for assessing the future land use including settlement, liquefaction and slope stability;
- Compile all of the above detail into a geotechnical investigation report to provide recommendations for the future industrial land development.

2 SITE DESCRIPTION

2.1 Site Location

The site comprises an area of approximately 6.1 hectares and is located at 66 Washer Road, Te Puke as shown on *Error! Reference source not found.* below.

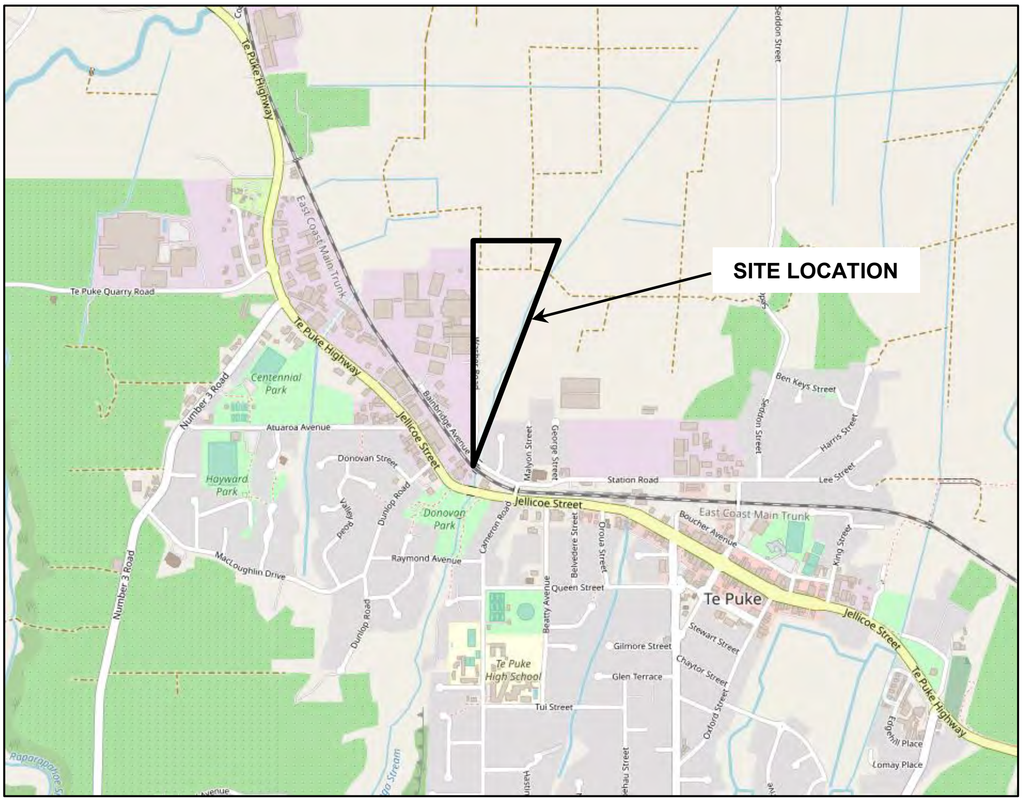

Figure 1: Site Location Plan (openstreetmap.org)

2.2 Landform

The current general landform, together with associated features located within and adjacent to the site, is presented on the attached Existing Contour Plan as ***Drawing 01.***

The site is bound to the west by Washer Road, to the north by farmland, to the east by the Ohineangaanga Stream which forms an incised gully approximately 5m below the level of the surrounding land, and to the south by Station Road. A gas line easement runs through the site, north to south, and a historic drainage easement is located approximately 15m west of the stream.

The site is gently sloping at RL 6.5m (Moturiki Datum) in the north rising to RL 12m in the south. The lower lying north eastern portion of the site has been identified as an area of flooding.

2.3 Site History

A review of available historic aerial photographs[1] shows the site has had little change since the 1930s, with the land remaining in pasture.

3 PROPOSED DEVELOPMENT

We understand no specific development proposals have been confirmed for the site at this stage. The proposed land use it to be industrial of a similar nature to the existing developments east of Washer Road. That can be broadly classified as large portal frame warehouse structures with shallow pad foundations with varying widespread floor loads.

Due to flood risks within the northern and eastern portion of the site, fills of between 0.5m and 1.0m are proposed west of the drainage easement as indicated in shaded colours on the Momentum Planning and Design Limited (MPAD) Flooding Map Overlayed Plan, dated April 2020 (refer ***Appendix B***).

We understand that any future development within the property will be outside the gas line, drainage and sewer easements. The remaining net area of developable land equates to approximately 61Ha.

4 PREVIOUS INVESTIGATIONS

A geotechnical investigation was undertaken by Foundation Engineering Consultants Limited (FECL) in 2005 for a proposed industrial subdivision at 66 Washer Road[2]. Those investigations included:

- The drilling of six hand auger boreholes to depths of up to 5m;
- The advancement of 6 Cone Penetration Tests (CPTs) up to 31m deep.

The findings of that report (refer ***Appendix C*** for investigation data) were reviewed during preparation of this report. Investigation locations are shown on the attached Plans and Sections ***(Drawings 01 to 04)***.

5 INVESTIGATION SCOPE

The recent field investigation was carried out 19 November 2020. All fieldwork was carried out under the direction of CMW Geosciences in general accordance with the NZGS specifications[3]. The scope of fieldwork completed was as follows:

[1] http://retrolens.nz/

[2] Foundation Engineering (2005), Geotechnical Investigation Report on Proposed Industrial Subdivision, reference 12491

[3] NZ Geotechnical Society (2017) NZ Ground Investigation Specification, Volume 1 – Master Specification

- An engineering geologist undertook a walkover survey of the site to assess the general landform, site conditions and existing service locations;
- 10 Cone Penetrometer Tests, denoted CPT01 to CPT10 were advanced to 20m depth to further define the ground model variability beneath the proposed development site. Results of the CPT's, presented as traces of tip resistance (qc), friction resistance (fs), friction ratio (Rf) and pore pressure (u2) are presented in ***Appendix D***;

The approximate locations of the respective investigation sites referred to above are shown on the Geotechnical Investigation Plan ***(Drawing 01)***. Test locations were measured using a handheld GPS. Elevations were inferred from the survey plan provided.

6 GROUND MODEL

6.1 Published Geology

The local geological map[4] and our experience indicates that the site is underlain by Late Pleistocene to Holocene aged alluvial river deposits overlying Upper Matua Subgroup deposits at depth.

6.2 Stratigraphic Units

The ground conditions at the site and inferred from the investigations are generally consistent with the published geology. With reference to the prepared geological sections ***(Drawings 03 and 04)*** the strata is defined as follows:

6.2.1 Topsoil

Topsoil was noted in the previous hand auger borehole investigations as comprising organic silts with a typical depth ranging from 100mm to 400mm.

6.2.2 Fill

Pre-existing fill was noted in the previous hand auger borehole investigations within the hummocky ground towards the southern portion of the site to depths of up approximately 1.0m. The approximate extent of this fill is outlined in the appended FECL Site Plan ***(Appendix C)***.

6.2.3 Alluvium

Holocene aged alluvium comprising interbedded sandy silts, clayey silts and organic soils inferred to be very soft to stiff were presence in all CPT tests to depths of up to approximately 10 metres below existing ground level. A distinct bed of sandy dominant soils inferred to be pumiceous sands was observed within the alluvium between 5.0m and 8.0m below existing ground level, at up to 5m thick.

6.2.4 Upper Matua Subgroup

Medium dense to dense silty sands and sandy silts inferred to be Upper Matua Subgroup deposits were present in all CPT tests from between 9.0m and 13.2m below existing ground level to beyond the extent of the CPT tests.

Previous deep CPT tests carried out by FECL had termination in dense sands at approximately 30m below existing ground, inferred to be ignimbrite deposits.

[4] Briggs, R.M. et al, 1996, Geology of the Tauranga Area, Institute of Geological and Nuclear Sciences Limited, Sheet U14, 1:50,000

6.3 Groundwater

During the investigation, which was completed in November 2020, groundwater was encountered within all CPTs at depths ranging between 2.1 and 5.2m below ground level, equating to levels of between RL 3.8m and RL 7.8m (Moturiki Datum).

7 GEOHAZARDS ASSESSMENT

7.1 Seismicity

A seismic assessment has been carried out in general accordance with NZGS guidance[5] to calculate the peak horizontal ground acceleration or PGA (a_{max}) as follows:

$$a_{max} = C_{0,1000} \frac{R}{1.3} x\ f\ x\ g$$

Where: $C_{0,1000}$ = unweighted PGA coefficient (refer Section 8.1 for subsoil class)
R = return period factor given in NZS1170.5, Table 3.5
f = site response factor subject to subsoil class
g = acceleration due to gravity

The ULS PGA was calculated based on a 50-year design life in accordance with the New Zealand Building Code[6] and importance level (IL) 2 structures. The PGA for the serviceability limit state (SLS) and ultimate limit state (ULS) earthquake scenarios is as follows:

Table 1: Design Peak Ground Acceleration (PGA) for Various Limit States

Limit State	AEP	R	PGA(g)	$\text{Magnitude}_{\text{eff}}$
SLS	25	0.25	0.07	5.9
ULS	500	1.0	0.26	5.9

Note: SLS = serviceability limit state; ULS = ultimate limit state; AEP = annual exceedance probability

7.2 Liquefaction

7.2.1 General

Soil liquefaction is a process where typically saturated, granular soils develop excess pore water pressures during cyclic (earthquake) loading that exceed the effective stress of the soil. In loose soils, some dilation can occur during this process, which can lead to individual soil grains moving into suspension. Following the onset of liquefaction, the shear strength and stiffness of the liquefied soil is effectively lost causing excessive differential settlement of the ground surface, bearing capacity failure and collapse of structures and low-angle lateral spreading of slopes in liquefiable soils.

In accordance with NZGS guidance[7] the liquefaction susceptibility of the soils at this site has been considered with respect to geological age, soil fabric and soil consistency / density.

[5] NZ Geotechnical Society publication "Earthquake geotechnical engineering practice, Module 1: Overview of the standards", (March 2016)
[6] Ministry of Business, Innovation and Employment (1992) NZ Building Code Handbook, Third Edition, Amendment 13 (effective from 14 February 2014)
[7] Earthquake Geotechnical Engineering Practice, Module 3: Identification, assessment and mitigation of liquefaction hazards", (May 2016)

7.2.2 Geological Age

The vast majority, and nearly all, case history data compiled in empirical charts for liquefaction evaluation come from Holocene deposits or man-made fills[8] [9]. Pleistocene aged alluvium (>12,000 years) is also considered to have a very low to low risk of liquefaction[9].

The recent alluvium found across the site is of Holocene geological age and therefore, in terms of geological age, is considered susceptible to liquefaction.

The underlying Pleistocene age Upper Matua Group alluvium are significantly older than what case history data would suggest as being susceptible to liquefaction.

Notwithstanding this, age alone is often debated as being of insufficient evidence to discount liquefaction potential due to its qualitative nature. Consideration can therefore be given to applying an ageing factor (K_{DR}) to site specific liquefaction analyses in accordance with methods described in Saftner et al[10] based on the following relationship (where t = time (years)):

$$K_{DR}=0.189\cdot\log(t)+0.878$$

An aging factor of 1.92 was therefore applied to the Matua Subgroup deposits, in accordance with the above equation. The Holocene alluvium did not have aging applied.

7.2.3 Soil Fabric

Soils are also classified with respect to their grain size and plasticity to assess liquefaction susceptibility. Based on more recent case histories, there is general agreement that sands, non-plastic silts, gravels and their mixtures form soils that are susceptible to liquefaction. Clays, although they may significantly soften under cyclic loading, do not exhibit liquefaction features, and therefore are not considered liquefiable. NZGS guidance[5] sets out the plasticity index (PI) criteria for liquefaction susceptibility as follows:

PI < 7: Susceptible to Liquefaction
7 ≤ PI ≥ 12: Potentially Susceptible to Liquefaction
PI ≥ 12: Not Susceptible to Liquefaction

The fines content of the sands beneath the site also has a significant impact on their liquefaction susceptibility.

As no specific laboratory testing for fines content or plasticity index was undertaken for this project, reliance on CPT based analysis software was made to determine soil liquefaction susceptibility based on an industry standard soil behaviour type index (Ic) cutoff value of 2.6.

7.2.4 Specific Analyses

Liquefaction analyses were undertaken to confirm liquefication susceptibility based on CMW CPT tests using the software package CLiq by comparing the cyclic stress ratio (CSR), being a function of the earthquake magnitude for the design return period event, to the cyclic resistance ratio (CRR), being a

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[8] Seed, H.B. and Idriss, I.M. (1971) *A simplified procedure for evaluating soil liquefaction potential*, Earthquake Engineering Research Centre, Report No. EERC 70-9, University of California

[9] Youd, T.L. and Perkins, D.M. (1978) Mapping liquefaction-induced ground failure potential, *Journal of the Geotechnical Engineering Division,* ASCE, Vol. 104, No. GT4, Proc Paper 13659, p. 433-446

[10] Saftner, D.A.; Green, R.A.; Hryciw, R.D. (2015). Use of explosives to investigate liquefaction resistance of aged sand deposits, *Engineering Geology*, Vol 199, p.140-147.

function of the CPT cone resistance (qc) and friction ratio (Rf). Raw data was not available from the previous FECL CPT's, which prevented specific analyses of those tests.

Results are presented in ***Appendix F*** and can be summarised as follows:

Table 2: Liquefaction Analyses Results

CPT No.	SLS Index Settlement (mm)	ULS Index Settlement (mm)	Depth to Liquefied Layer (m)	Liquefaction Soil Profile Thickness (m)	
				Individual Lenses	Cumulative Total
01	<10mm	200	6.0	6.0-6.5, 9.0-10.3, 12.5-16.9, 17.3-19.5	8.4
02	<10mm	370	6.4	6.4-7.5, 8.1-14.4	7.4
03	<10mm	260	6.5	6.6-14.4, 15.5-16.2	8.5
04	<10mm	140	6.9	6.9-8.3, 10.3-10.7, 11-12.5, 13-13.5, 16.4-16.9	4.6
05	<10mm	200	7.1	7.1-9.0, 12.7-16.6	5.8
06	<10mm	220	4.7	4.7-11, 11.4-12.2	7.1
07	<10mm	130	6.0	6-9.1, 10.5-11.5	4.1
08	<10mm	150	9.6	9.6-11.4, 11.7-14.5	4.6
09	<10mm	140	9.7	9.7-13, 14-14.9	4.2
10	<10mm	220	7.0	7-10.5, 11.7-13, 13.4-15.4	6.8

Note: Settlements and depths are based on the existing ground profile.

Under a SLS seismic event, index settlements are considered negligible. Under a ULS seismic event, the sands and silty sands below the groundwater table are shown to be susceptible to liquefaction with index ground settlements of 130mm to 370mm.

Differential settlements may be typically assumed to be in the order of one half to two thirds of total settlements where surface manifestation does not occur, ie. of the order of 65 to 250mm in this case.

Reference to Ishihara (1985)[11] suggests a non-liquefiable crust of at least 4.5 is adequate to prevent liquefaction induced ground damage for a ULS seismic event (PGA 0.26). Liquefaction results show a non-liquefiable crust of 4.7m to 9.7m (average 7.0m) during a ULS earthquake event, which suggests that the potential for any surface manifestation of liquefaction across the site is low.

Figure 2 below presents predicted index settlements for each CPT trace against the change in PGA. This parametric analysis indicates that settlements in excess of building code limits (25mm) are likely to be experienced in a 1/50 AEP and 1/100 AEP event.

[11] Ishihara, K., (1985) "Stability of Natural Deposits During Earthquakes," Proc. Of the Eleventh International Conference on Soil Mechanics and Foundation Engineering, San Francisco, 12- 16th August 1985, Vol. 1, Theme Lectures Conferences, pp321- 376.

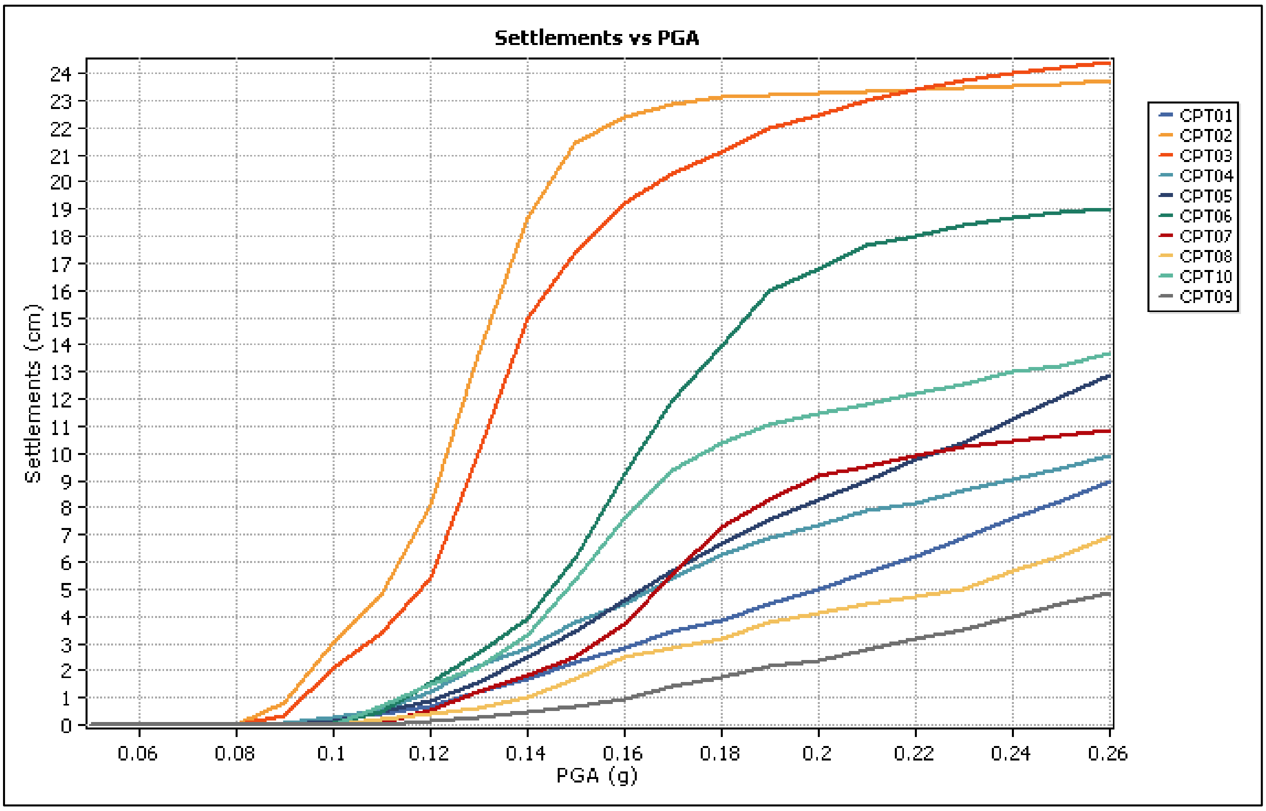


Figure 2: Parametric Settlement Analysis

The implications of these results on future industrial building construction across the site are provided in Section 8.2 below.

7.3 Slope Stability

7.3.1 Design Criteria

The stability of the land adjacent to the gully on the eastern boundary of the site has been assessed under a range of design conditions. This is expressed in terms of a factor of safety, which is defined as the ratio of forces resisting failure to the forces causing failure. The following performance standards are recommended for slope stability assessment:

Table 3: Slope Stability Factor of Safety Criteria	
Condition	**Required Factor of Safety**
Static long term conditions (drained soil conditions, normal groundwater)	1.5
Transient short term conditions (elevated groundwater)	1.2
Ultimate Limit State (ULS) seismic condition	1.0*
Note*: Factor of safety < 1.0 acceptable where displacement-based approach is adopted.	

7.3.1 Design Parameters

Representative effective stress and total stress parameters were developed for each of the nominated geological units based on the results of our investigation and experience in modelling these materials. These parameters are summarised in **Table 4** below.

Undrained soil shear strengths (Su) used for assessing the stability of slopes during seismic loading were sourced from in-situ shear strength readings within the test pits and also inferred from the CPT data based on the following relationship:

$$Su = \frac{qc - \sigma}{Nk}$$

Where: Su = undrained shear strength (kPa)

q_c = CPT cone resistance (kPa)

σ = total overburden pressure (kPa)

Nk = factor, typically between 10 and 20, 12 adopted for Bay of Plenty soils.

Table 4: Summary of Effective & Total Stress Shear Strength Parameters				
Geological Unit	**Unit Weight (kN/m^3)**	**Effective Stress**		**Total Stress**
		c' (kPa)	**Ø' (deg)**	**Su (kPa)**
Recent Alluvium – Stiff to very stiff silts	15	2	25	50
Recent Alluvium – Soft to Firm Silts and Peats	14	2	22	15
Recent Alluvium – Pumiceous Sands	15	0	36	N/A
Upper Matua Subgroup – Silty sand and sandy silt	16	3	32	100
Note: Where c' = effective cohesion, Ø' = effective friction angle, Su = Undrained Shear Strength				

7.3.2 Static Slope Stability

Slope stability analyses were undertaken using the Morgenstern-Price method of slices under both circular and translational failure mechanisms using the proprietary software SLIDE Version 8.

Selected stability printouts are attached in ***Appendix E*** and summarised as follows:

Table 5: Slope Stability Analyses Results					
Location	**Stability Case**	**Factor of Safety <10m from Slope**		**Factor of Safety >10m from Slope**	
		Prevailing	**Transient**	**Prevailing**	**Transient**
Section A-A	Existing Surface	1.39	1.37	>2.0	>1.7

Results show that the static slope stability factor of safety (FoS) criteria are achieved under transient elevated groundwater cases but not under prevailing groundwater cases. Failures under the prevailing case were constrained to 5 to 10m from the gully invert. Beyond 10m requisite factors of safety were being met.

7.3.3 Seismic Slope Stability

Seismic stability analysis was undertaken using peak undrained shear strengths in cohesive soils to model the immediate response to a short duration ULS magnitude earthquake event.

Following the onset of liquefaction, the liquefied soils behave as weak undrained materials, which can give rise to lateral spreading where a free face is present within the vicinity of the site. This case was analysed for Section A by applying liquefied shear strengths to the liquefiable soils under ULS PGA loading.

A Newmark Sliding Block approach was used to estimate the yield acceleration (PGA for FOS of 1), to ULS PGA ratio (Ac/Amax) and estimate seismic displacements based on Bray and Travasarou[12] and Martin & Qiu[13]. Results show:

- With the sand lenses liquefied and no seismic loading (PGA=0.0g) applied, slope stability factors of safety are greater than 1.0, demonstrating that lateral spread flow failure is not expected to occur;
- Under the ULS PGA, the slope stability factor of safety is less than 1.0, demonstrating that some displacement of the gully slope will occur. Analysis shows Ac = 0.16g;
- Displacements of the order of 10mm are expected during a ULS earthquake event. This displacement was observed for a 280m wide block, resulting in very low strains.

On this basis, the risk of lateral spreading resulting in damage to the proposed development is low.

7.4 Static Settlement

The soft and compressible alluvial soils encountered within the upper 10m of the site will experience significant primary consolidation and long-term secondary creep settlements in response to the placement of future filling or widespread floor loading.

Compressible soils were estimated by summing CPT cone resistances (qc) less than 0.6 MPa, which resulted in thicknesses ranging from 2.0m to 6.0m thick across the site. This was mapped based on available CPT's as shown on ***Drawing 02***.

An initial estimate of load induced settlements from the 0.5m to 1m thick fill embankment to be constructed across the site and from nominal 10kPa to 20kPa future building floor loads was made using the CPT based software package CPeTiT. Resulting consolidation settlements ranged from 50mm to 150mm.

Settlements were used and rationalised with settlement monitoring results over sites with similar ground conditions, to back calculate Terzaghi one dimensional consolidation parameters presented in Table 6.

Table 6: Adopted Consolidation Parameters	
Parameter	**Design Value**
Compression Index (Cc)	0.4
Recompression Index (Cr)	0.05
Initial Void Ratio (e_0)	1.7
Cα / Cc Ratio	0.06

Settlement calculation results are presented in ***Appendix G*** and summarised below.

The implications of those settlement predictions are provided in Section 8.3 below.

[12] Bray, J.D. and Travasarou, T., (2007) Simplified Procedure for Estimating Earthquake-Induced Deviatoric Slope Displacements, Journal of Geotechnical and Geoenvironmental Engineering, Vol 133, No. 4

[13] Martin, G.R. and Qiu, P., (1994) A Comparative Study of Predictive Methods for Liquefaction Induced Embankment Displacements, NCEER Technical Report 94-0026

Table 7: Load Induced Settlements				
Compressible Soil Thickness (m)	**Fill Induced Settlement (mm)**		**Floor load Settlement (mm)**	
	0.5m	**1.0m**	**10kPa**	**20kPa**
2.0	30	55	35	65
4.0	50	100	65	120
6.0	70	150	85	160

8 GEOTECHNICAL RECOMMENDATIONS

8.1 Seismic Site Subsoil Category

The geological units encountered beneath the site comprise soil strength materials, which with respect to the seismic site subsoil category defined in Section 3.1.3 of NZS1170.5, is defined as having a UCS <1MPa. Based on those ground conditions, the seismic site subsoil category is assessed as being Class D (deep soil site) in accordance with NZS1170.5.

8.2 Liquefaction Mitigation

Significant liquefaction settlement magnitudes of 130mm to 370mm are predicted during the ULS seismic event. In all cases however, a thick (minimum 4.7m) non-liquefiable soil crust is present that should suppress any ground surface effects.

It is expected that large span portal frame industrial buildings can be designed to accommodate the magnitude of predicted ULS settlements without collapse.

However, further CPT based investigations will be required at specific subdivision scheme and / or building design stages to assess differential settlement magnitudes across individual building platforms. Where increased resilience is desired, deep foundation solutions (piles or ground improvement) could be adopted.

The parametric settlement analysis results from Section 7.3 should also be used as a preliminary guide to structural engineers to assess the level of resilience required for design of building structures to resist seismic settlements outside of the SLS and ULS design cases.

8.3 Static Settlement Design

Ground settlements induced by future building loads combined with long term creep settlements over a 50-year building design life are predicted to exceed building code limits.

The depth of compressible soils exceeds what can be practically undercut and replaced and therefore surcharging is expected to be the most effective means of ground improvement to mitigate load induced settlements. Surcharging involves the placement of a temporary fill embankment above design ground level to over-consolidate the compressible soils, which is monitored during the surcharge period.

A preliminary surcharge design was undertaken for the range of compressible soil thicknesses and for future industrial widespread floor loads of nominally 10kPa and 20kPa. Where heavier floor loads are required, higher surcharge embankments will be required. Surcharge requirements to reduce load induced settlements to less than 25mm over a 50-year building design life are presented in Table 8.

Table 8: Temporary Surcharge Design Requirements

Compressible Soil Thickness (m)	Surcharge Embankment Height (m)	
	10kPa Floor Load	20kPa Floor Load
2.0	1.1	1.9
4.0	1.4	2.2
6.0	1.7	2.5

The above requirements must be treated as preliminary only and would need to be verified by a network of monitoring plates established prior to any fill construction across the site.

it is expected that the temporary surcharge would need to be in place and monitored for a period of at least 6 months following its placement where at least 90% of primary consolidation has occurred.

8.4 Easement Setbacks

Surcharging will induce settlements laterally beyond the toe of fill embankments where setbacks would be required from any existing underground services, such as the live sewer and gas easements that run through the site. Consideration to the proposed development works with respect to these easements will be required to ensure that they are not adversely affected.

As a preliminary guide, based on monitoring results over similar ground conditions, a nominal buffer distance of 15m from existing service pipes to the toe of future fill embankments should be considered to mitigate associated settlement risks.

Alternative deep ground improvement methods could also be considered to support fill embankment and buildings within close proximity to services although may be cost prohibitive.

8.5 Gully Setbacks

Slope stability analysis outlined in Section 7.4.2 show that stability conditions adjacent to the Ohineangaanga Stream are marginal under prevailing ground conditions for future building development.

Any future building or infrastructure development should therefore be setback a minimum distance of 10 metres from the edge of the stream with this zone forming a planting zone to help stabilise the stream banks.

8.6 Foundation Bearing Capacity

Based on the investigations completed by CMW and the previous investigations, building to be constructed outside of areas proposed to be filled will be bearing on the low strength alluvial soils.

The proposed surcharging will serve to reduce post construction ground settlements for future buildings to meet the requirements of the New Zealand Building Code. However, given the low soil strengths of the natural ground, a geotechnical ultimate bearing capacity of 150 kPa should be adopted for shallow pad and strip footings with a short axis plan dimension of 2m or less.

Higher bearing capacities may be achieved by undercutting and hardfill replacement of the natural soils. Nominal undercut depths of typically 2m below the base of foundation would be required.

Higher bearing capacities may also be achieved in the proposed fill areas depending on the depth of foundation systems proposed and the thickness of fills placed.

8.7 Earthworks

8.7.1 General

All earthwork activities must be carried out in general accordance with the requirements of NZS 4431[14] and the requirements of the WBoPDC 2009 Development Code under the guidance of a WBOPDC Category 1 Geotechnical Engineer. The specific earthwork requirements for this development are summarised below.

8.7.2 Existing Fill Suitability

The existing fills present at the site are of variable strength and consistency with most of the fills being underlain by the original topsoil. Therefore, we recommend the site is stripped of topsoil during the initial earthworks period and the preload extent marked out. Any areas of existing fill not being preloaded should be undercut and replaced with engineered fill in association with subgrade inspections by the project geotechnical engineer.

[14] Standards New Zealand (1989) Code of practice for earth fill for residential development, incorporating Amendment No. 1, NZS 4431:1989, NZ Standard

8.7.3 Compaction & Quality Control

All fills must be placed as homogeneous materials in layers of no more than 200mm loose prior to compaction, with the soils being at or near optimum moisture content.

The source and type of fill used as engineered fill dictates the type and quality control testing undertaken. The source of any imported fill should be discussed and approved for use by the project geo-professional prior to importing to verify its appropriateness and quality control testing requirements.

For granular (sand and gravel) fill materials, testing following compaction should principally be in terms of 95% of the maximum dry density within the appropriate water content range as determined form laboratory compaction curve tests. This density may be calibrated with a dynamic cone (scala) penetrometer or soil impact hammer test. Where the source or quality of the fill changes, re-calibration will be required.

Where fine grained soils (silts and clays) are used, an alternative test criterion using vane shear strength (minimum 150 kPa) and air voids (maximum 10%) should be used. However, quality control criteria will be subject to specific in-situ testing or use of a plateau test method during initial fill lifts. The WBOPDC Development Code Section CS10 includes minimum testing frequencies required for certification of fills.

8.7.4 Cut & Fill Batters

To minimise the risk of slumping and scour, permanent engineered fill batters may be formed at no steeper than 1(v) in 2(h) and cut batters at no steeper than 1(v) in 2.5(h) to a maximum height of 2 metres.

Short duration (no more than 2 weeks duration) cut batters associated with temporary works or platform preparation may be formed no steeper than 1(v) in 1(h) to maximum of 2 metres where stiff and dry subsoils are present during periods of fine weather.

Where proposed batters exceed this height or grade, they should be specifically designed or supported by engineer designed retaining walls.

8.8 Civil Works

8.8.1 Subgrade CBR

Road subgrade CBR’s in the natural are expected to be low and it is likely that road subgrades will require undercuts to achieve suitable design capacities.

Geogrid reinforced subgrades comprising 0.5m to 1m thick undercuts with a basal geotextile and several layers of geogrid between compacted hardfill can significantly improve the pavement design capacities in areas of low strength ground. Specific design of pavement improvement can be provided once road alignments and design equivalent standard axle (ESA) for the roads are understood.

In any case, we recommend that a programme of penetration resistance testing is carried out when the roads and pavement areas are being formed to their final levels to confirm actual CBR values.

8.8.2 Services

All of the materials to be exposed during the excavation of service trenches should be readily removed using an excavator.

The design of stormwater and sewer services must give consideration to predicted long term differential settlements, determined by the distribution of compressible soils and the results of settlement monitoring data from preloading activities. Given the soil conditions, we recommend increasing bedding thickness and service design gradients where possible to mitigate the risk of sags and ponding within service lines during the design life of the development.

All service pipes must be designed to maintain sufficient fall gradient over the design life of the project allowing for the predicted long-term creep settlements as defined above.

9 FURTHER WORK

This report has been prepared to support a plan change for future commercial/industrial development within the property. Further work is required to achieve resource consents for future development, including:

- Further CPT and laboratory investigations to define the magnitude of liquefaction induced settlements across individual building platforms;
- Design of preloading and/or ground improvement works specific to the development areas and loads proposed;
- Design of ground improvements for pavements where required for roads, parking areas and storage zones;
- Develop an earthworks specification to be used for the bulk earthworks and ground improvement construction across the site;
- Confirmation of bearing capacities and foundation requirements for buildings once development areas are known.

USE OF THIS REPORT

Site subsurface conditions cause more construction problems than any other factor and therefore are generally the largest technical risk to a project. These notes have been prepared to help you understand the limitations of your geotechnical report.

Your geotechnical report is based on project specific criteria

Your geotechnical report has been developed on the basis of our understanding of your project specific requirements and applies only to the site area investigated. Project requirements could include the general nature of the project; its size and configuration; the location of any structures on or around the site; and the presence of underground utilities. If there are any subsequent changes to your project you should seek geotechnical advice as to how such changes affect your report's recommendations. Your geotechnical report should not be applied to a different project given the inherent differences between projects and sites.

Subsurface conditions can change

Subsurface conditions are created by natural processes and the activity of man. For example, water levels can vary with time, fill may be placed on a site and pollutants may migrate with time. Because a report is based on conditions which existed at the time of subsurface investigation, the conditions may have changed, particularly when large periods of time have elapsed since the investigations were performed.

Interpretation of factual data

Site investigations identify actual subsurface conditions at points where samples are taken. Additional geotechnical information (e.g. literature and external data source review, laboratory testing on samples, etc) are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact on the proposed development and recommended actions. Actual conditions may differ from those inferred to exist, because no professional, no matter how qualified, can exactly predict what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions.

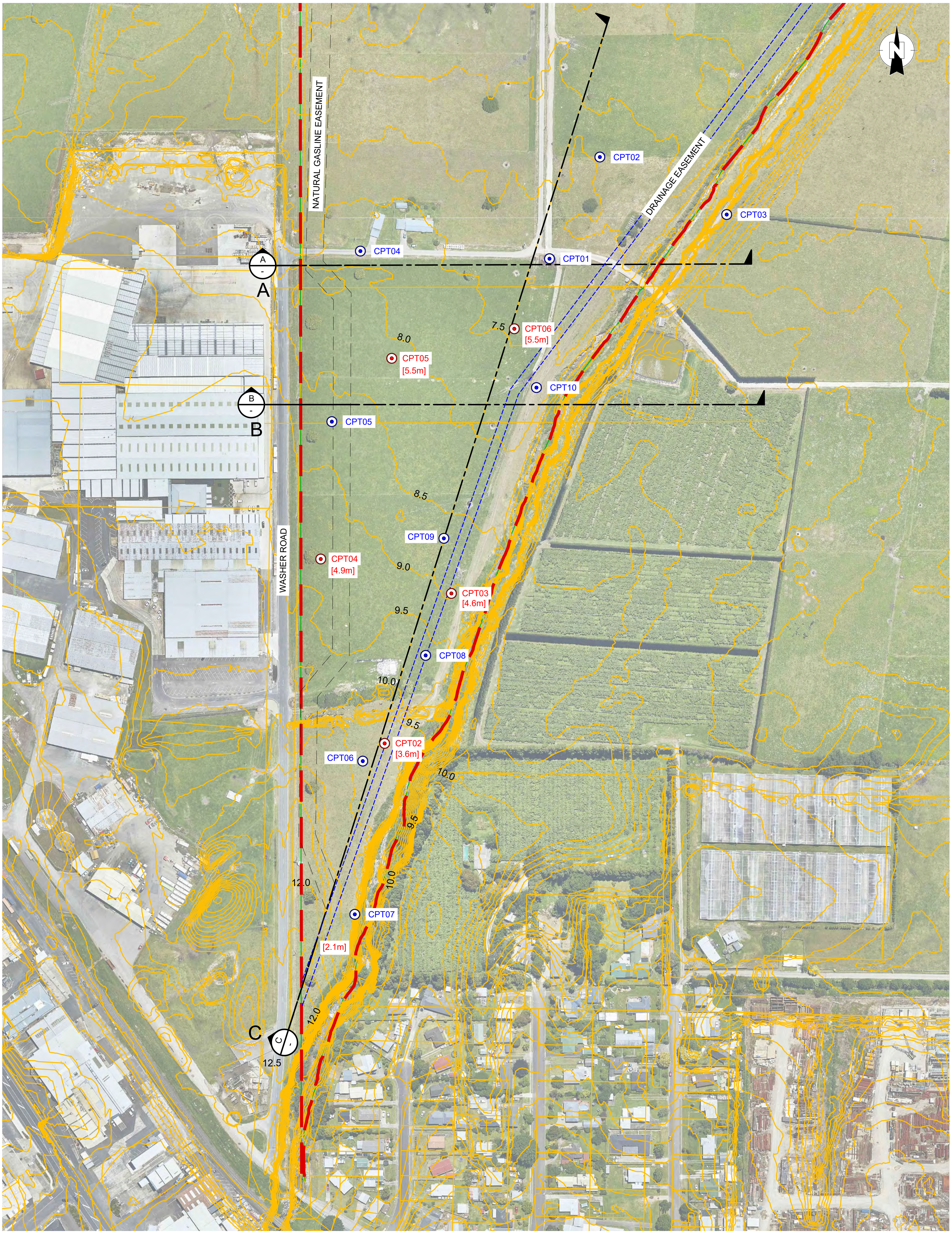
Your report's recommendations require confirmation during construction

Your report is based on the assumption that the site conditions as revealed through selective point sampling are indicative of actual conditions throughout an area. This assumption cannot be substantiated until project implementation has commenced. For this reason, you should retain geotechnical services throughout the construction stage, to identify variances, conduct additional tests if required, and recommend solutions to problems encountered on site. A geotechnical designer, who is fully familiar with the background information, is able to assess whether the report's recommendations are valid and whether changes should be considered as the project develops. An unfamiliar party using this report increases the risk that the report will be misinterpreted.

Interpretation by other design professionals

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a geotechnical report. Read all geotechnical documents closely and do not hesitate to ask any questions you may have. To help avoid misinterpretations, retain the assistance of geotechnical professionals familiar with the contents of the geotechnical report to work with other project design professionals who need to take account of the contents of the report. Have the report implications explained to design professionals who need to take account of them, and then have the design plans and specifications produced reviewed by a competent Geotechnical Engineer.

Drawings



NOTES:

1. BASE PLAN ADAPTED FROM LINZ.

LEGEND:

CPT01 CONE PENETROMETER TEST (CPT) LOCATION

SITE BOUNDARY

CMW Geosciences

CLIENT: D.L MARSHALL	DRAWN: WPJ	PROJECT No: TGA2019-0228
PROJECT: 66 WASHER ROAD, TE PUKE	CHECKED: EC	DRAWING: 01
	REVISION: 0	SCALE: 1:2500
TITLE: GEOTECHNICAL INVESTIGATION PLAN	DATE: 16/12/2020	SHEET: A3

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NOTES:

1. BASE PLAN ADAPTED FROM LINZ.

LEGEND:

- CPT01 — CONE PENETROMETER TEST (CPT) LOCATION
- [2.2m] — SOFT SOIL THICKNESS (METRES)
- ?–6.0 — SOFT SOIL THICKNESS CONTOUR
- CPT01 — PREVIOUS CONE PENETROMETER TEST LOCATION (FOUNDATION ENGINEERING, 2005)
- [2.1m] — SOFT SOIL THICKNESS (METRES)
- SITE BOUNDARY

0 25 50 75 100 125 m

1:2500

CMW Geosciences

CLIENT: D.L. MARSHALL		DRAWN: WPJ	PROJECT No: TGA2019-0228
PROJECT: 66 WASHER ROAD, TE PUKE		CHECKED: EC	DRAWING: 02
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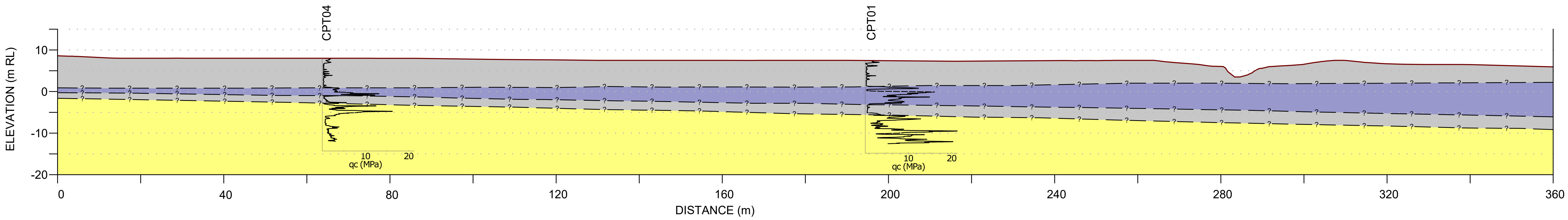
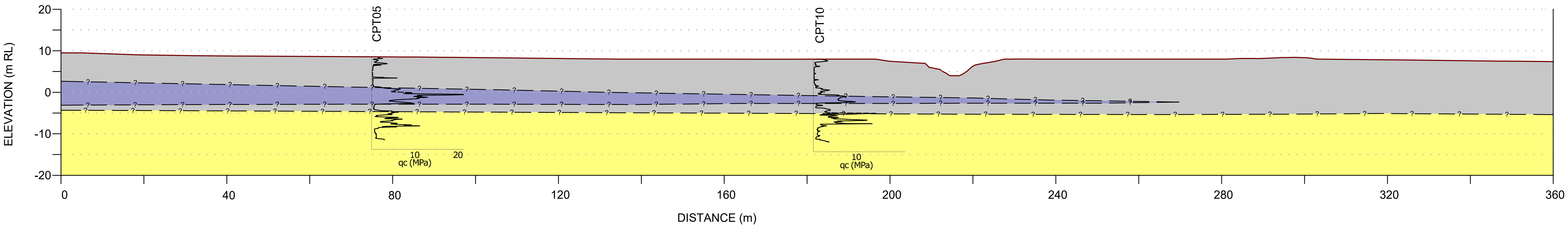


SECTION A



SECTION B

LEGEND

EXISTING PROFILE

INFERRED GEOLOGICAL BOUNDARY

ALLUVIAL SILTS AND SANDY SILTS

ALLUVIAL PUMICEOUS SANDS

SILTY SAND AND SANDY SILT (UPPER MATUA SUBGROUP)

1:1000 — 0 10 20 30 40 50 m

CMW Geosciences

CLIENT: D.L. MARSHALL		DRAWN: WPJ	PROJECT No: TGA2019-0228
PROJECT: 66 WASHER ROAD, TE PUKE		CHECKED: LC	DRAWING: 03
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TITLE: SECTIONS A & B		DATE: 01/12/2020	SHEET: A3

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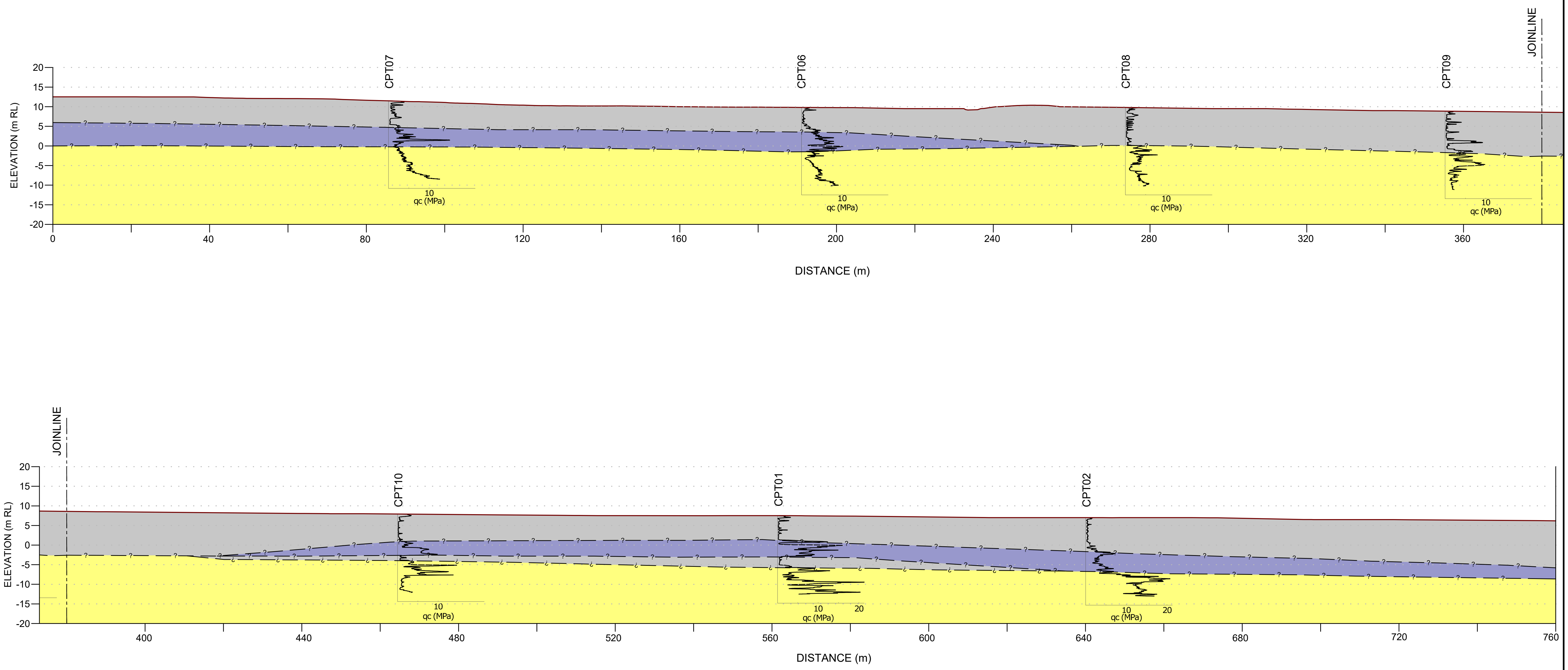

SECTION C

LEGEND

- EXISTING PROFILE
- INFERRED GEOLOGICAL BOUNDARY
- ALLUVIAL SILTS AND SANDY SILTS
- ALLUVIAL PUMICEOUS SANDS
- SILTY SAND AND SANDY SILT (UPPER MATUA SUBGROUP)

1:1000 0 10 20 30 40 50 m

CMW Geosciences

CLIENT: D.L. MARSHALL		DRAWN: WPJ	PROJECT No: TGA2019-0228
PROJECT: 66 WASHER ROAD, TE PUKE		CHECKED: LC	DRAWING: 04
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Appendix A: Statement of Professional Opinion

To: Western Bay of Plenty District Council

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

Development: LAND USE CHANGE FOR 66 WASHER ROAD, TE PUKE

Owner: D.L MARSHALL

Location: 66 WASHER ROAD, TE PUKE

I David John Morton of CMW Geosciences (NZ)
(full name)

Limited Partnership; 116 Cameron Rd, Tauranga
(name and address of firm)

Hereby confirm that:

1. I am a professional person, appropriately qualified and experienced in geotechnical engineering to ascertain the suitability of the land for building development.

2. An appropriate level of site investigation has been carried out under my direction and is described in my report dated: 20/01/2021 (Referenced TGA2019-0228AC)

3. I am aware of the details of the proposed plan of development and of the general nature of the proposed engineering works as shown on the following drawings.

   MOMENTUM PLANNING AND DESIGN DRAWING - FLOODING MAP OVERLAYED, APRIL 2020
   TOGETHER WITH DRAWINGS 01 TO 04 ATTACHED TO MY REPORT DATED 20/01/2021 (REFERENCED TGA2019-0228AC)

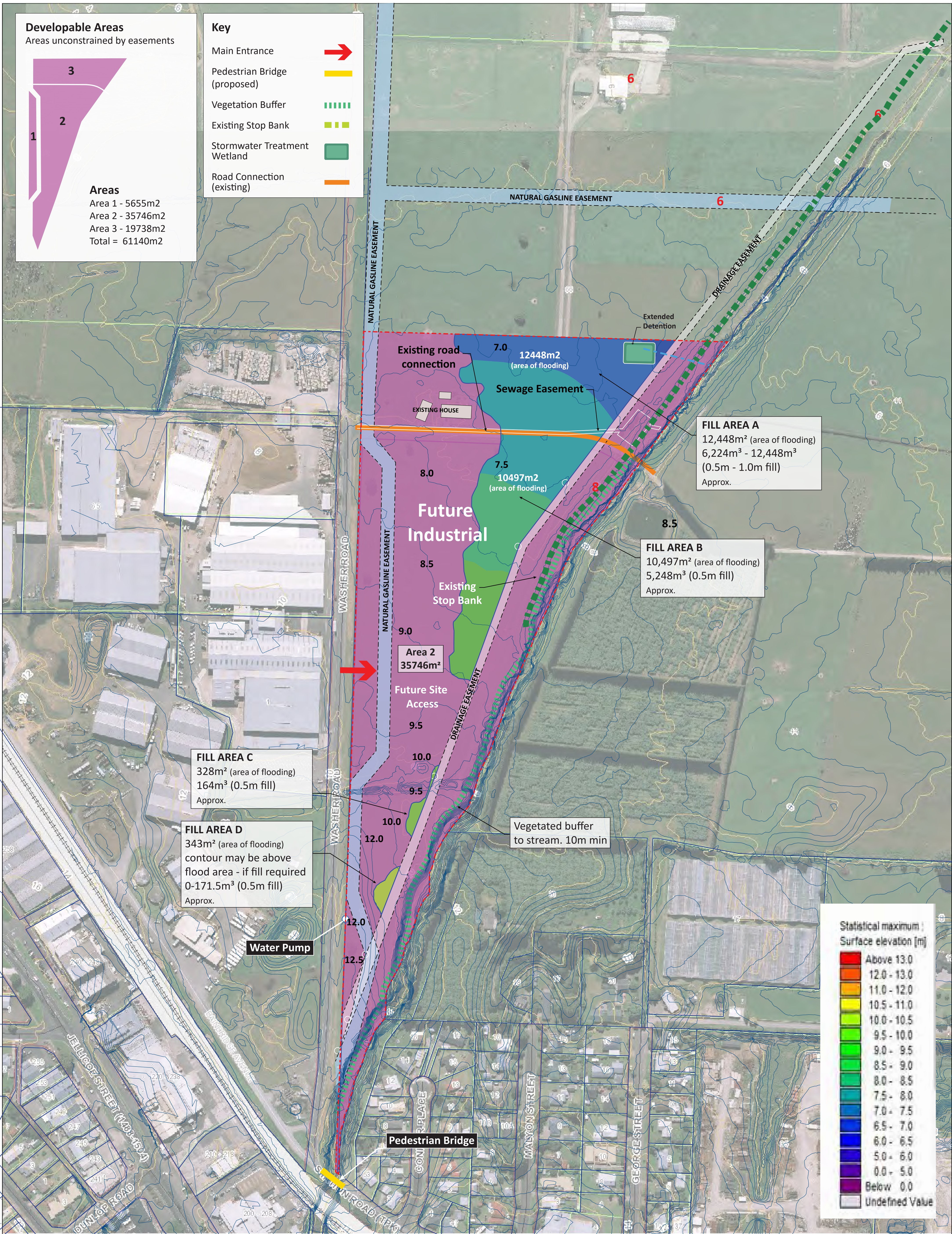
4. In my professional opinion, not to be construed as a guarantee, I consider that the proposed works give due regard to land slope and foundation stability considerations and that the land is suitable for the proposed development provided that:

   a) The recommendations provided in my Geotechnical Investigation Report dated 20 January 2021 are adequately implemented
   ~~b)~~
   ~~c)~~

5. This professional opinion is furnished to the Council and the owner for the purpose alone, on the express condition that it will not be relied upon by any other person and does not remove the necessity for further inspection during the course of the works.

Signed: [signature] Date: 20 January 2021

Appendix B: Momentum Plans



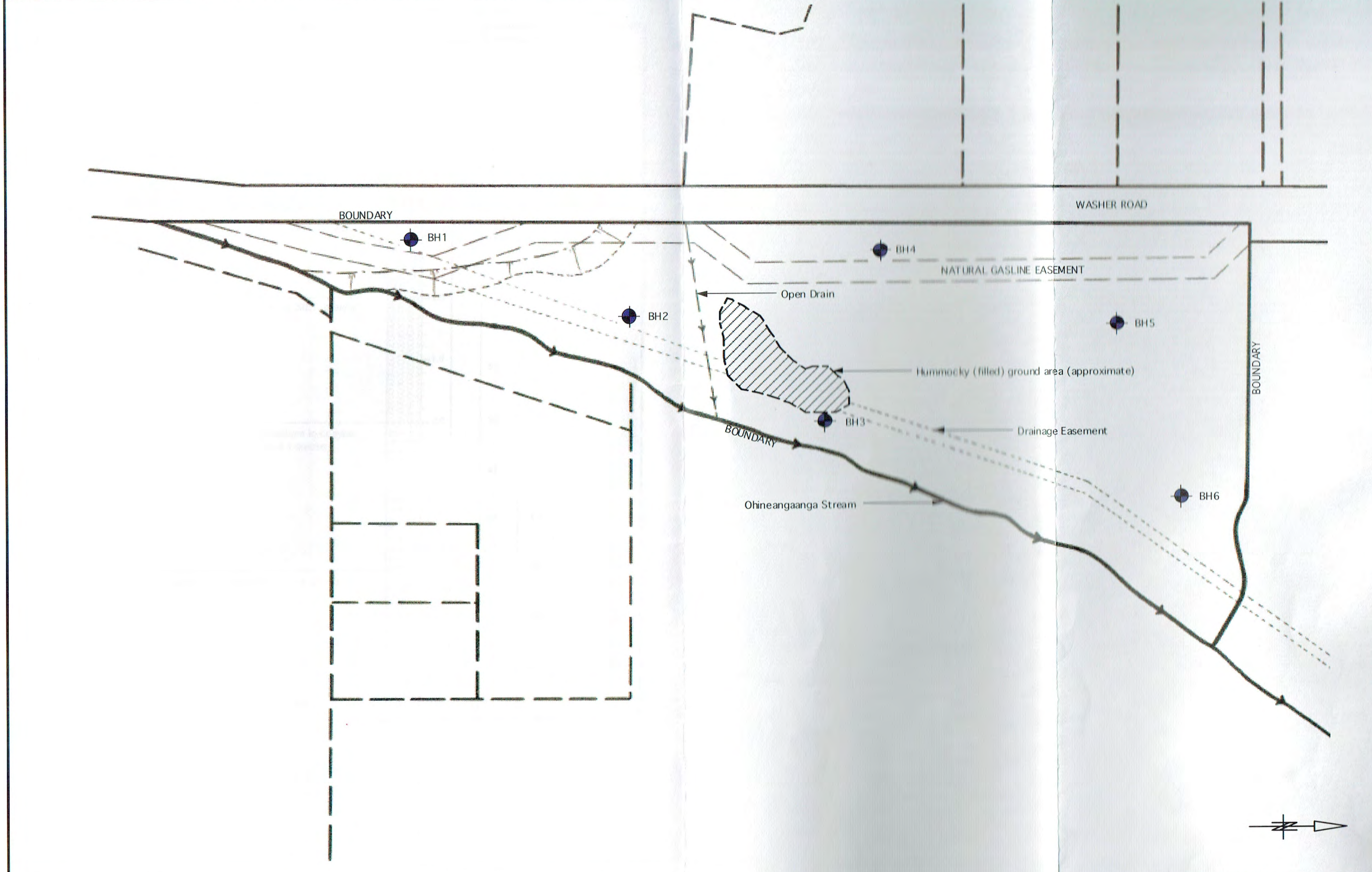
MOMENTUM
PLANNING AND DESIGN

66 WASHER ROAD, TE PUKE
Flooding Map Overlayed
flood data provided by Regional Council

N
66 WASHER ROAD
TE PUKE

Date: APRIL 2020 Drawn: TW
Scale: NTS Checked: RC
Drawing No. 66 WASHER ROAD

Appendix C: FECL Plans



FOUNDATION ENGINEERING

CLIENT
MR D. MARSHALL

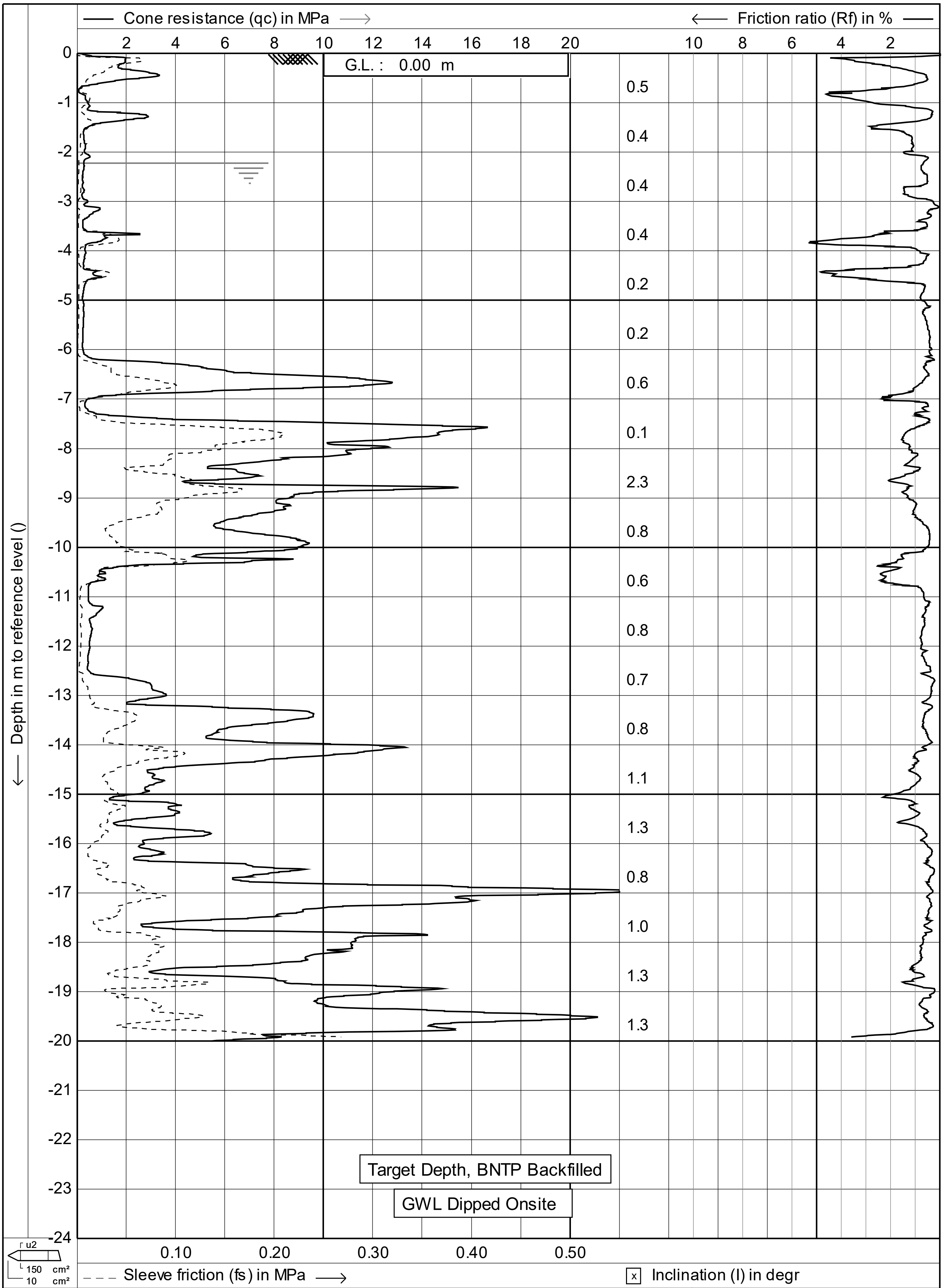
DRAWING TITLE
SITE PLAN
WASHER ROAD, TE PUKE

LEGEND AND/OR NOTES:
Borehole
Top of slope
Toe of slope

Foundation Engineering
247 Fraser Street
Tauranga
Ph +64 7 571 6081

JOB NUMBER 12491	DATE 22.11.05
DRAWN ALM	SCALE (A3) 1 : 2000
CHECKED	SHEET 1 of 1

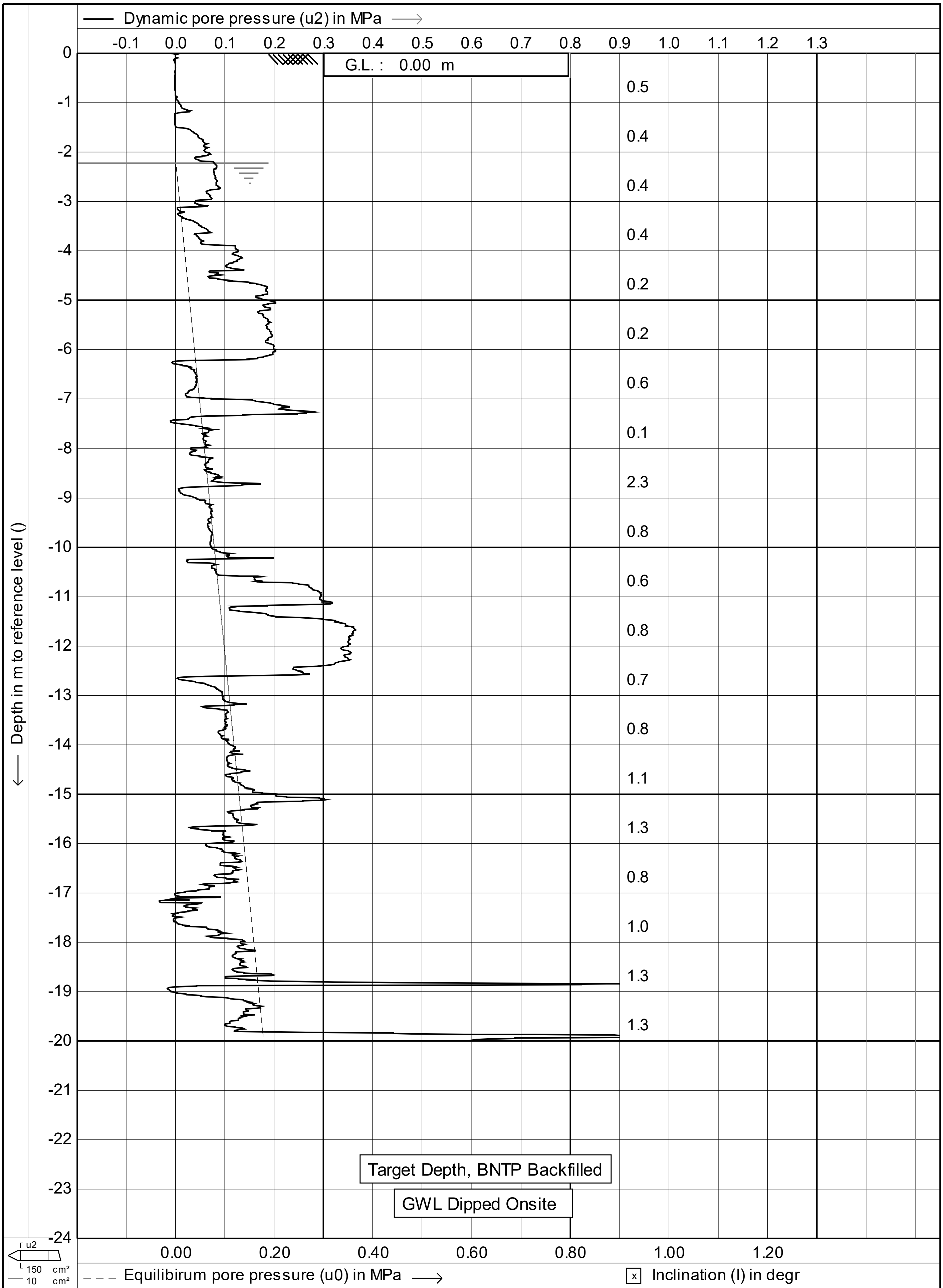
Appendix D: CPT Results



A.S.T.M D5778-12	Date : **19/11/2020**
Project : **Site Investigations**	Cone no. : **C10CFIIP.C14433**
Location: **Washer Rd - Te Puke**	Project no. : **02CMW15**
Position: **0, 0**	CPT no. : **01** **1/14**

PERRY GEOTECH

1.48



A.S.T.M D5778-12

Project : **Site Investigations**

Location: **Washer Rd - Te Puke**

Position: **0, 0**

Date	: **19/11/2020**
Cone no.	: **C10CFIIP.C14433**
Project no. :	**02CMW15**
CPT no.	: **01**

2/14

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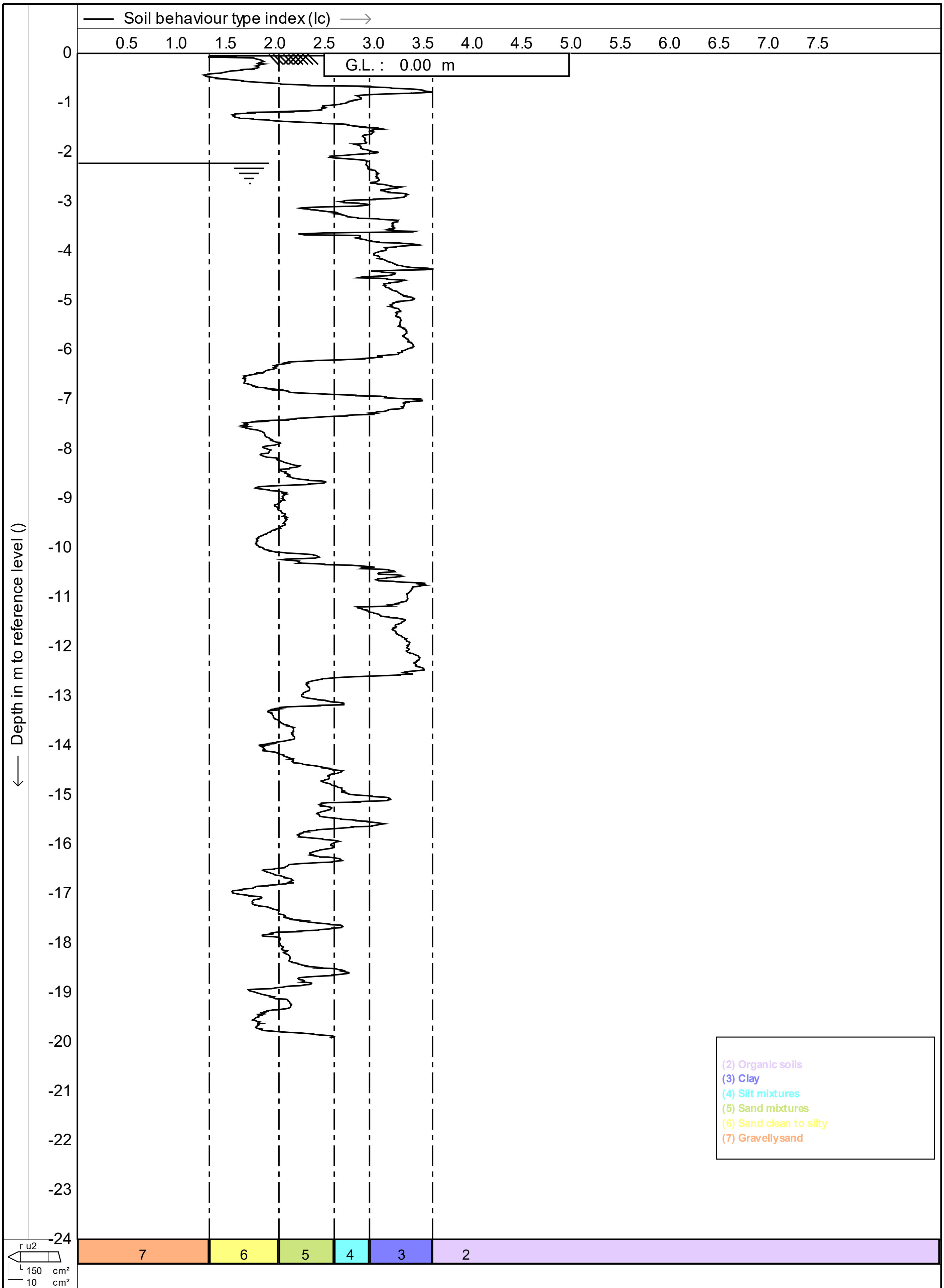

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A.S.T.M D5778-12

Project : **Site Investigations**

Location: **Washer Rd - Te Puke**

Position: **0, 0**

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Project no. :	**02CMW15**
CPT no.	: **01**

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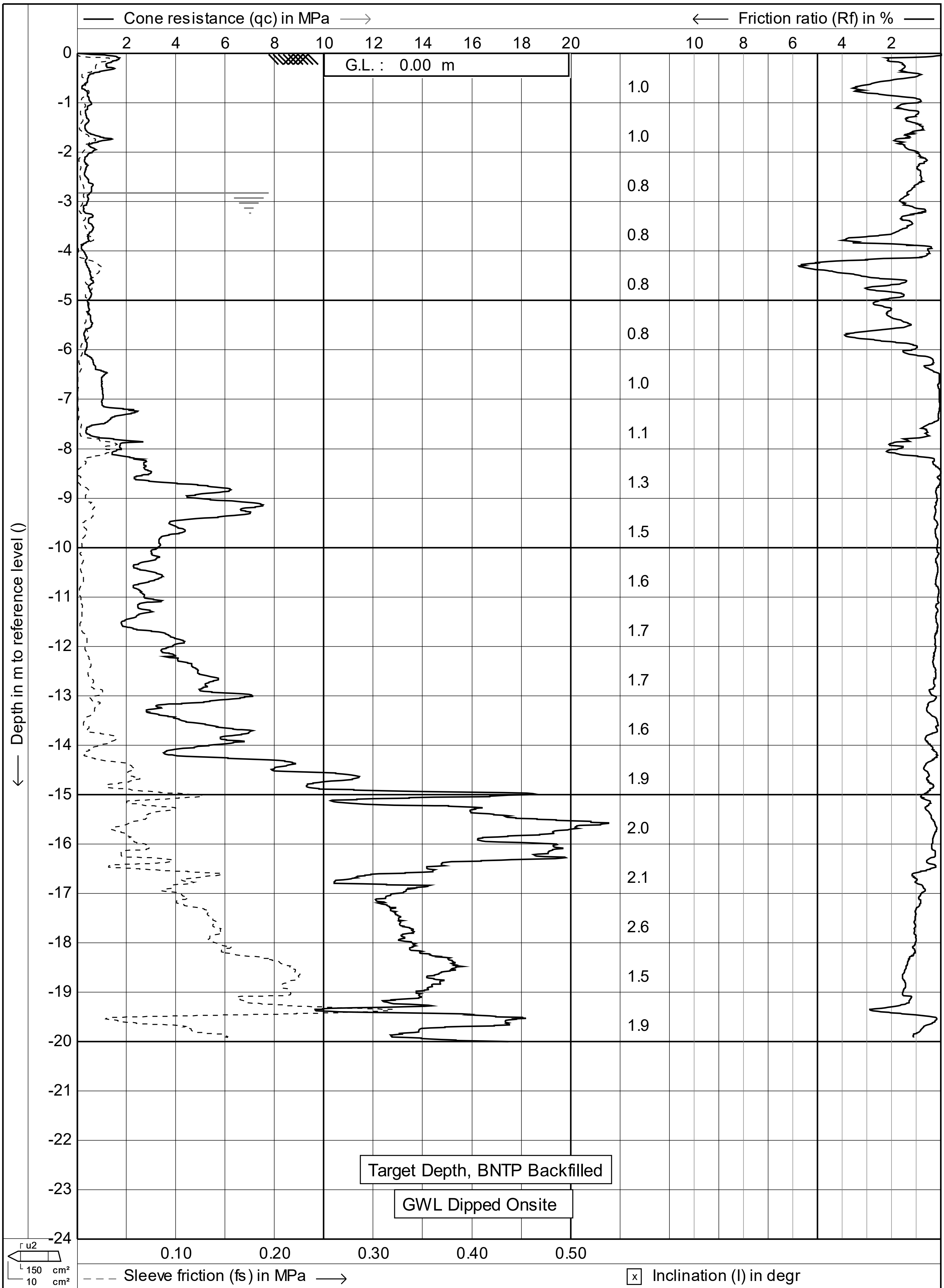

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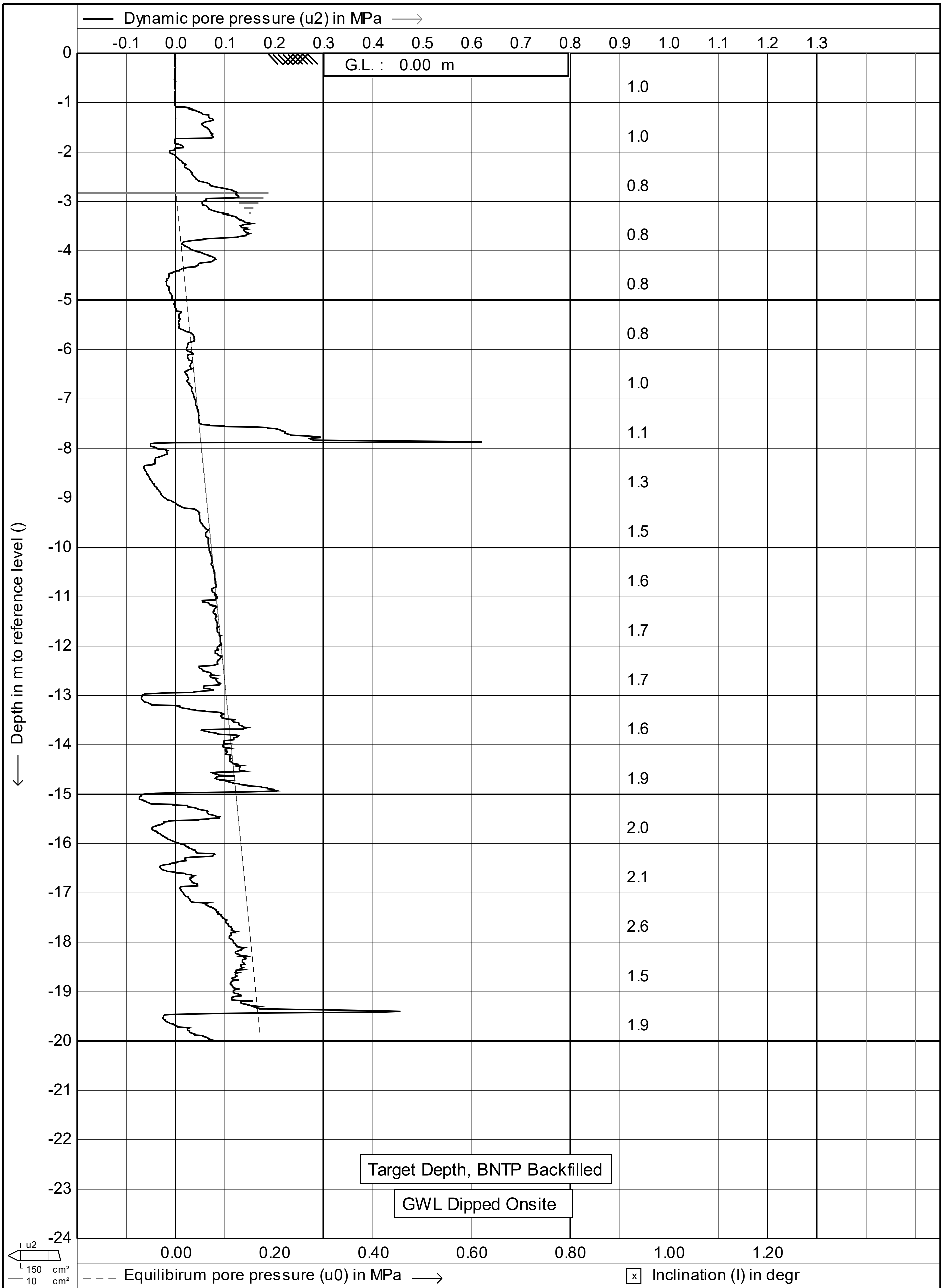

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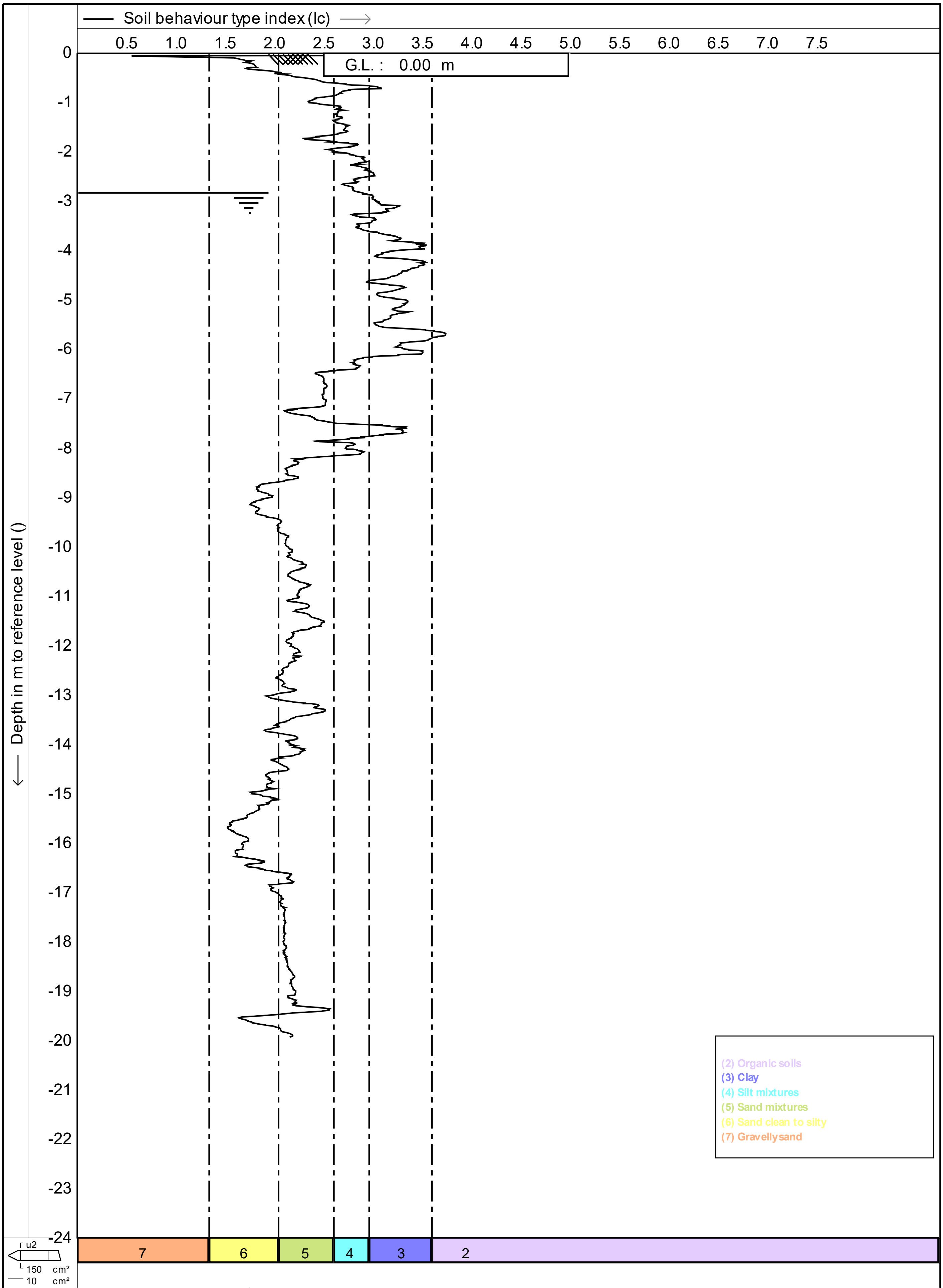

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A.S.T.M D5778-12	Date	: **19/11/2020**
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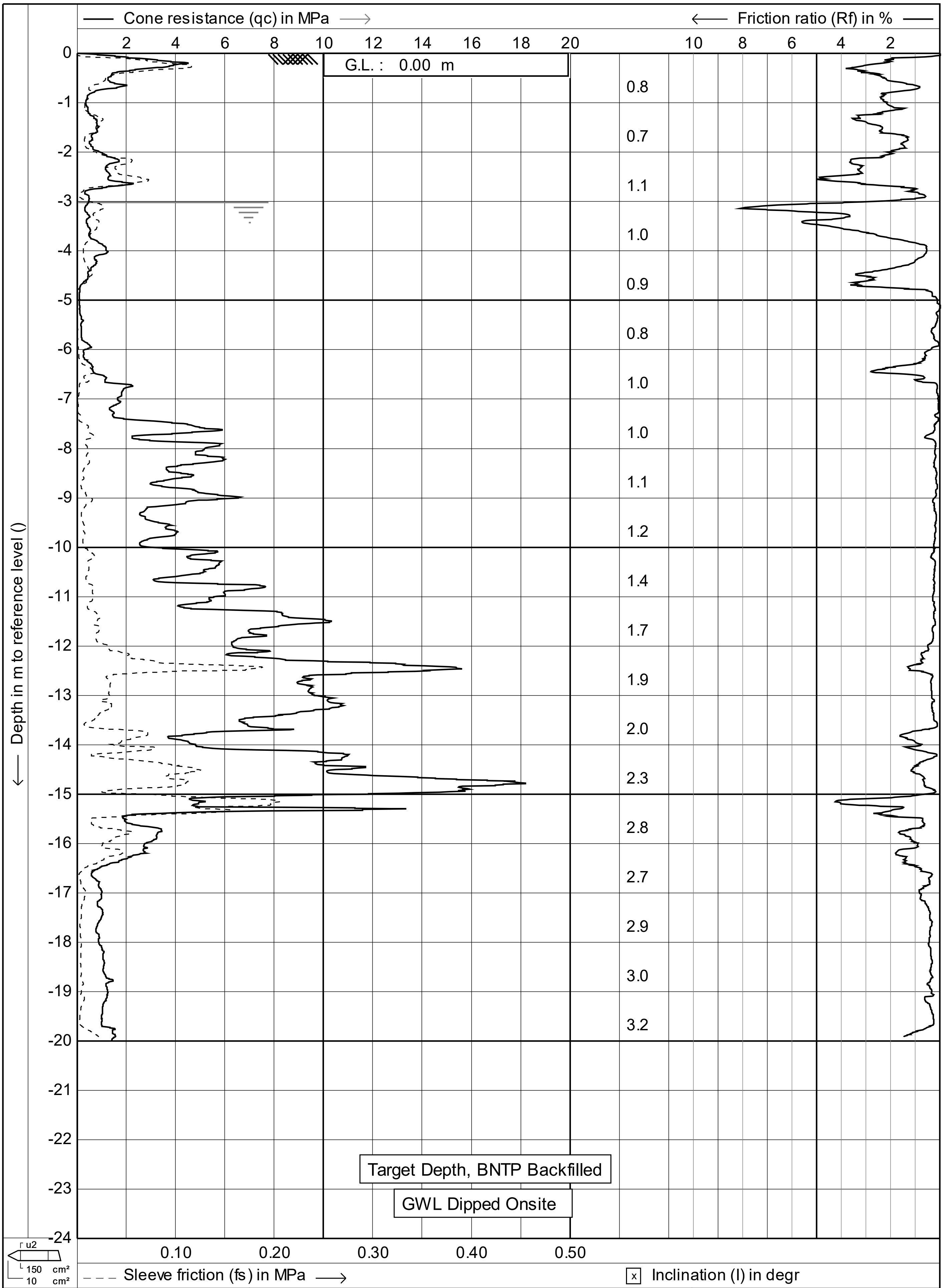

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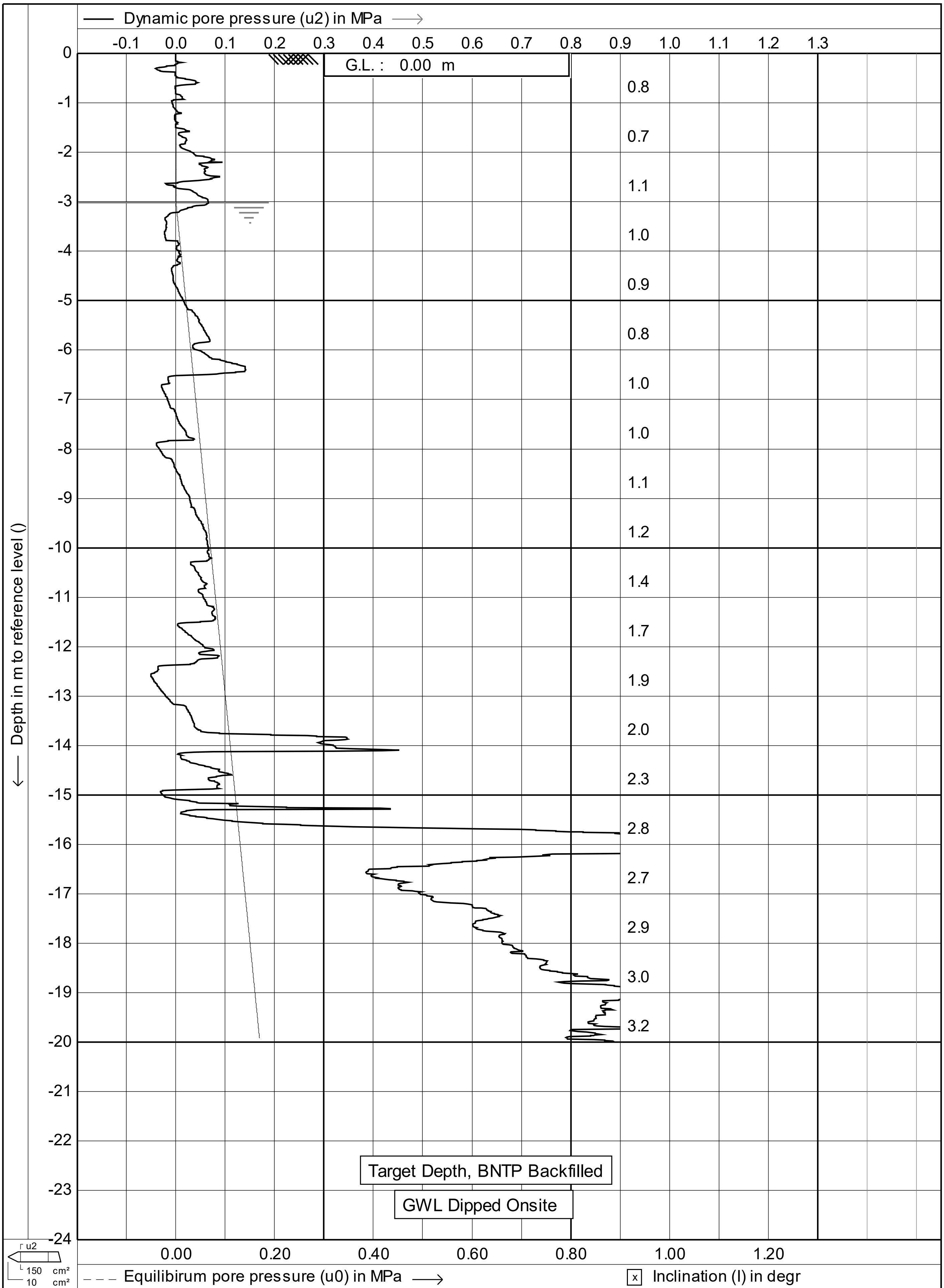

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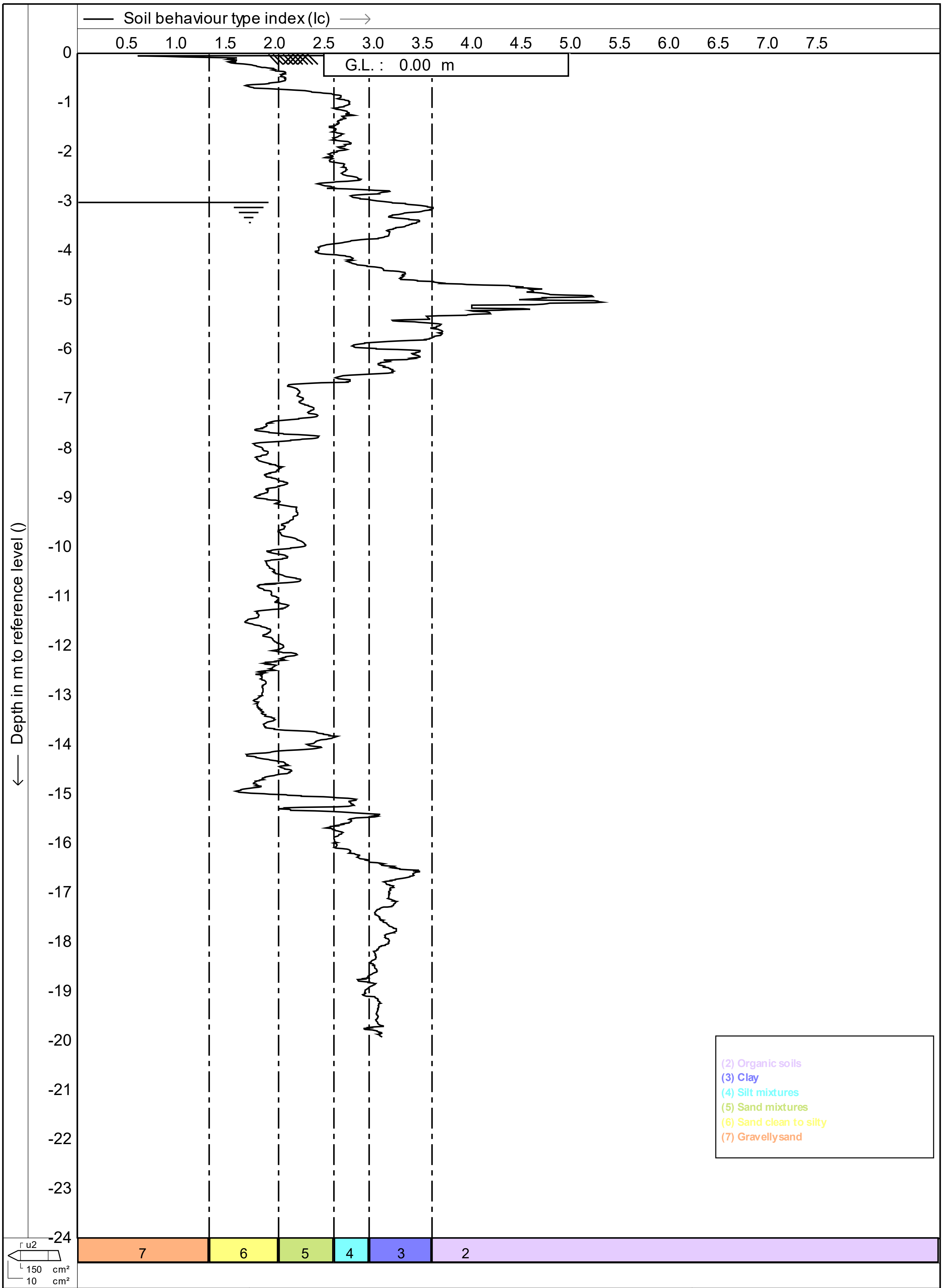

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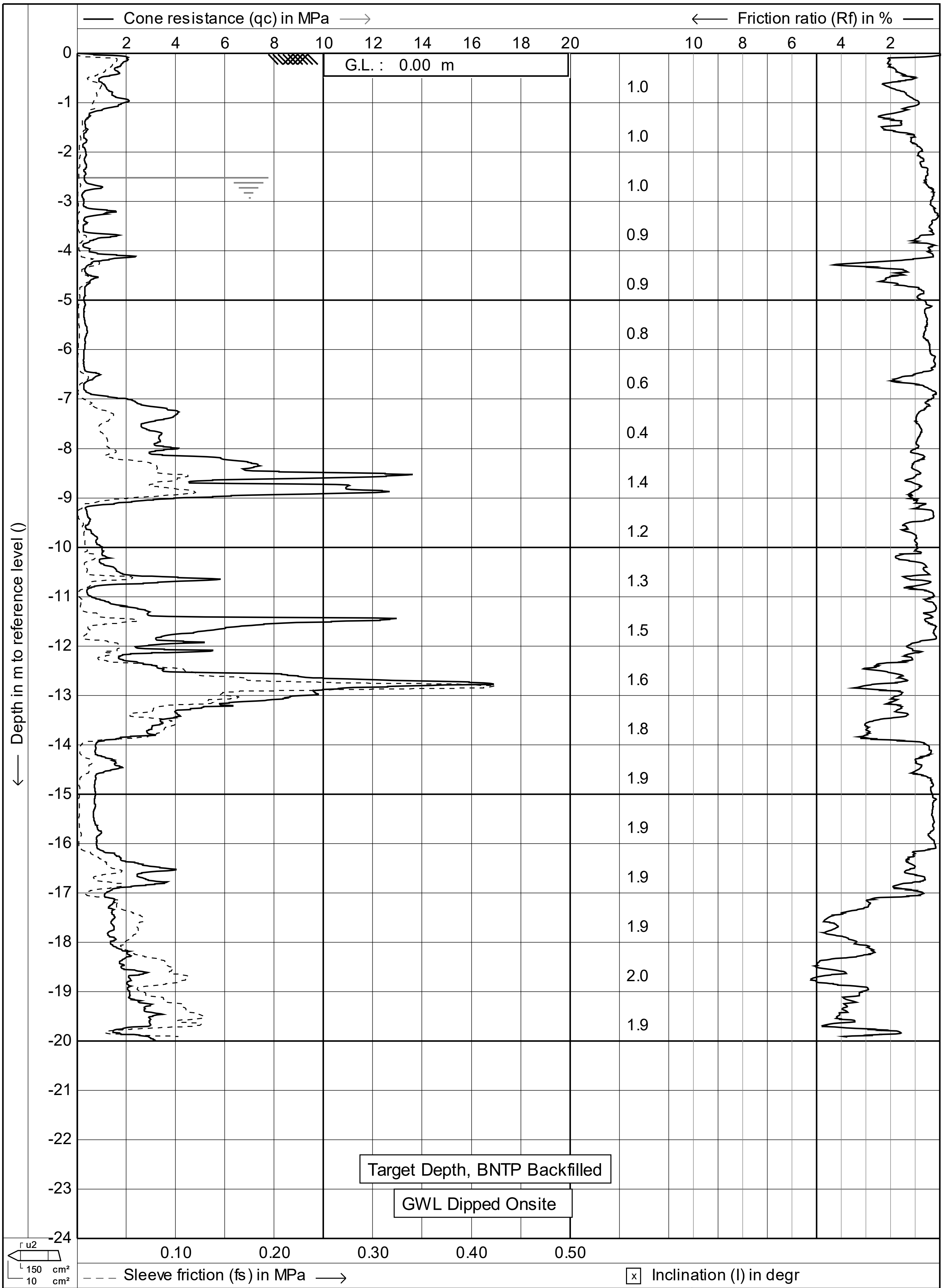

A.S.T.M D5778-12

PERRY GEOTECH

Project	: **Site Investigations**
Location:	**Washer Rd - Te Puke**
Position:	**0, 0**

Date	: **19/11/2020**
Cone no.	: **C10CFIIP.C14433**
Project no. :	**02CMW15**
CPT no.	: **04**
	1/14

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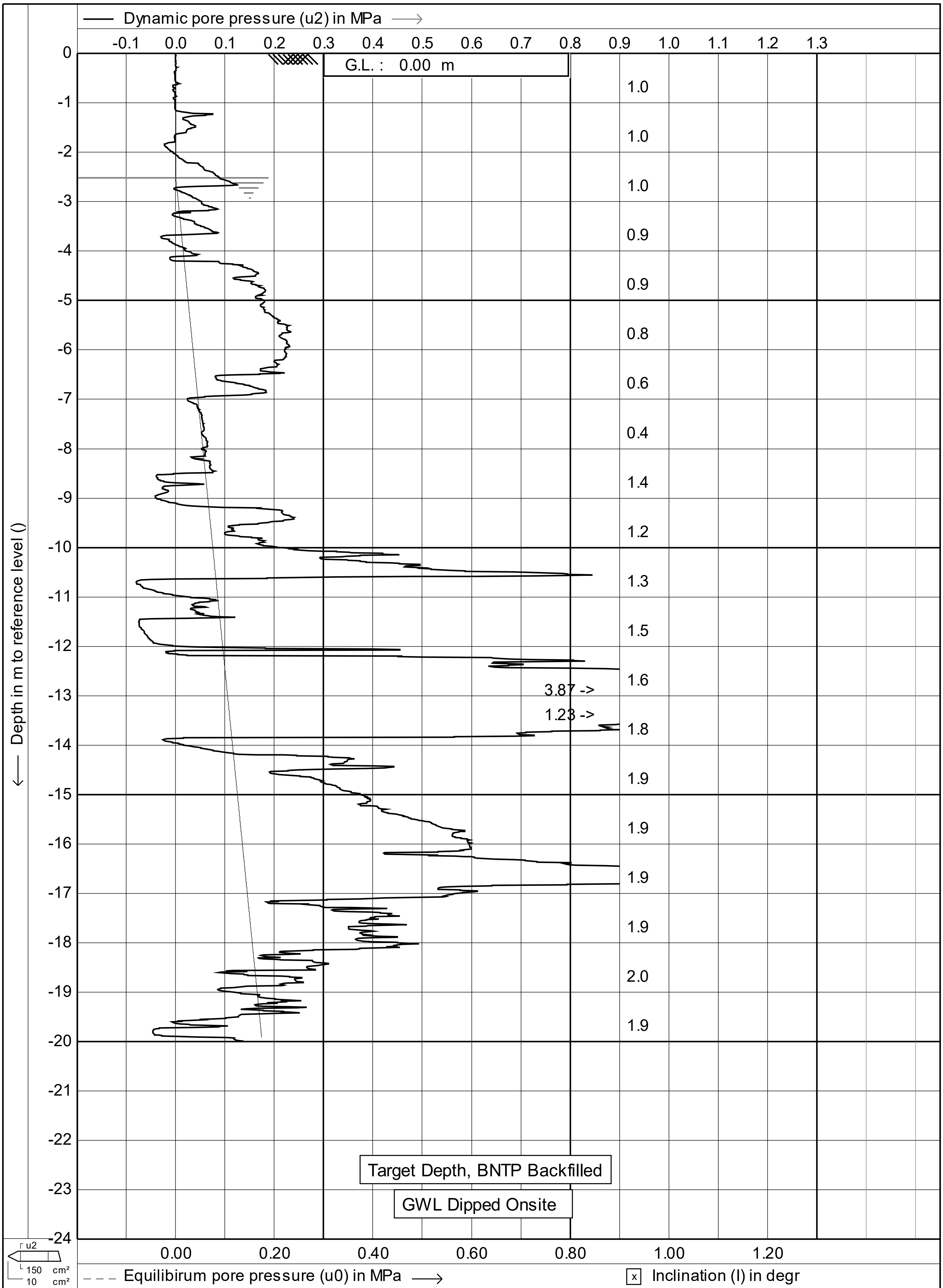

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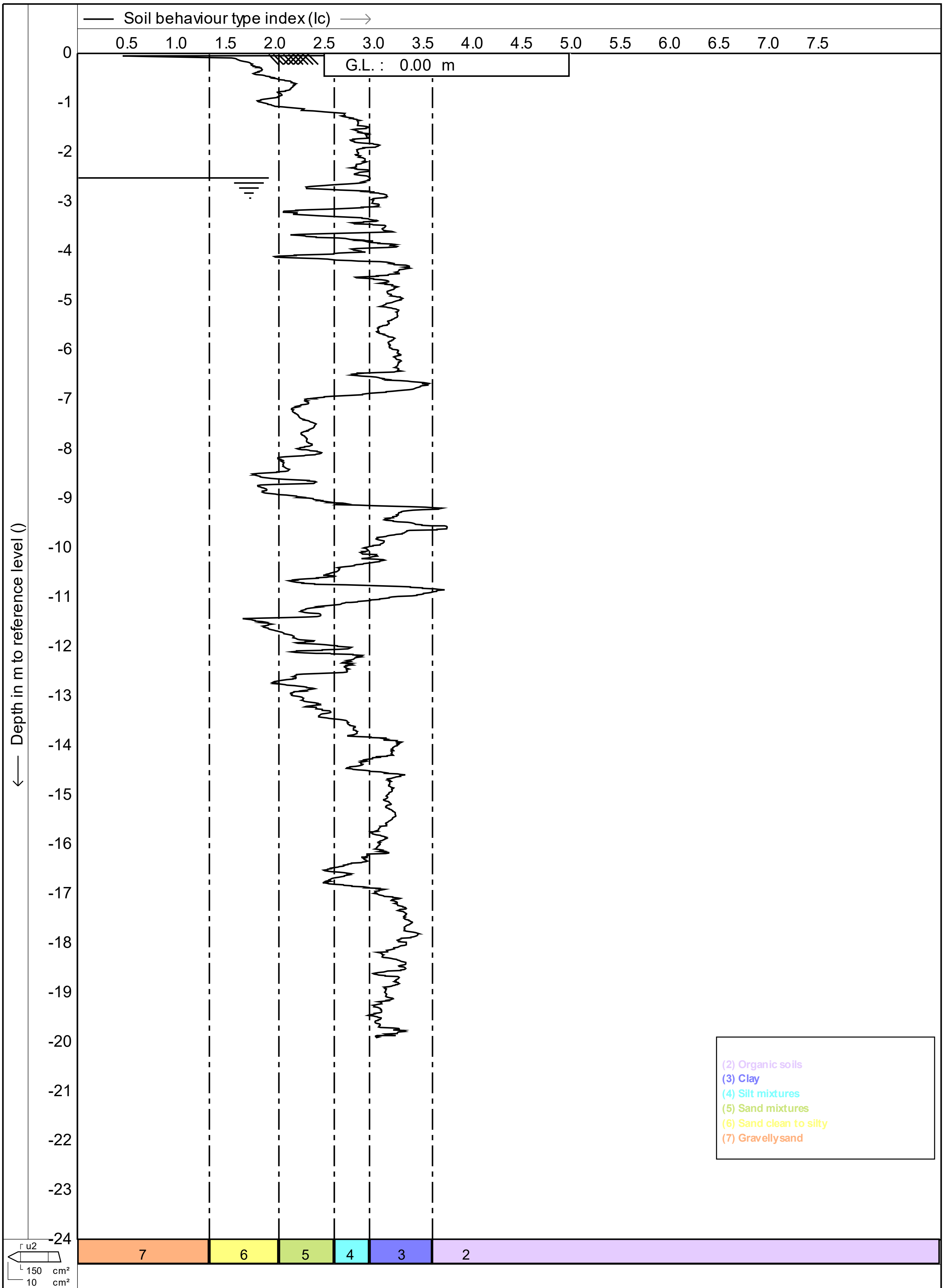

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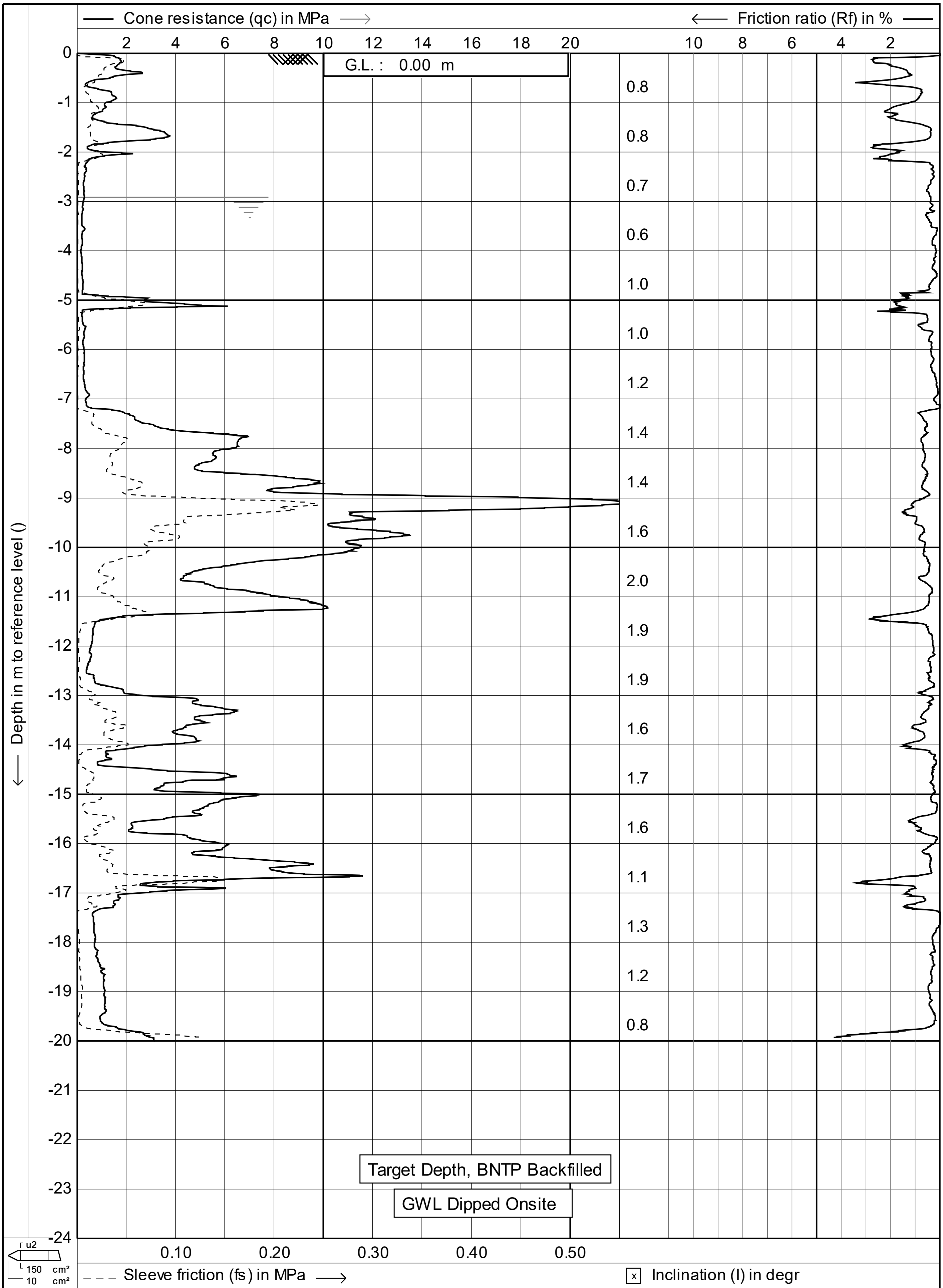

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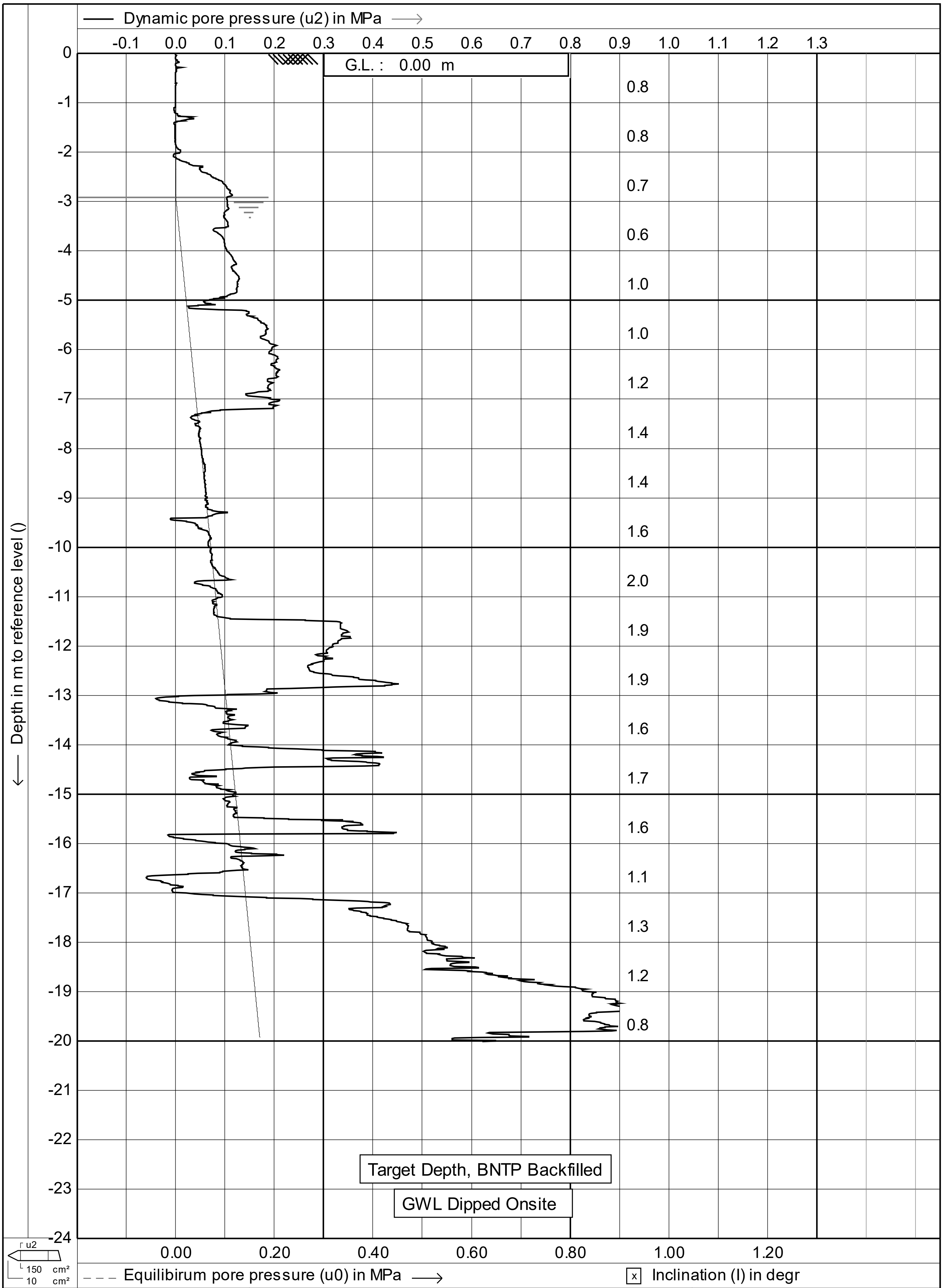

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Project : **Site Investigations**	Date : **19/11/2020**
Location: **Washer Rd - Te Puke**	Cone no. : **C10CFIIP.C14433**
Position: **0, 0**	Project no. : **02CMW15**
	CPT no. : **05** **2/14**

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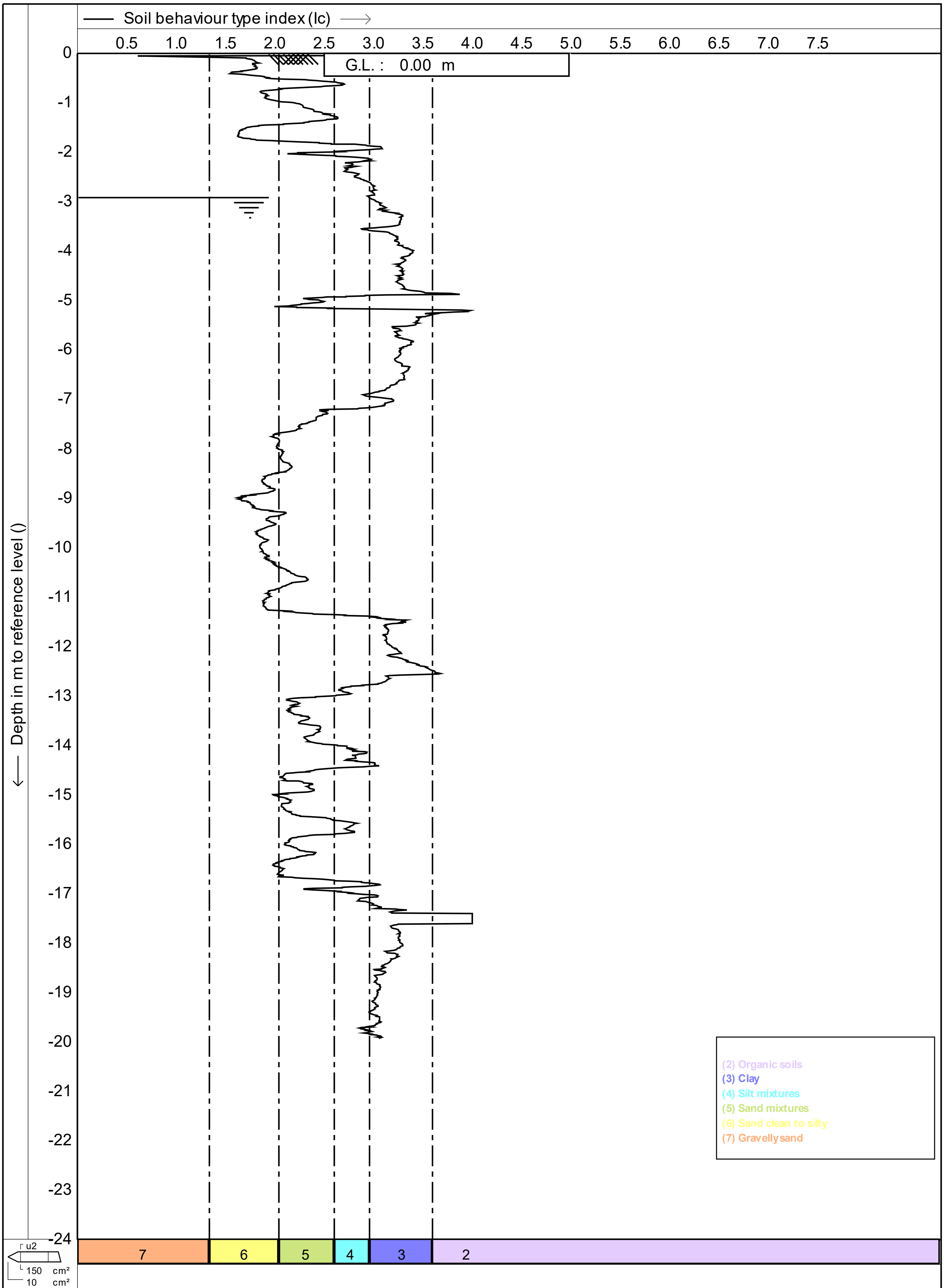

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Project : **Site Investigations**

Location: **Washer Rd - Te Puke**

Position: **0, 0**

Date : **19/11/2020**

Cone no. : **C10CFIIP.C14433**

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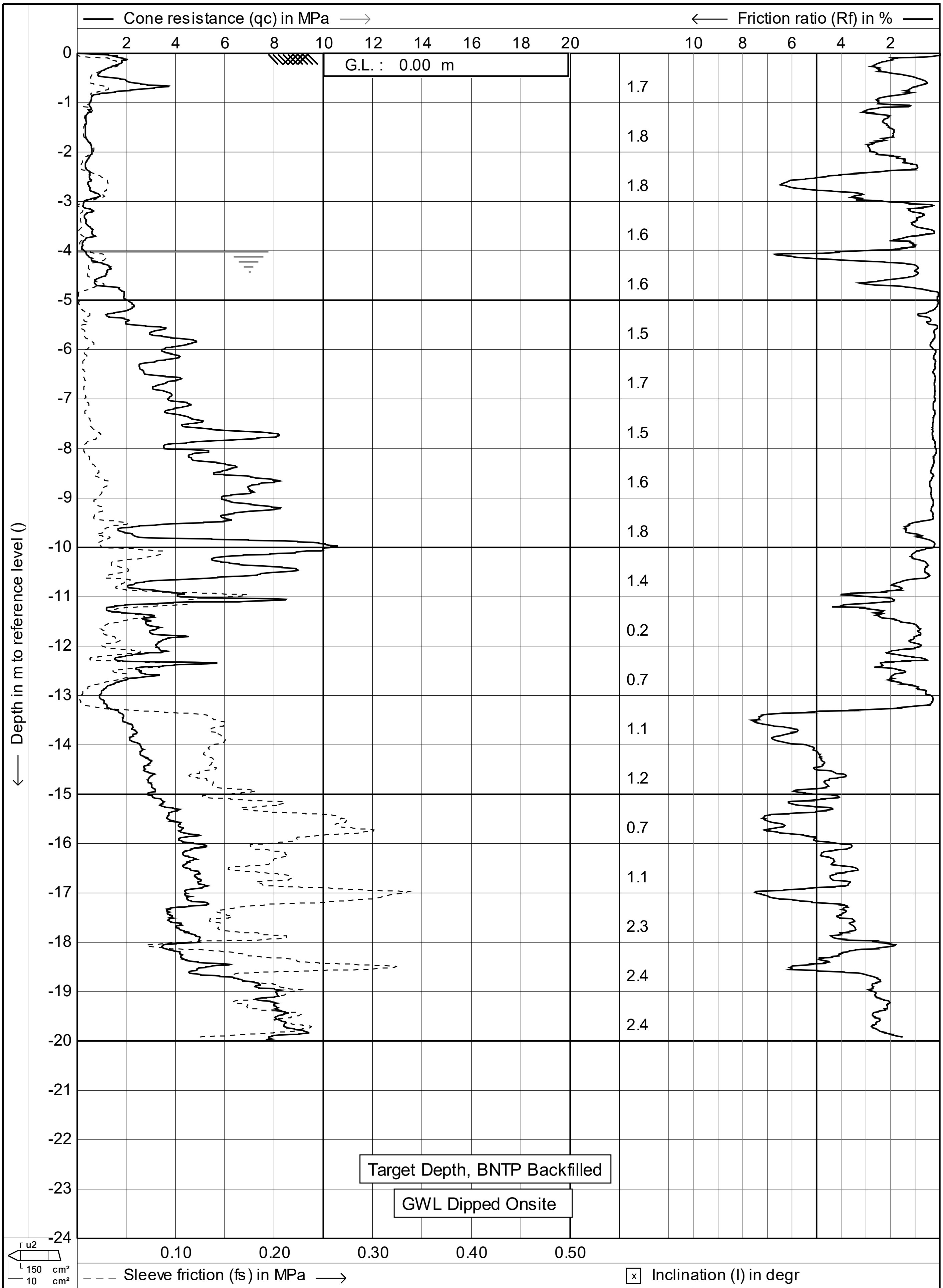

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A.S.T.M D5778-12

Project : **Site Investigations**

Location: **Washer Rd - Te Puke**

Position: **0, 0**

Date	: **19/11/2020**
Cone no.	: **C10CFIIP.C14433**
Project no. :	**02CMW15**
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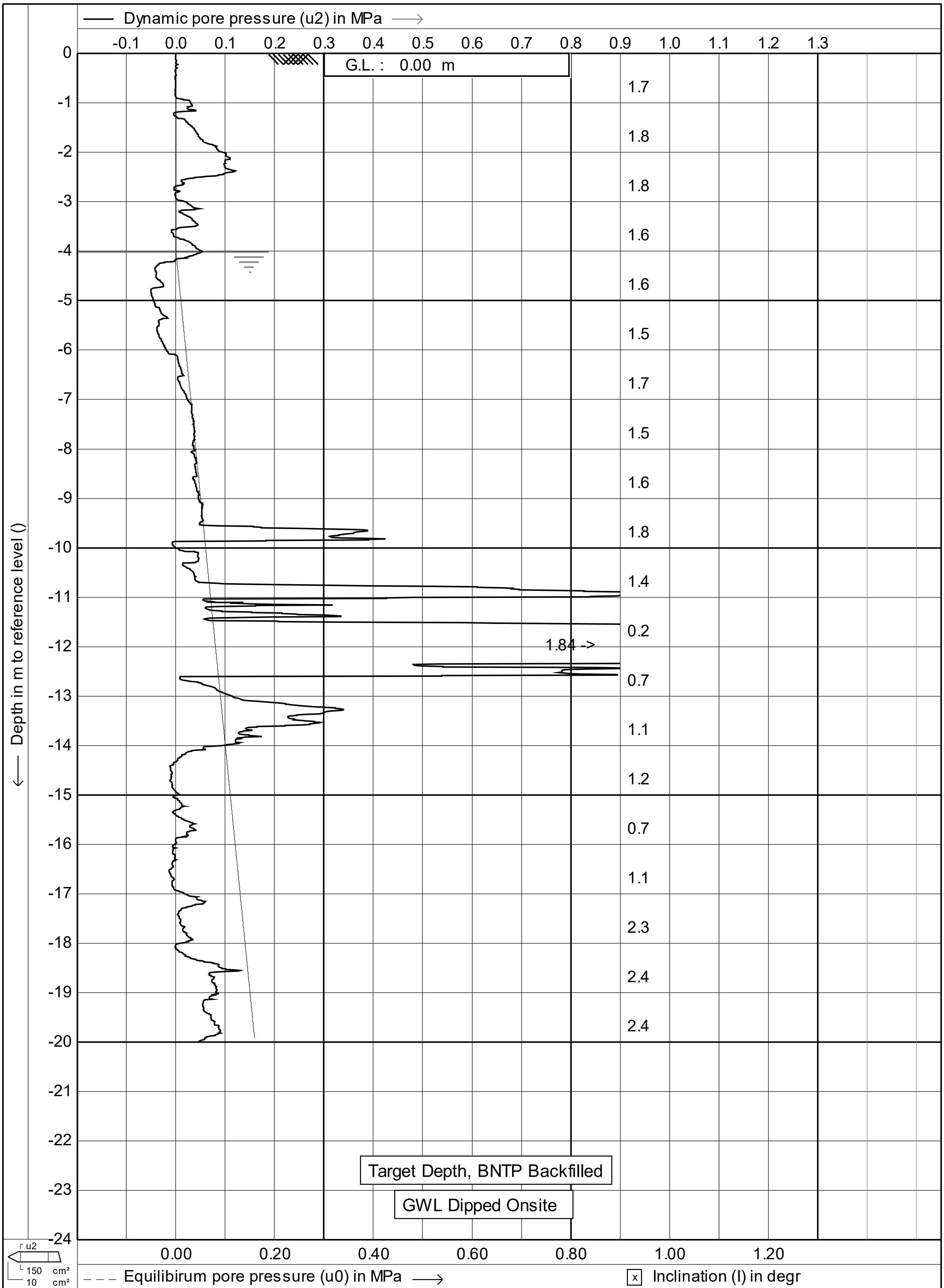

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Project : **Site Investigations**

Location: **Washer Rd - Te Puke**

Position: **0, 0**

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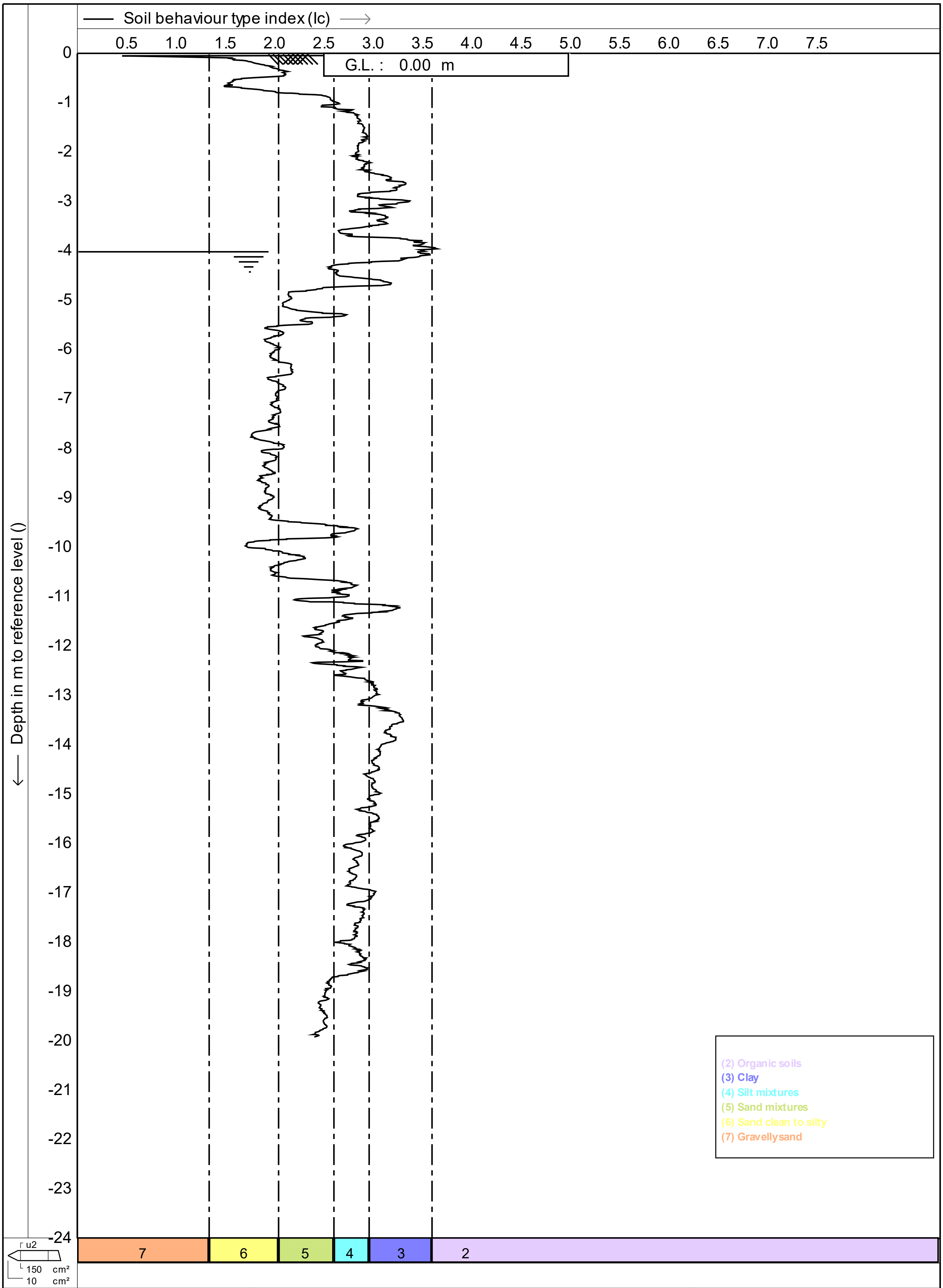

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A.S.T.M D5778-12

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Location: **Washer Rd - Te Puke**

Position: **0, 0**

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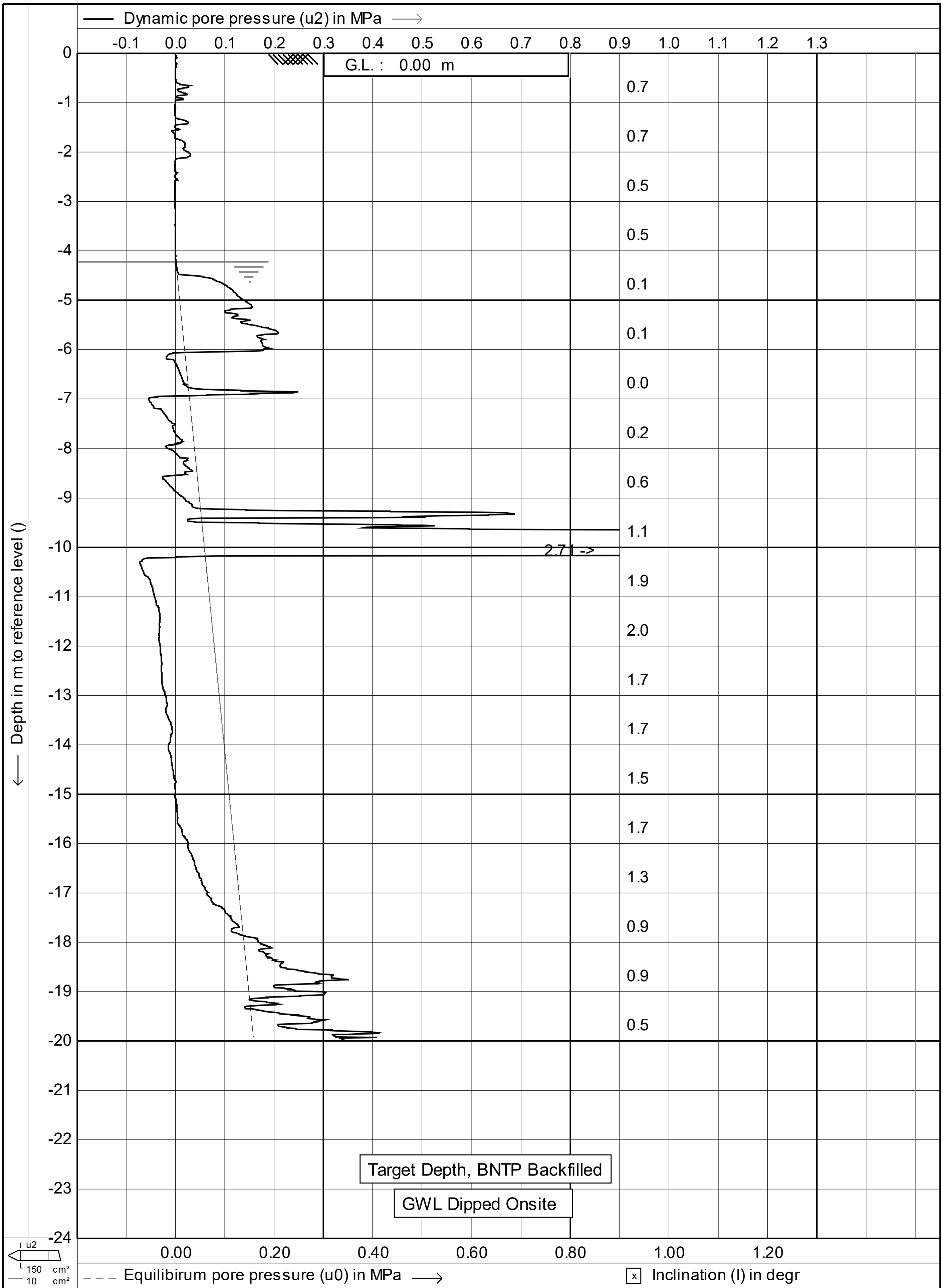
Project no. : **02CMW15**

CPT no. : **06**

9/14



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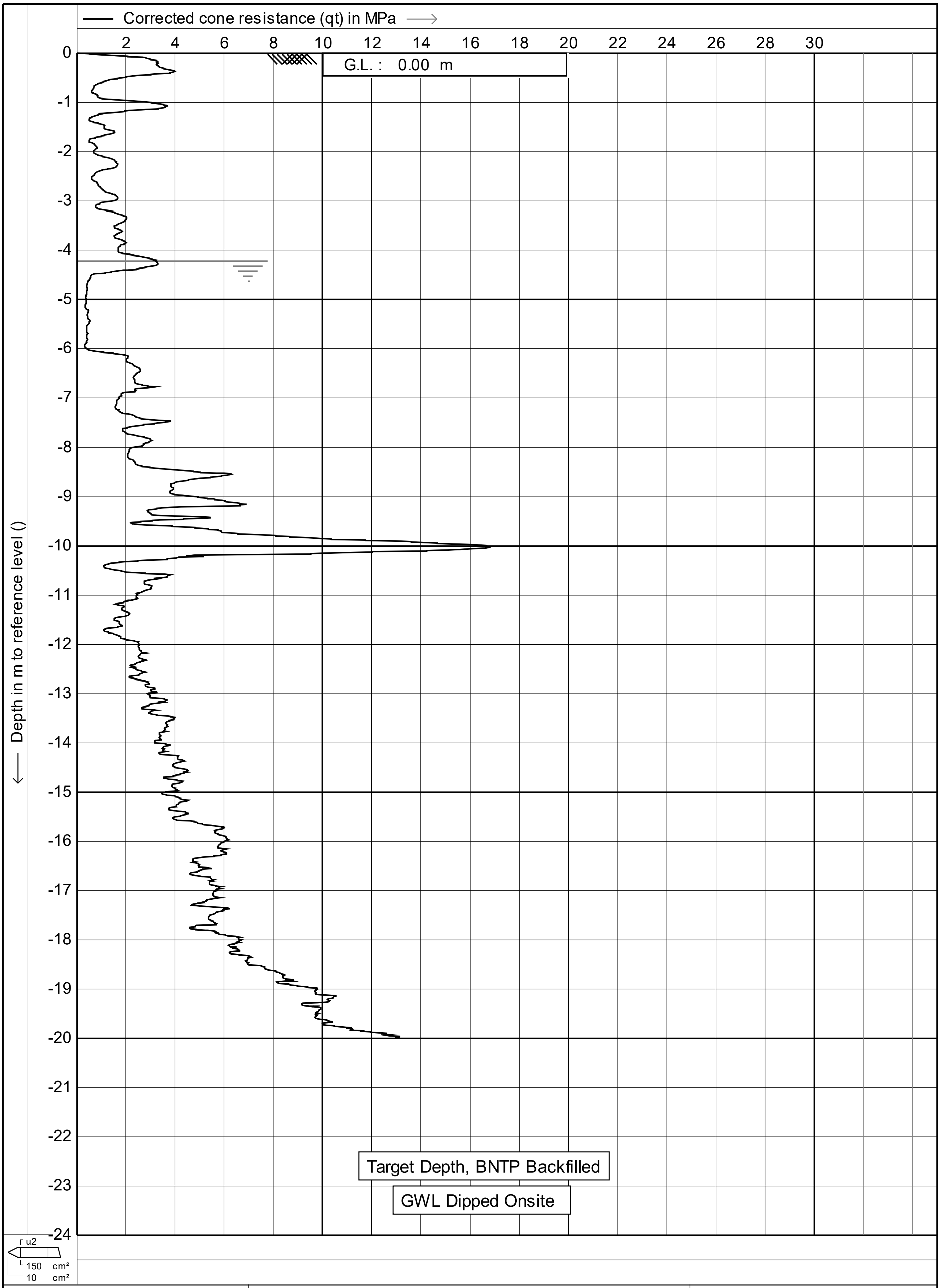
	Location: **Washer Rd - Te Puke**	Project no. : **02CMW15**
	Position: **0, 0**	CPT no. : **07** **2/14**



PERRY GEOTECH

A.S.T.M D5778-12

Project : **Site Investigations**
Location: **Washer Rd - Te Puke**
Position: **0, 0**

Date	: **19/11/2020**
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Project no.	: **02CMW15**
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3/14

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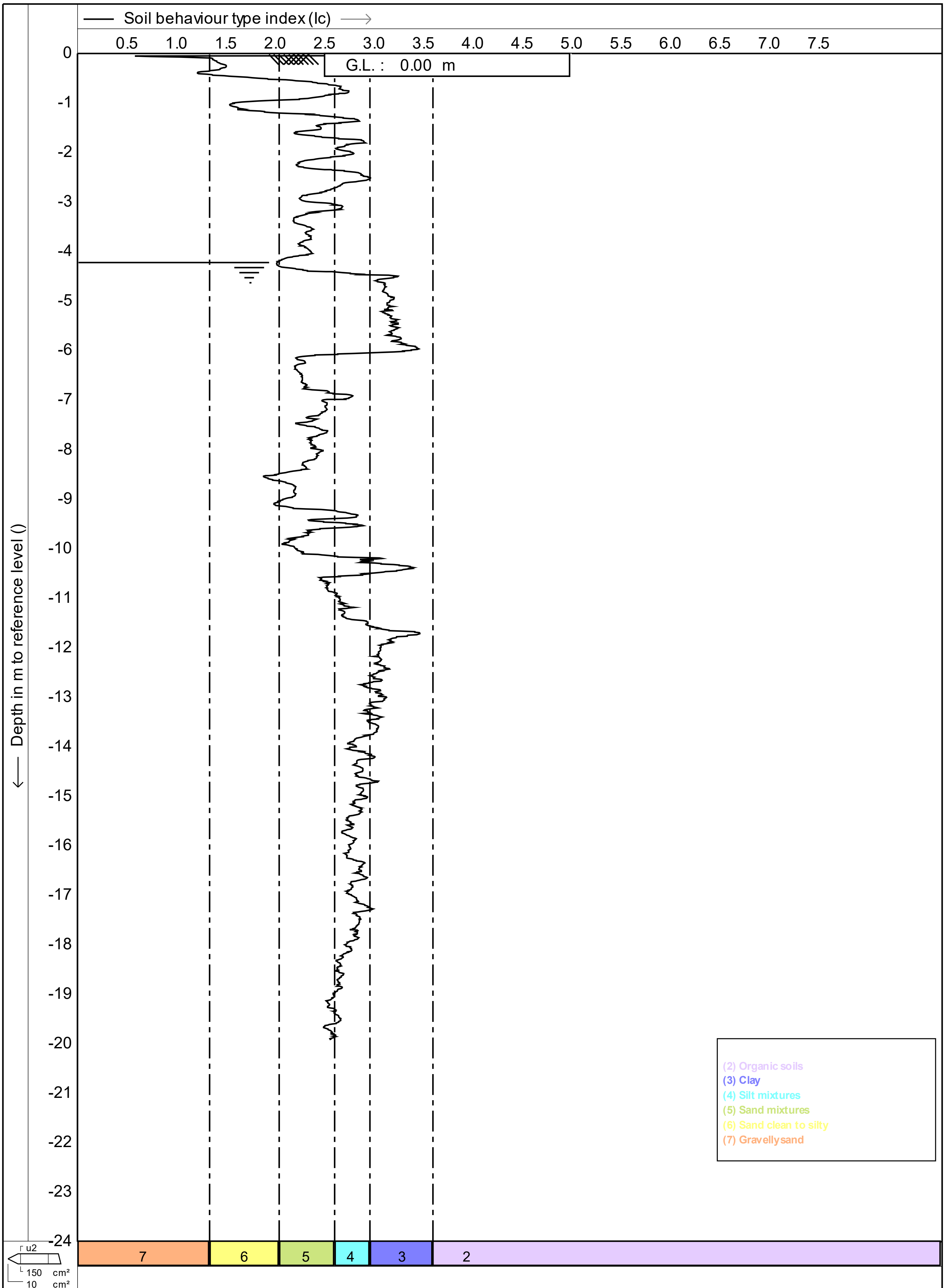

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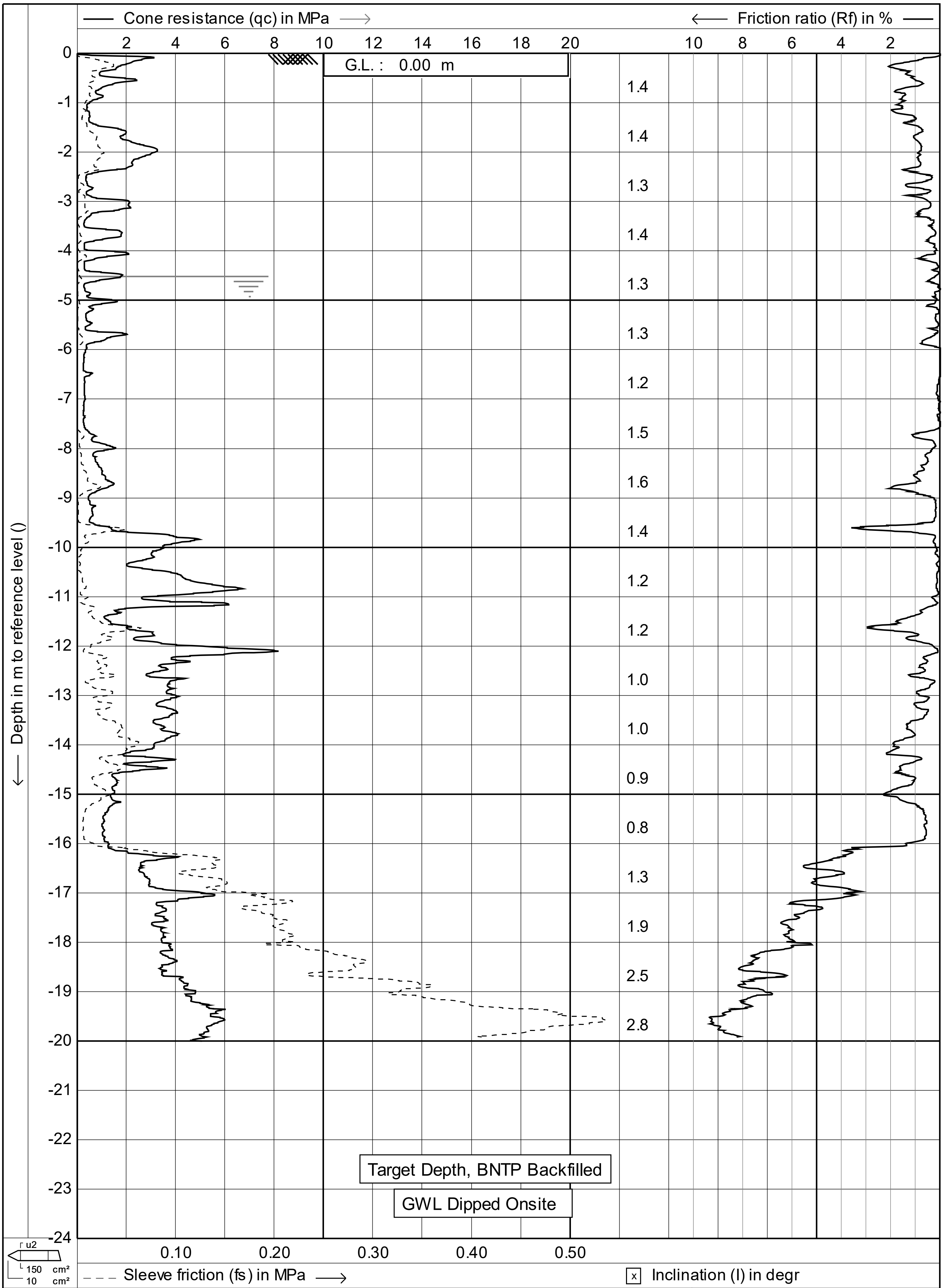
	Project : **Site Investigations**	Cone no. : **C10CFIIP.C14433**
	Location: **Washer Rd - Te Puke**	Project no. : **02CMW15**
	Position: **0, 0**	CPT no. : **07** — **9/14**

1.48



PERRY GEOTECH

A.S.T.M D5778-12

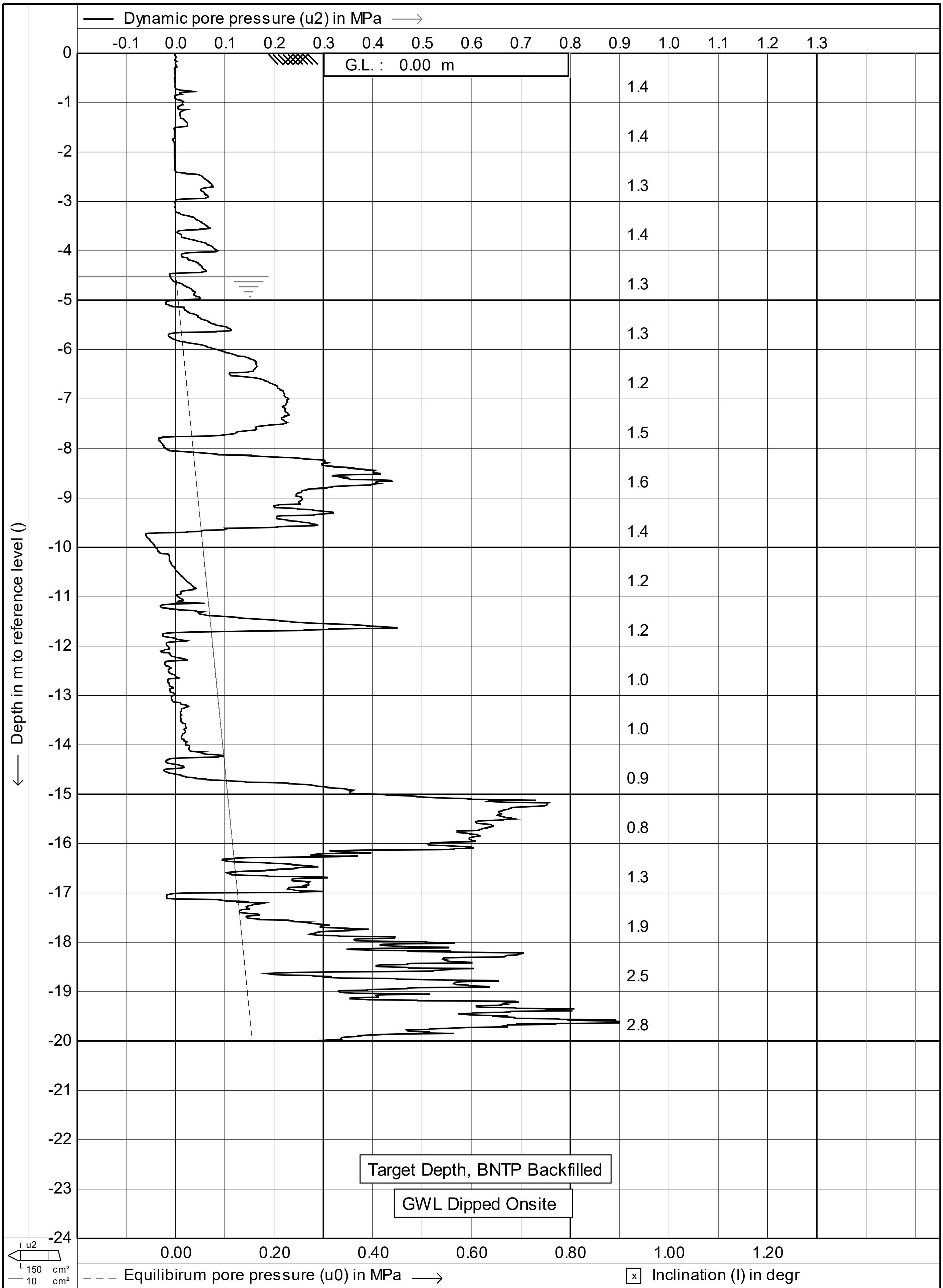
Project : **Site Investigations**

Location: **Washer Rd - Te Puke**

Position: **0, 0**

Date	: **19/11/2020**
Cone no.	: **C10CFIIP.C14433**
Project no.	: **02CMW15**
CPT no.	: **08** **1/14**

1.48



PERRY GEOTECH	A.S.T.M D5778-12	Date : **19/11/2020**
	Project : **Site Investigations**	Cone no. : **C10CFIIP.C14433**
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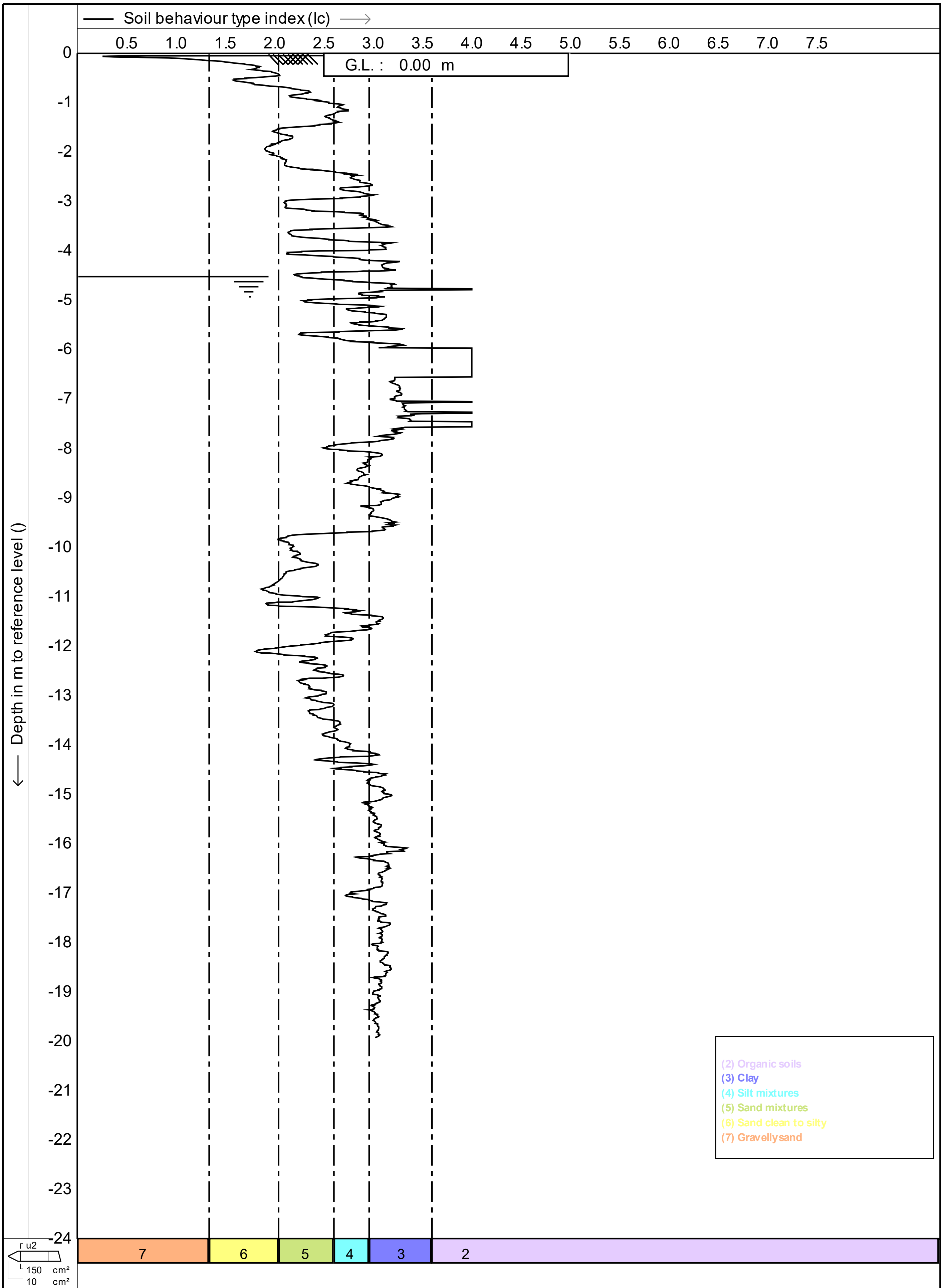
	Position: **0, 0**	CPT no. : **08** — **2/14**

1.48



PERRY GEOTECH

A.S.T.M D5778-12

Project : **Site Investigations**

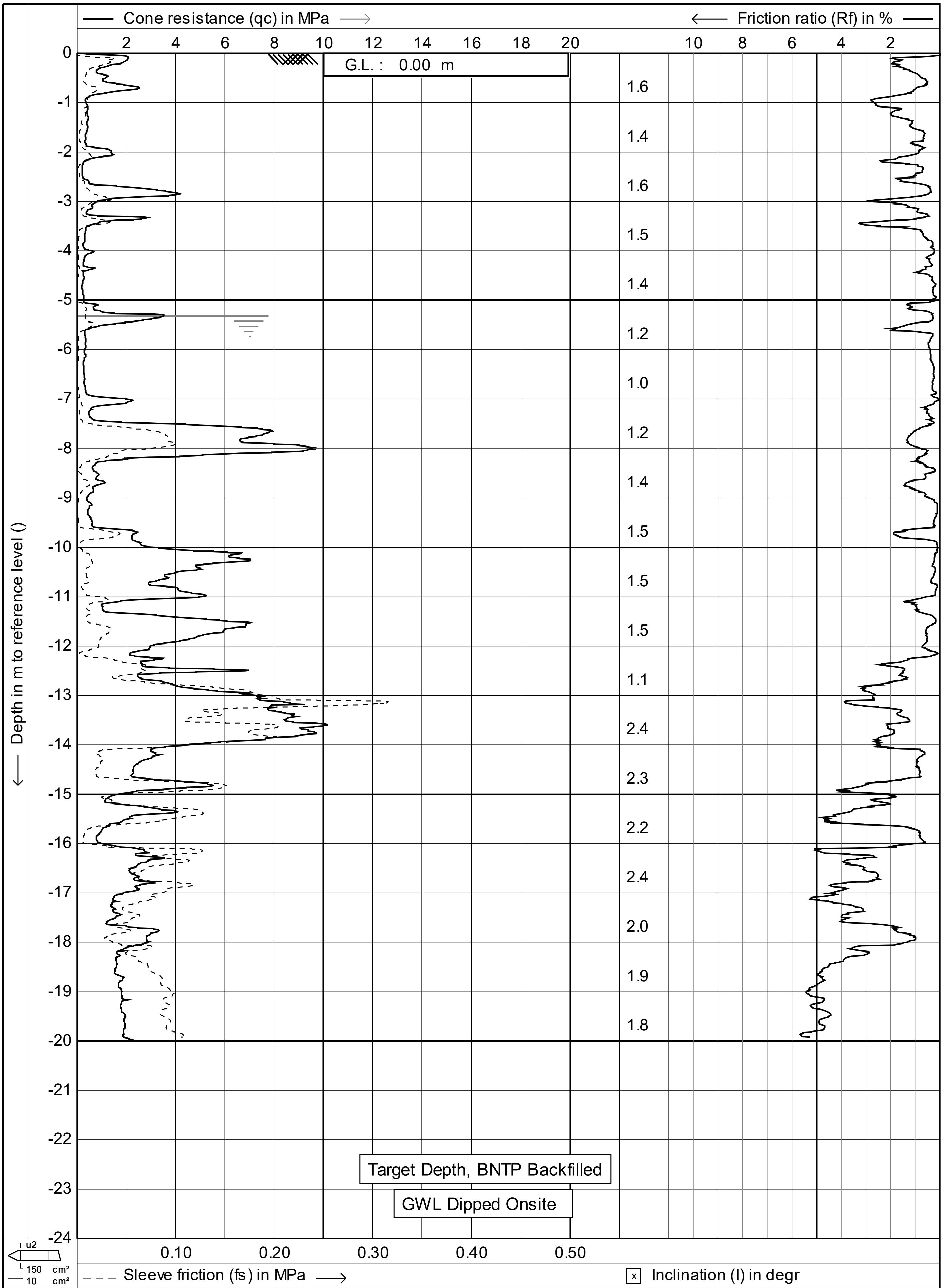
Location: **Washer Rd - Te Puke**

Position: **0, 0**

Date	: **19/11/2020**
Cone no.	: **C10CFIIP.C14433**
Project no. :	**02CMW15**
CPT no.	: **08**

9/14

1.48

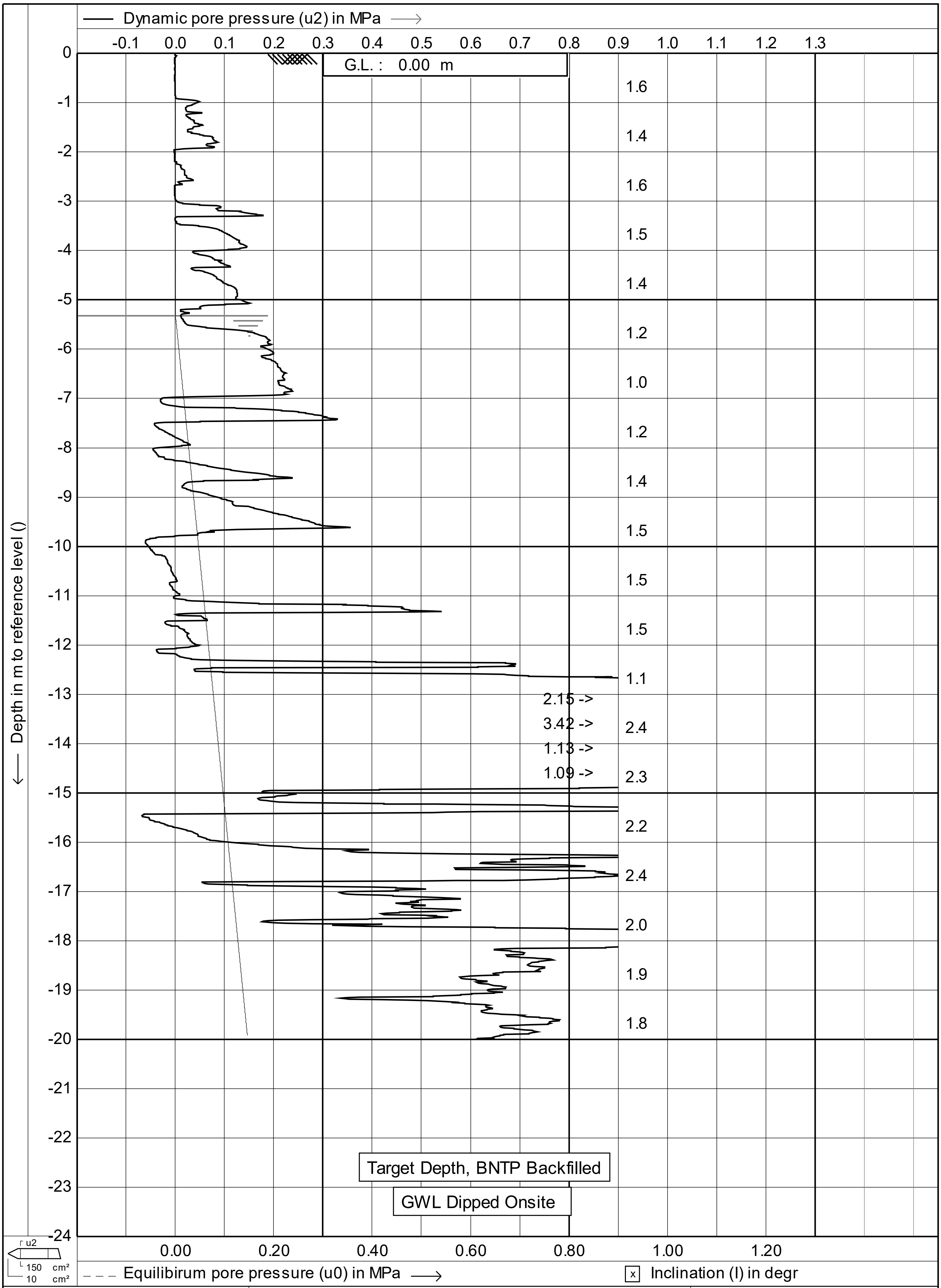


1.48

PERRY GEOTECH

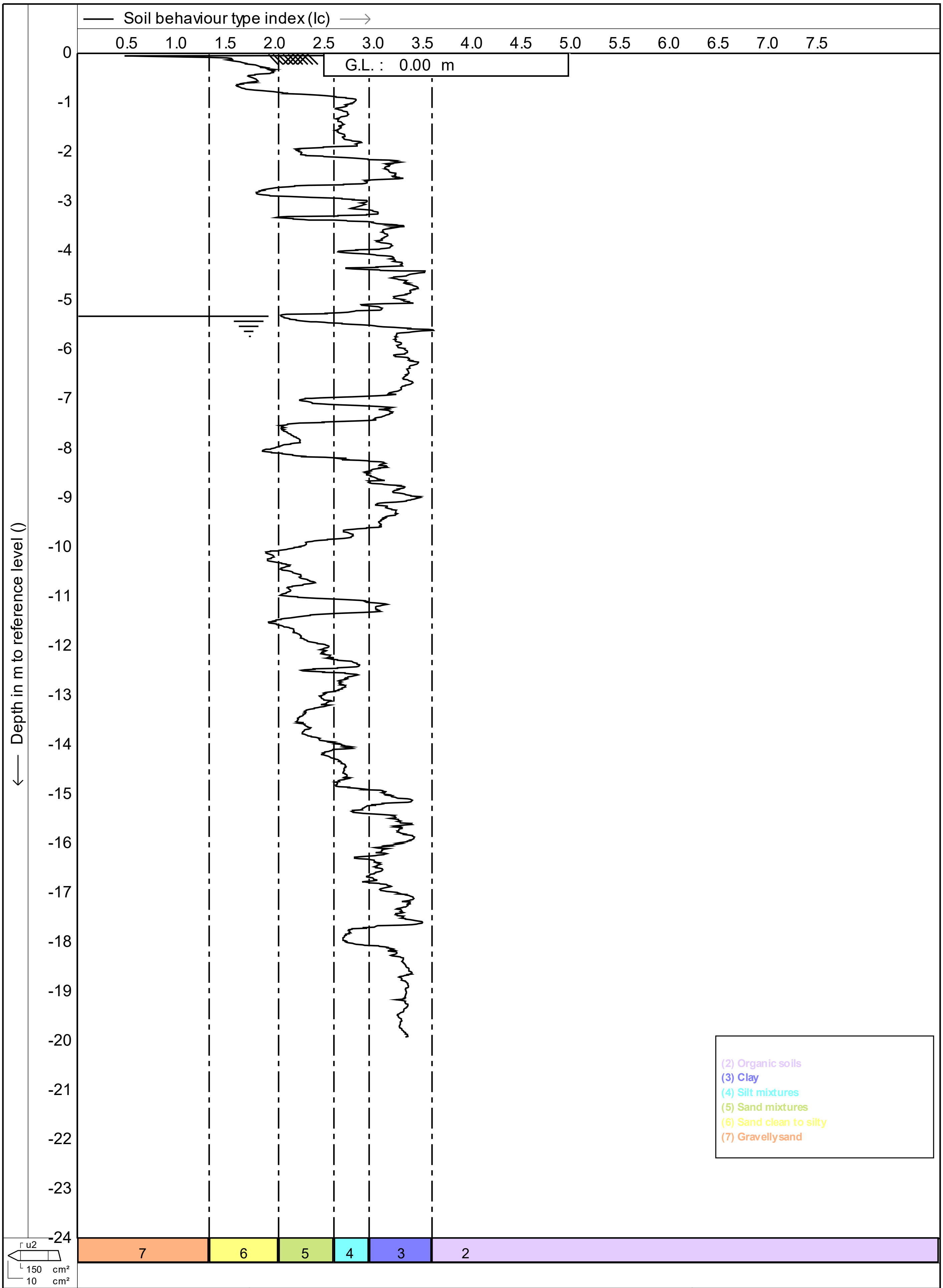
A.S.T.M D5778-12

Project : **Site Investigations**	Date : **19/11/2020**	
Location: **Washer Rd - Te Puke**	Cone no. : **C10CFIIP.C14433**	
Position: **0, 0**	Project no. : **02CMW15**	
	CPT no. : **09**	**1/14**



1.48

PERRY GEOTECH	A.S.T.M D5778-12	Date : **19/11/2020**	
	Project : **Site Investigations**	Cone no. : **C10CFIIP.C14433**	
	Location: **Washer Rd - Te Puke**	Project no. : **02CMW15**	
	Position: **0, 0**	CPT no. : **09**	**2/14**



A.S.T.M D5778-12

Project : **Site Investigations**

Location: **Washer Rd - Te Puke**

Position: **0, 0**

Date : **19/11/2020**

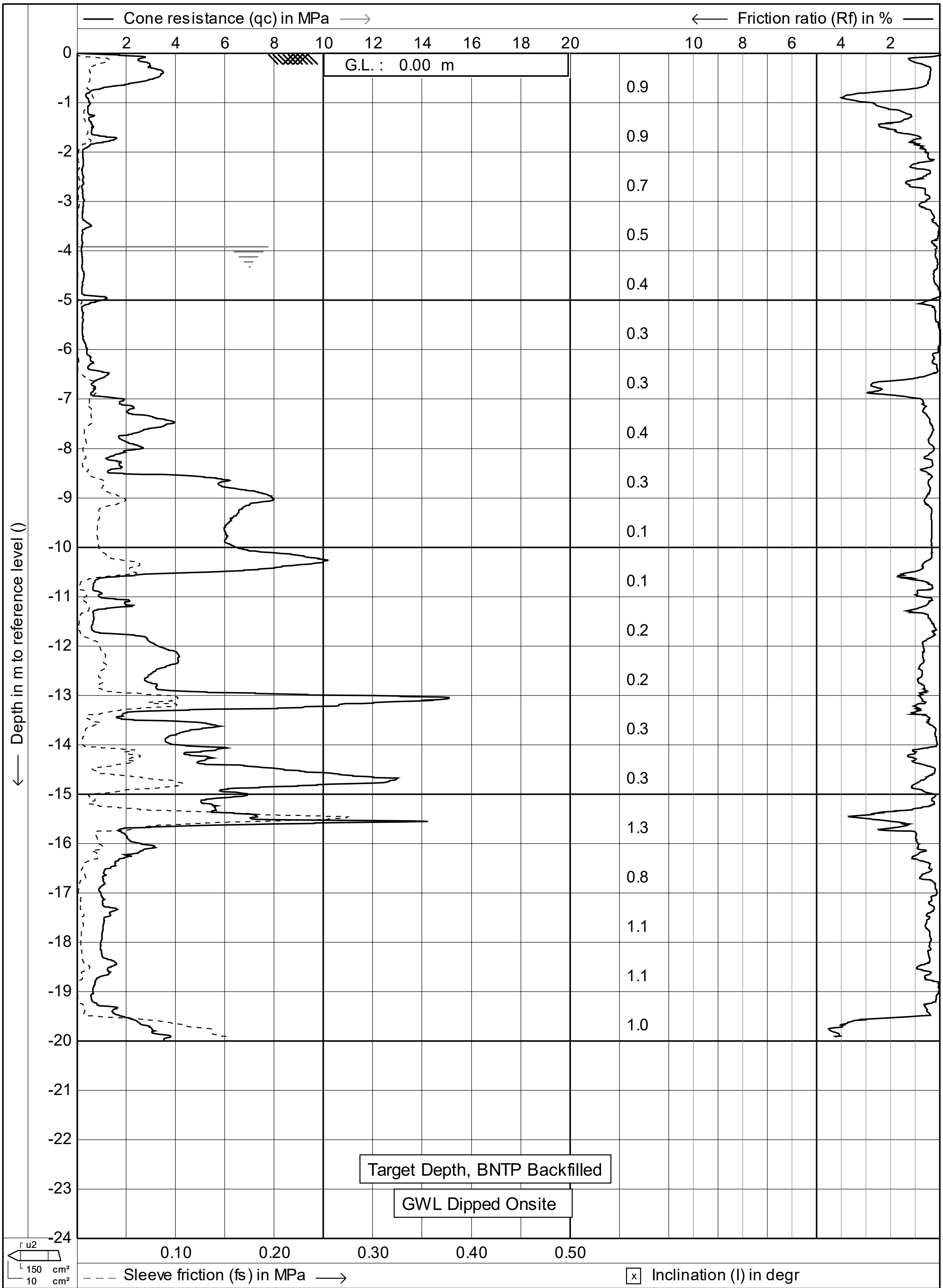
Cone no. : **C10CFIIP.C14433**

Project no. : **02CMW15**

CPT no. : **09**

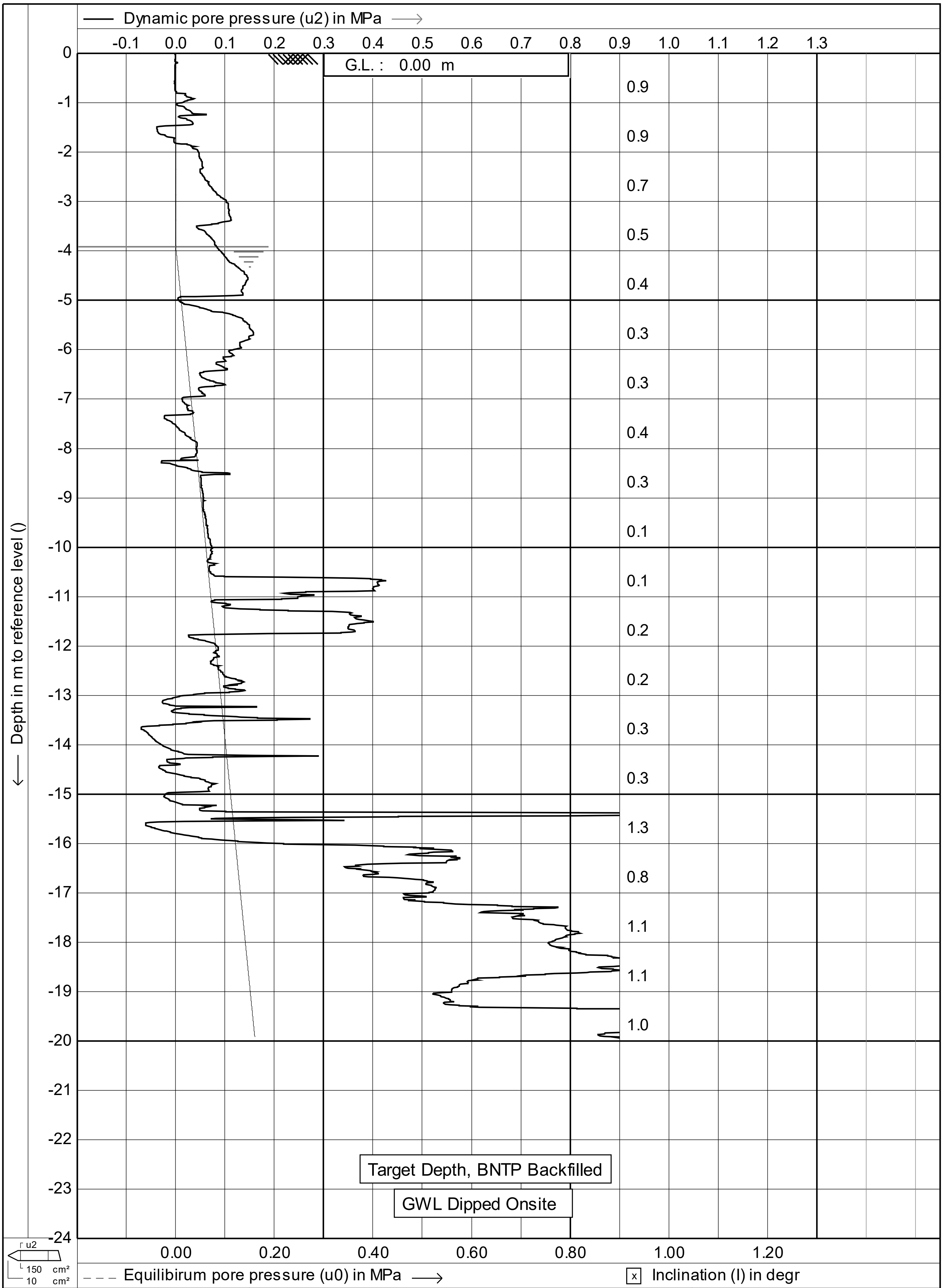
9/14

1.48



PERRY GEOTECH	A.S.T.M D5778-12	Date : **19/11/2020**
	Project : **Site Investigations**	Cone no. : **C10CFIIP.C14433**
	Location: **Washer Rd - Te Puke**	Project no. : **02CMW15**
	Position: **0, 0**	CPT no. : **10** — **1/14**

1.48



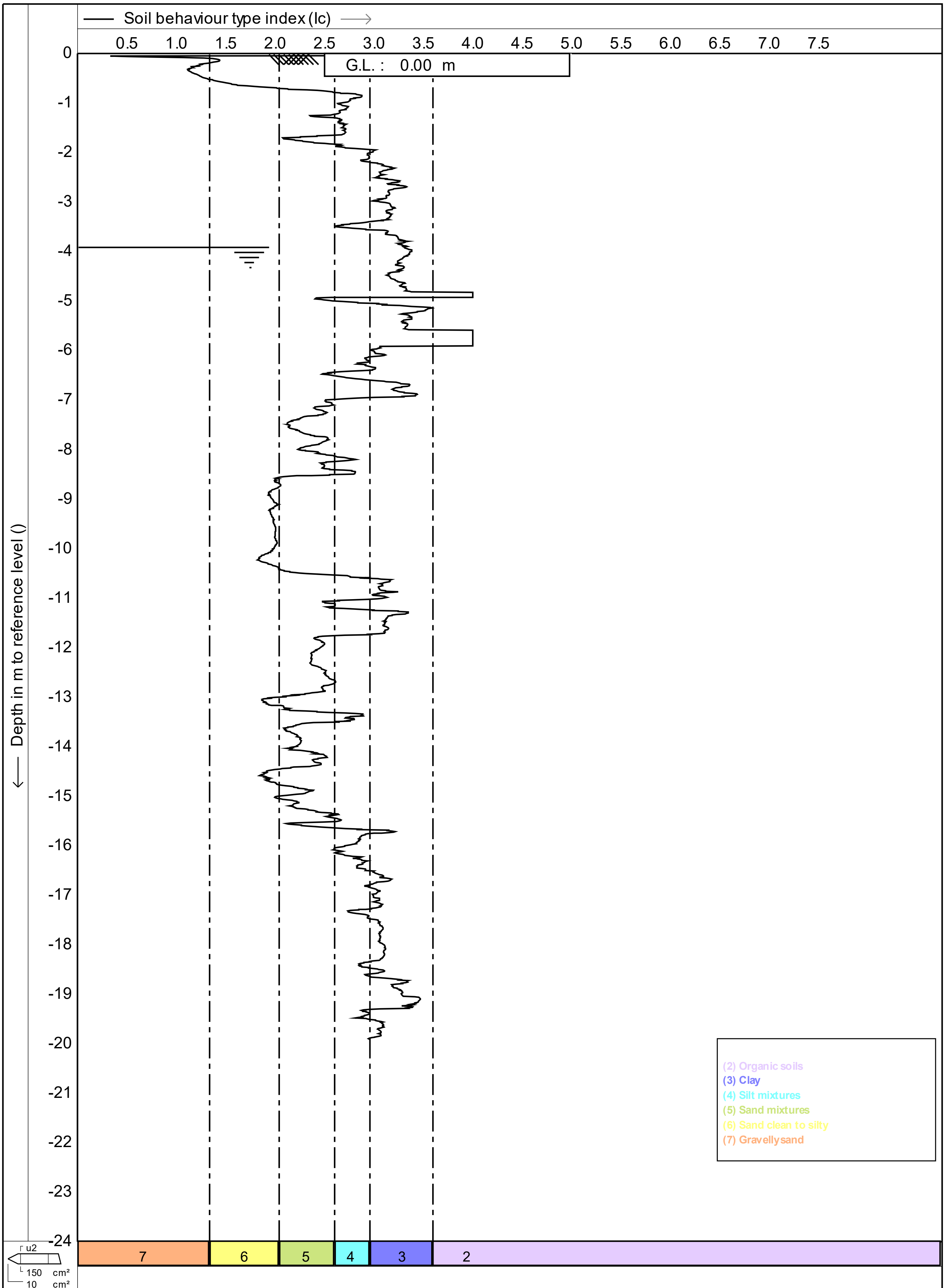
A.S.T.M D5778-12

Project : **Site Investigations**
Location: **Washer Rd - Te Puke**
Position: **0, 0**

Date : **19/11/2020**
Cone no. : **C10CFIIP.C14433**
Project no. : **02CMW15**
CPT no. : **10**

2/14

1.48



PERRY GEOTECH

A.S.T.M D5778-12

Project : **Site Investigations**

Location: **Washer Rd - Te Puke**

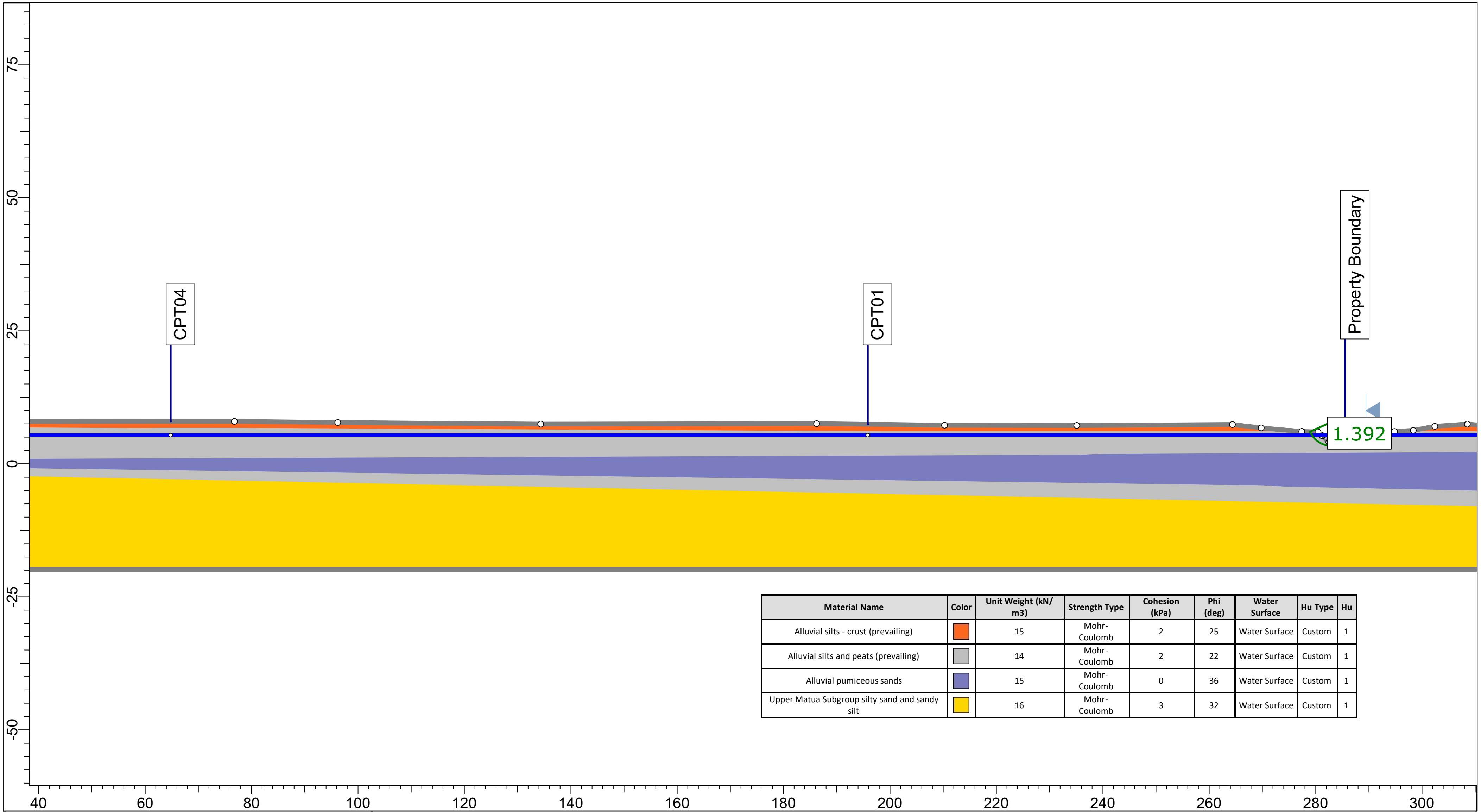
Position: **0, 0**

Date	: **19/11/2020**
Cone no.	: **C10CFIIP.C14433**
Project no.	: **02CMW15**
CPT no.	: **10**

9/14

1.48

Appendix E: Stability Analyses



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type	Hu
Alluvial silts - crust (prevailing)		15	Mohr-Coulomb	2	25	Water Surface	Custom	1
Alluvial silts and peats (prevailing)		14	Mohr-Coulomb	2	22	Water Surface	Custom	1
Alluvial pumiceous sands		15	Mohr-Coulomb	0	36	Water Surface	Custom	1
Upper Matua Subgroup silty sand and sandy silt		16	Mohr-Coulomb	3	32	Water Surface	Custom	1

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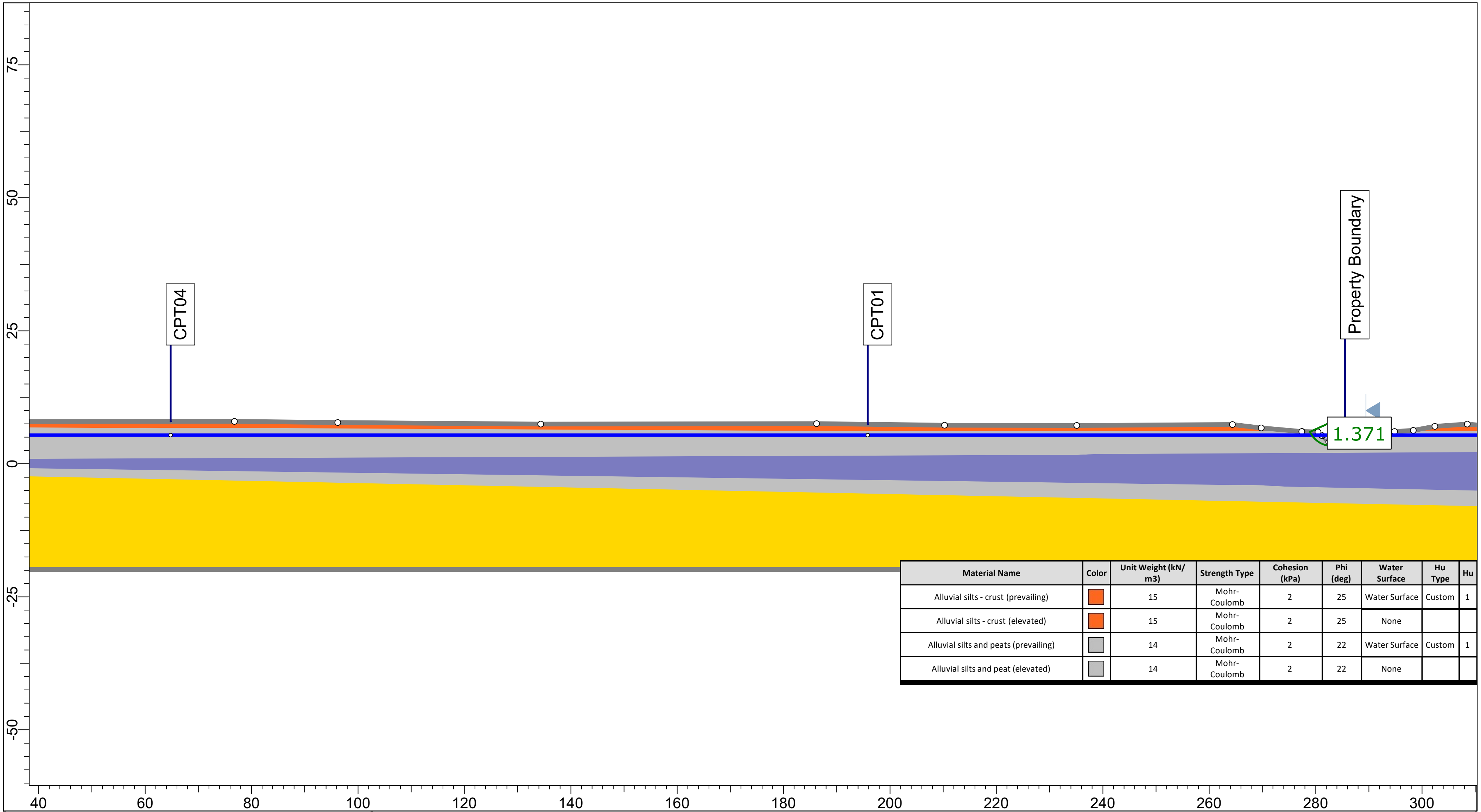
SLIDEINTERPRET 9.008

Project	66 Washer Road Te Puke		
Analysis Description	Existing Surface, Static, Prevailing Groundwater		
Drawn By ETC	*Date* December 2020	*Scale* 1:1000	*Client* D.L Marshall
Figure No		*Job No* TGA2019-0228	*File Name* Slide1.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type	Hu
Alluvial silts - crust (prevailing)		15	Mohr-Coulomb	2	25	Water Surface	Custom	1
Alluvial silts - crust (elevated)		15	Mohr-Coulomb	2	25	None		
Alluvial silts and peats (prevailing)		14	Mohr-Coulomb	2	22	Water Surface	Custom	1
Alluvial silts and peat (elevated)		14	Mohr-Coulomb	2	22	None		

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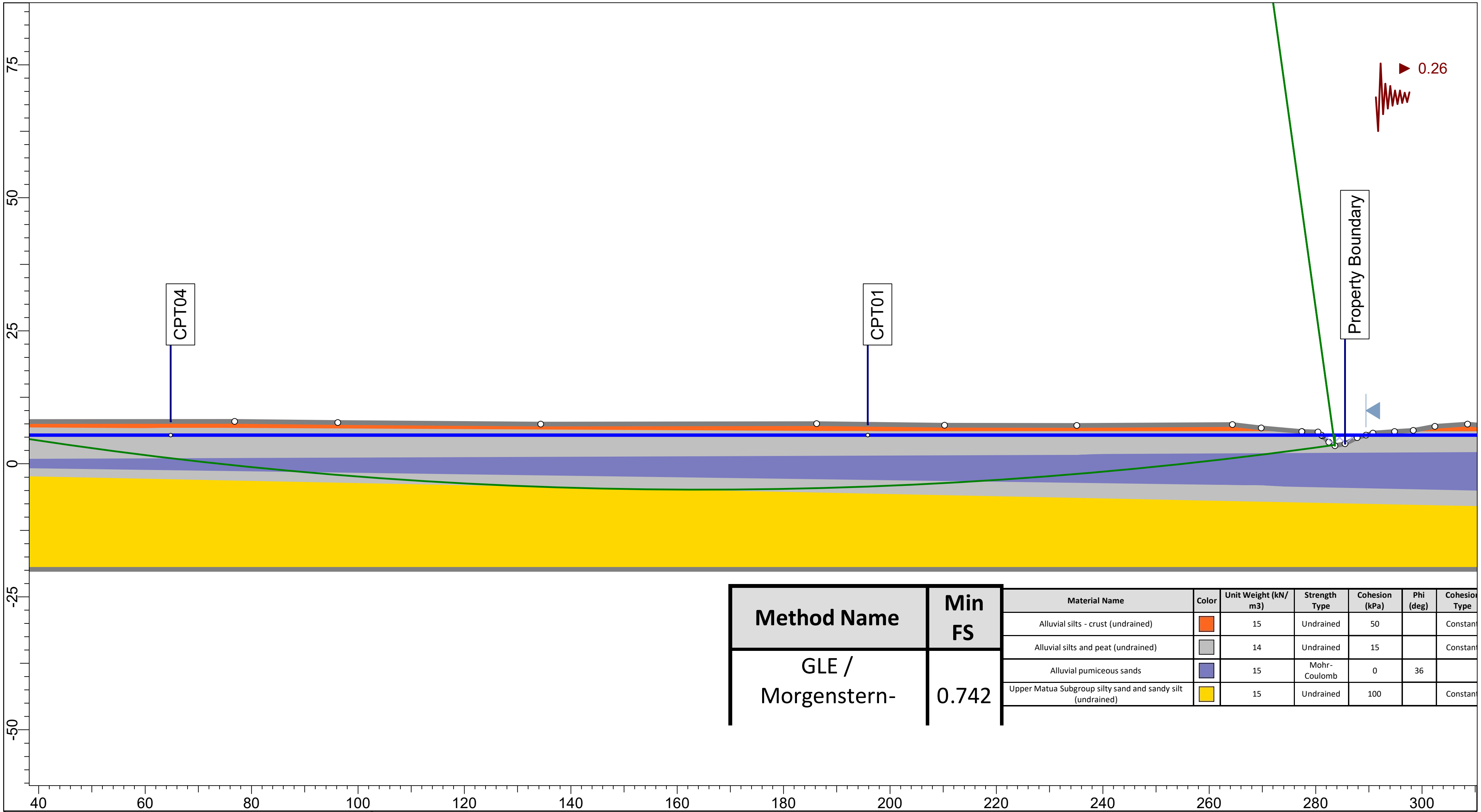
SLIDEINTERPRET 9.008

Project 66 Washer Road Te Puke

Analysis Description Existing Surface, Static, Elevated Groundwater

Drawn By ETC | *Date* December 2020 | *Scale* 1:1000 | *Client* D.L Marshall

Figure No | *Job No* TGA2019-0228 | *File Name* Slide1.slmd



Method Name	Min FS
GLE / Morgenstern-	0.742

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Cohesion Type
Alluvial silts - crust (undrained)		15	Undrained	50		Constant
Alluvial silts and peat (undrained)		14	Undrained	15		Constant
Alluvial pumiceous sands		15	Mohr-Coulomb	0	36	
Upper Matua Subgroup silty sand and sandy silt (undrained)		15	Undrained	100		Constant

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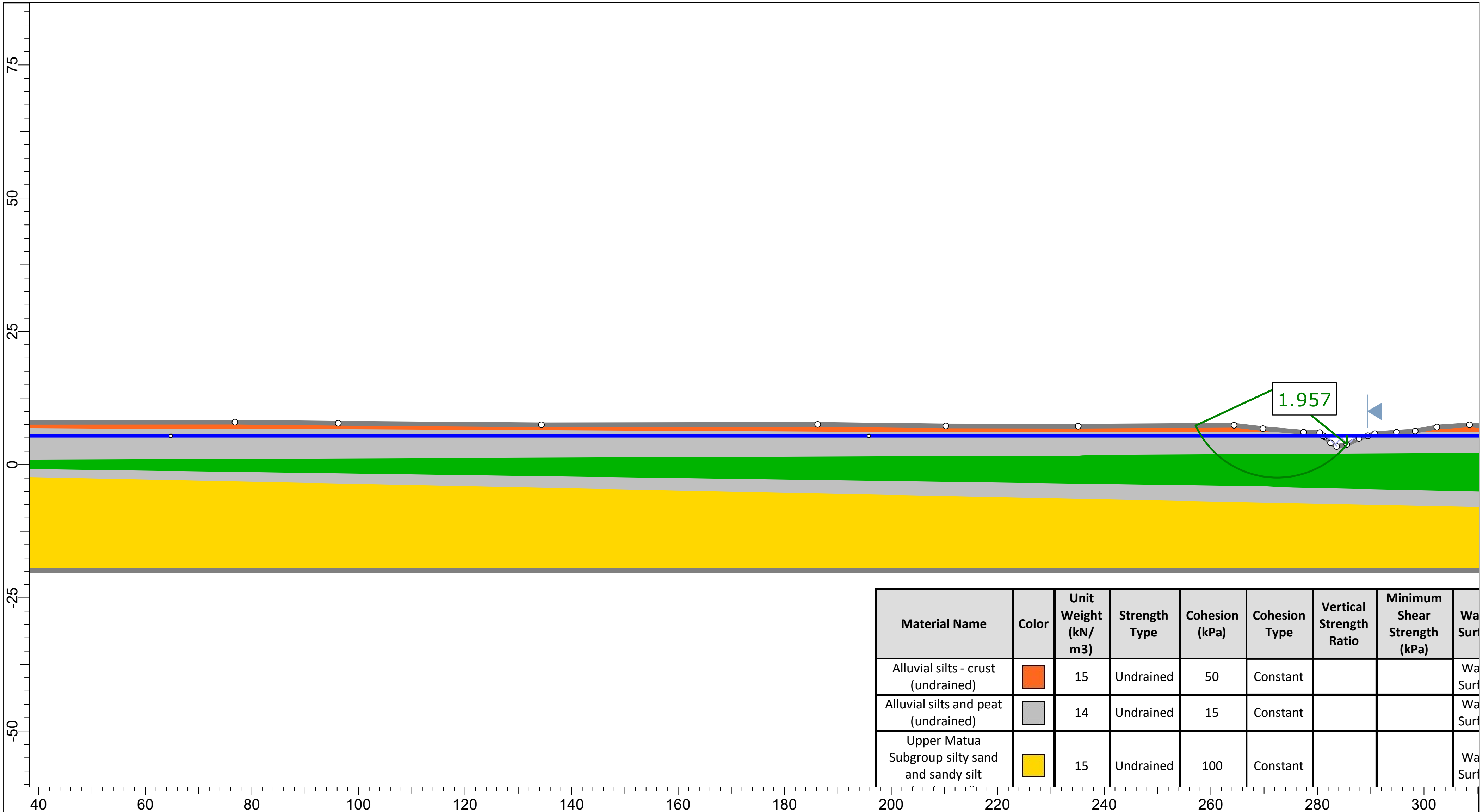
Project	66 Washer Road Te Puke				
Analysis Description	Existing Surface, Seismic ULS, Undrained				
Drawn By ETC	*Date* December 2020	*Scale* 1:1000		*Client* D.L Marshall	
Figure No		*Job No* TGA2019-0228		*File Name* Slide1.slmd	

SLIDEINTERPRET 9.008



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Cohesion Type	Vertical Strength Ratio	Minimum Shear Strength (kPa)	Wa Surf
Alluvial silts - crust (undrained)		15	Undrained	50	Constant			Wa Surf
Alluvial silts and peat (undrained)		14	Undrained	15	Constant			Wa Surf
Upper Matua Subgroup silty sand and sandy silt		15	Undrained	100	Constant			Wa Surf

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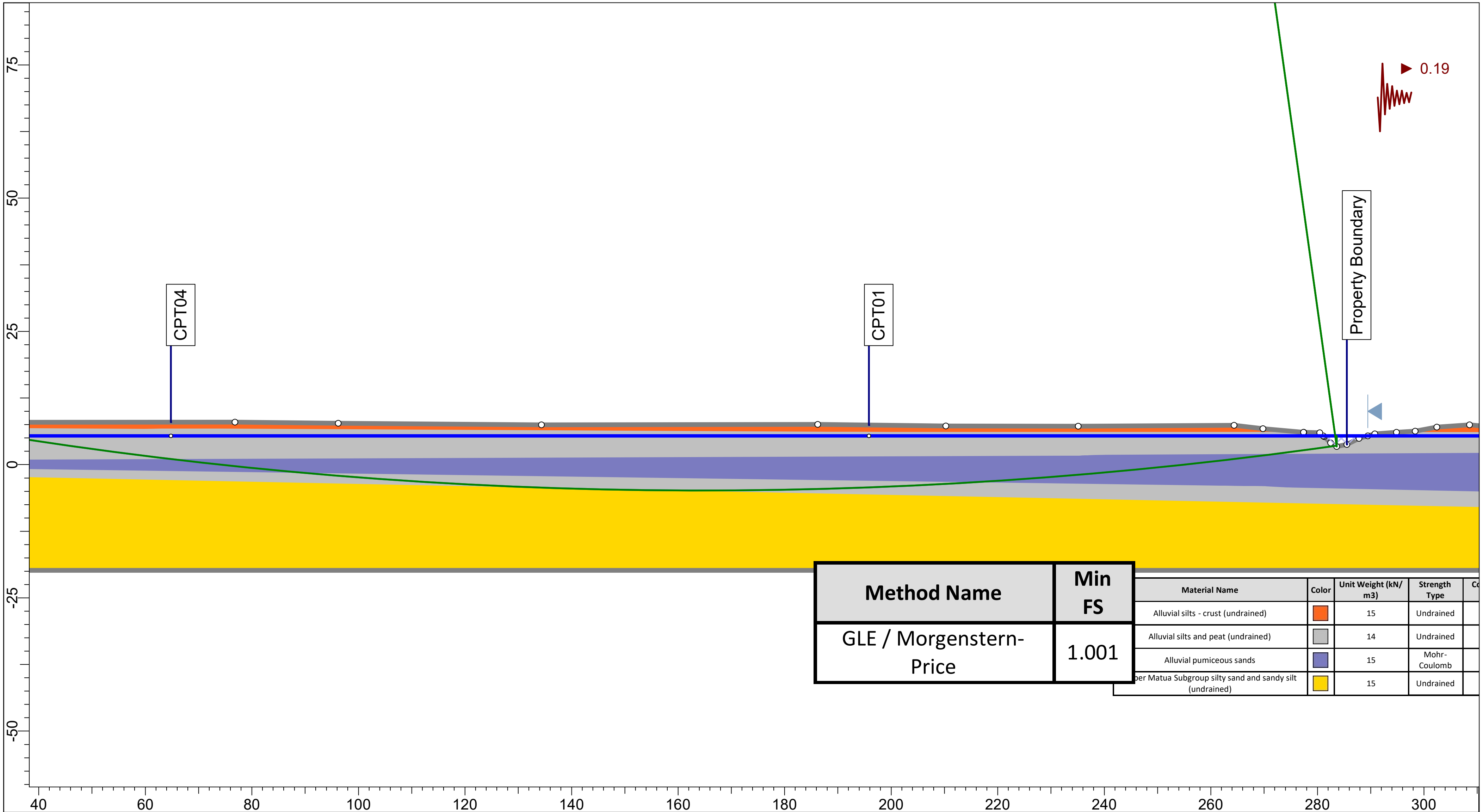
Project	66 Washer Road Te Puke
Analysis Description	Seismic Analysis, Flow Failure Check
Drawn By	ETC
Date	December 2020
Scale	1:1000
Client	D.L Marshall
Figure No	
Job No	TGA2019-0228
File Name	Slide1.slmd



Method Name	Min FS
GLE / Morgenstern-Price	1.001

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Co
Alluvial silts - crust (undrained)		15	Undrained	
Alluvial silts and peat (undrained)		14	Undrained	
Alluvial pumiceous sands		15	Mohr-Coulomb	
per Matua Subgroup silty sand and sandy silt (undrained)		15	Undrained	

Project	66 Washer Road Te Puke		
Analysis Description	Seismic Analysis, Seismic Yield Acceleration		
Drawn By ETC	*Date* December 2020	*Scale* 1:1000	*Client* D.L Marshall
Figure No		*Job No* TGA2019-0228	*File Name* Slide1.slmd

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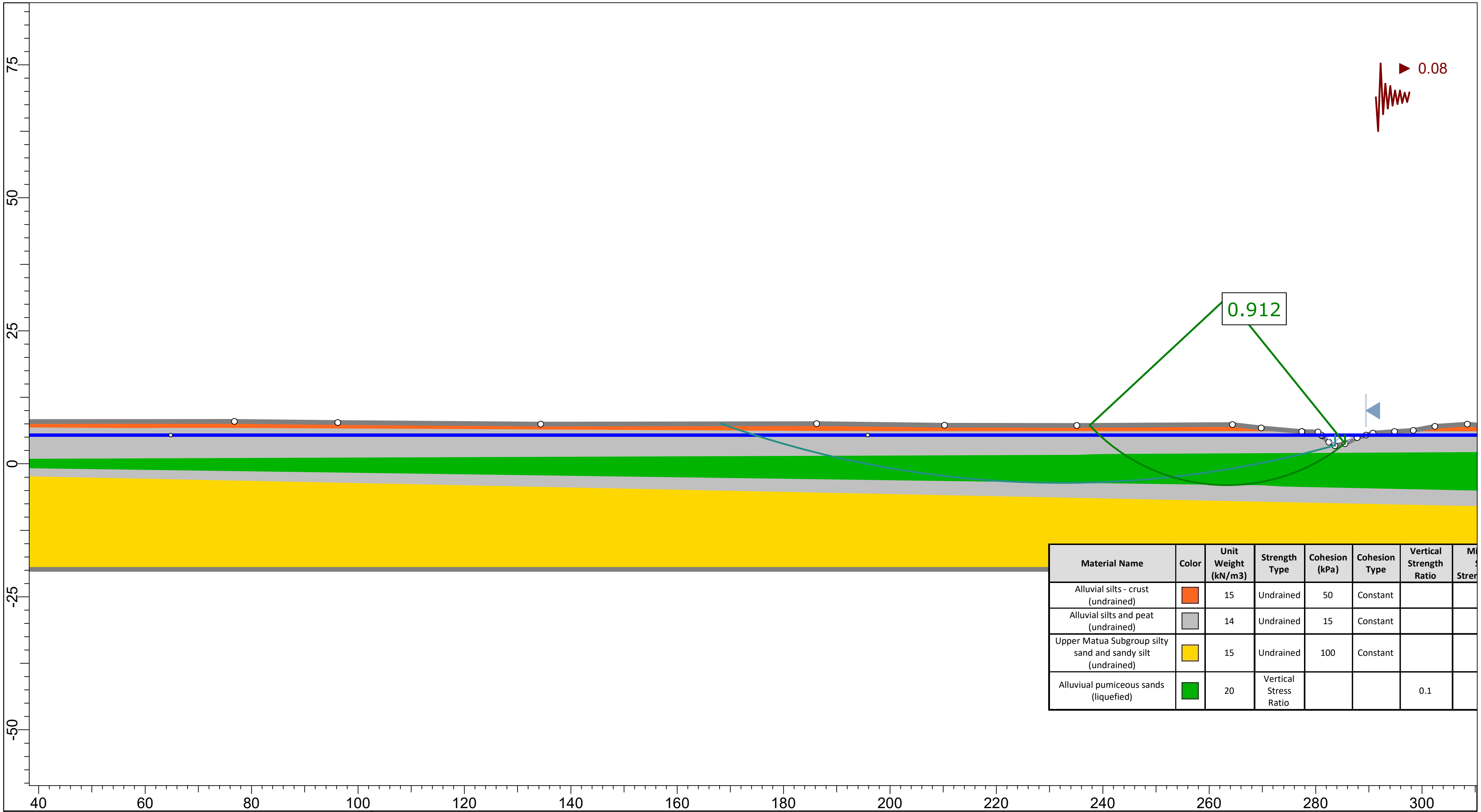

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Cohesion Type	Vertical Strength Ratio	Mi S Stren
Alluvial silts - crust (undrained)		15	Undrained	50	Constant		
Alluvial silts and peat (undrained)		14	Undrained	15	Constant		
Upper Matua Subgroup silty sand and sandy silt (undrained)		15	Undrained	100	Constant		
Alluviual pumiceous sands (liquefied)		20	Vertical Stress Ratio			0.1	

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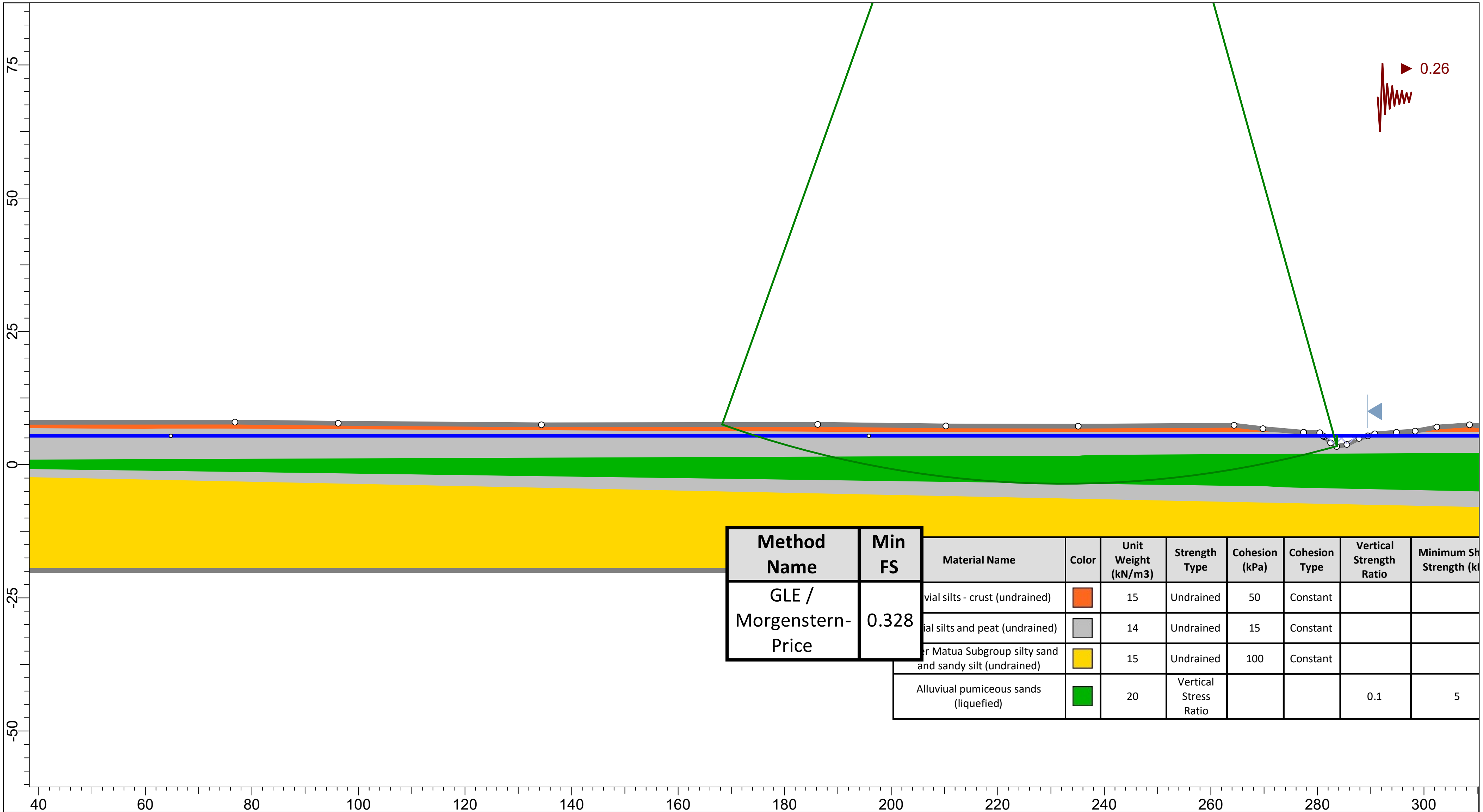
Project	66 Washer Road Te Puke		
Analysis Description	Liquefied Sands Sesimic, Seismic Yield Acceleration		
Drawn By ETC	*Date* December 2020	*Scale* 1:1000	*Client* D.L Marshall
Figure No		*Job No* TGA2019-0228	*File Name* Slide1.slmd



Method Name	Min FS
GLE / Morgenstern-Price	0.328

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Cohesion Type	Vertical Strength Ratio	Minimum Sh Strength (k
vial silts - crust (undrained)		15	Undrained	50	Constant		
ial silts and peat (undrained)		14	Undrained	15	Constant		
r Matua Subgroup silty sand and sandy silt (undrained)		15	Undrained	100	Constant		
Alluviual pumiceous sands (liquefied)		20	Vertical Stress Ratio			0.1	5

Project	66 Washer Road Te Puke		
Analysis Description	Liquefied Sands Sesimic, Seismic ULS		
Drawn By ETC	*Date* December 2020	*Scale* 1:1000	*Client* D.L Marshall
Figure No		*Job No* TGA2019-0228	*File Name* Slide1.slmd

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SLIDEINTERPRET 9.008

Appendix F: Liquefaction Assessment

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Geotechnical Engineers
Merarhias 56
http://www.geologismiki.gr

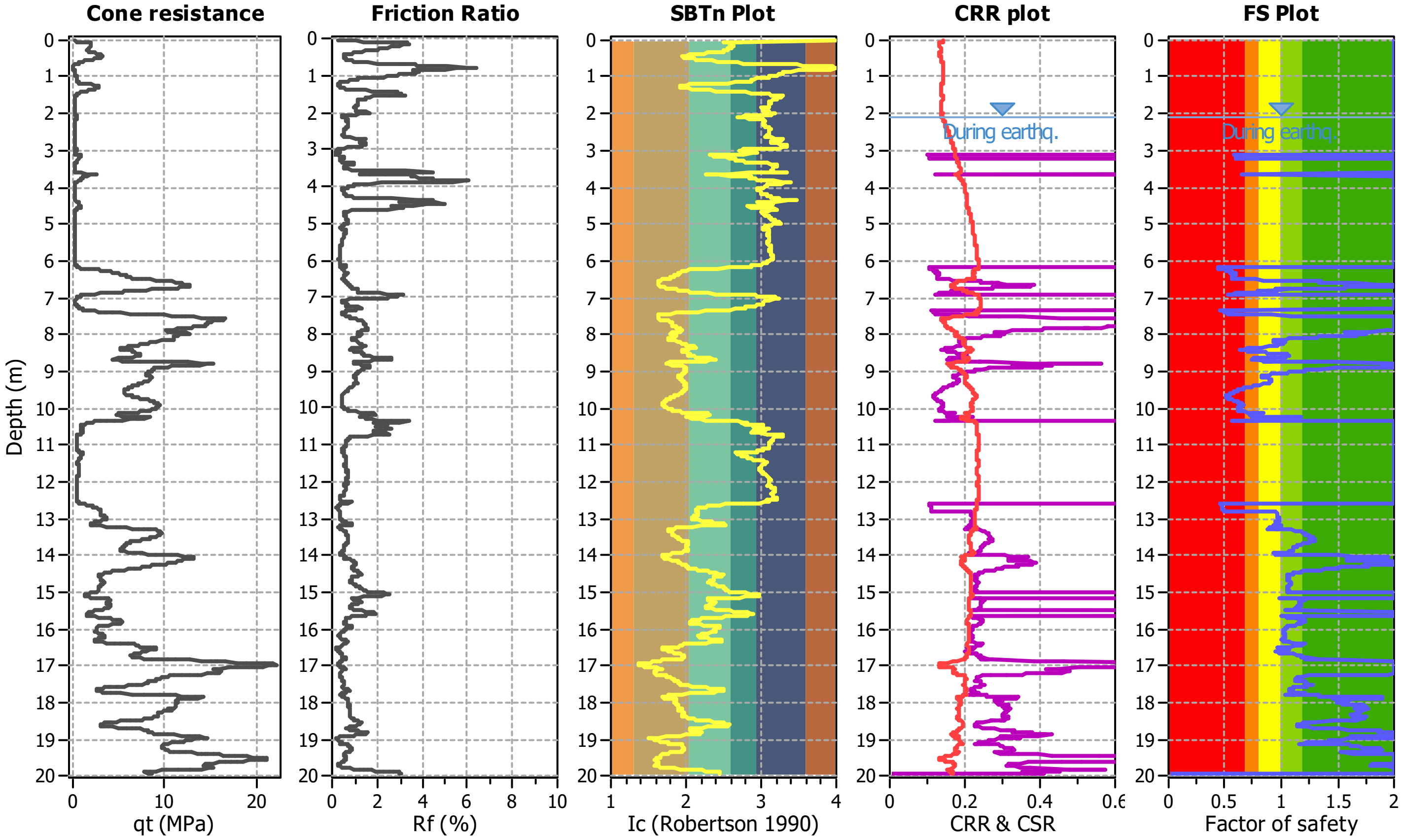
LIQUEFACTION ANALYSIS REPORT

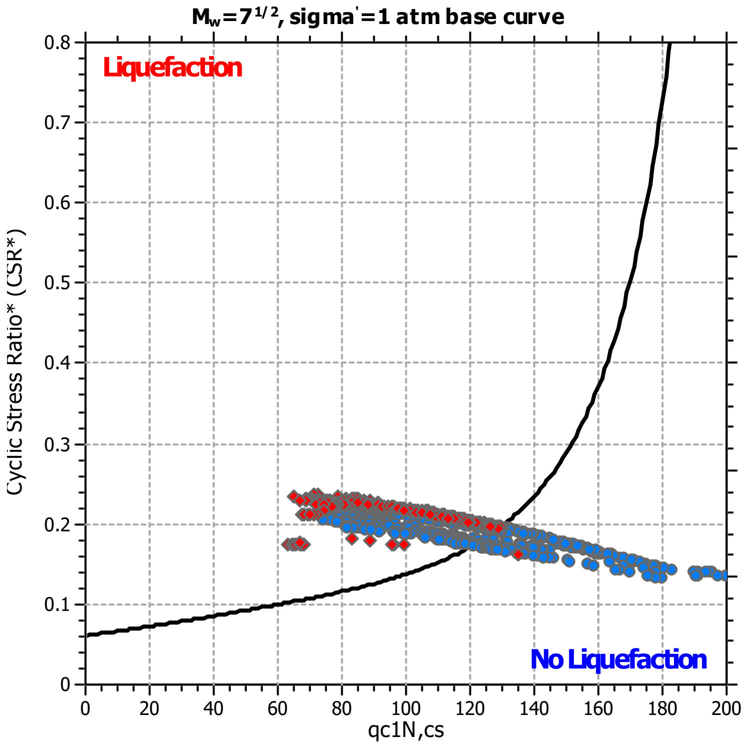
Project title : **Location :**

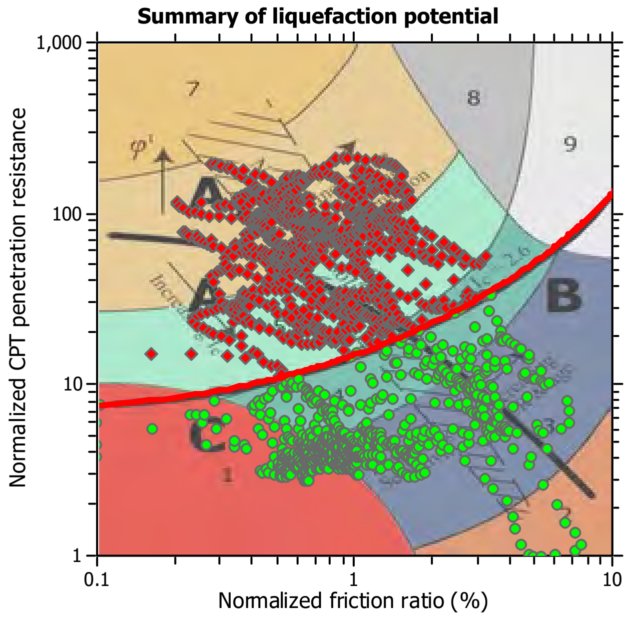
CPT file : CPT01

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.10 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.10 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.26	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

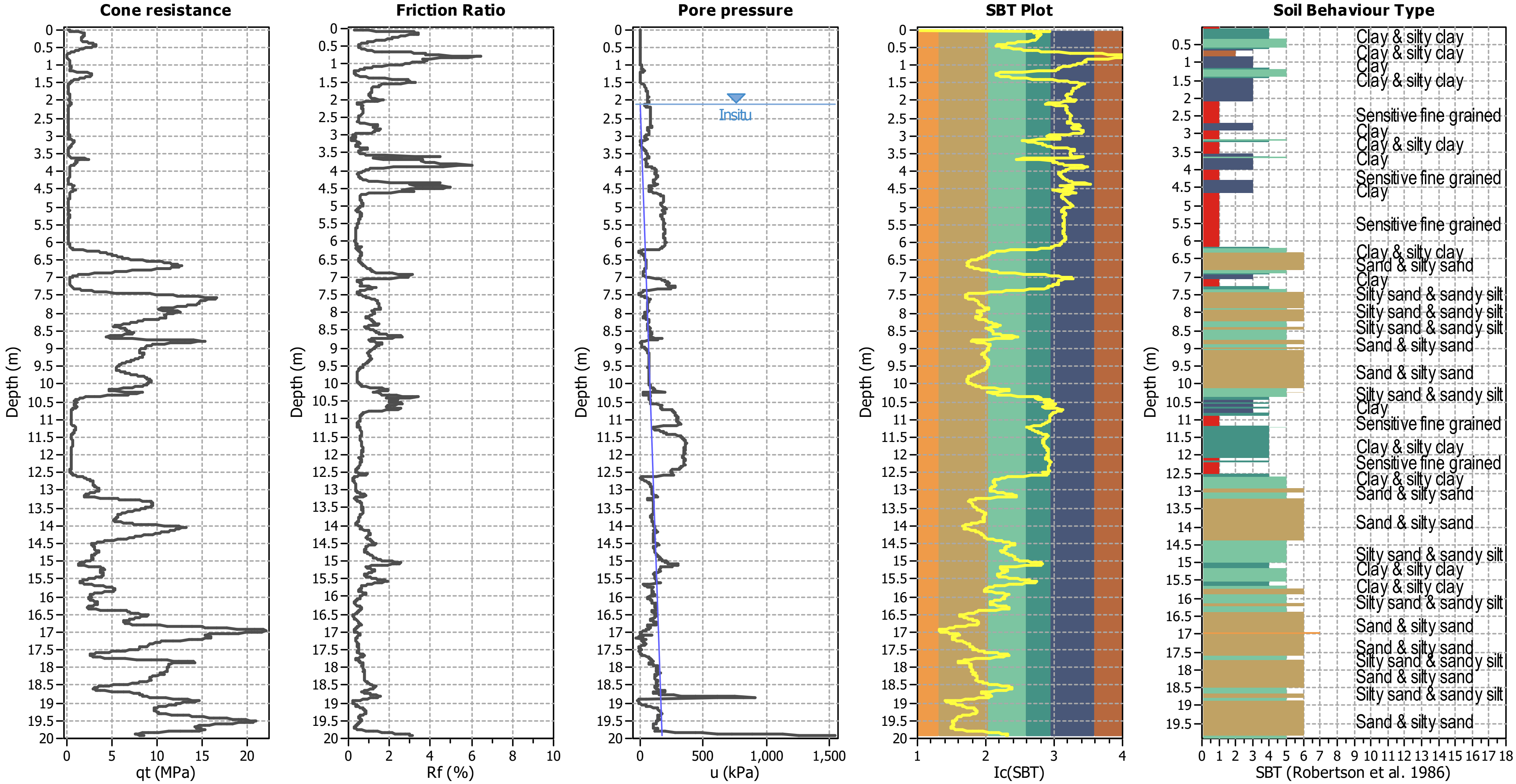






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



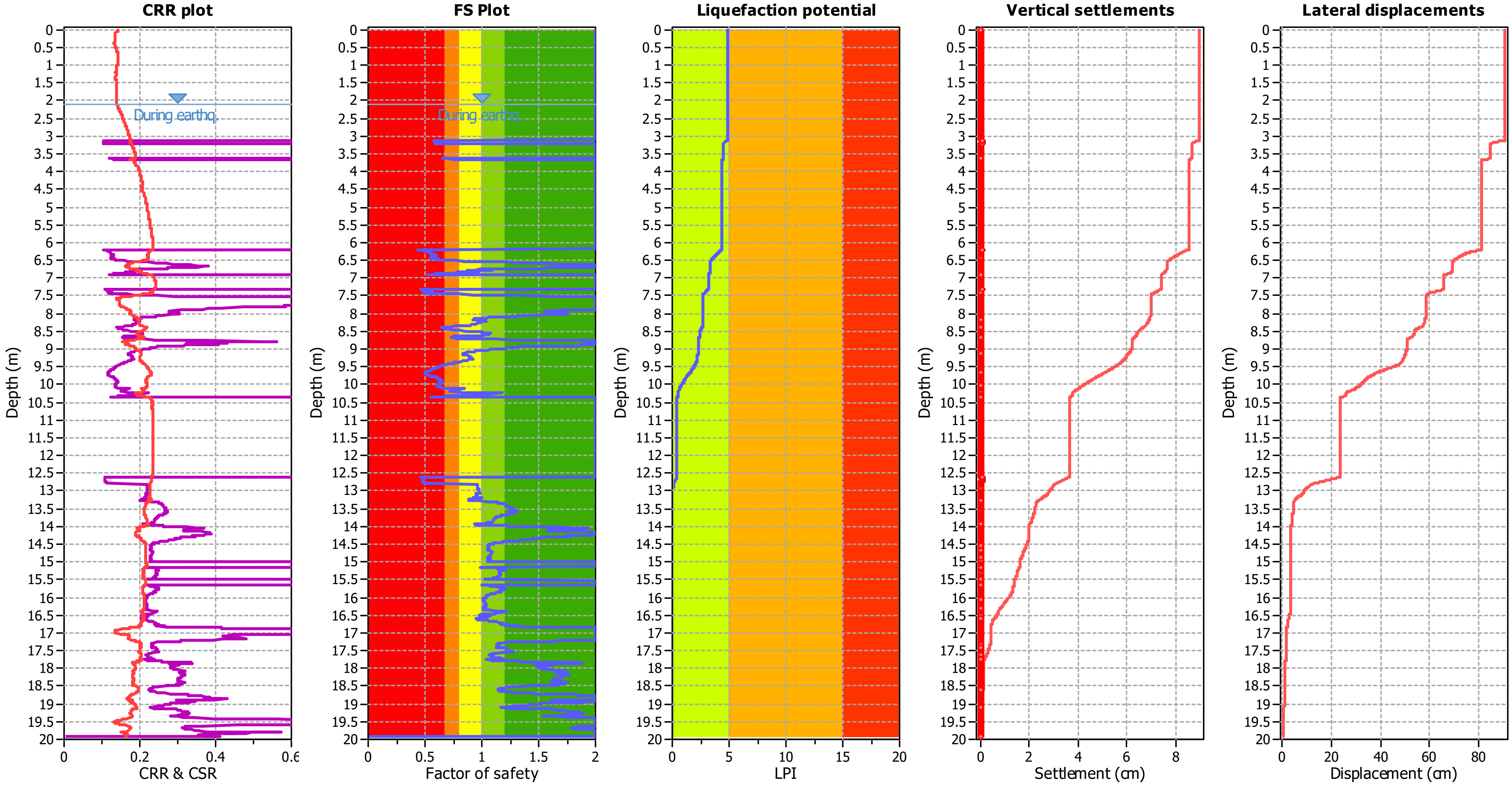
Input parameters and analysis data

Analysis method:	B&I (2014)
Fines correction method:	B&I (2014)
Points to test:	Based on Ic value
Earthquake magnitude M_w:	5.90
Peak ground acceleration:	0.26
Depth to water table (insitu):	2.10 m
Depth to GWT (erthq.):	2.10 m
Average results interval:	3
Ic cut-off value:	2.60
Unit weight calculation:	Based on SBT
Use fill:	No
Fill height:	N/A
Fill weight:	N/A
Transition detect. applied:	No
K_σ applied:	Yes
Clay like behavior applied:	Sands only
Limit depth applied:	No
Limit depth:	N/A

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.10 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.26	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.10 m	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

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http://www.geologismiki.gr

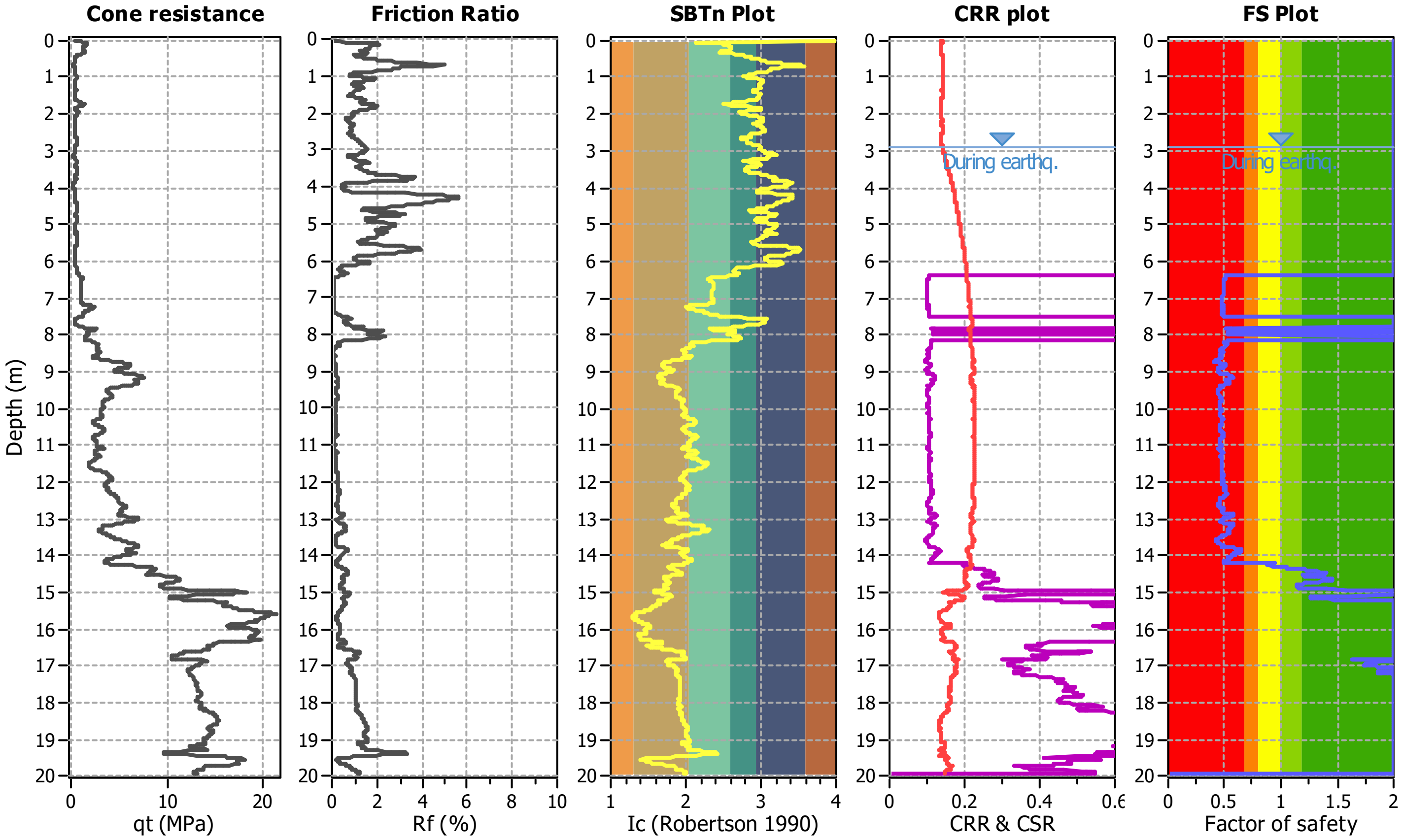
LIQUEFACTION ANALYSIS REPORT

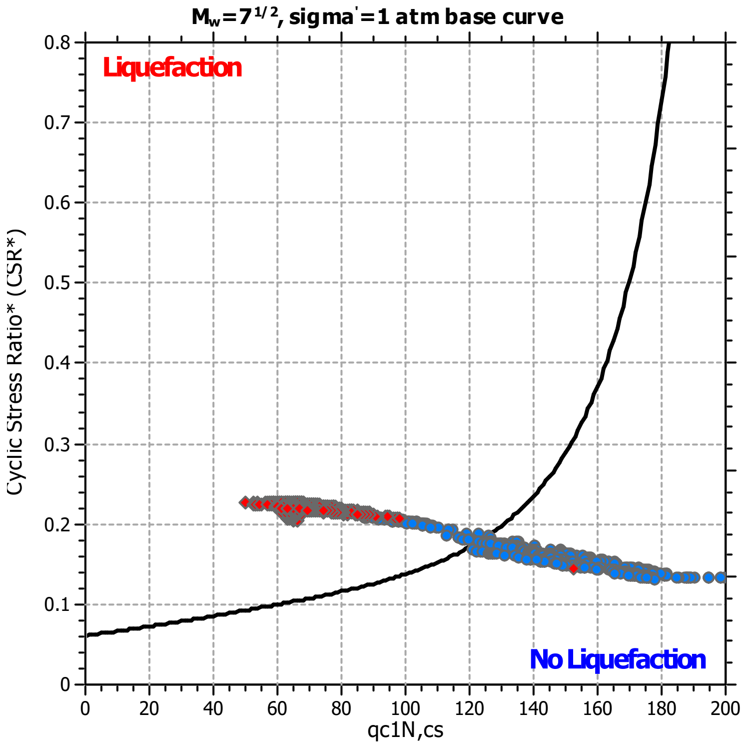
Project title : **Location :**

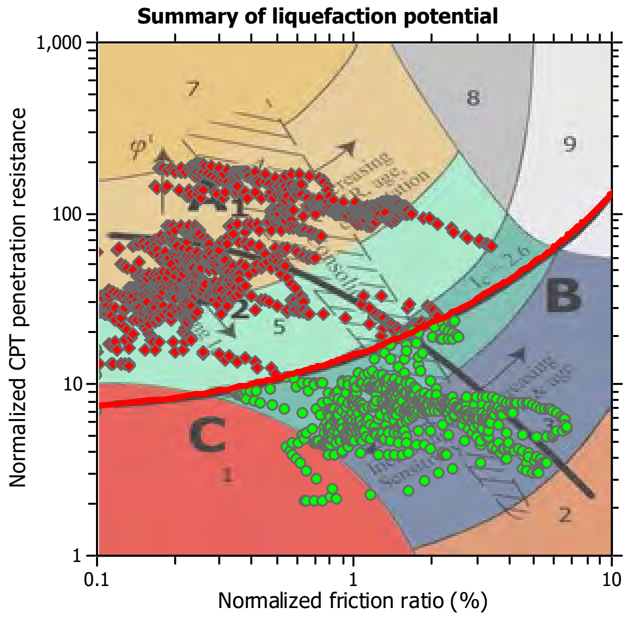
CPT file : CPT02

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.90 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.90 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.26	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

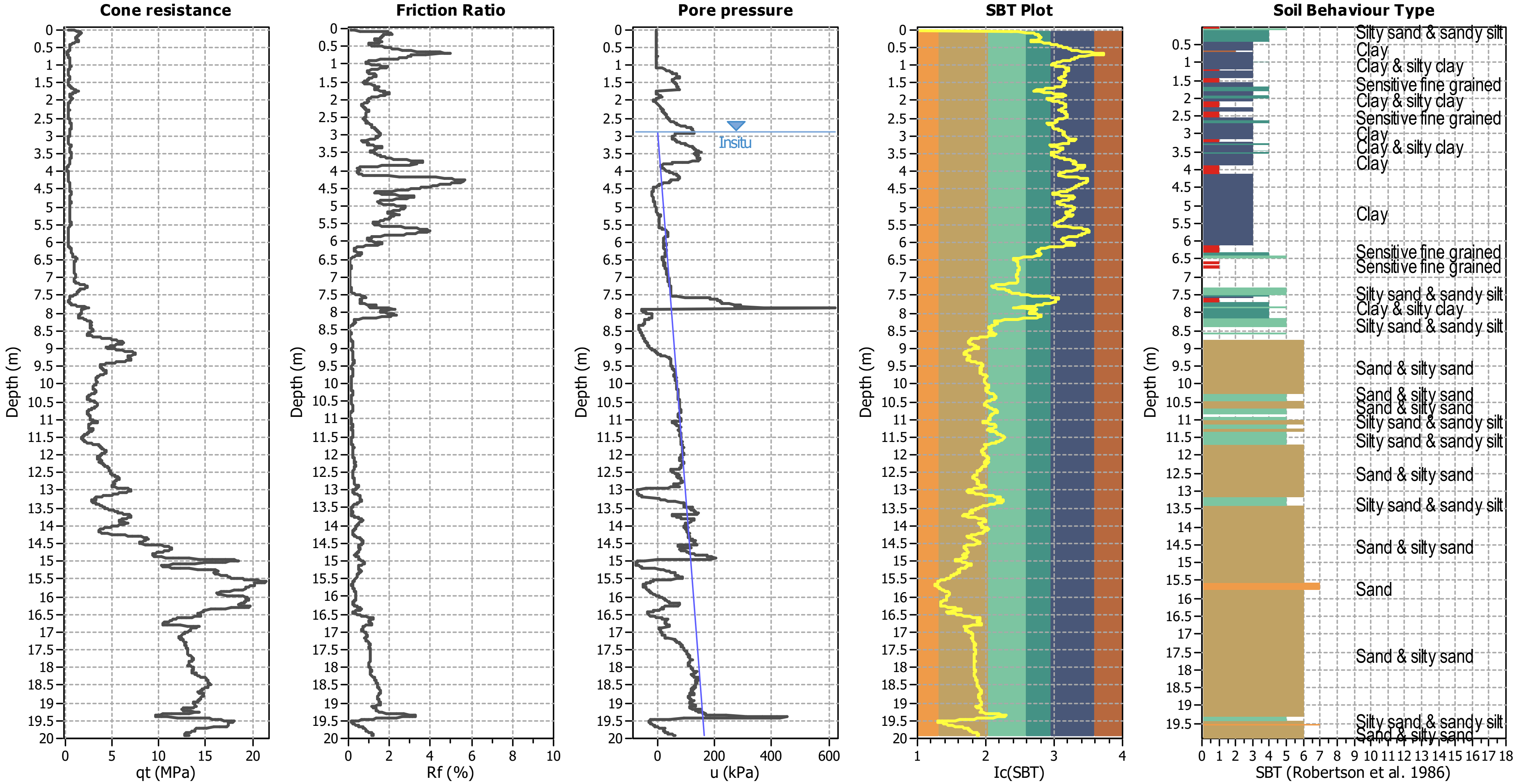






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



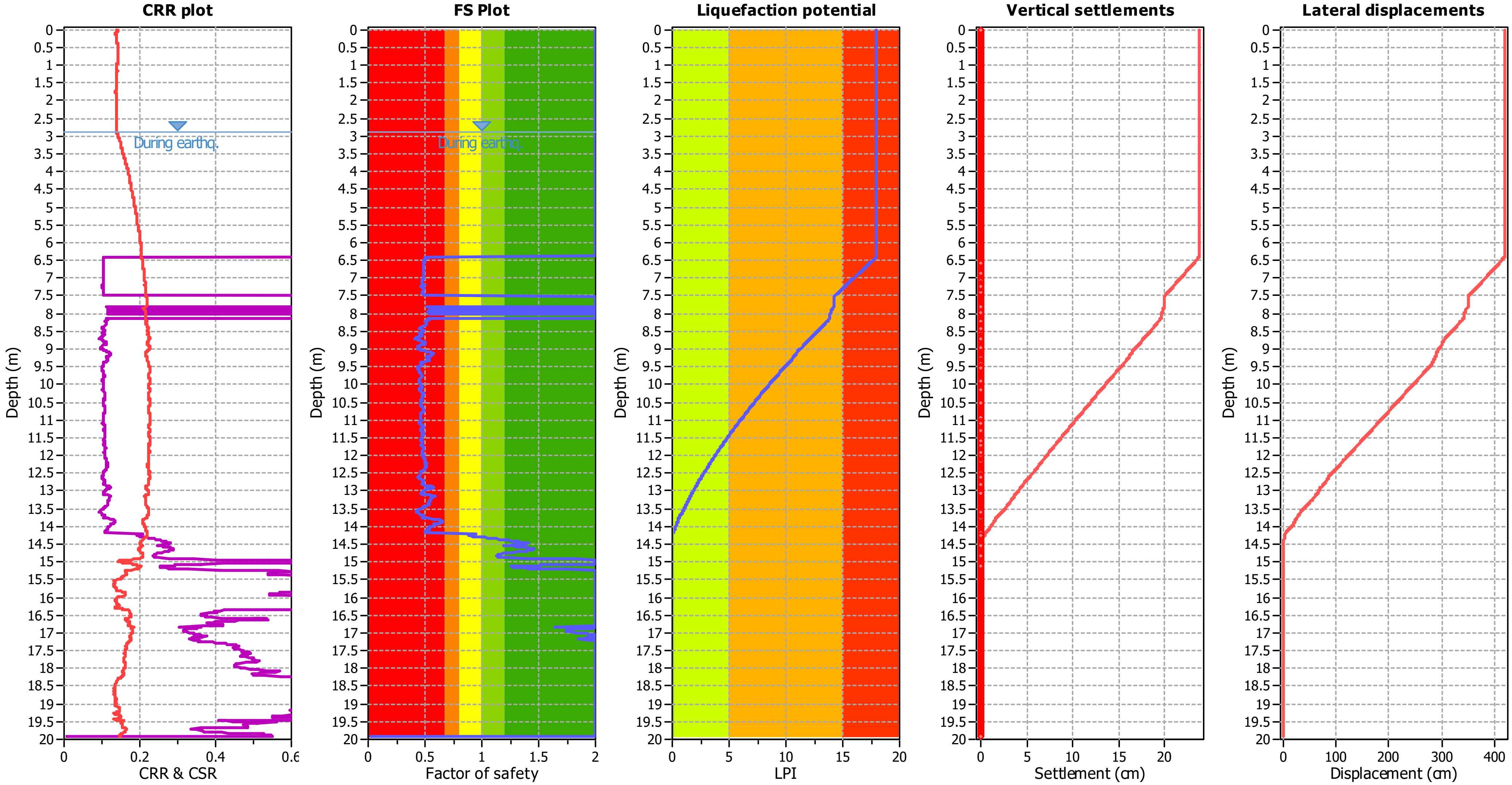
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.90 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.26	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.90 m	Fill height:	N/A	Limit depth:	N/A

SBT legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravely sand to sand
- 8. Very stiff sand to
- 9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.90 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.26	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.90 m	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

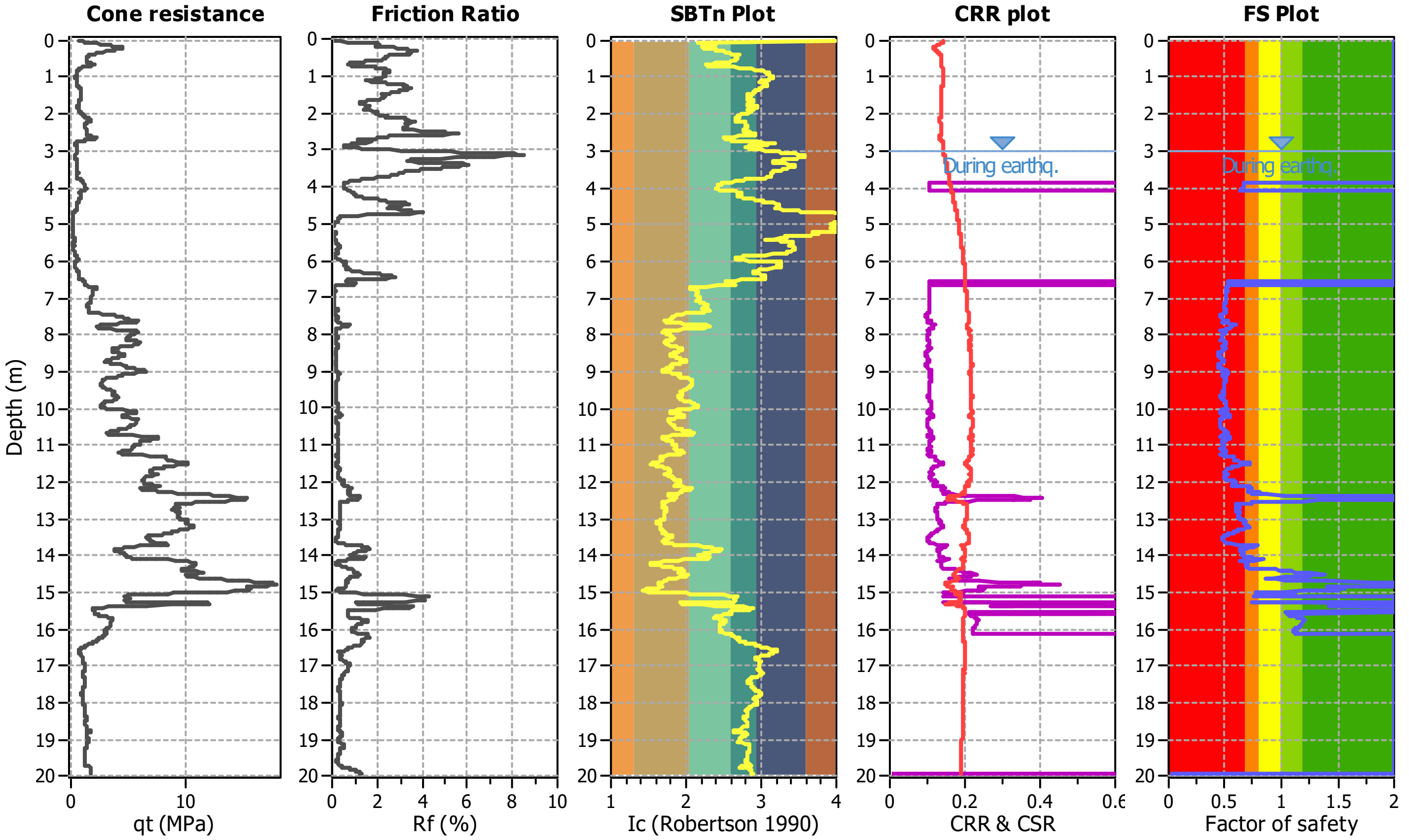
LIQUEFACTION ANALYSIS REPORT

Project title : **Location :**

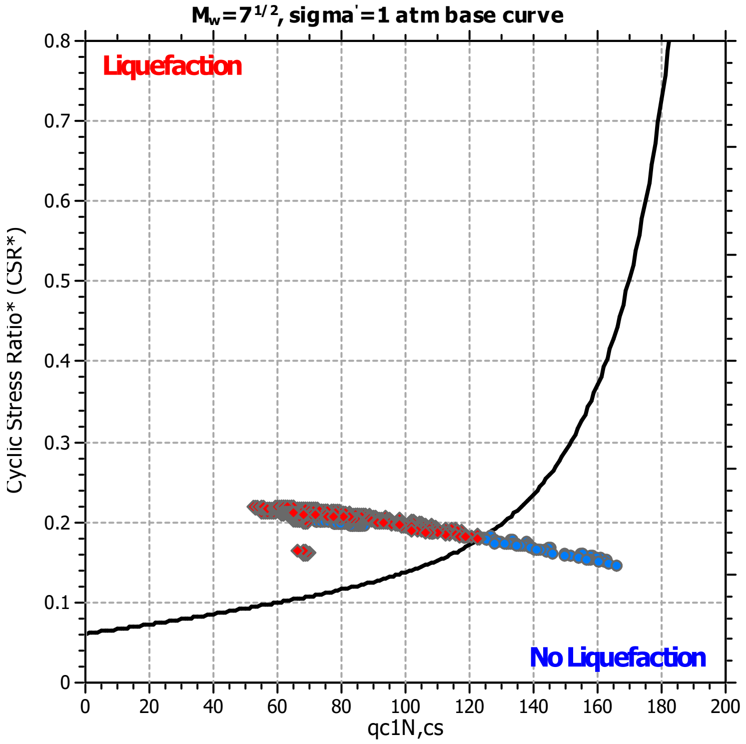
CPT file : CPT03

Input parameters and analysis data

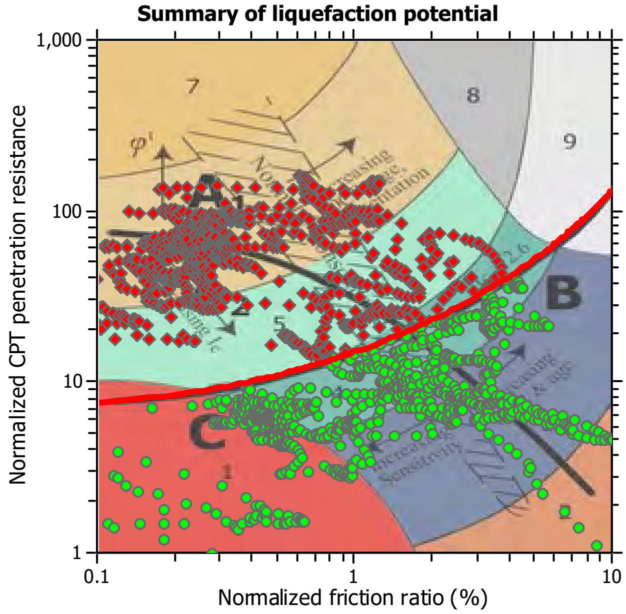
Analysis method:	B&I (2014)	G.W.T. (in-situ):	3.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	3.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.26	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



M_w=7$^{1/2}$, sigma'=1 atm base curve

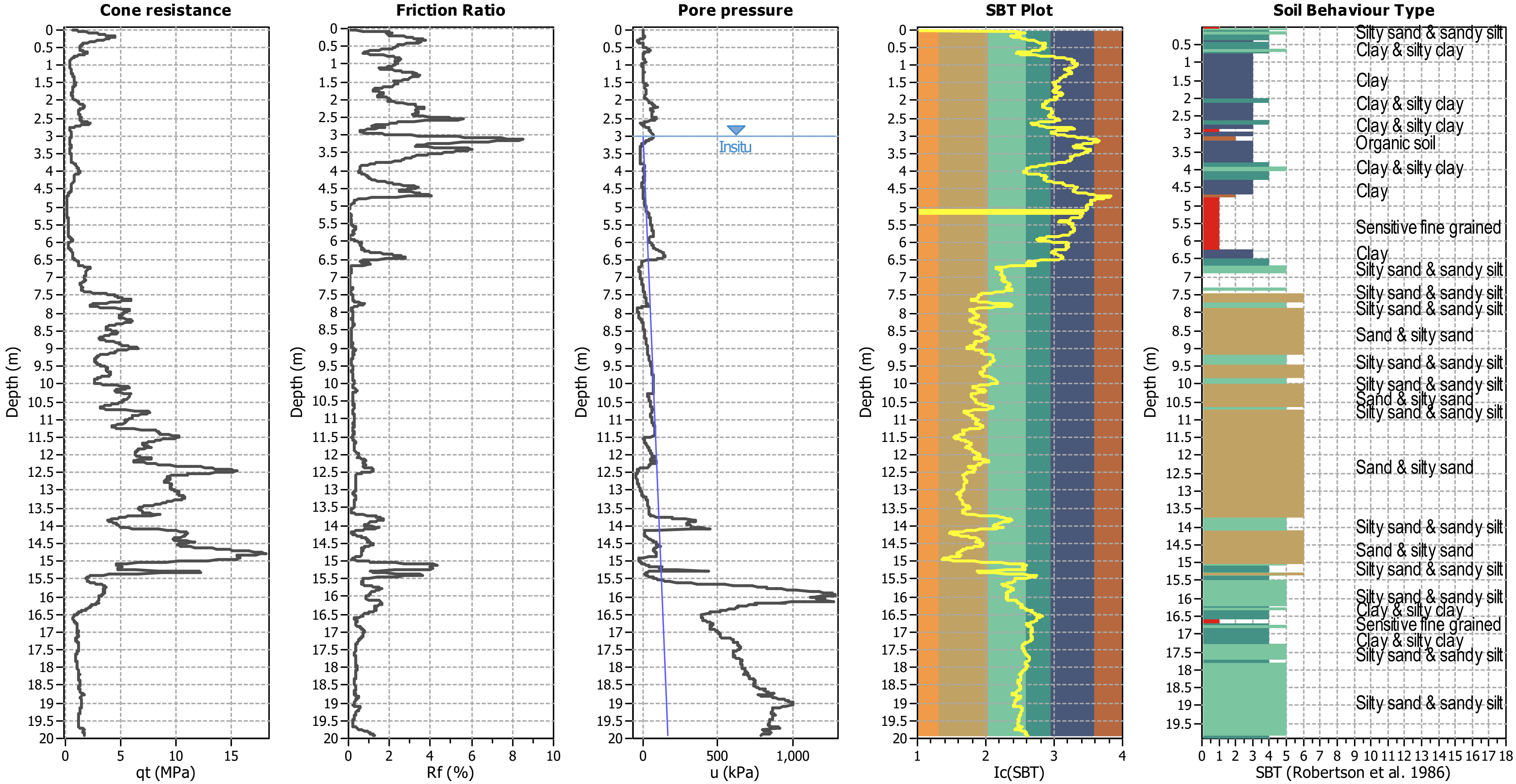


Summary of liquefaction potential



Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



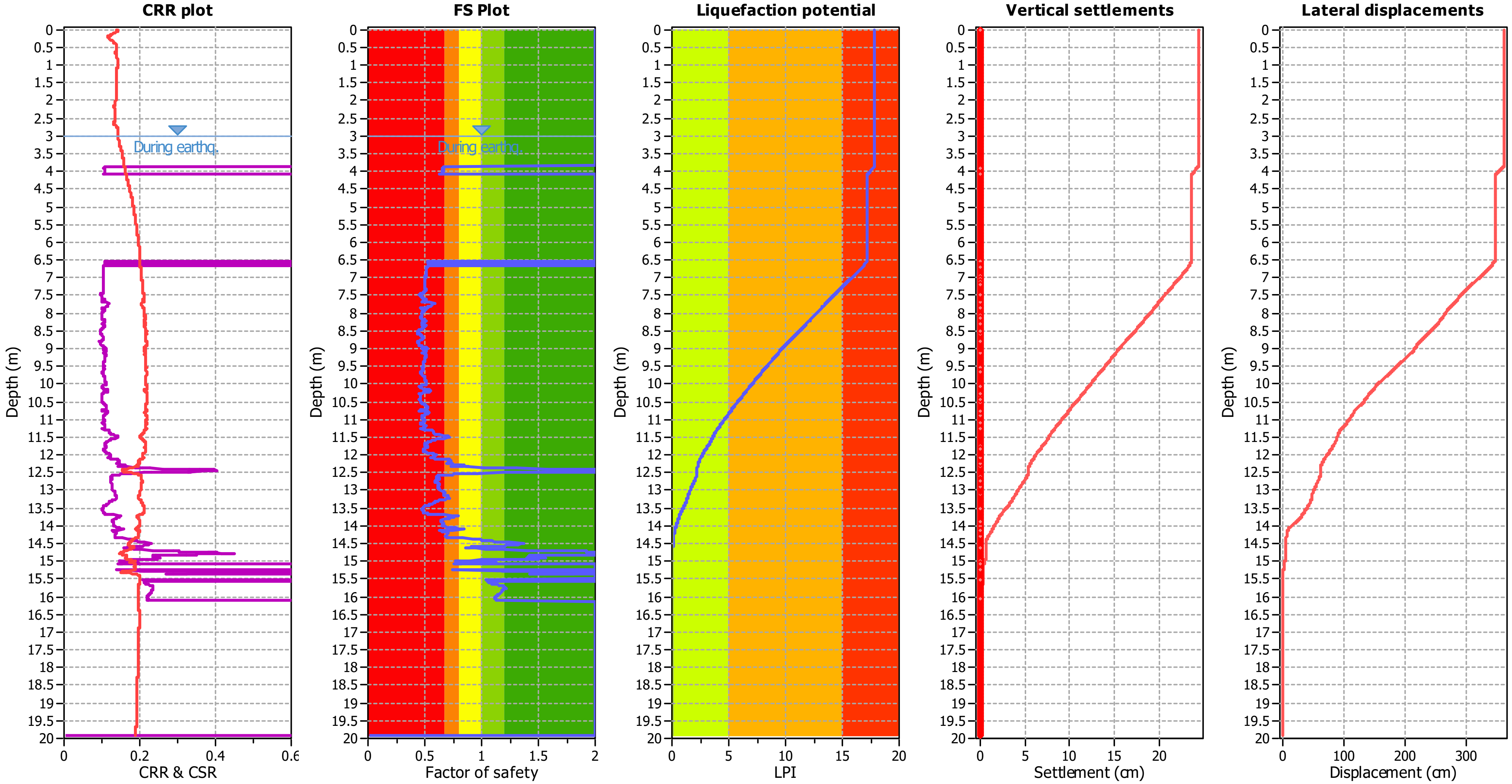
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.26	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	3.00 m	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.26	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	3.00 m	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

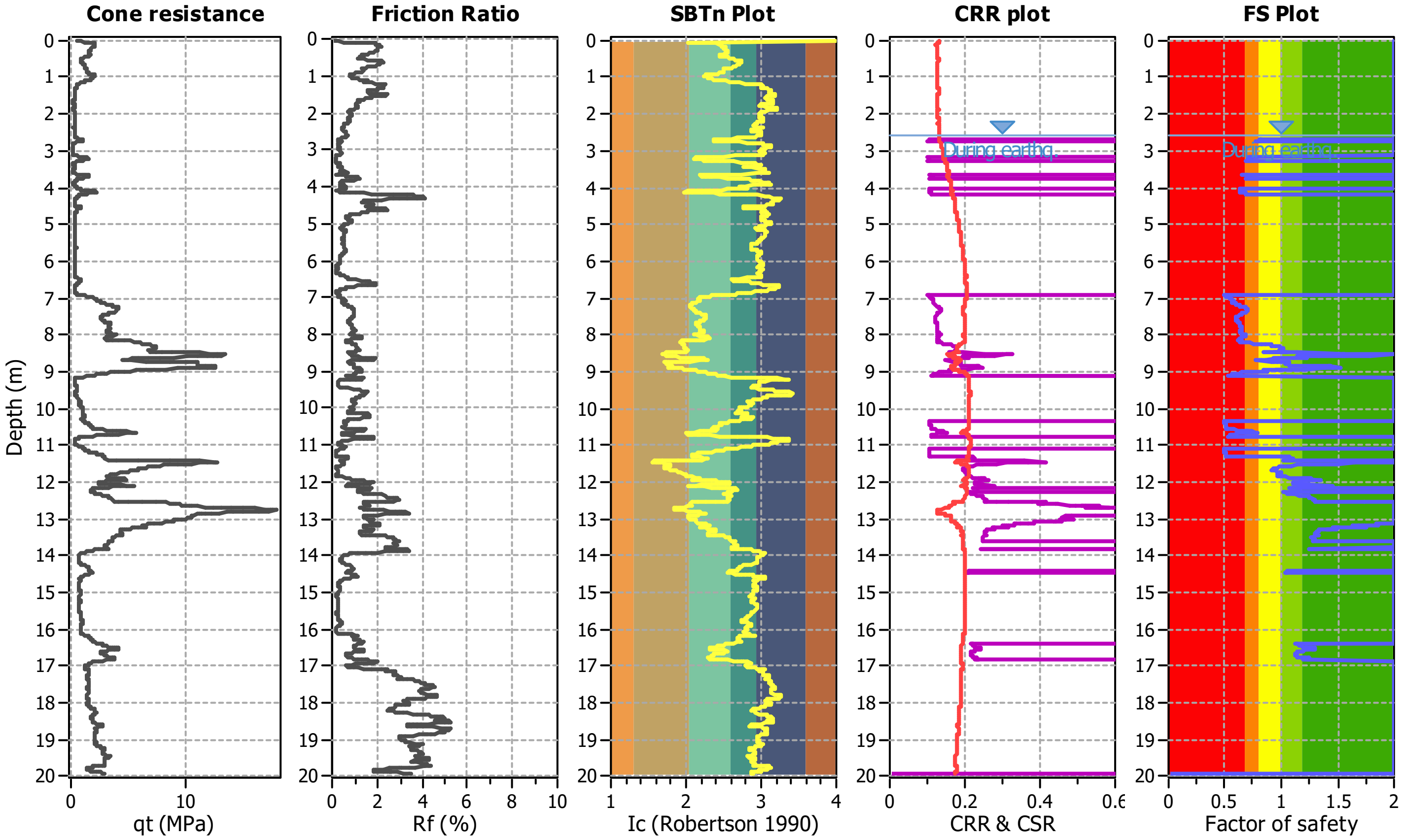
LIQUEFACTION ANALYSIS REPORT

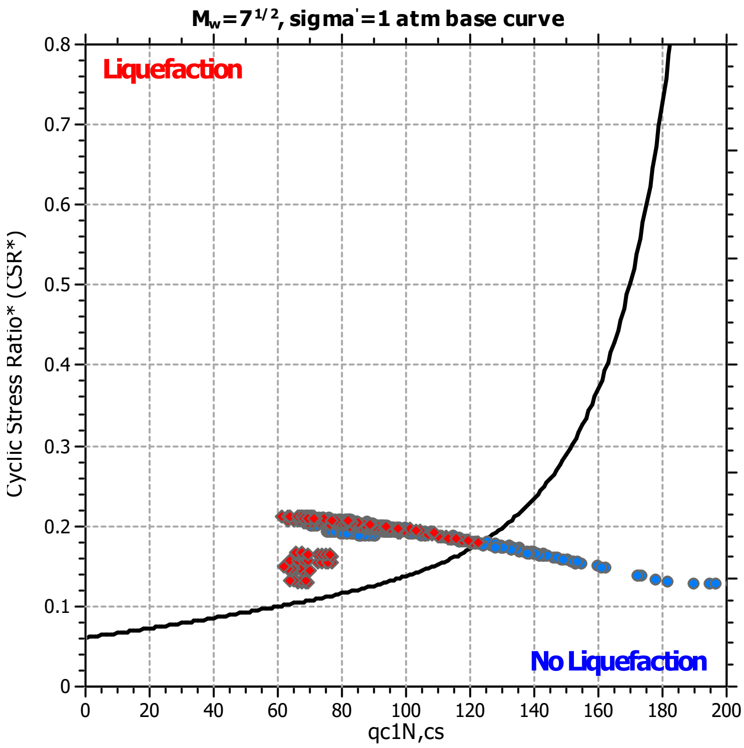
Project title : **Location :**

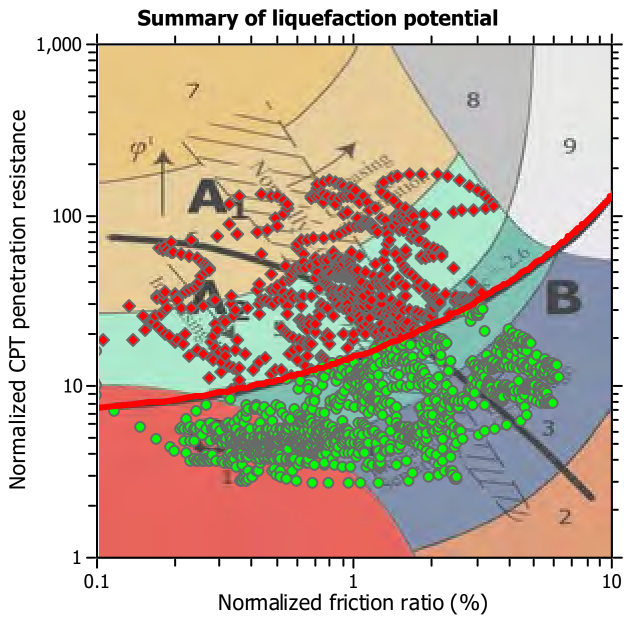
CPT file : CPT04

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.60 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.60 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.24	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

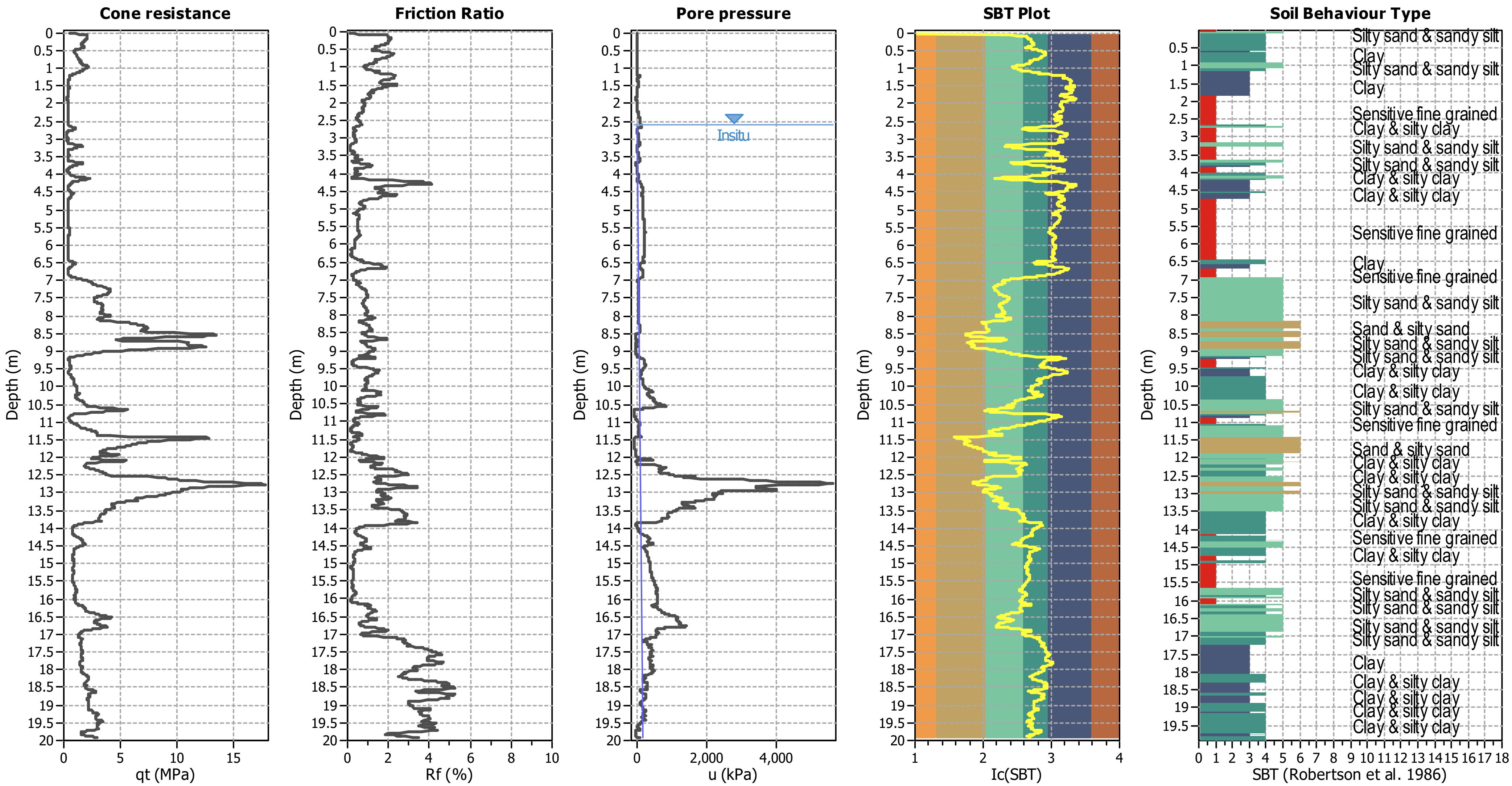






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



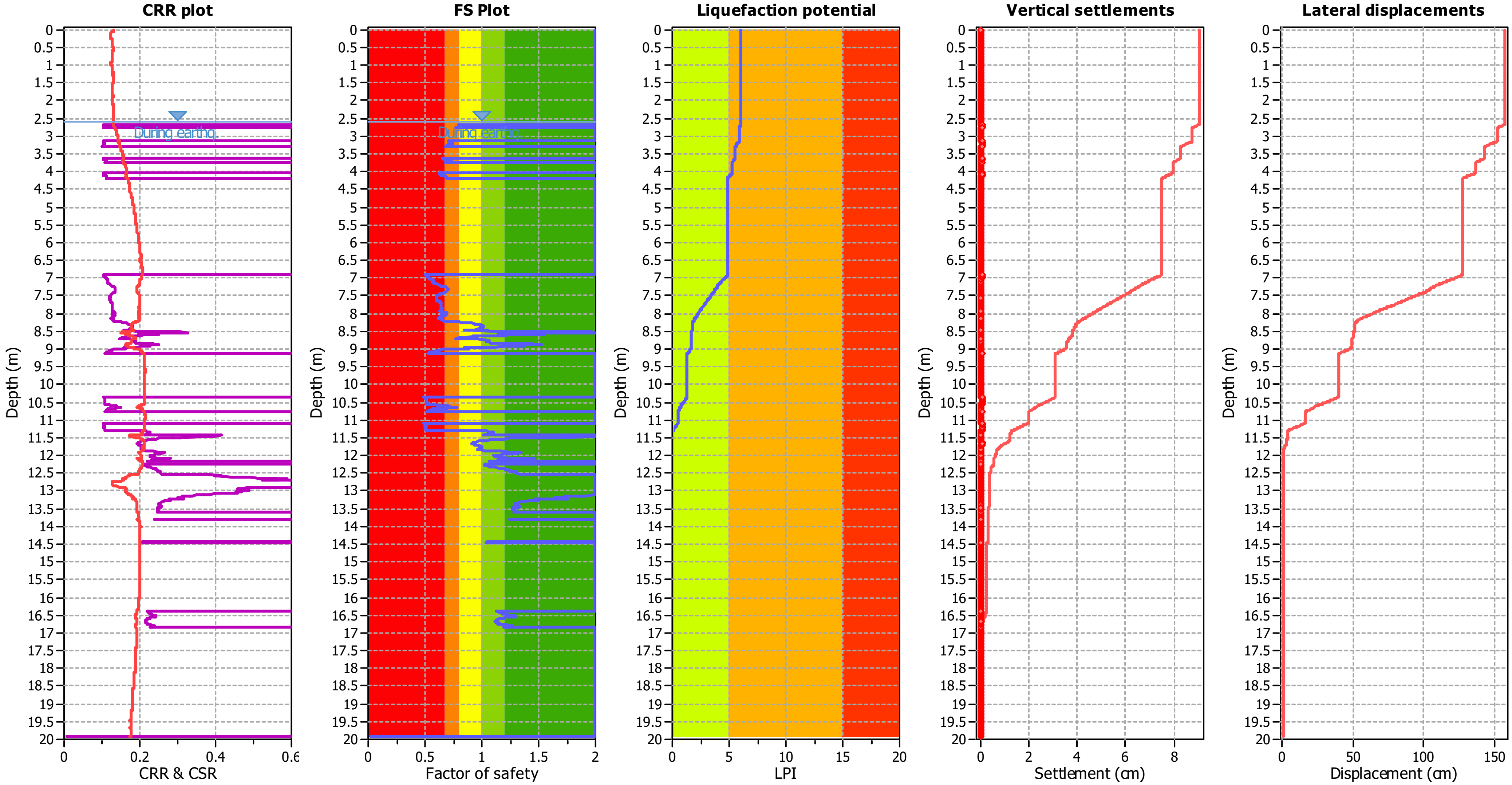
Input parameters and analysis data

Analysis method:	B&I (2014)
Fines correction method:	B&I (2014)
Points to test:	Based on Ic value
Earthquake magnitude M_w:	5.90
Peak ground acceleration:	0.24
Depth to water table (insitu):	2.60 m
Depth to GWT (erthq.):	2.60 m
Average results interval:	3
Ic cut-off value:	2.60
Unit weight calculation:	Based on SBT
Use fill:	No
Fill height:	N/A
Fill weight:	N/A
Transition detect. applied:	No
K_σ applied:	Yes
Clay like behavior applied:	Sands only
Limit depth applied:	No
Limit depth:	N/A

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.60 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.24	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.60 m	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

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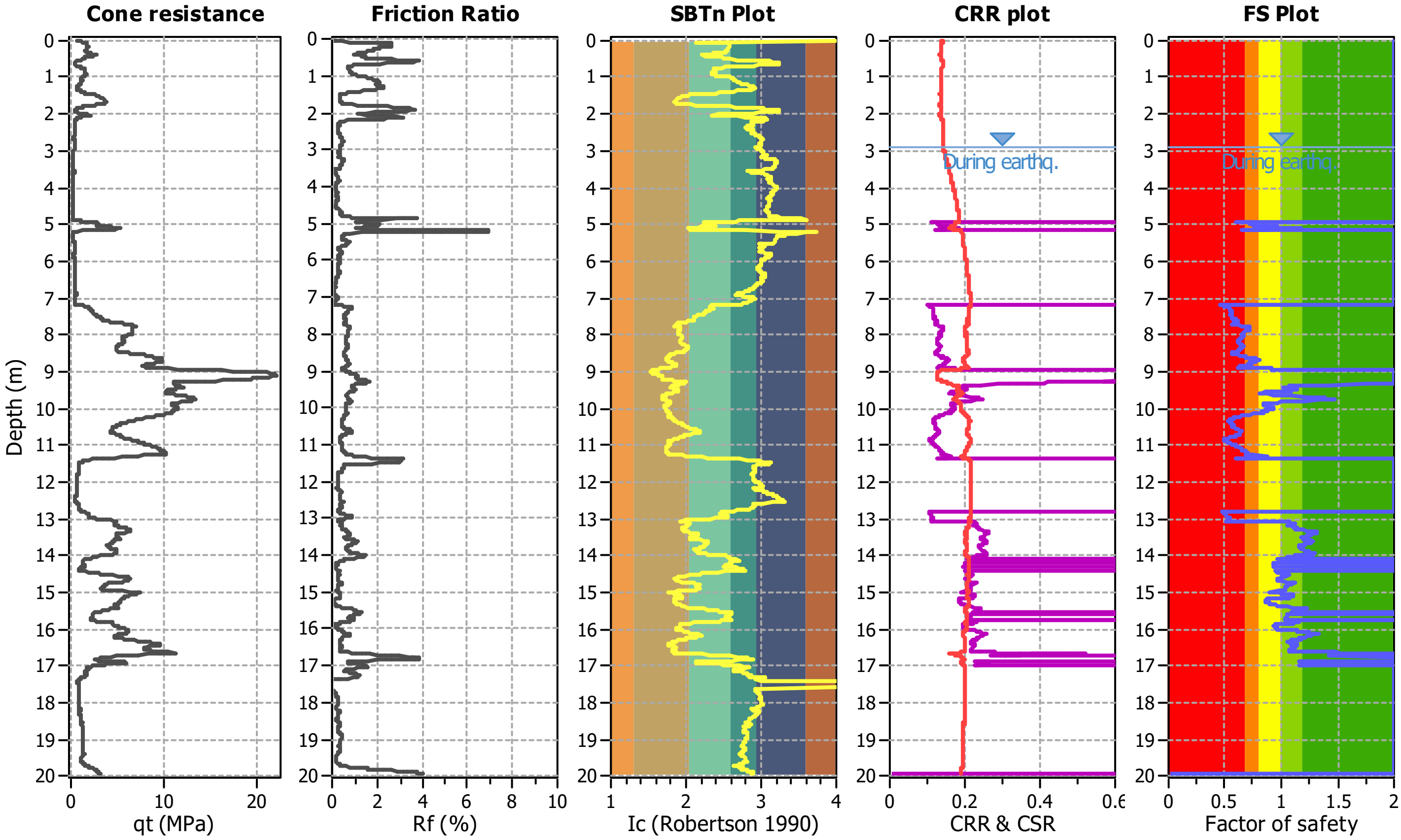
LIQUEFACTION ANALYSIS REPORT

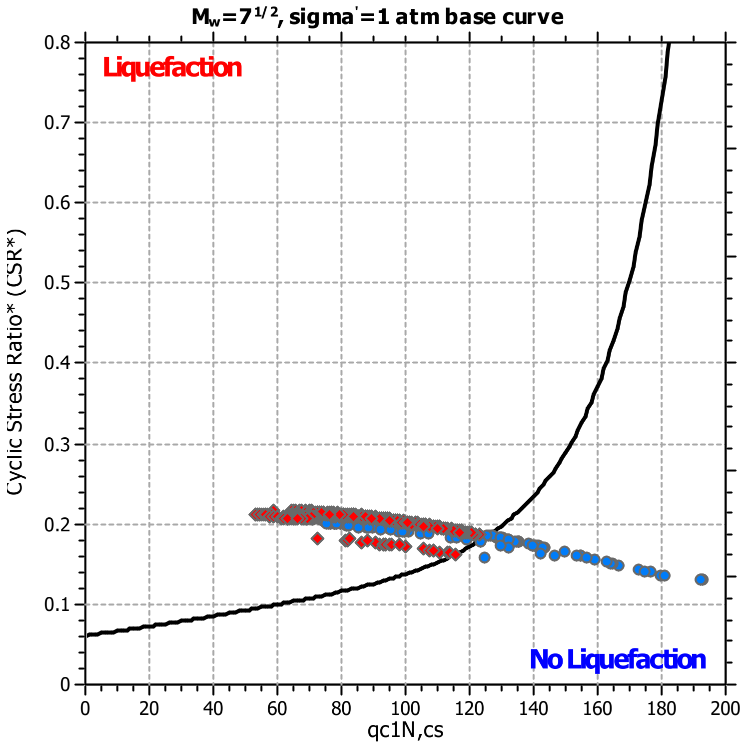
Project title : **Location :**

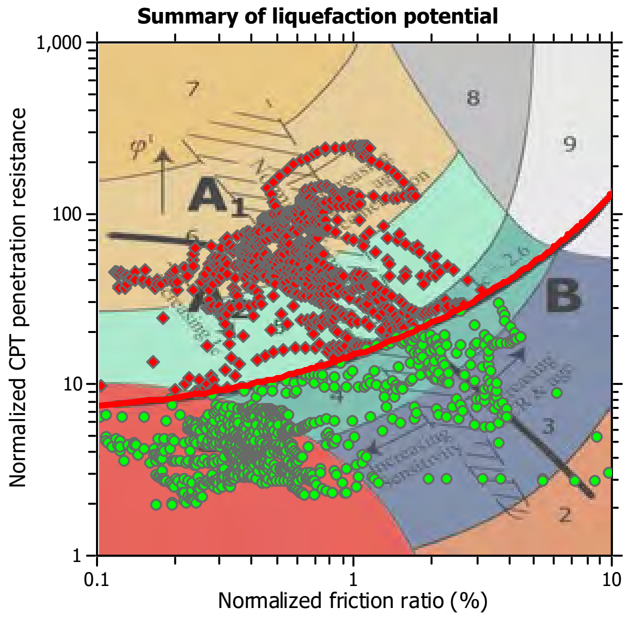
CPT file : CPT05

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.90 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.90 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.26	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

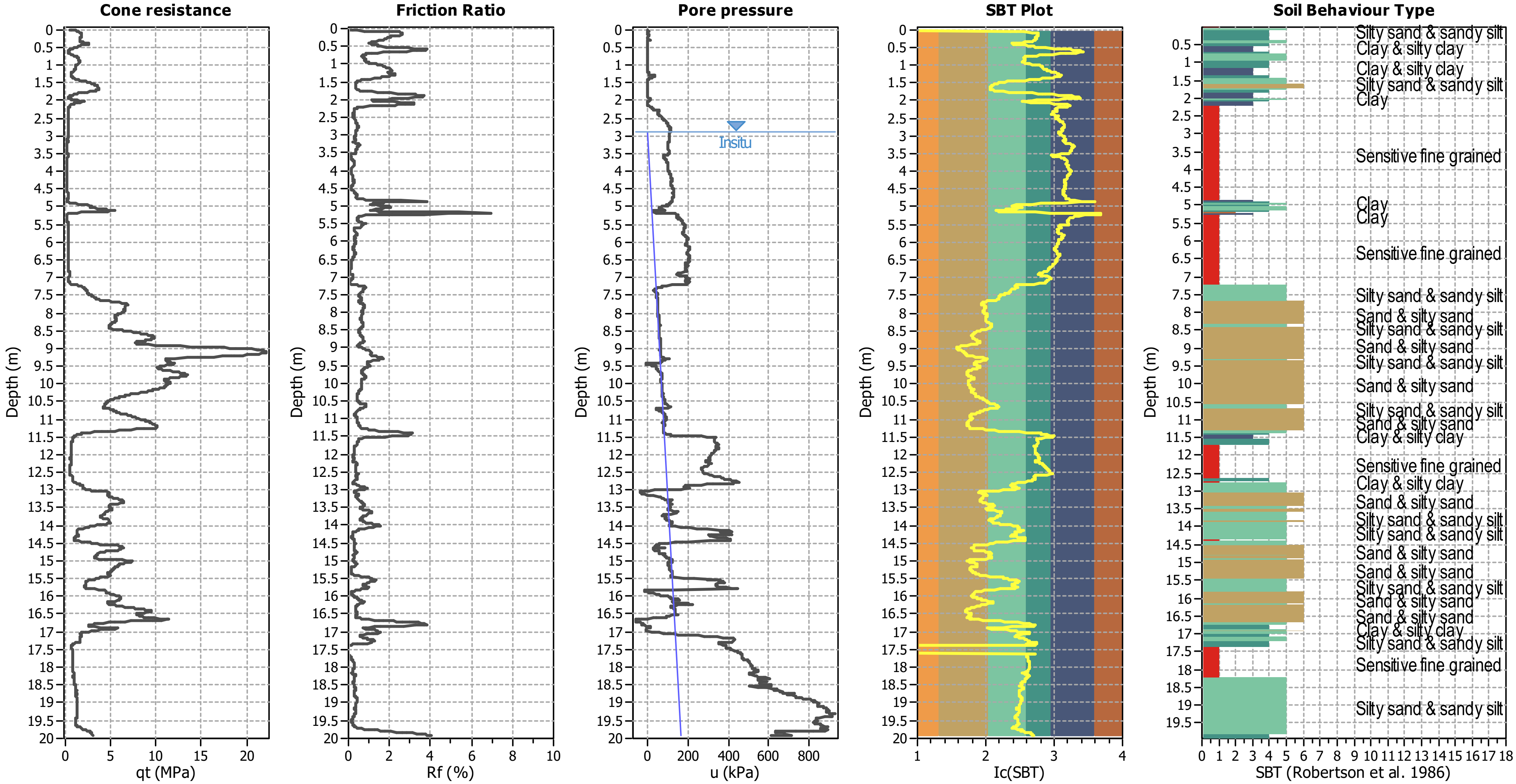






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



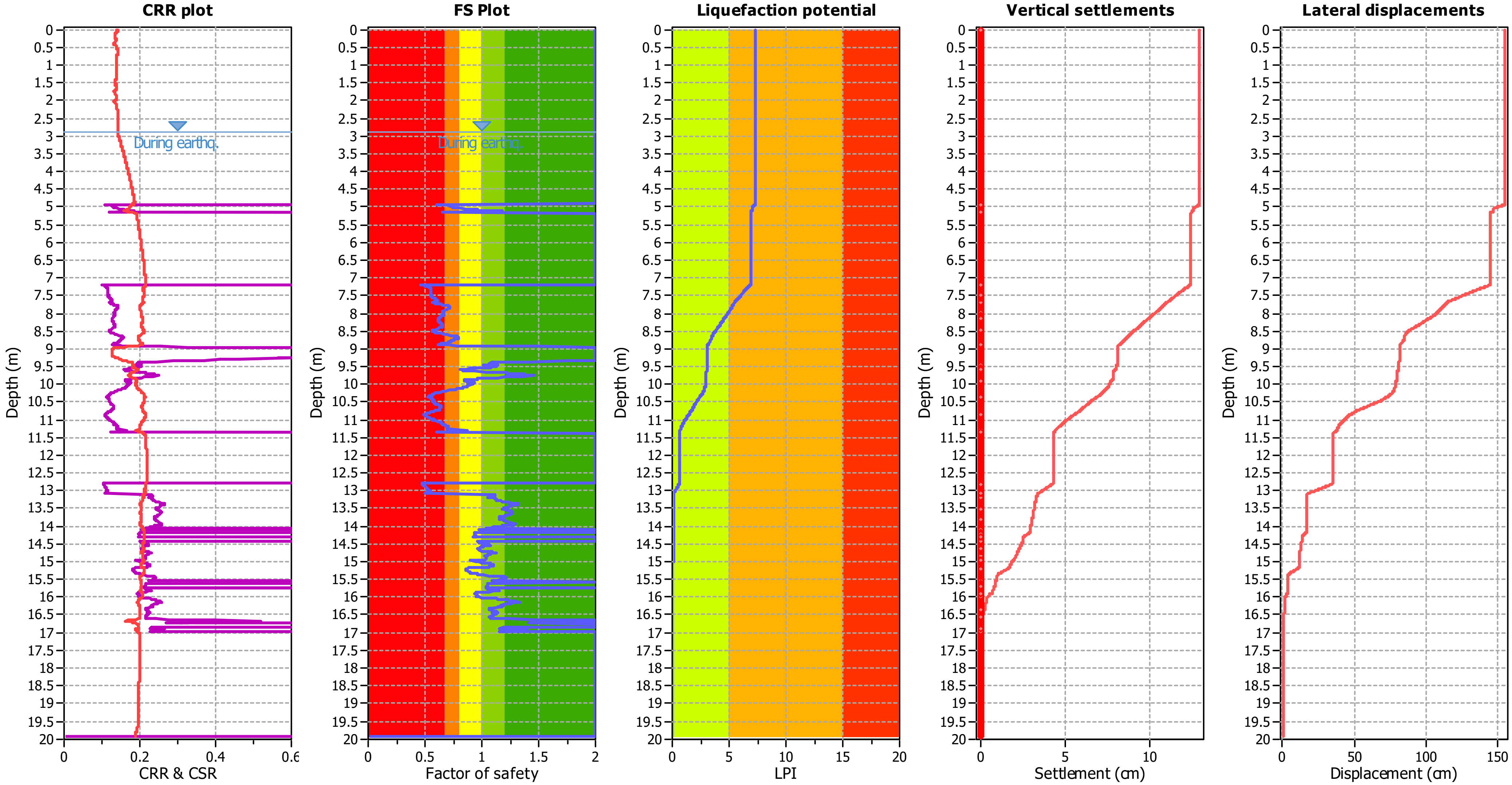
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.90 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.26	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.90 m	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.90 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_{σ} applied:	Yes
Earthquake magnitude M_w:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.26	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.90 m	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

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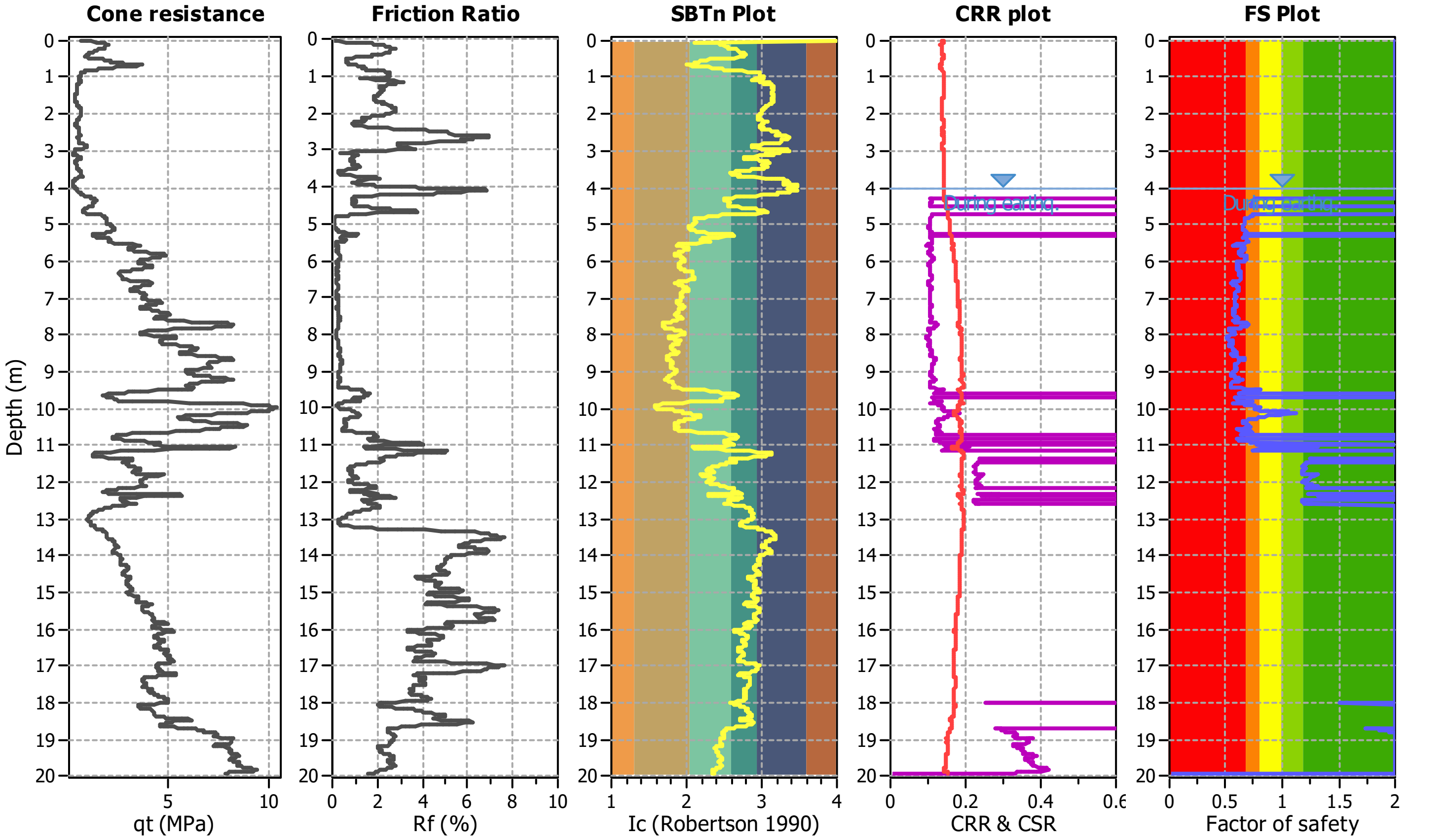
LIQUEFACTION ANALYSIS REPORT

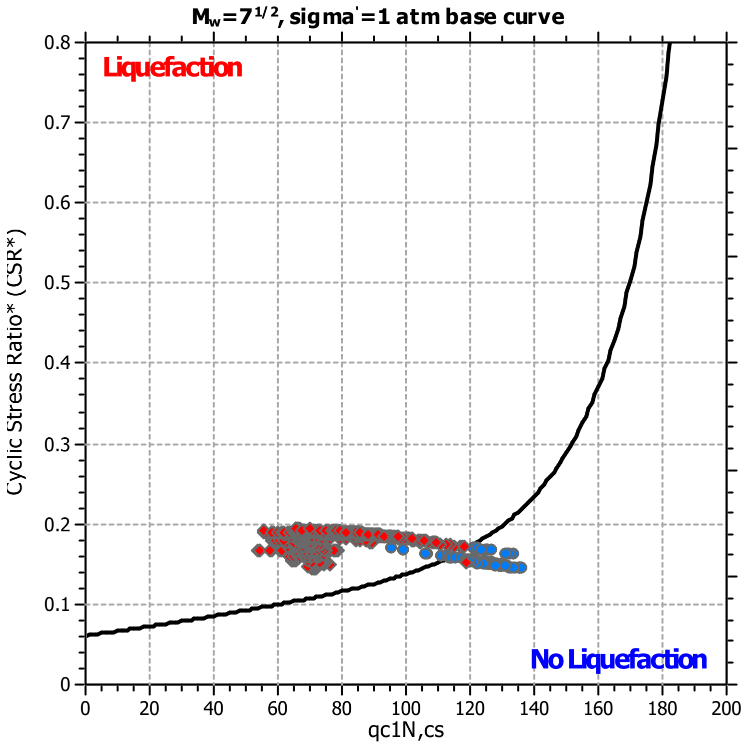
Project title : **Location :**

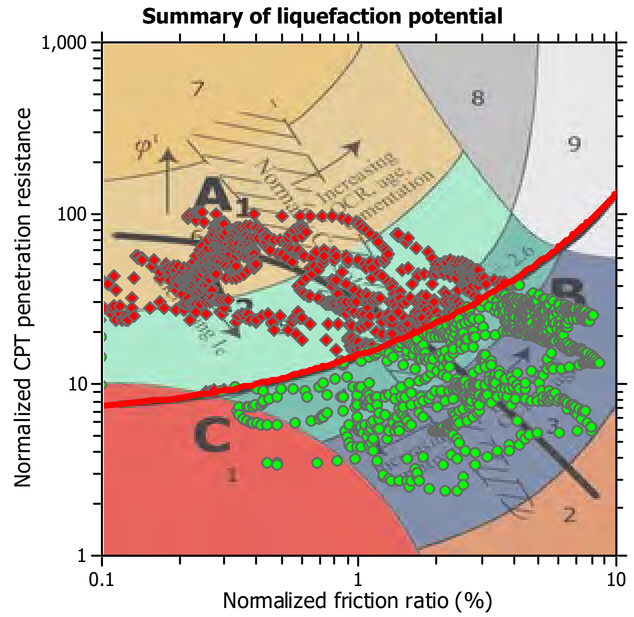
CPT file : CPT06

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	4.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	4.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.26	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

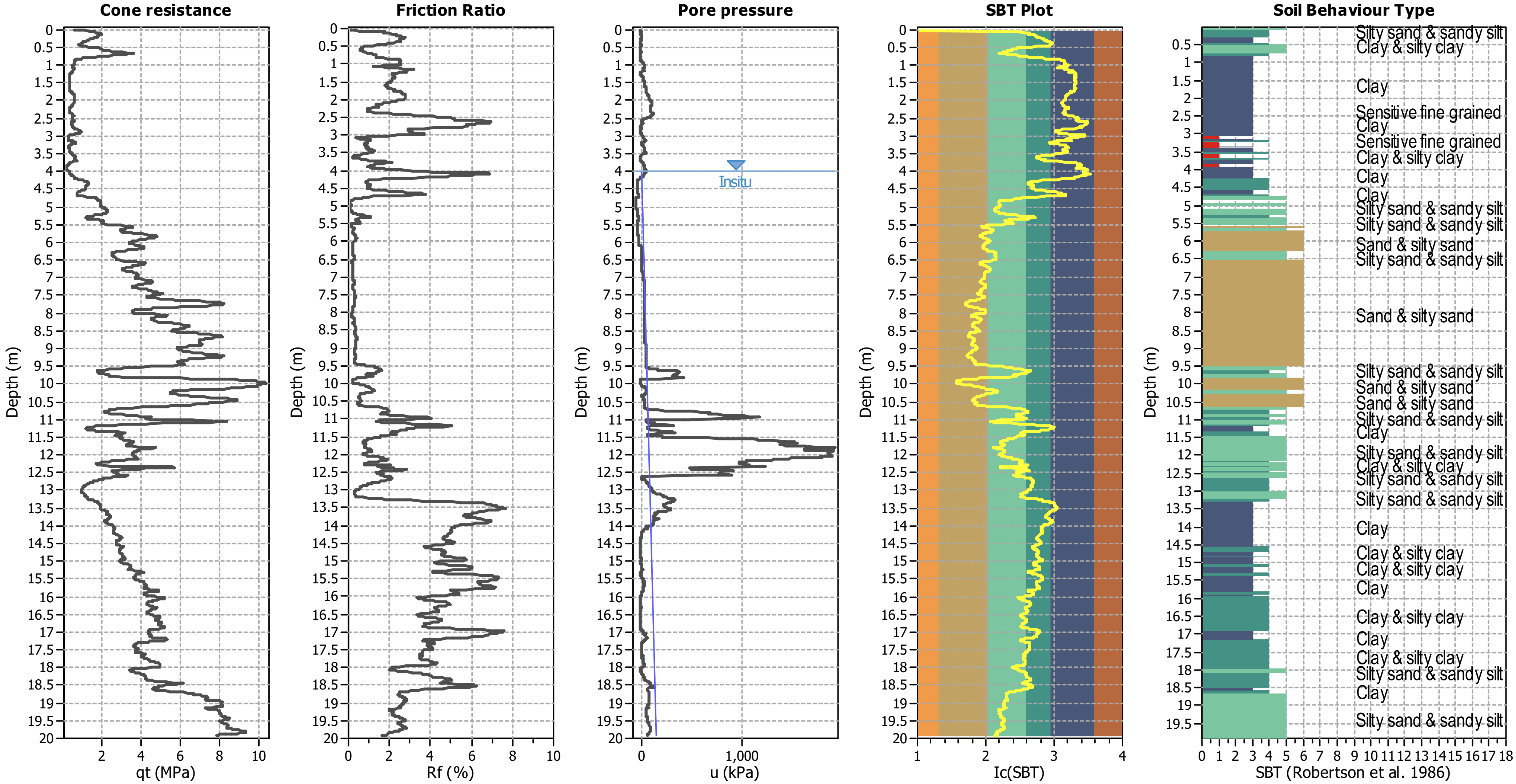






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



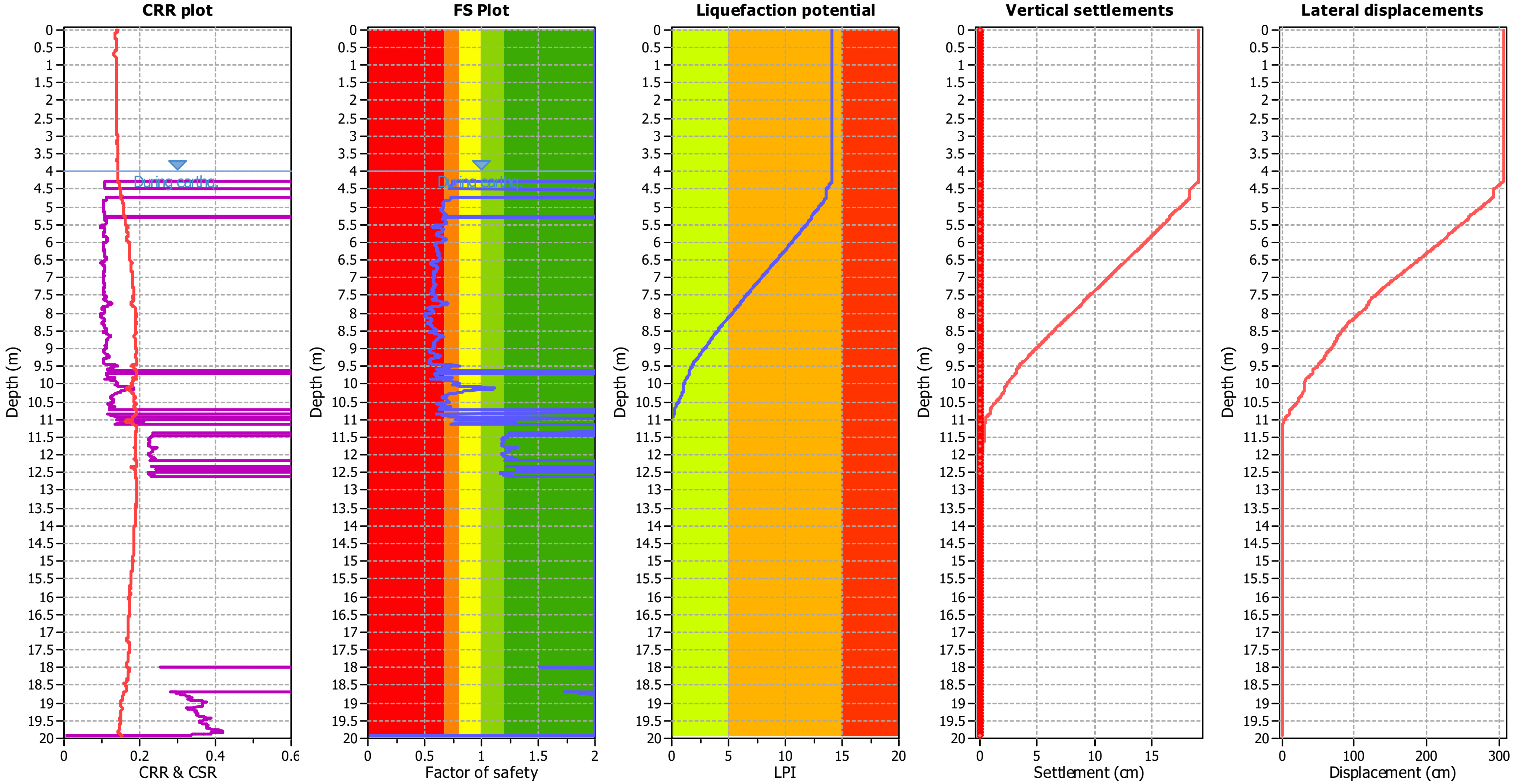
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	4.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.26	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	4.00 m	Fill height:	N/A	Limit depth:	N/A

SBT legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravely sand to sand
- 8. Very stiff sand to
- 9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	4.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.26	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	4.00 m	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

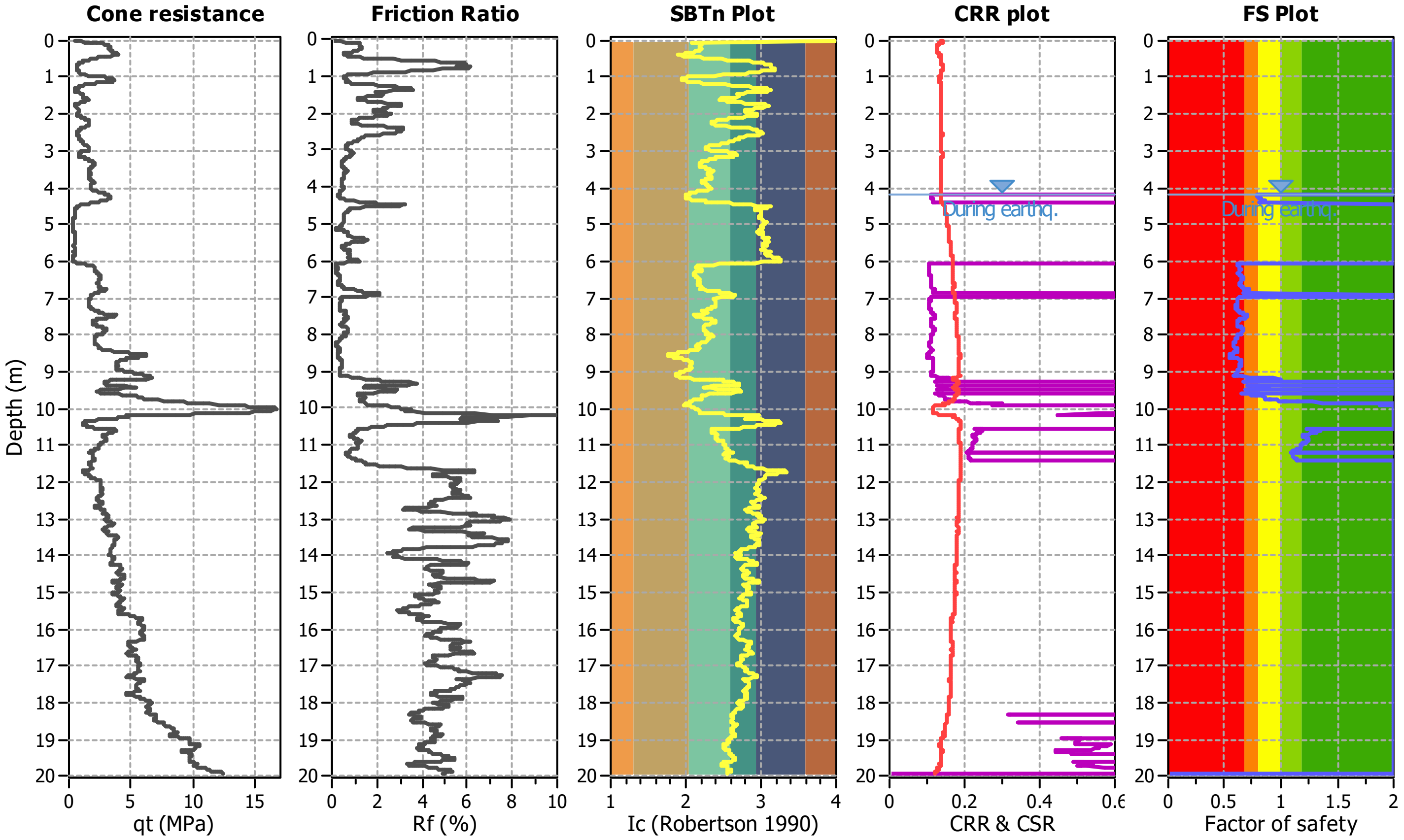
LIQUEFACTION ANALYSIS REPORT

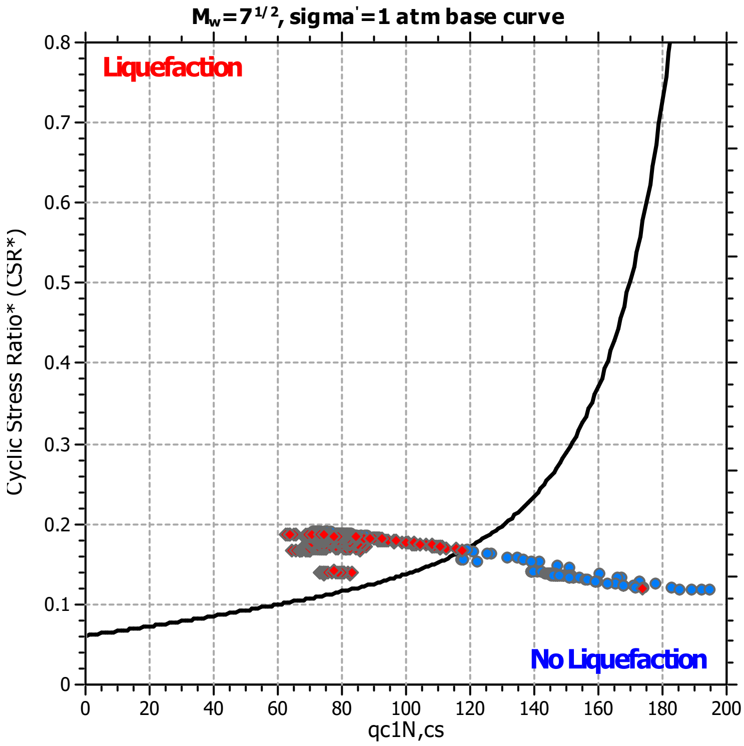
Project title : **Location :**

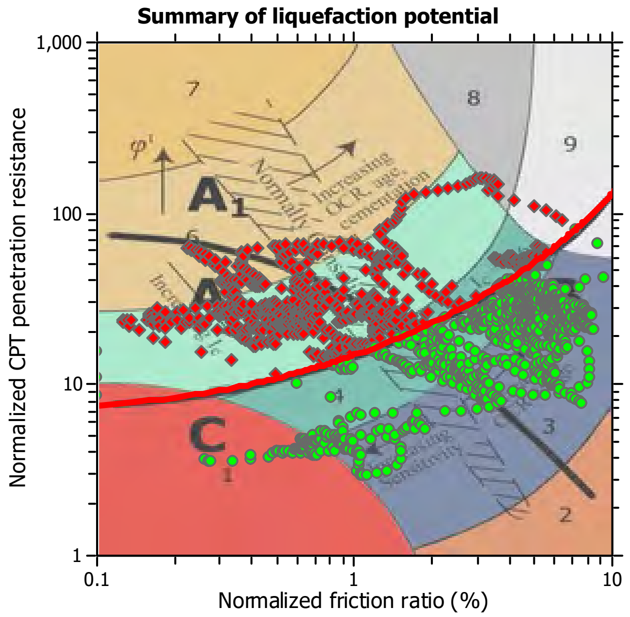
CPT file : CPT07

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	4.20 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	4.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.26	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

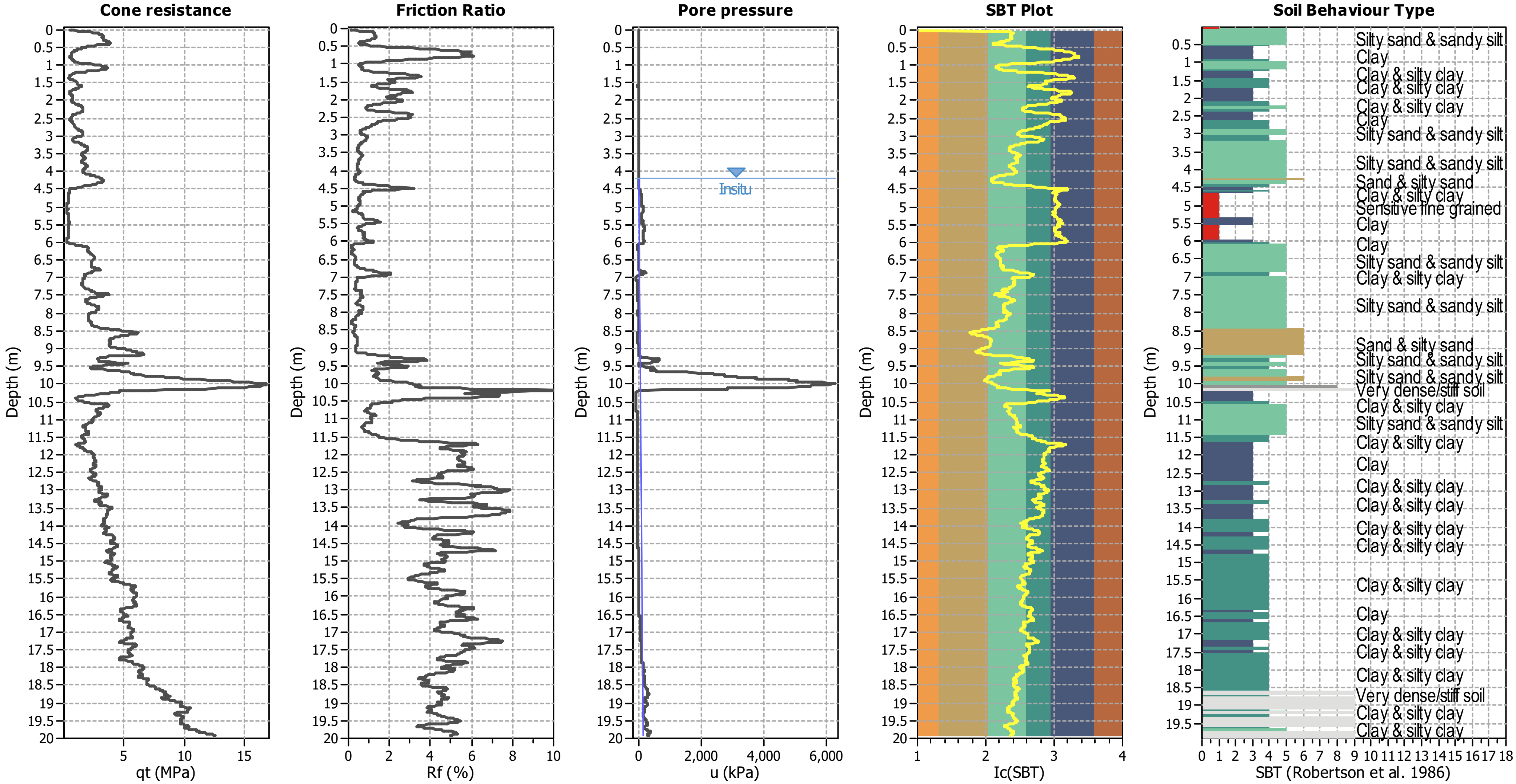






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



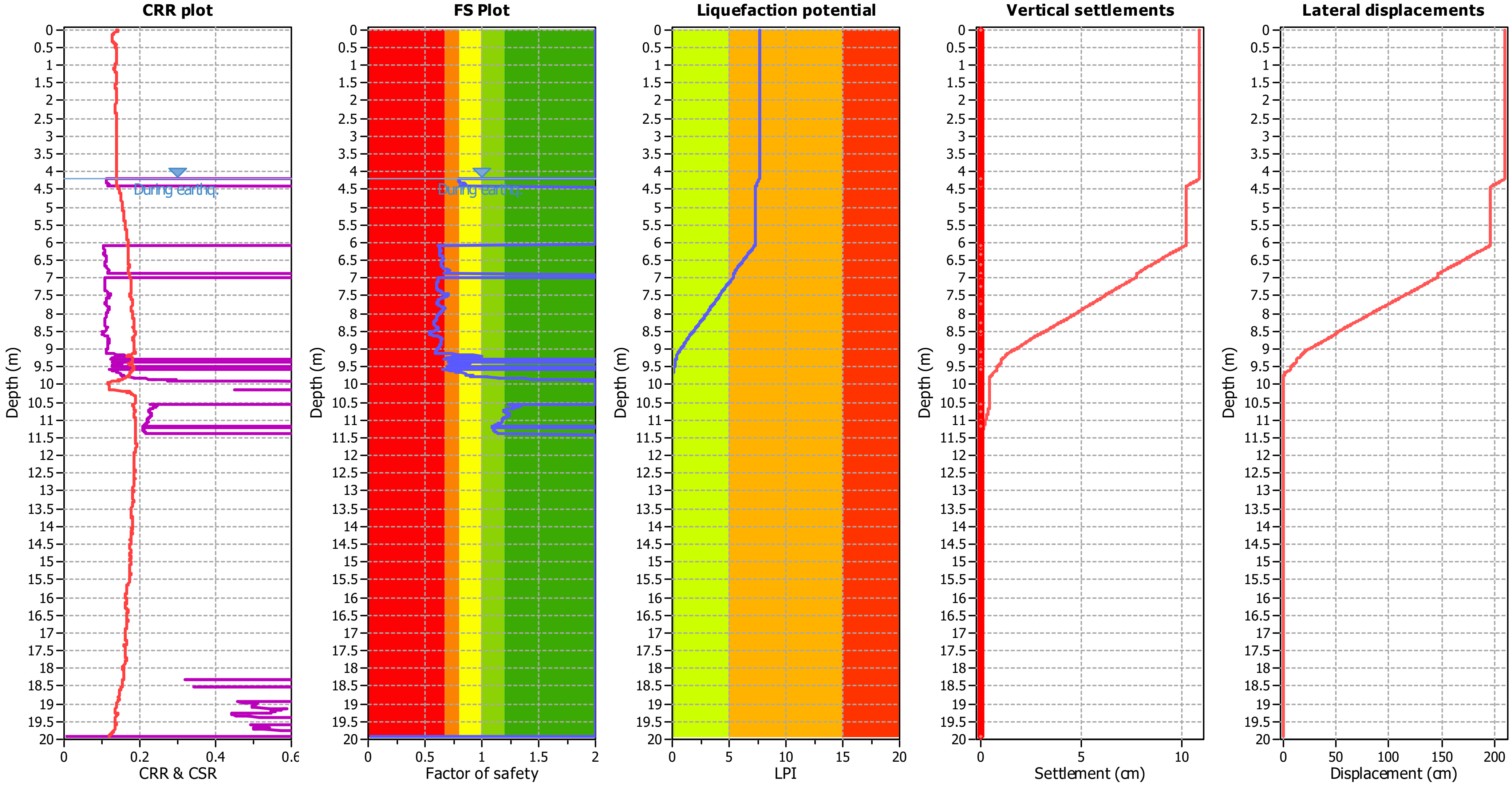
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	4.20 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.26	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	4.20 m	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained	4. Clayey silt to silty	7. Gravely sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	4.20 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.26	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	4.20 m	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

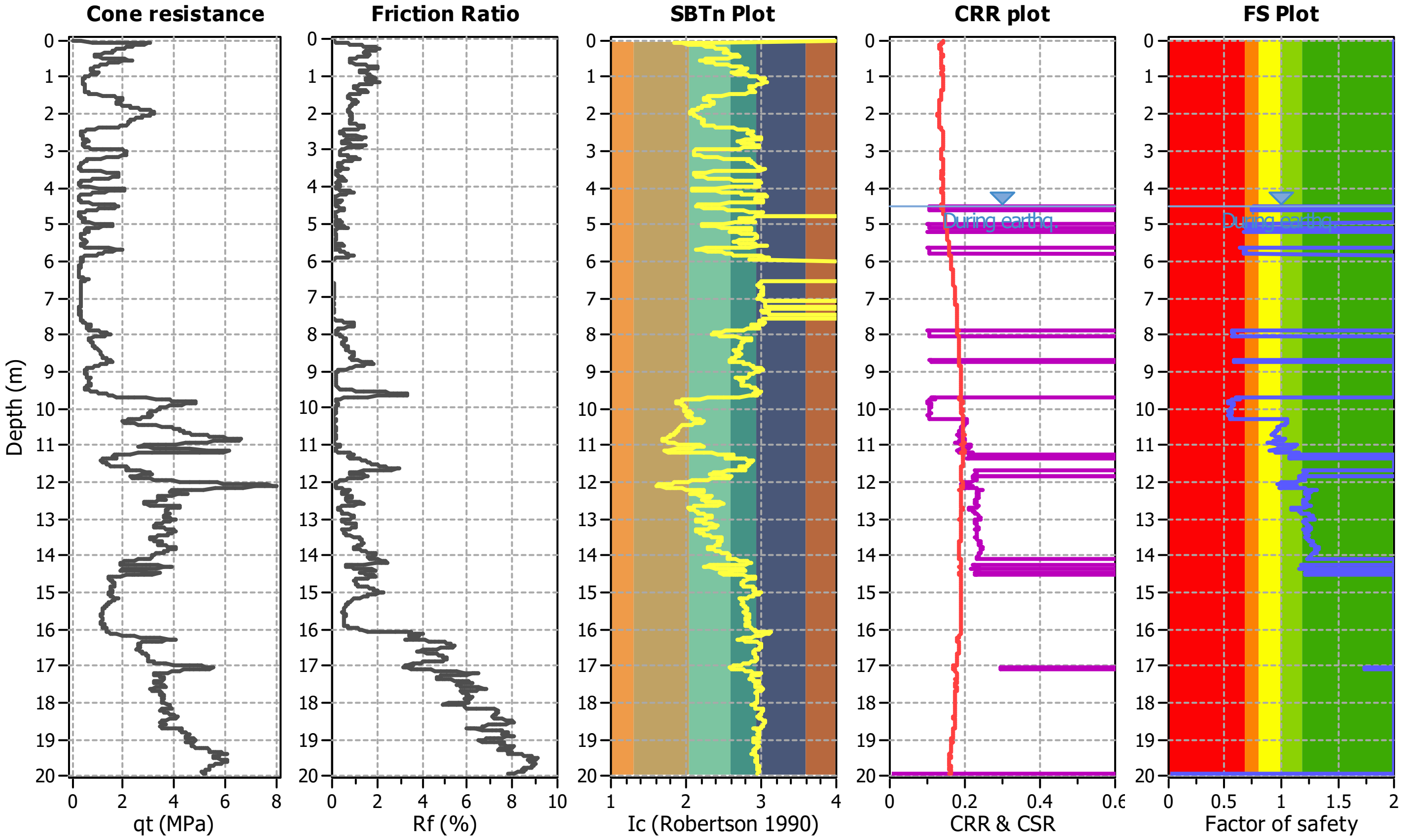
LIQUEFACTION ANALYSIS REPORT

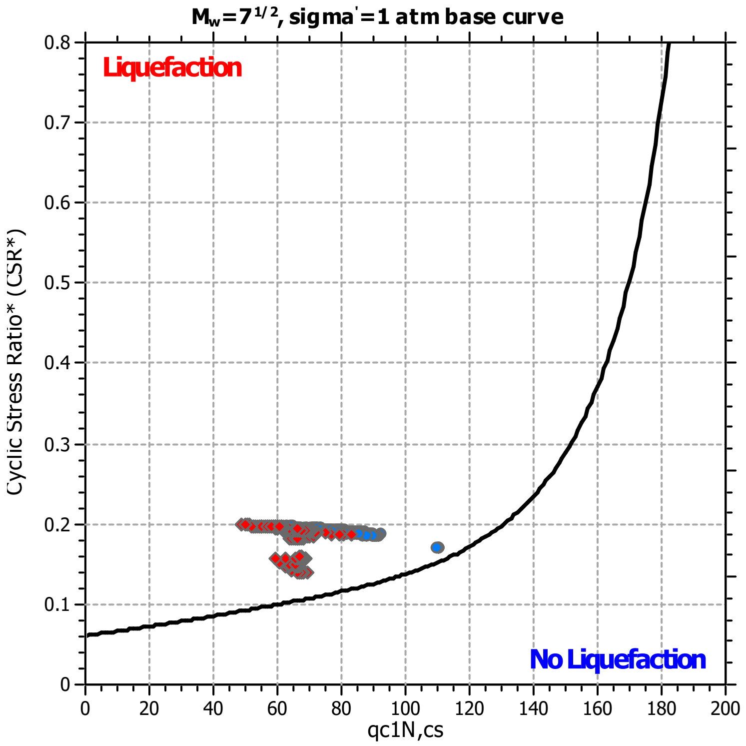
Project title : **Location :**

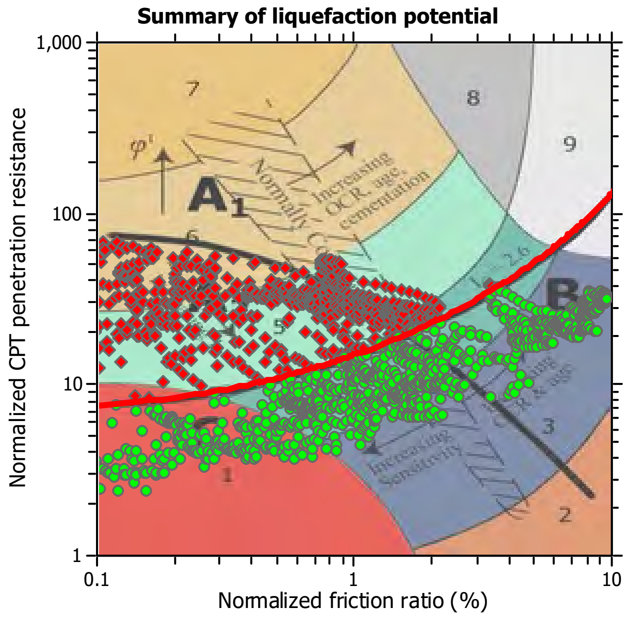
CPT file : CPT08

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	4.50 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	4.50 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.26	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

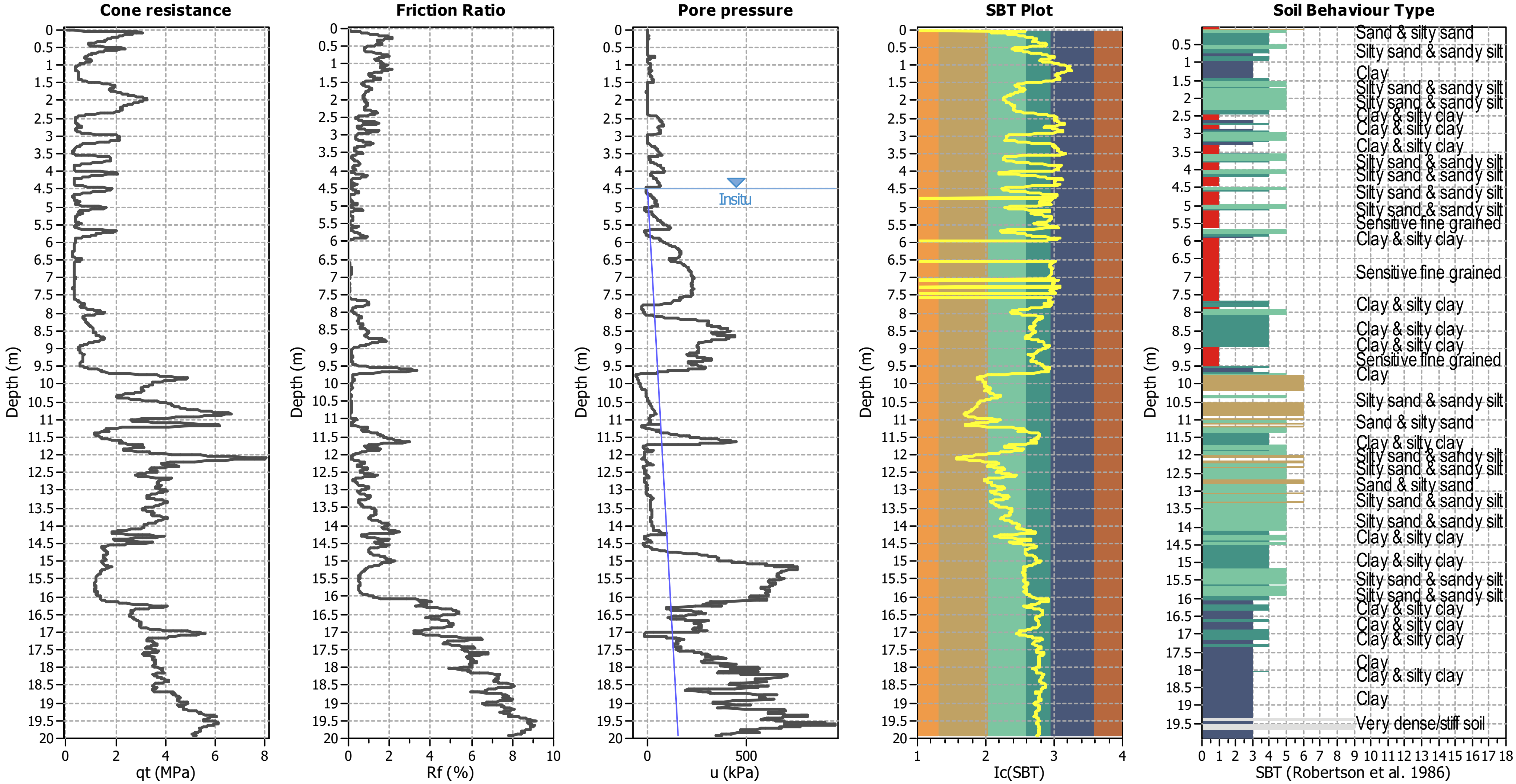






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



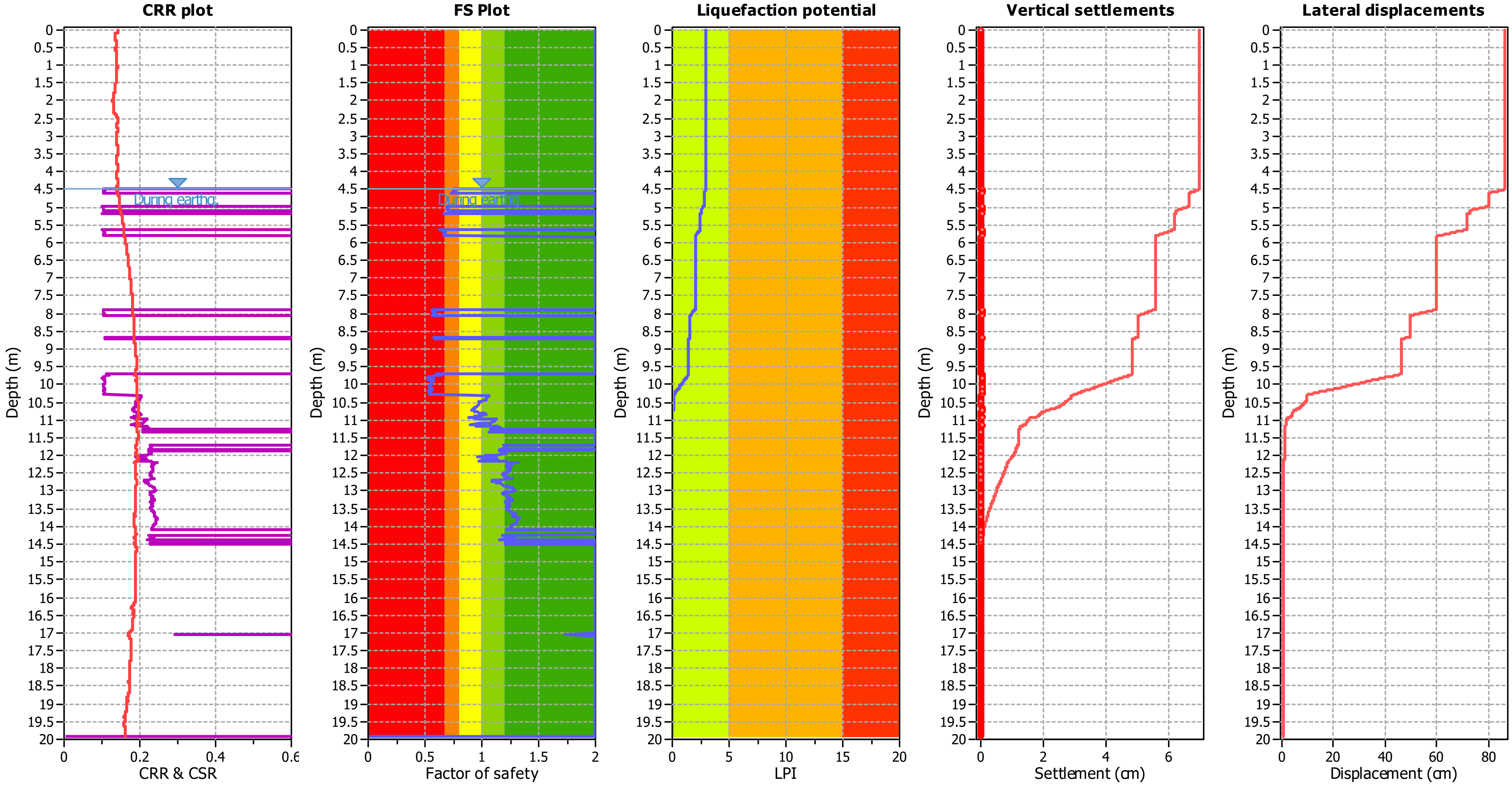
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	4.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.26	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	4.50 m	Fill height:	N/A	Limit depth:	N/A

SBT legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravely sand to sand
- 8. Very stiff sand to
- 9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	4.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.26	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	4.50 m	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

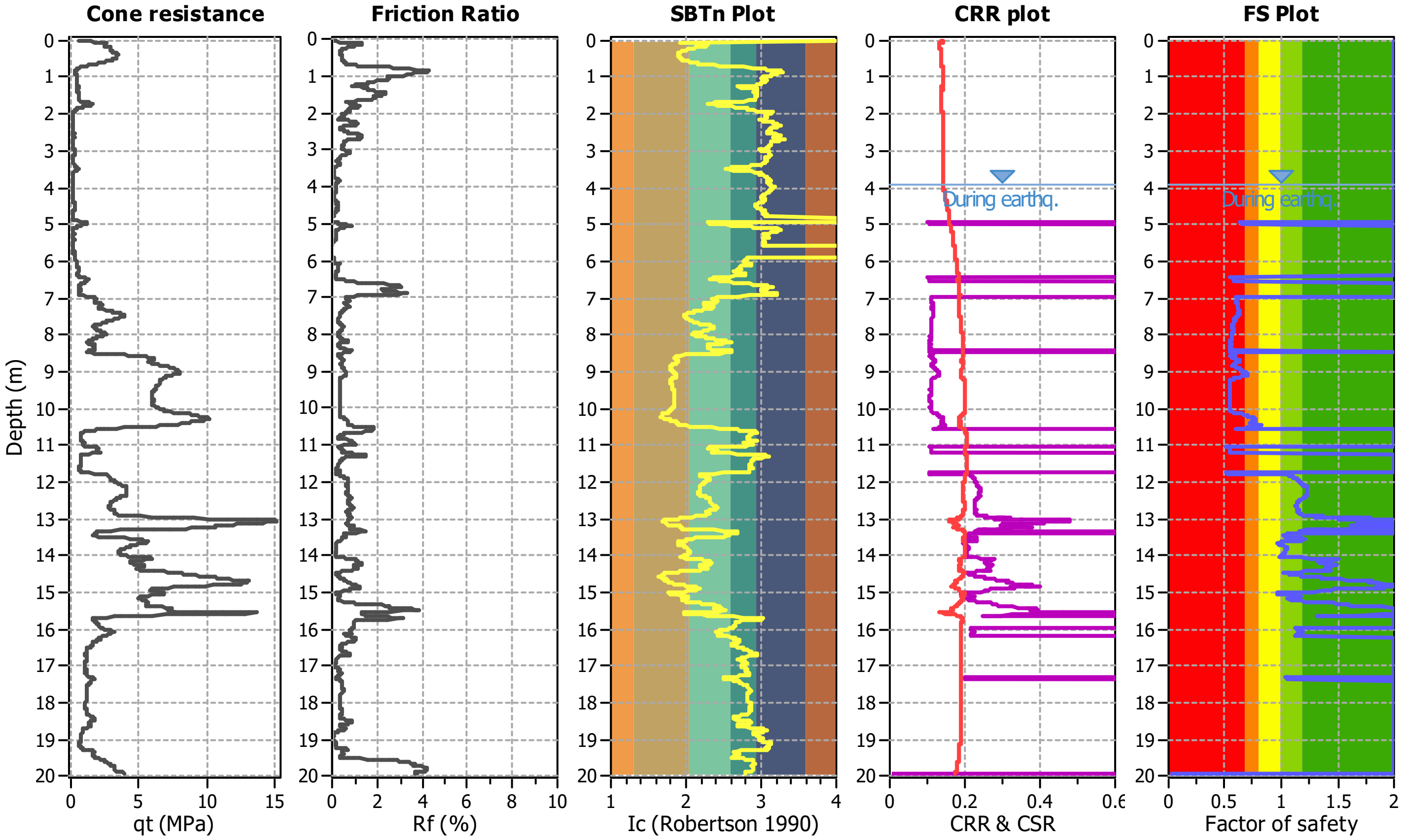
LIQUEFACTION ANALYSIS REPORT

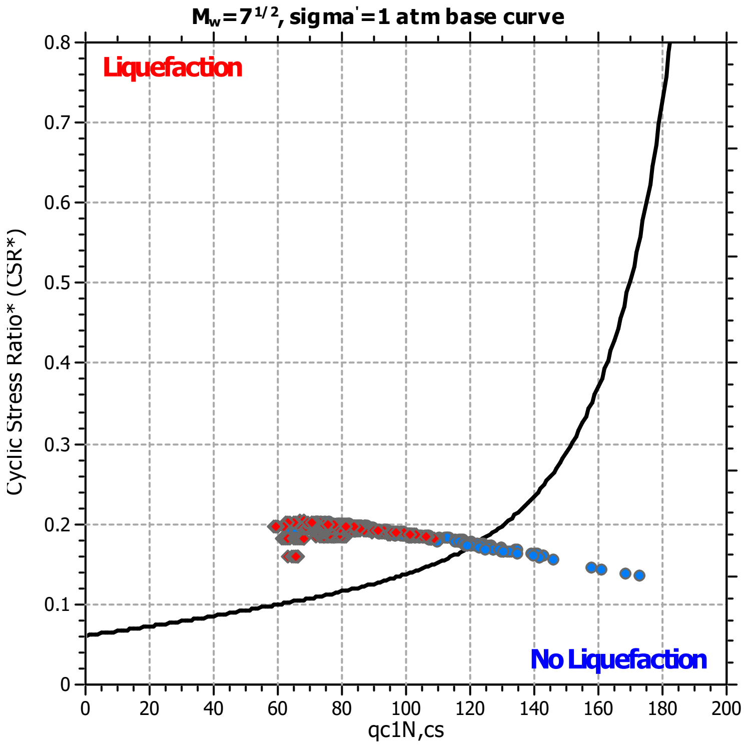
Project title : **Location :**

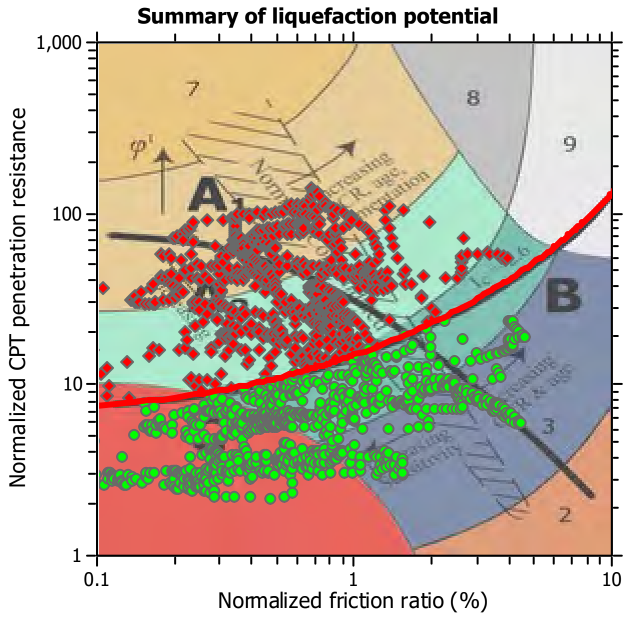
CPT file : CPT10

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	3.90 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	3.90 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.26	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

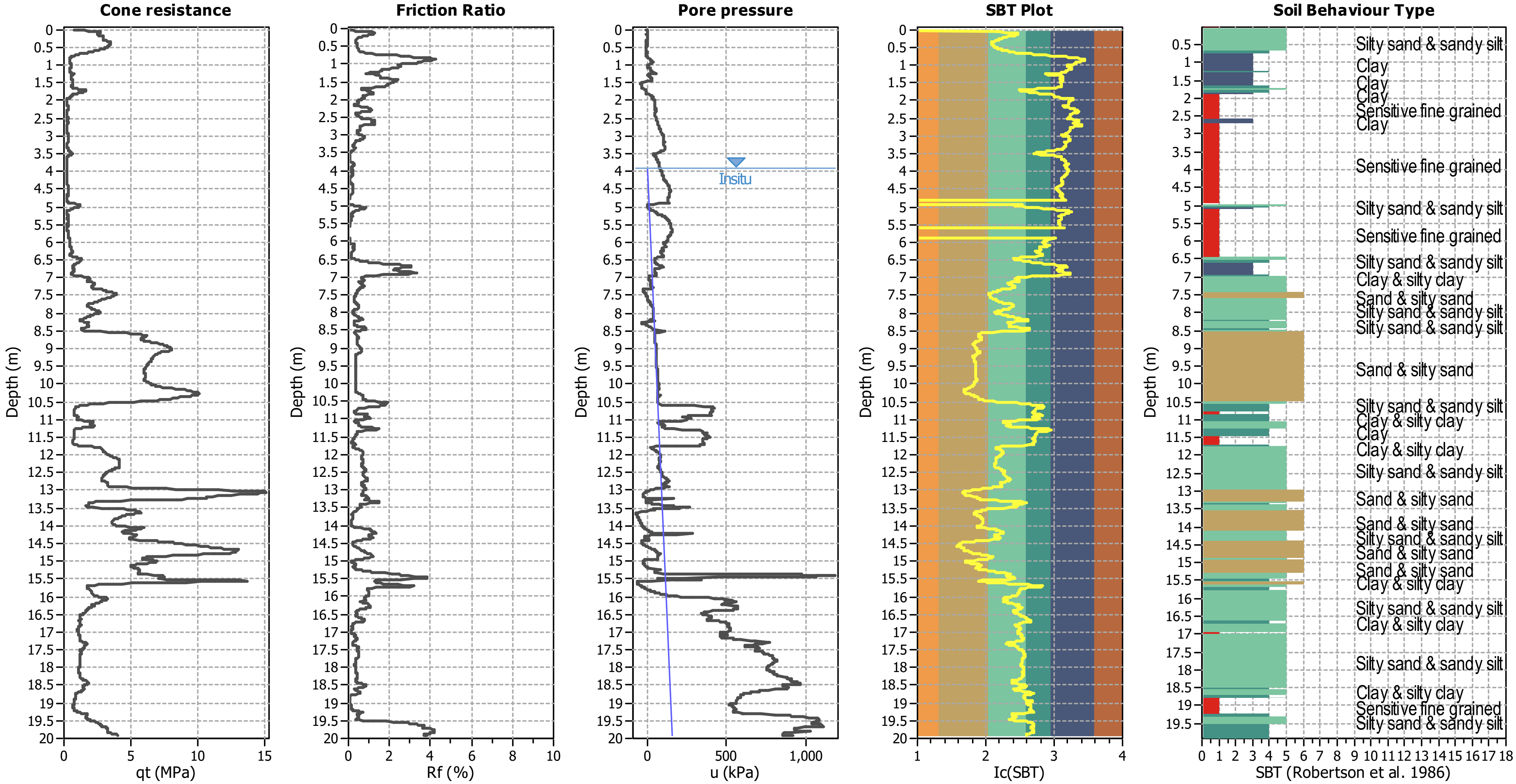






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



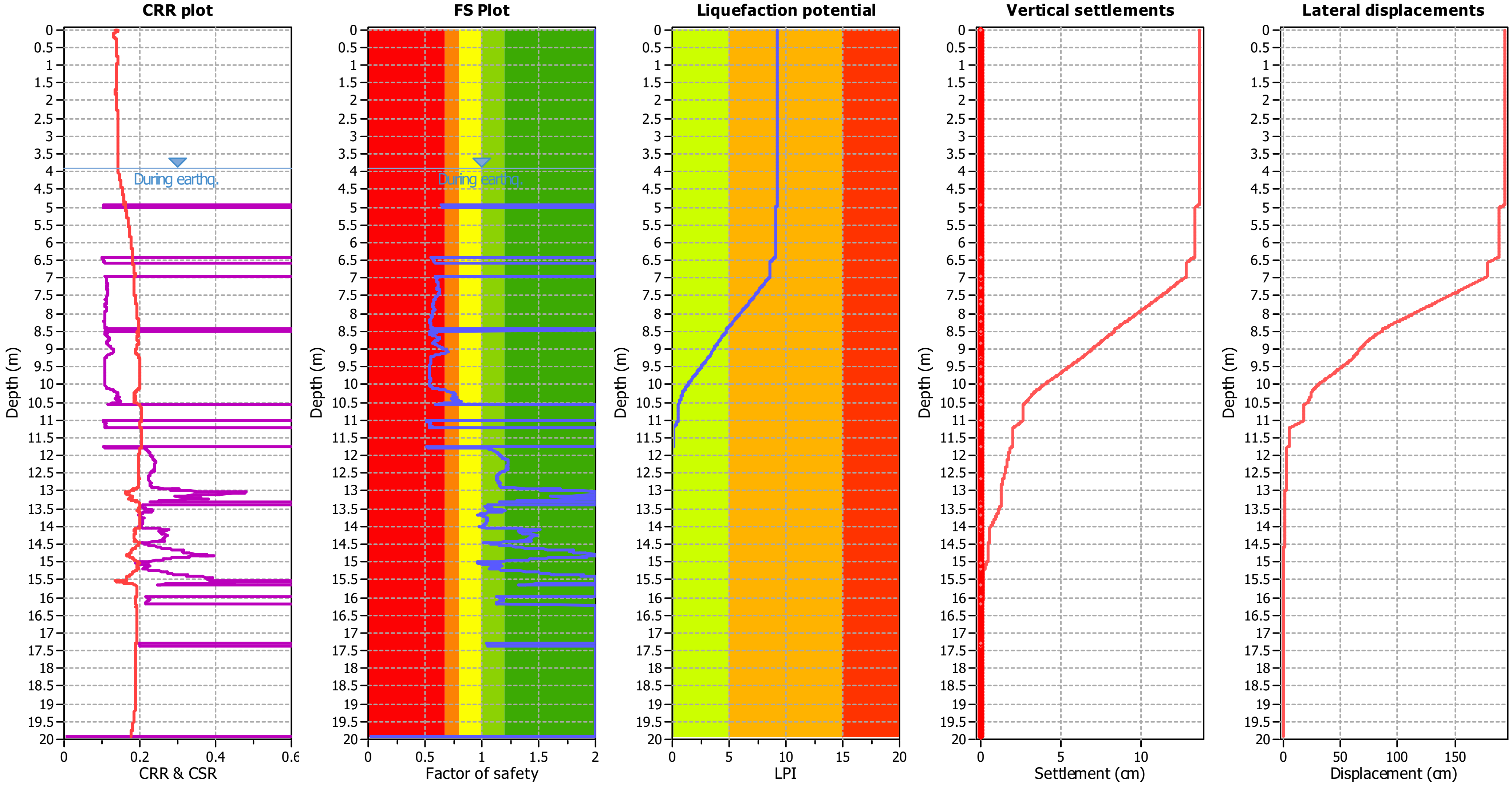
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.90 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.26	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	3.90 m	Fill height:	N/A	Limit depth:	N/A

SBT legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravely sand to sand
- 8. Very stiff sand to
- 9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.90 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.26	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	3.90 m	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

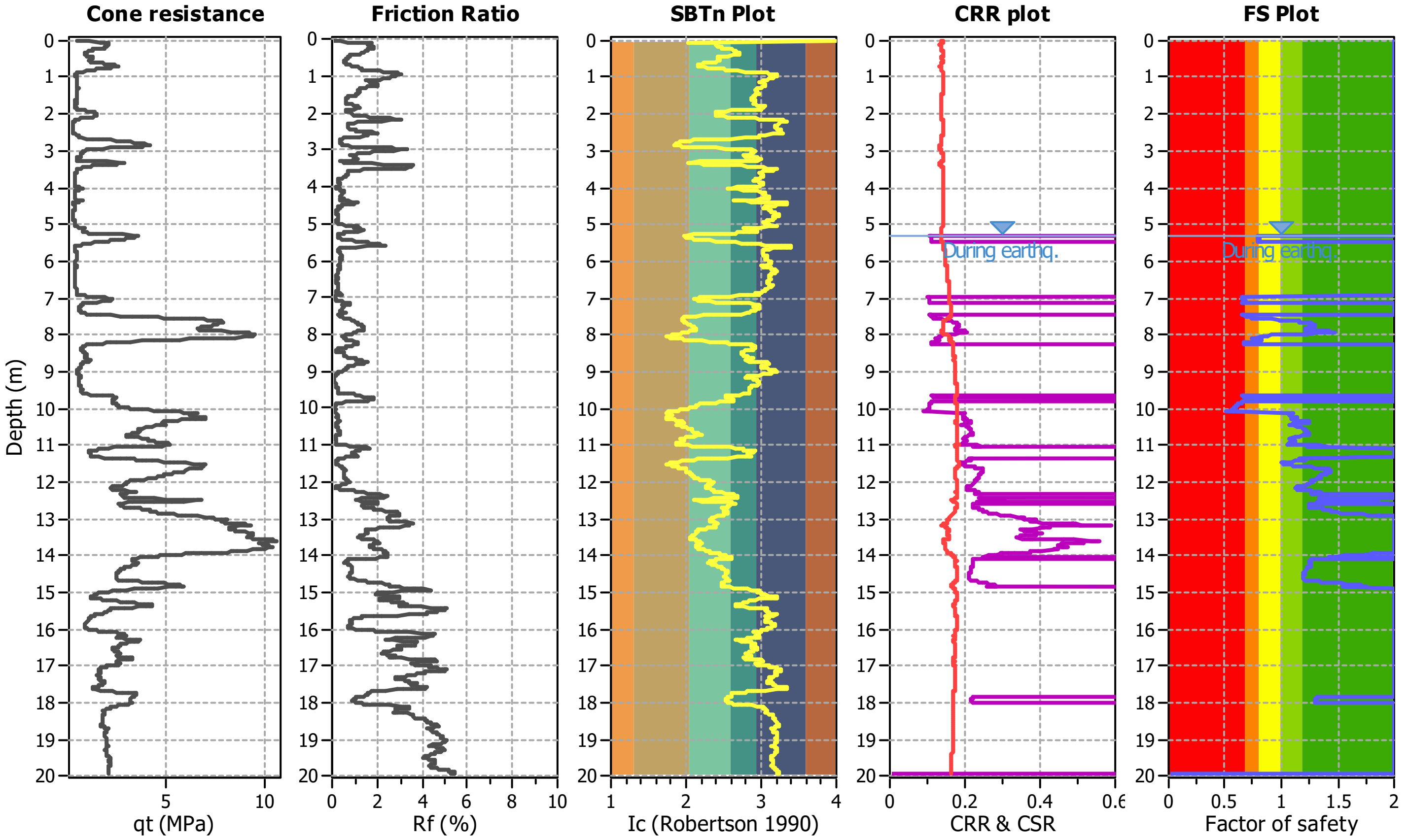
LIQUEFACTION ANALYSIS REPORT

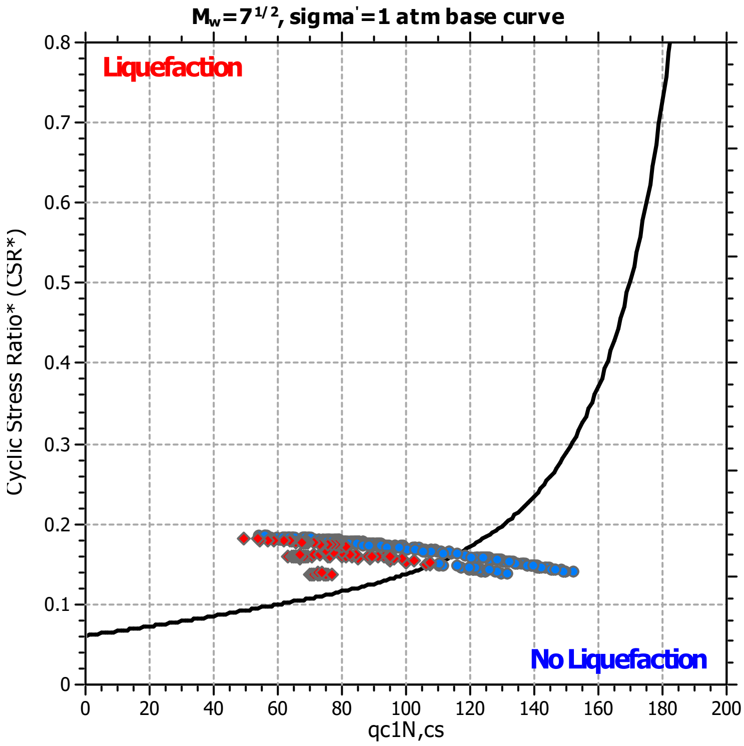
Project title : **Location :**

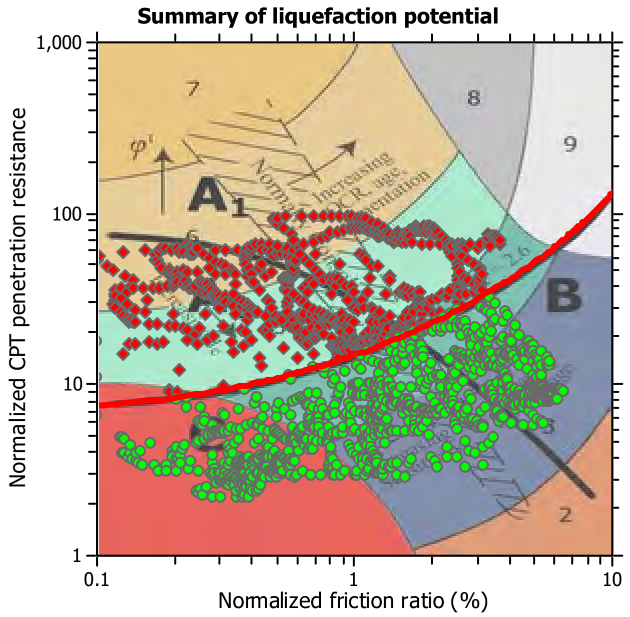
CPT file : CPT09

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	5.30 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	5.30 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.26	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

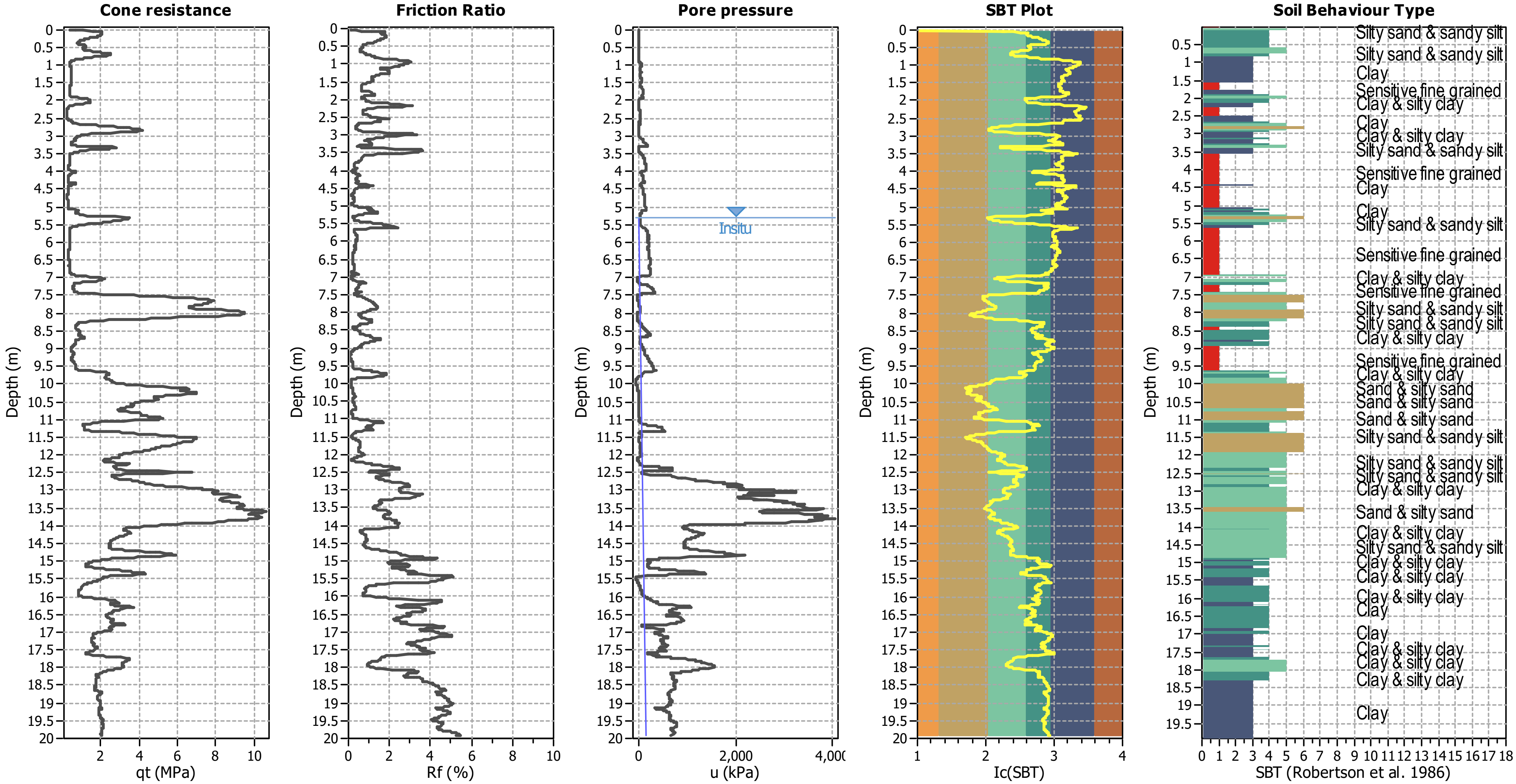






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



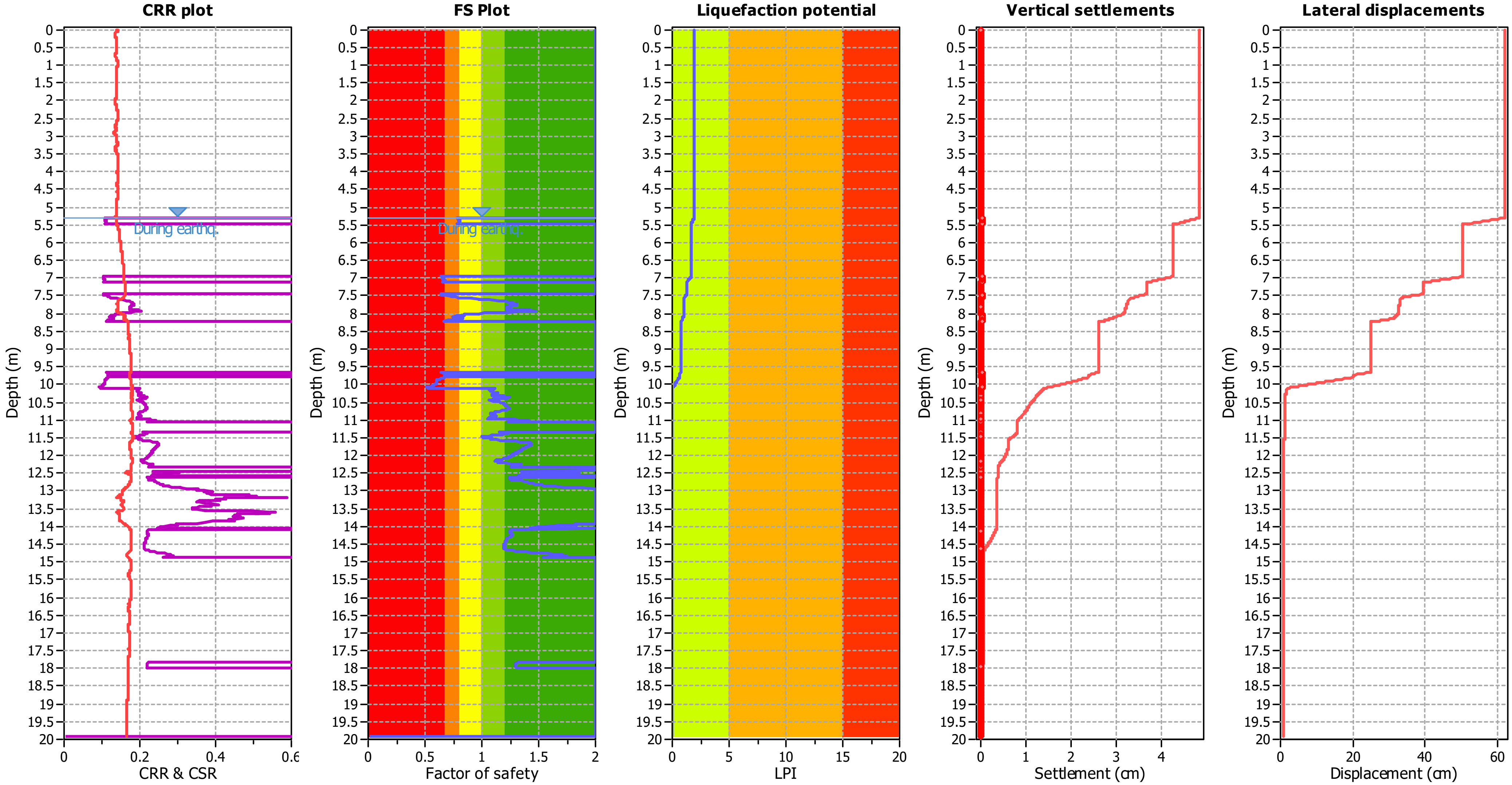
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	5.30 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.26	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	5.30 m	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained	4. Clayey silt to silty	7. Gravely sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	5.30 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.26	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	5.30 m	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

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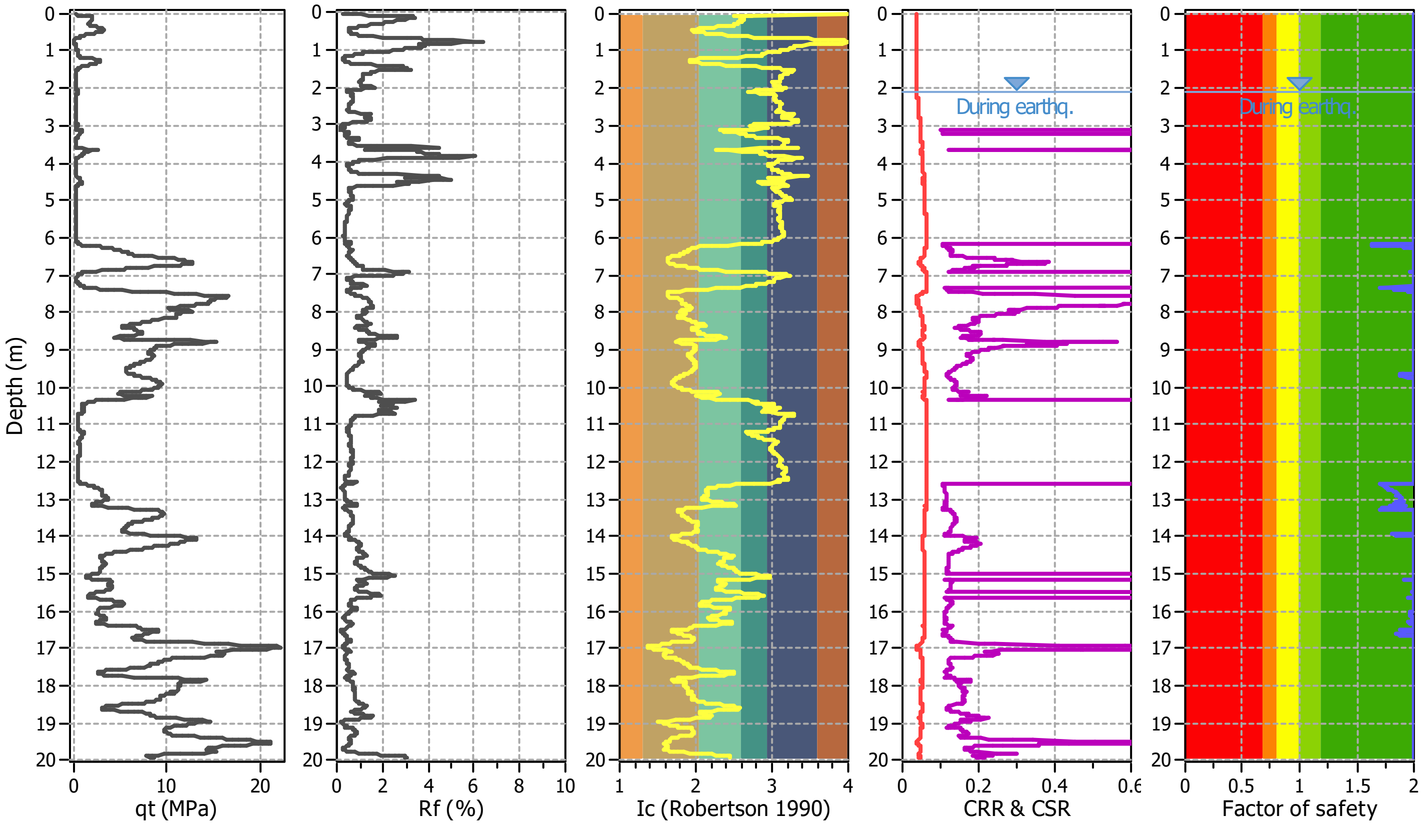
LIQUEFACTION ANALYSIS REPORT

Project title : **Location :**

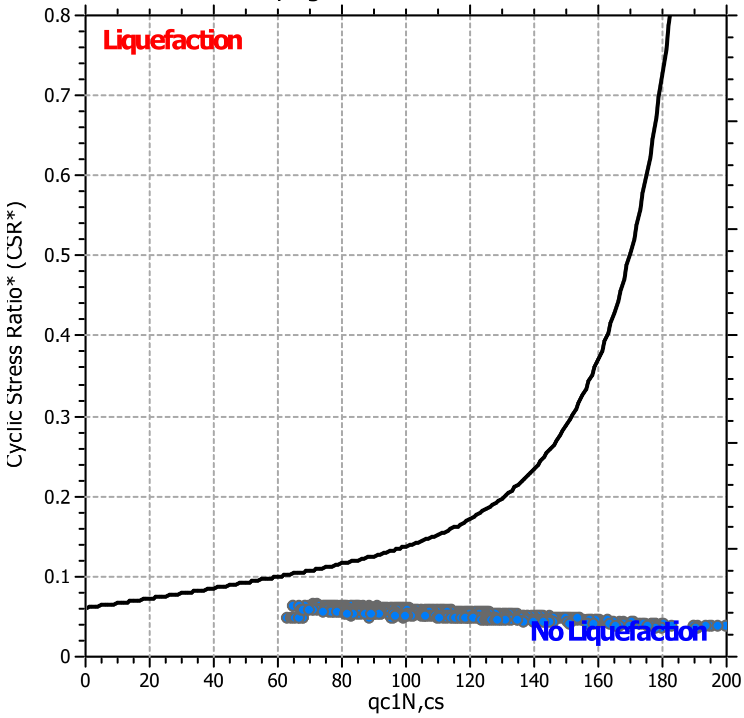
CPT file : CPT01

Input parameters and analysis data

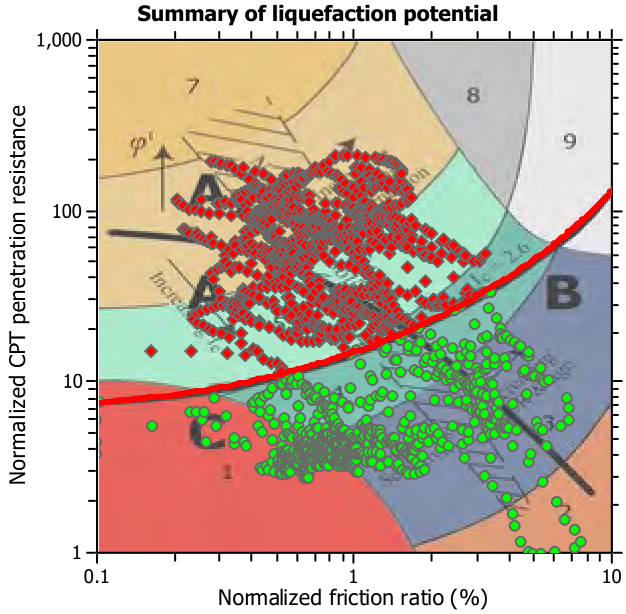
Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.10 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.10 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.07	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



$M_w=7^{1/2}$, sigma'=1 atm base curve

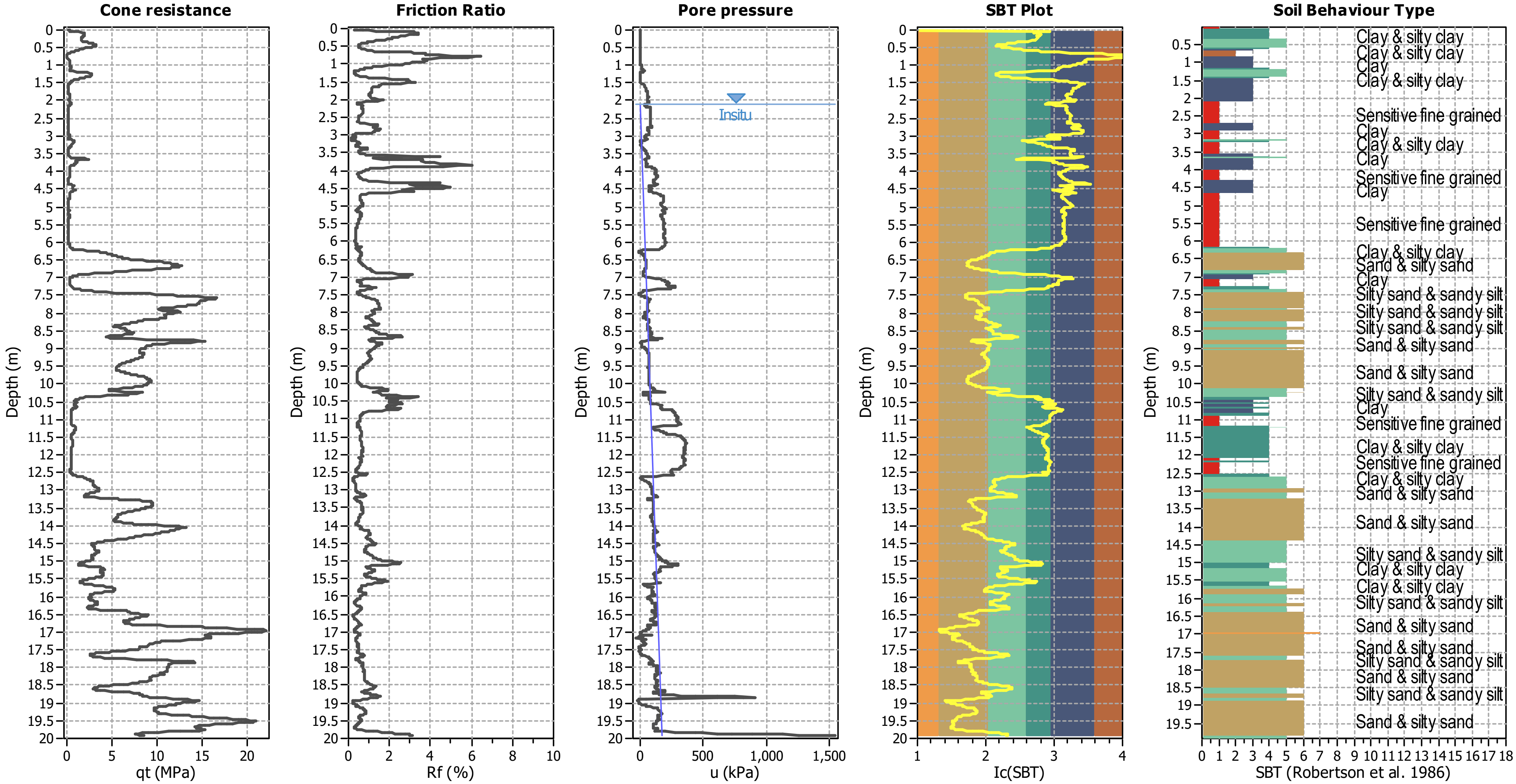


Summary of liquefaction potential



Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



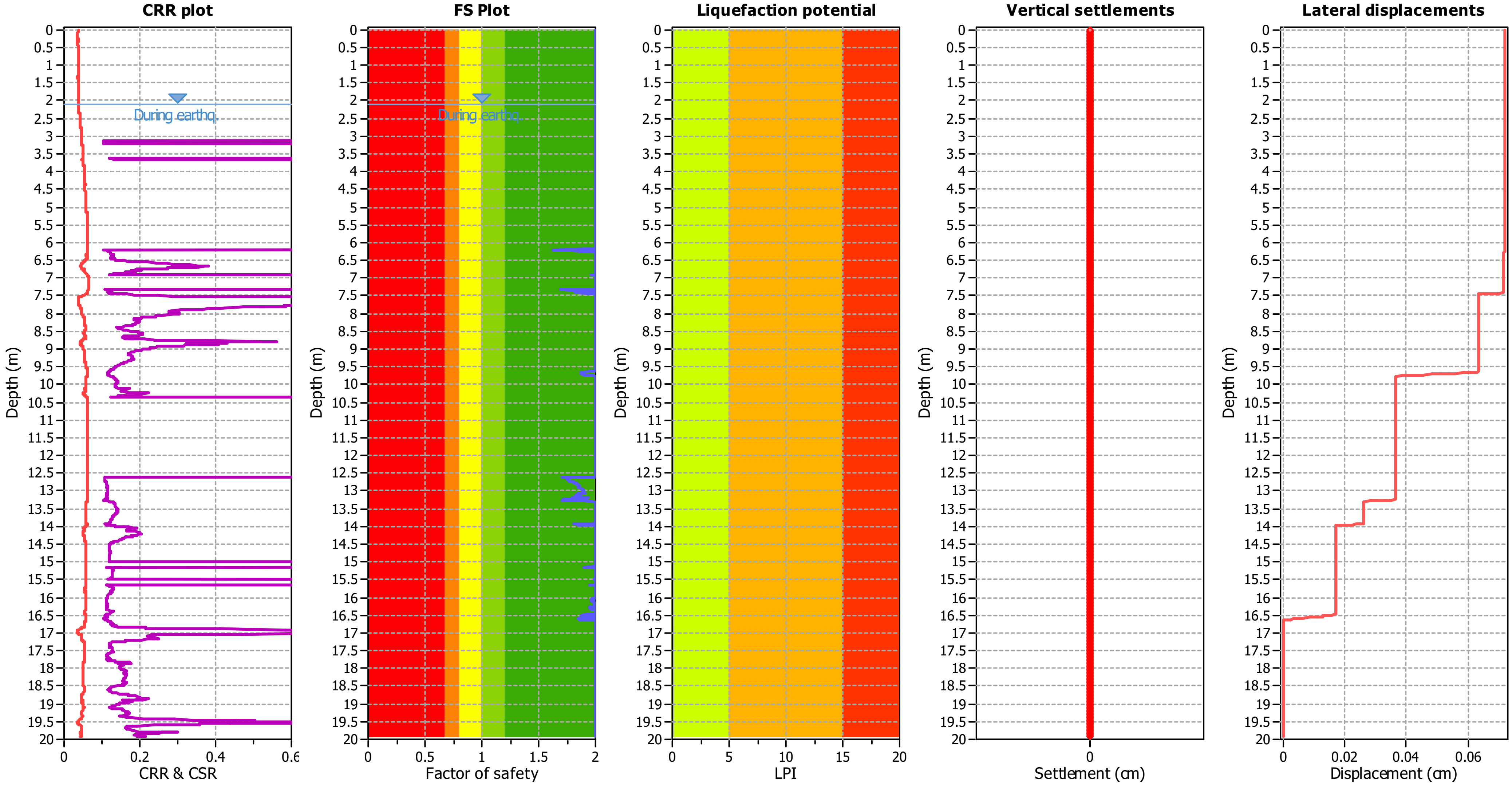
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.10 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.07	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.10 m	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.10 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.07	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.10 m	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

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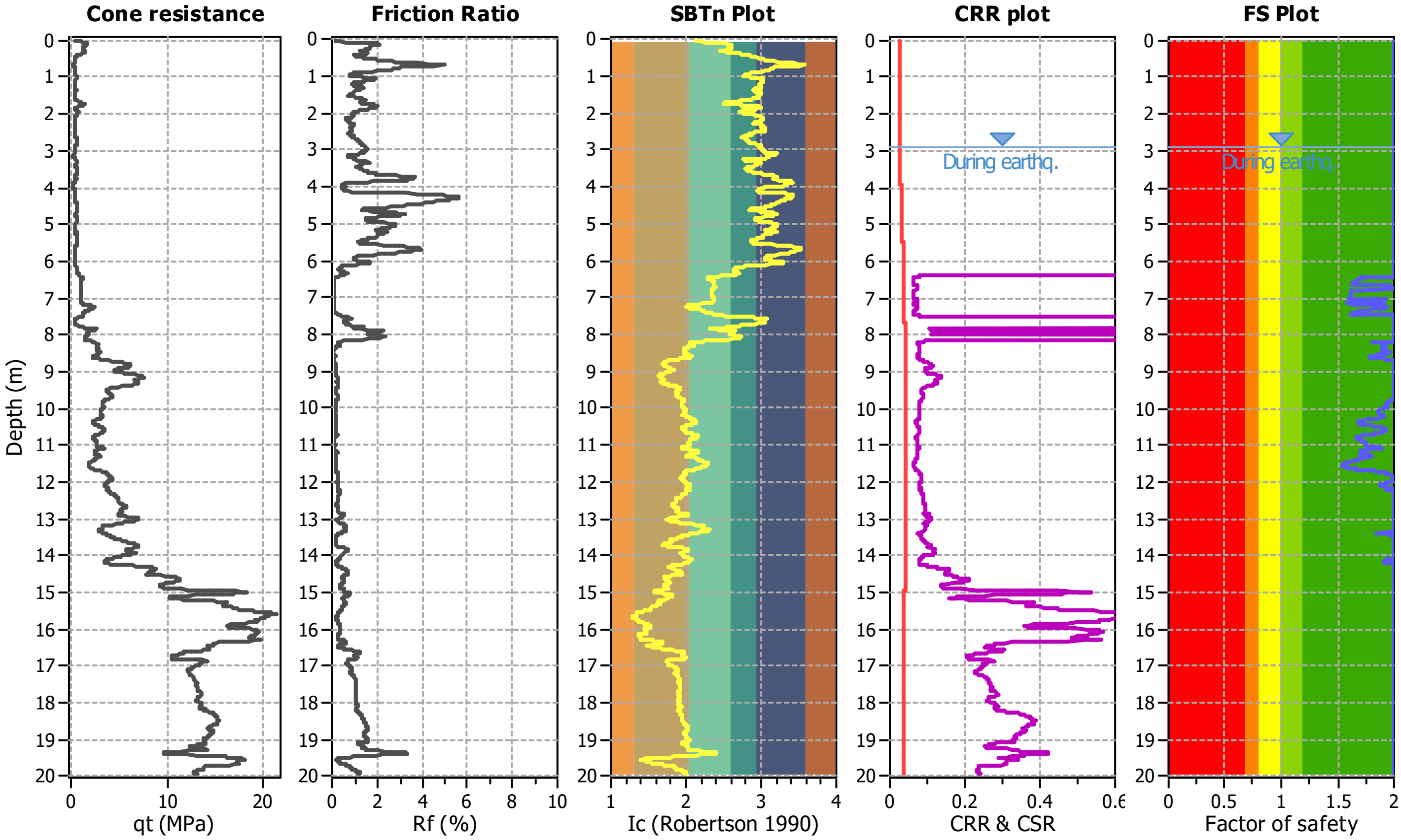
LIQUEFACTION ANALYSIS REPORT

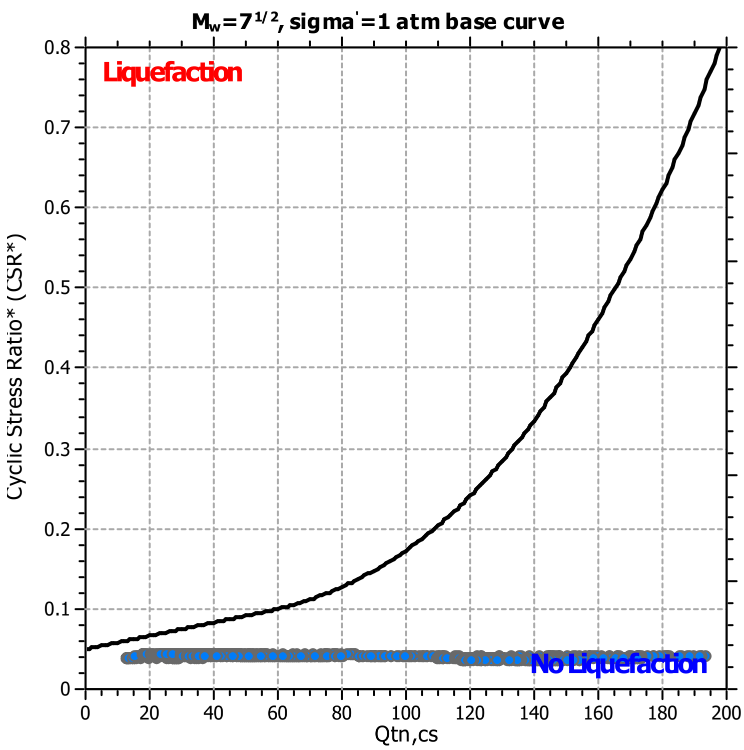
Project title : **Location :**

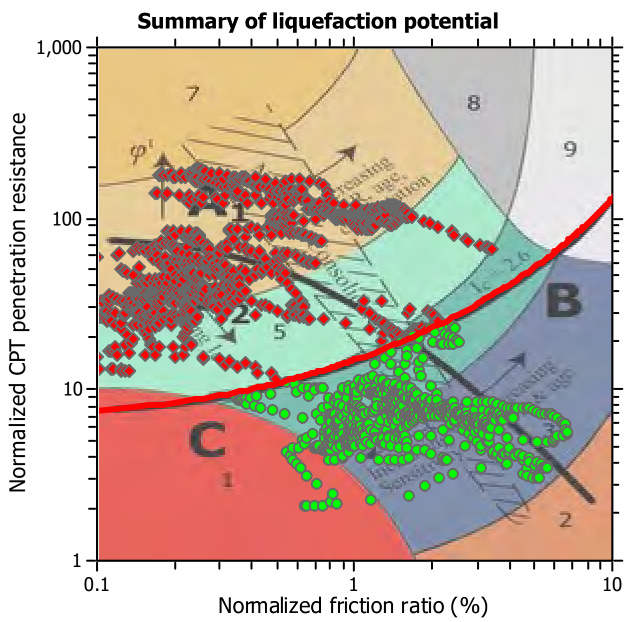
CPT file : CPT02

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	2.90 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	2.90 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.07	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

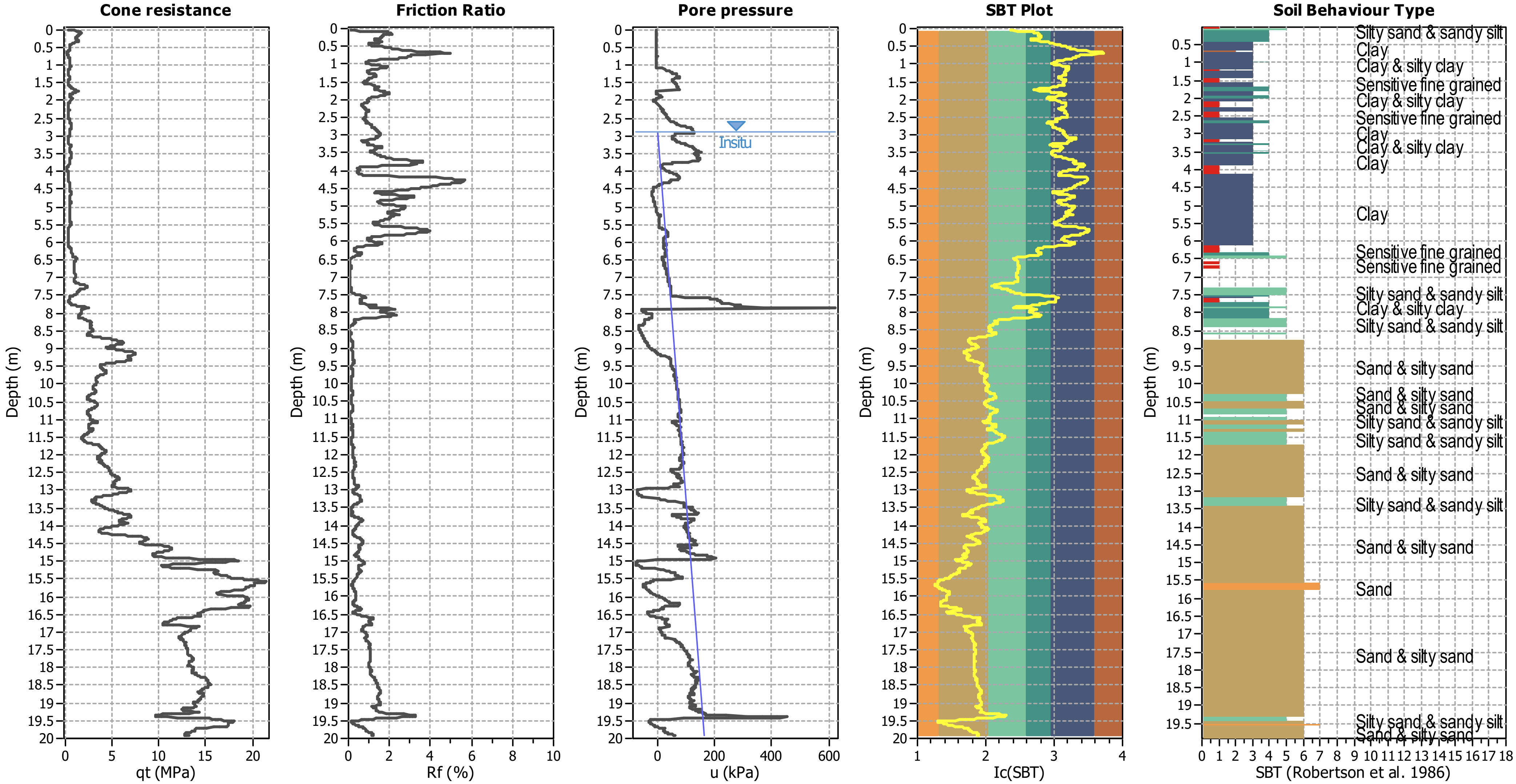






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



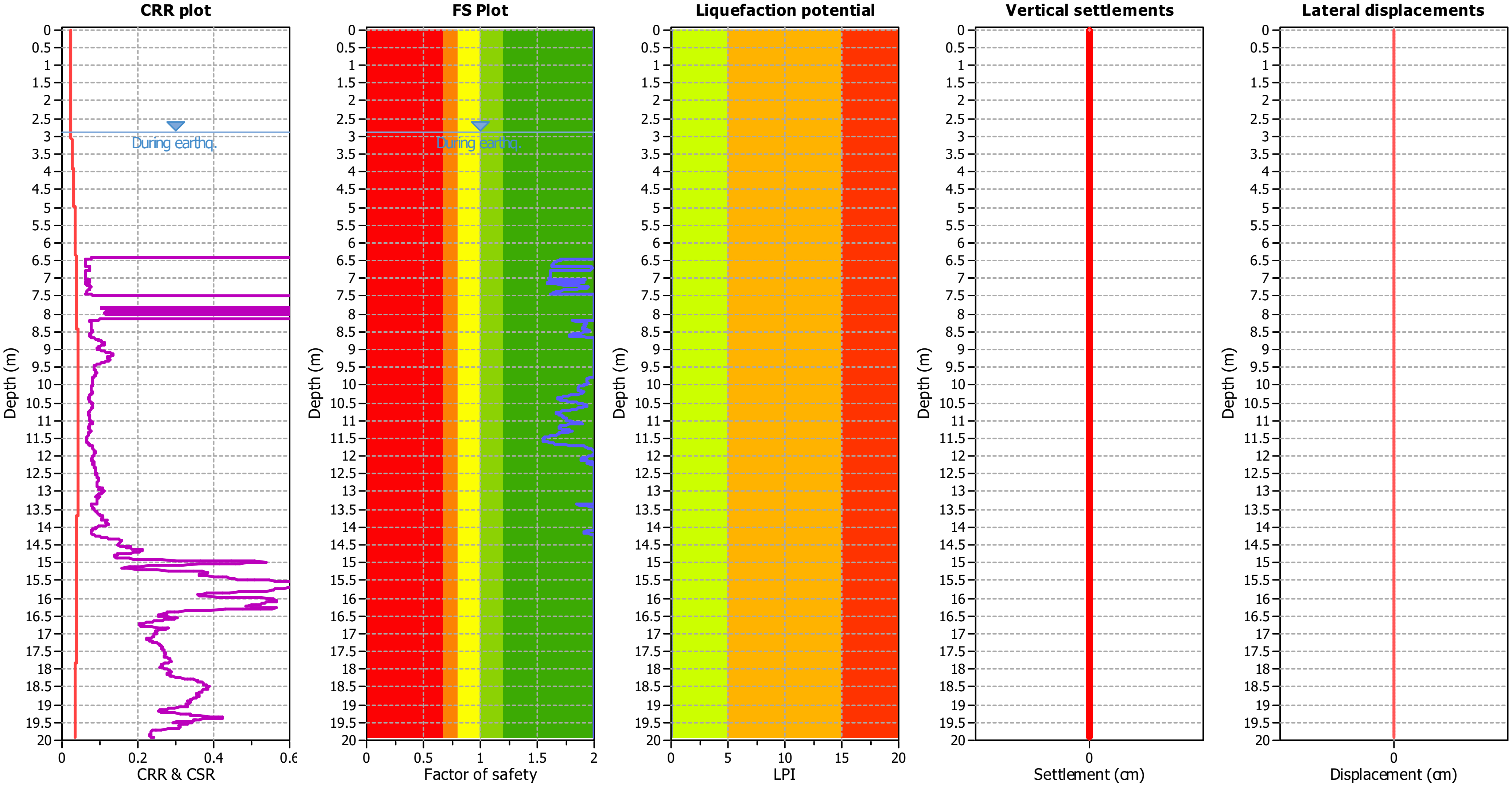
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	2.90 m	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.07	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.90 m	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained	4. Clayey silt to silty	7. Gravely sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	2.90 m	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.07	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.90 m	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

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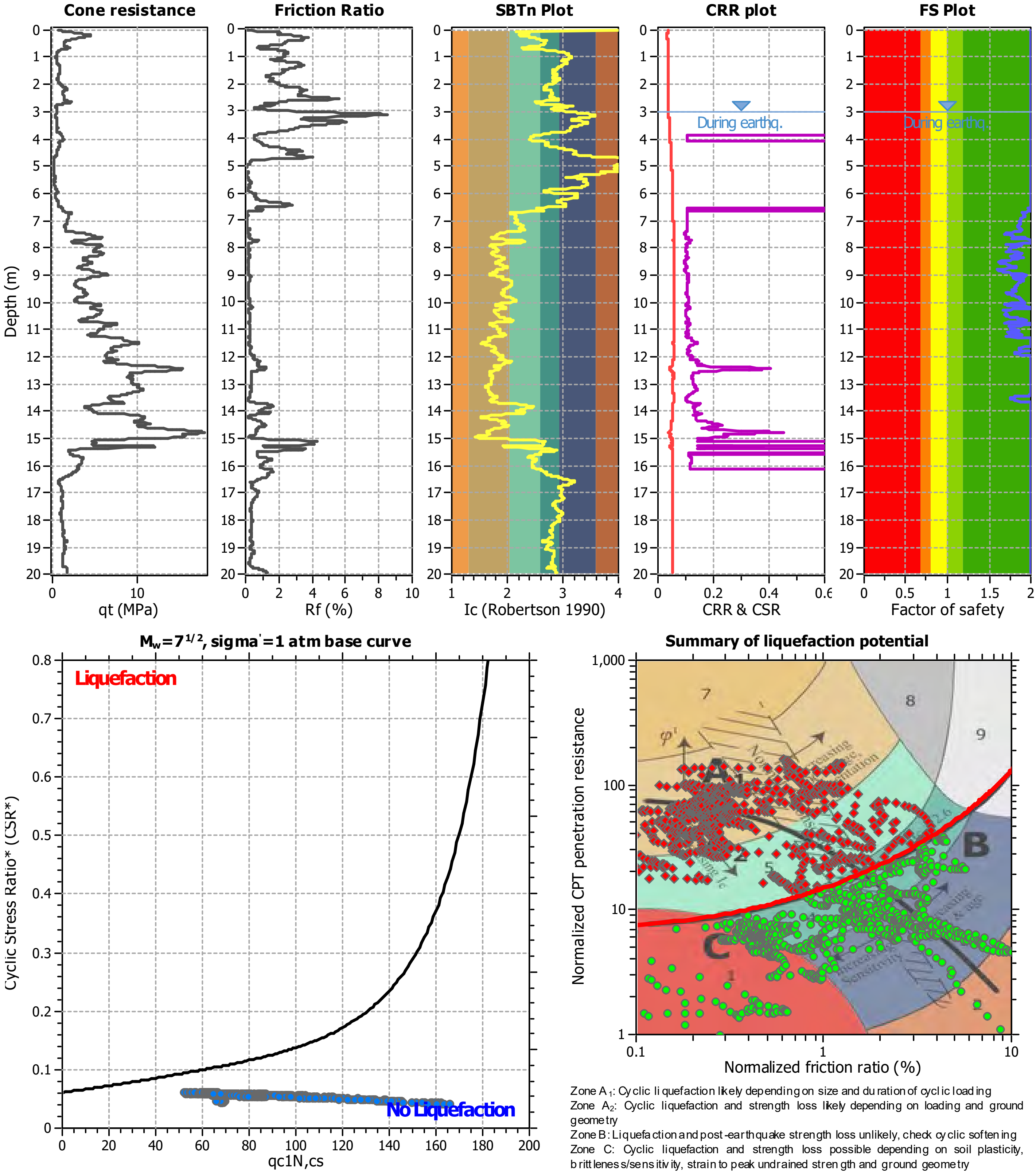
LIQUEFACTION ANALYSIS REPORT

Project title : **Location :**

CPT file : CPT03

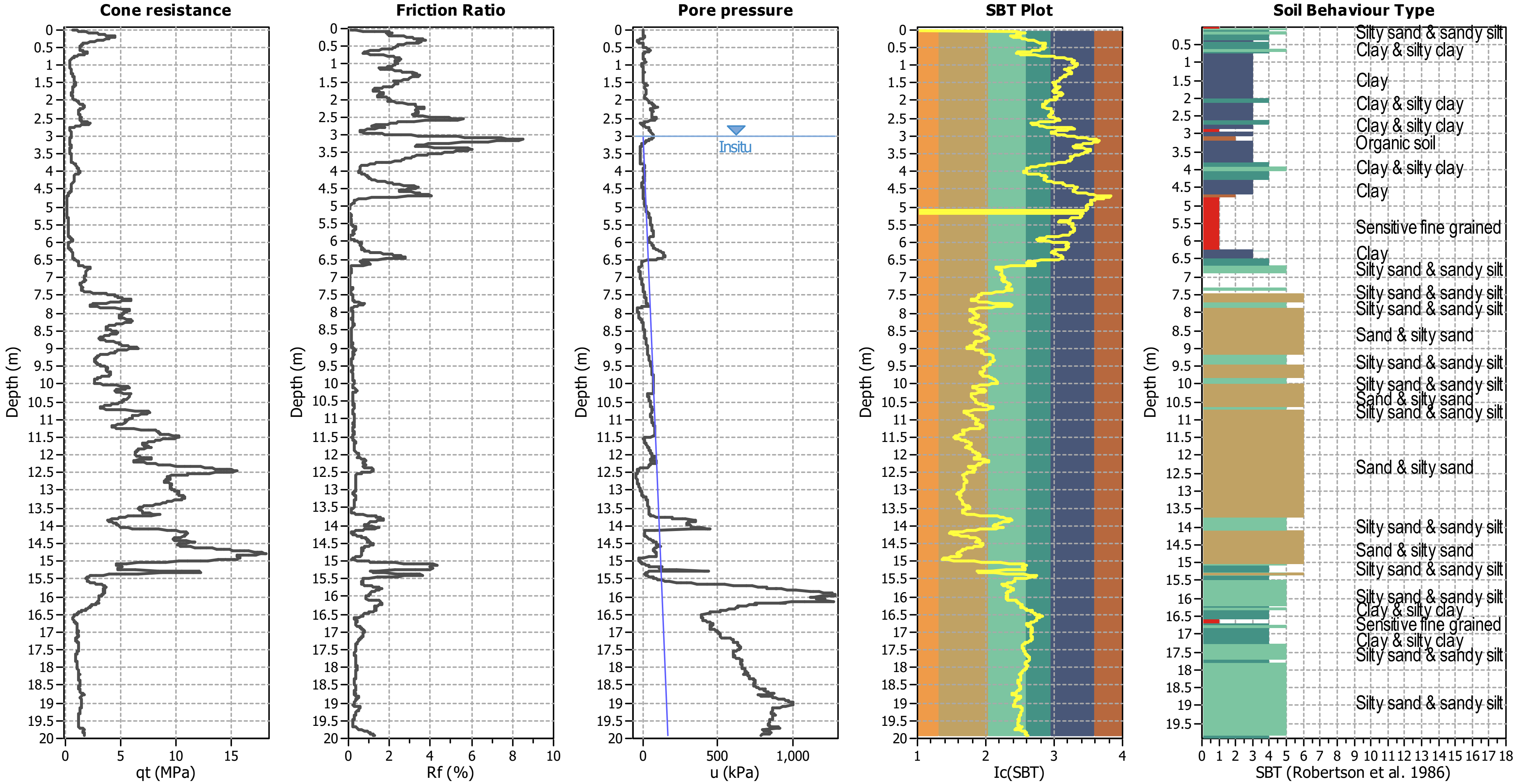
Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	3.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	3.00 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.07	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



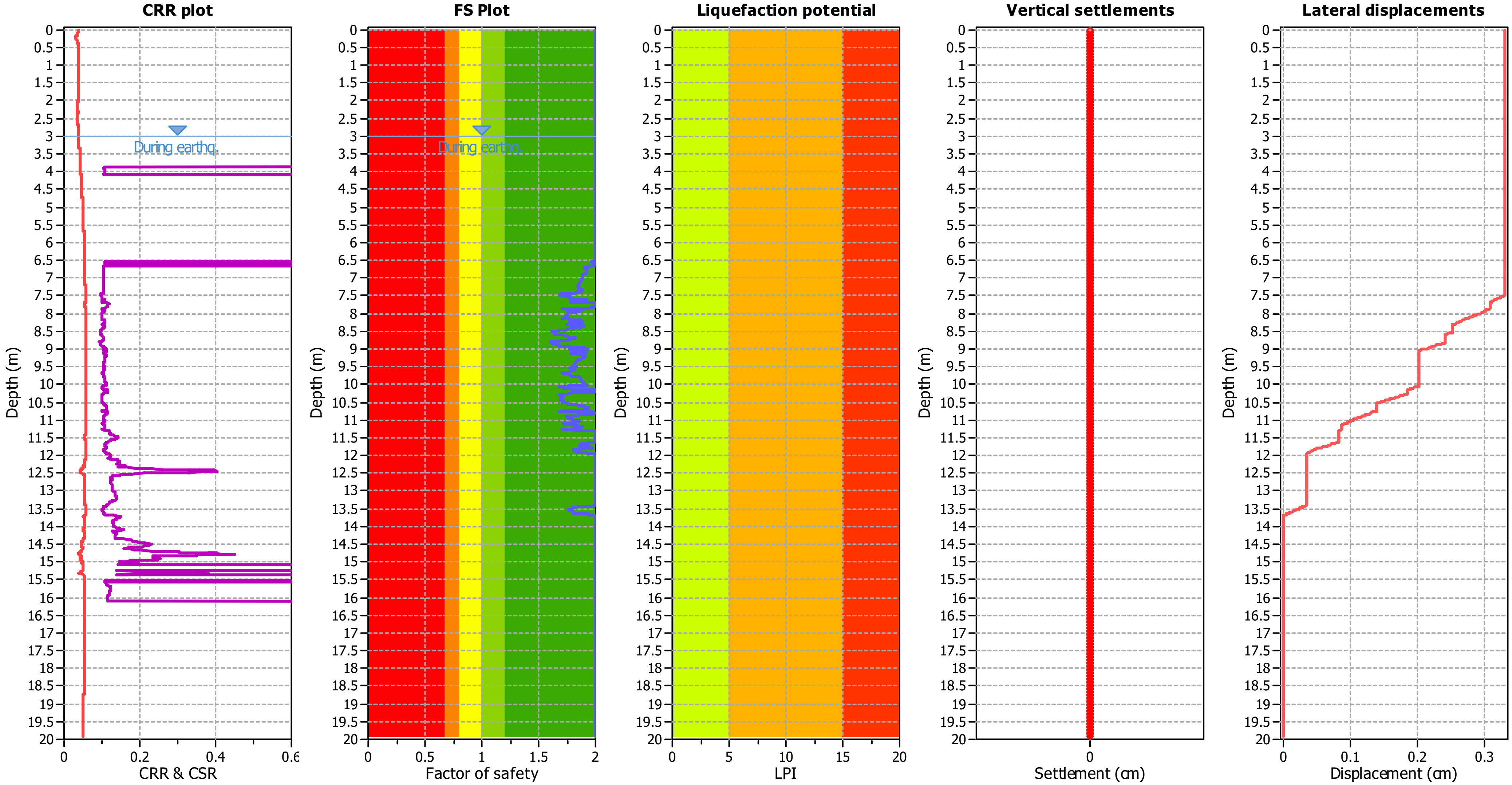
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.07	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	3.00 m	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained	4. Clayey silt to silty	7. Gravely sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.07	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	3.00 m	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

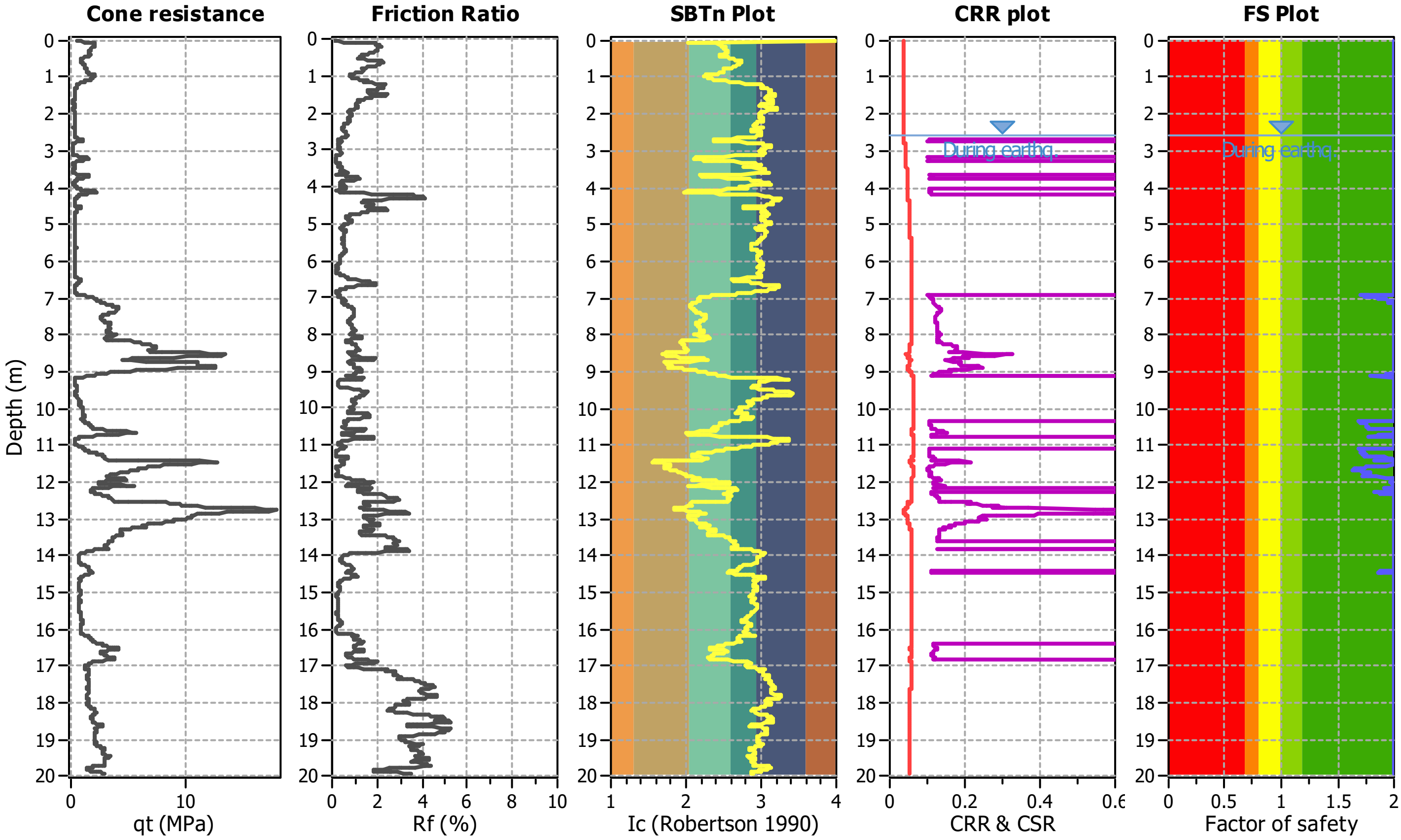
LIQUEFACTION ANALYSIS REPORT

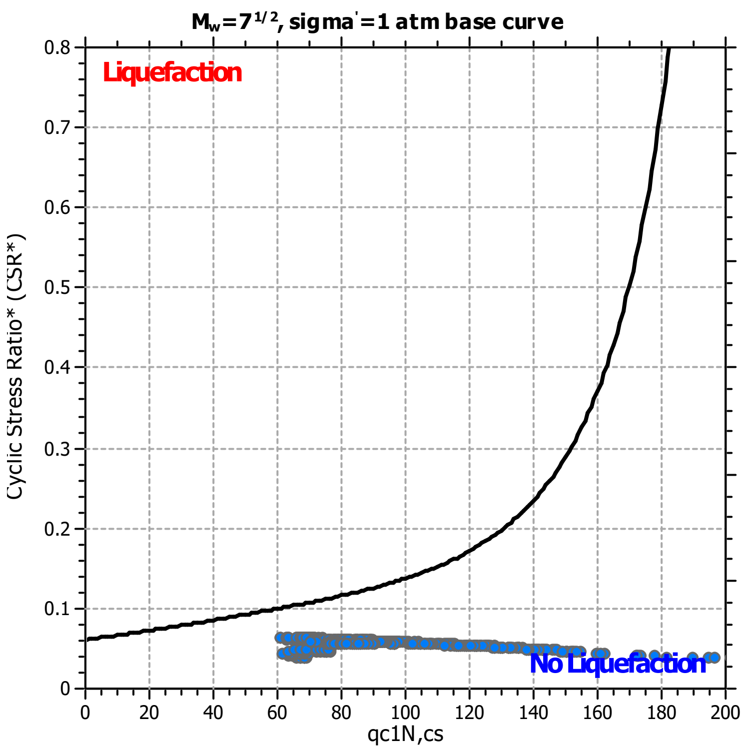
Project title : **Location :**

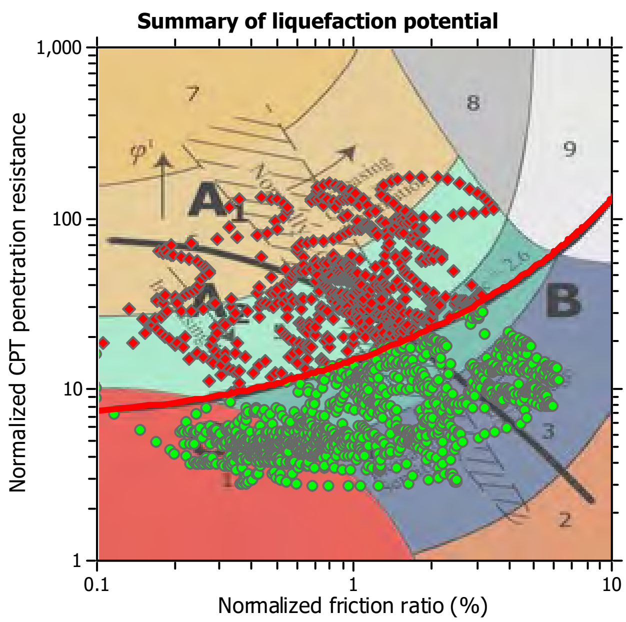
CPT file : CPT04

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.60 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.60 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.07	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

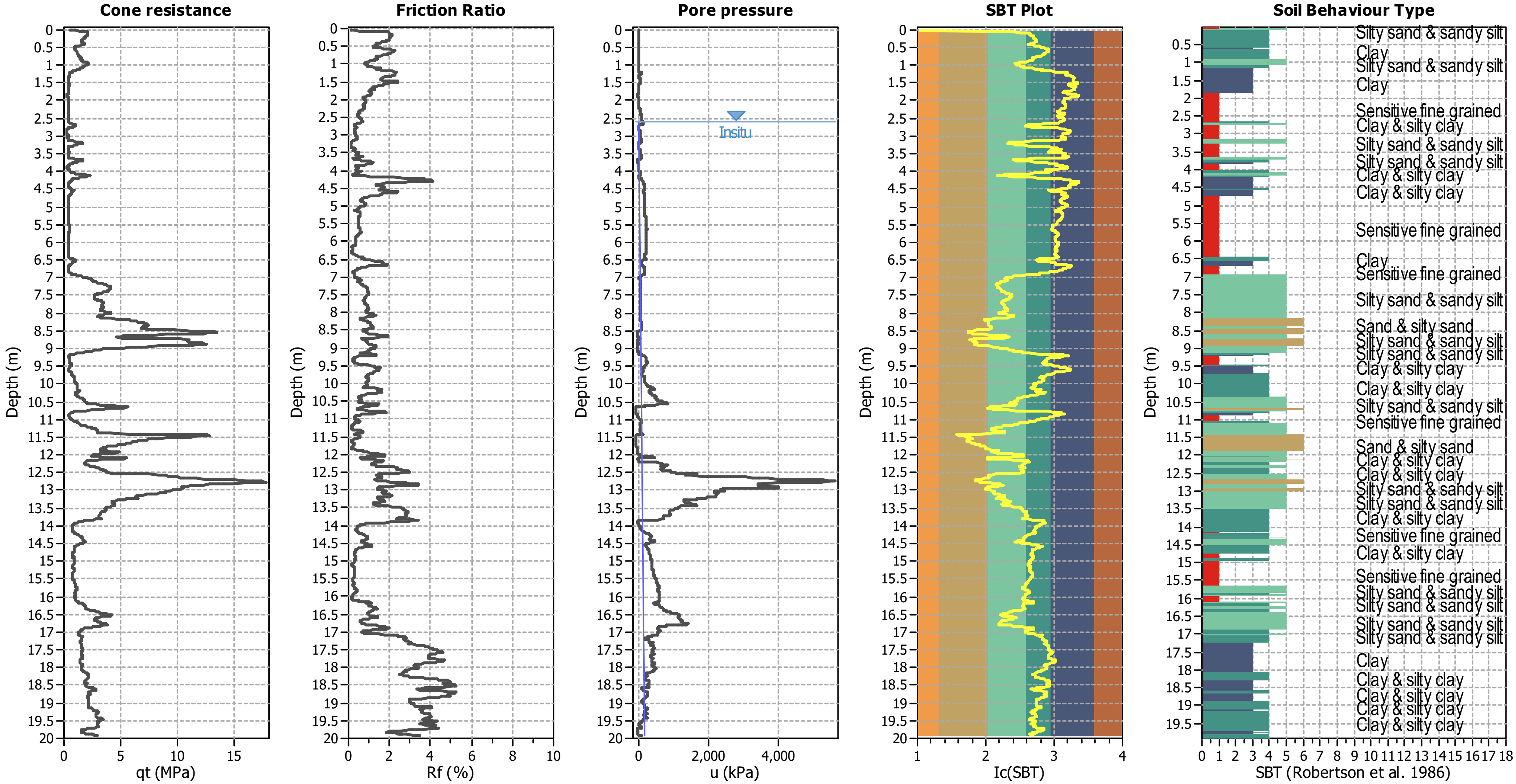






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



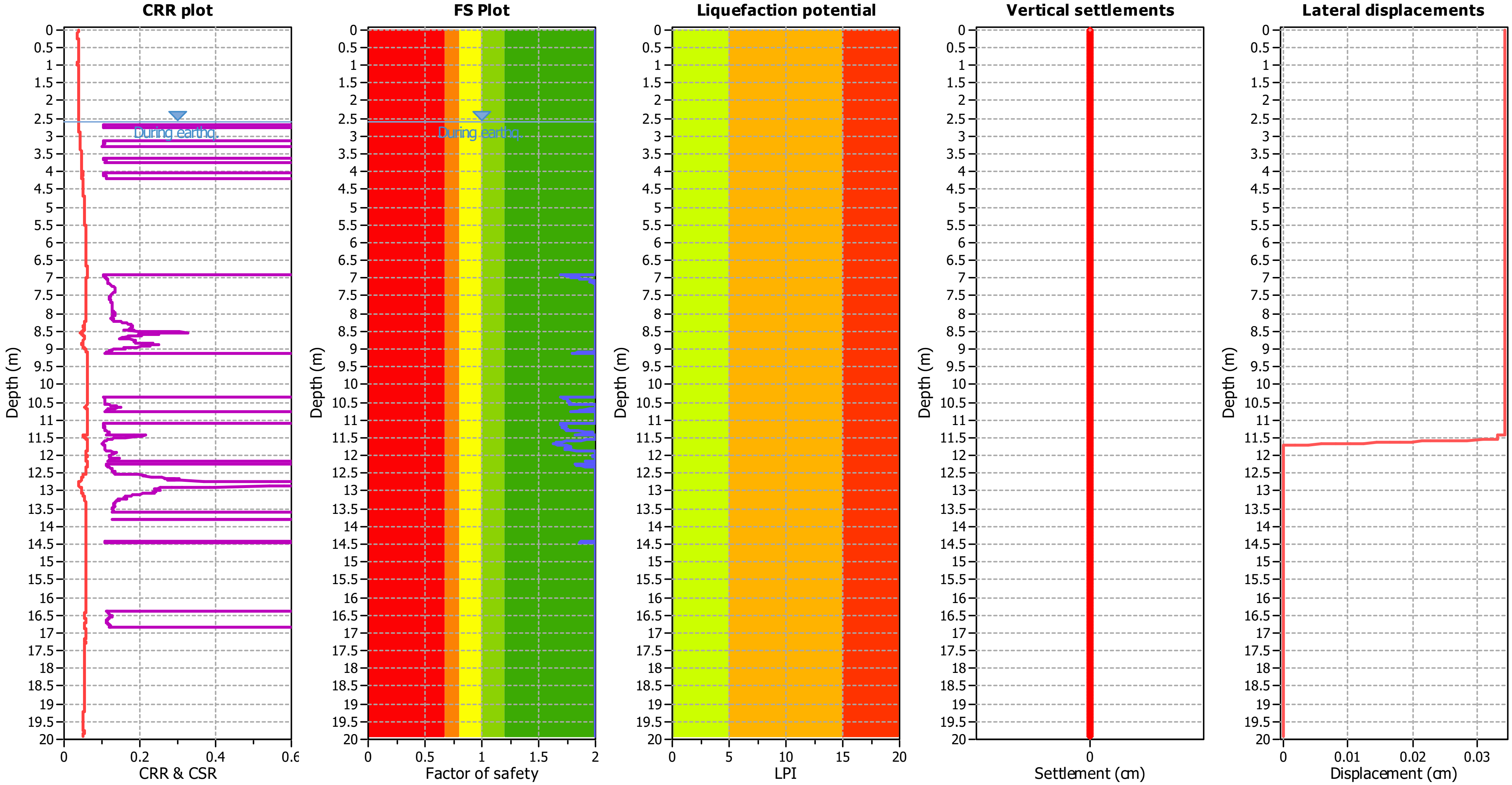
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.60 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.07	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.60 m	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained	4. Clayey silt to silty	7. Gravely sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.60 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.07	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.60 m	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

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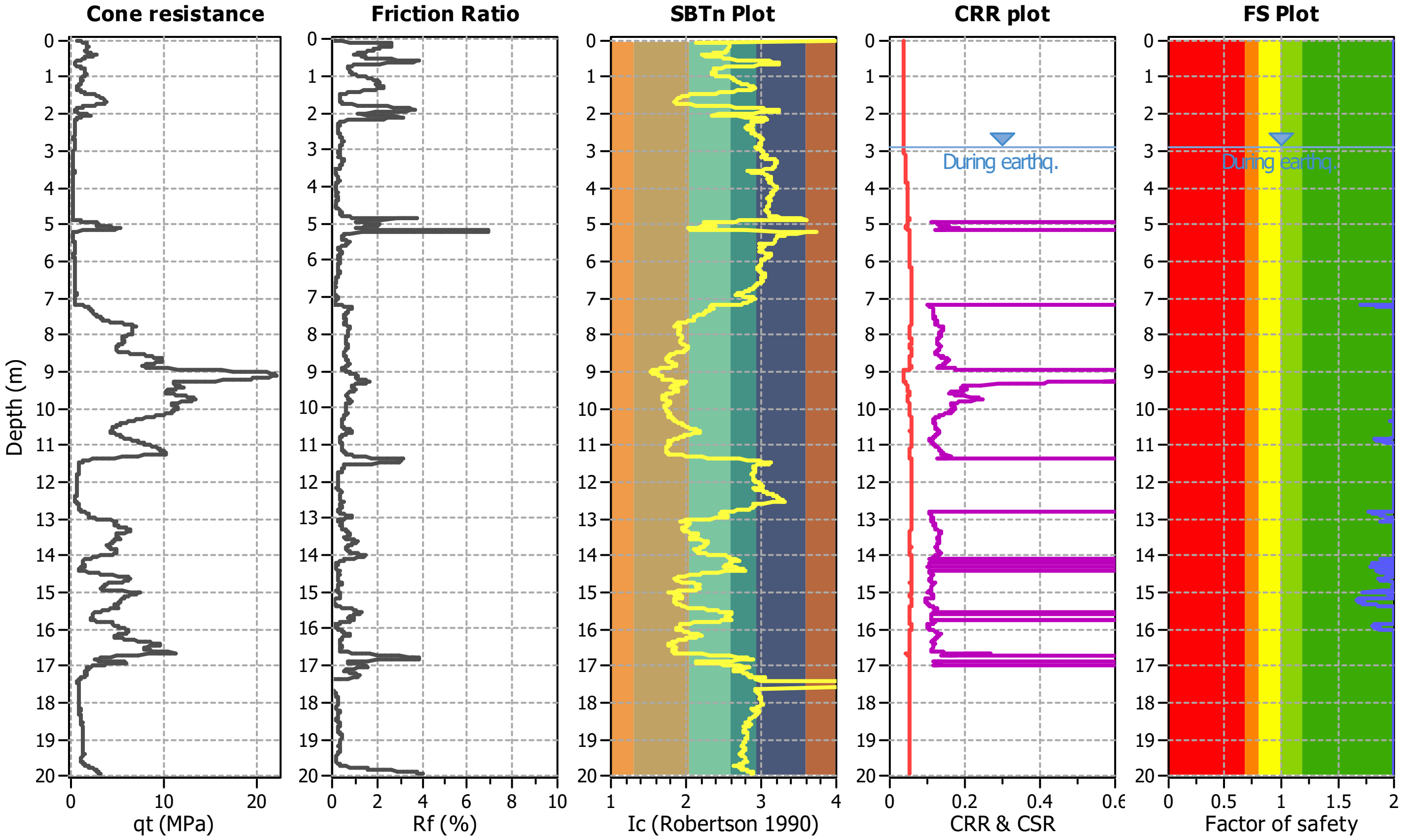
LIQUEFACTION ANALYSIS REPORT

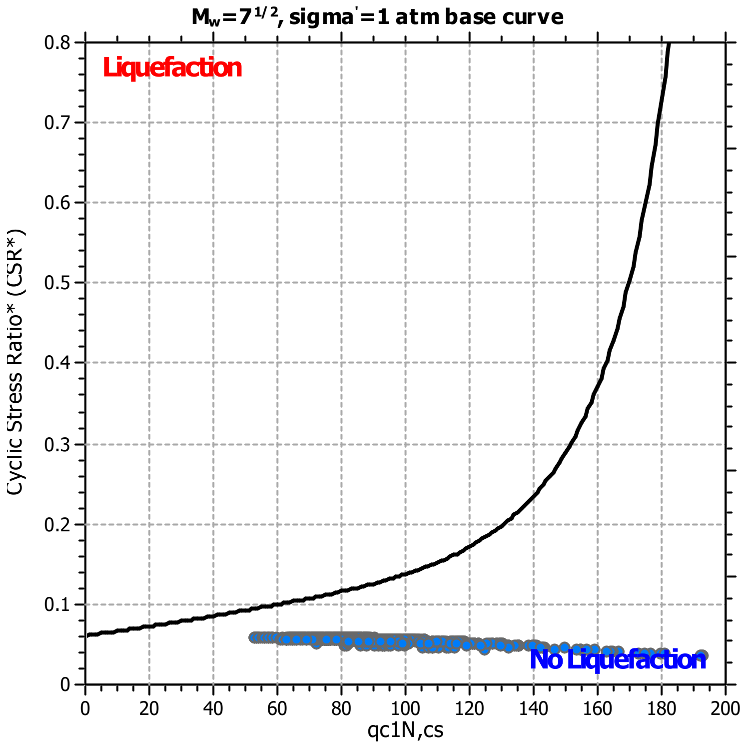
Project title : **Location :**

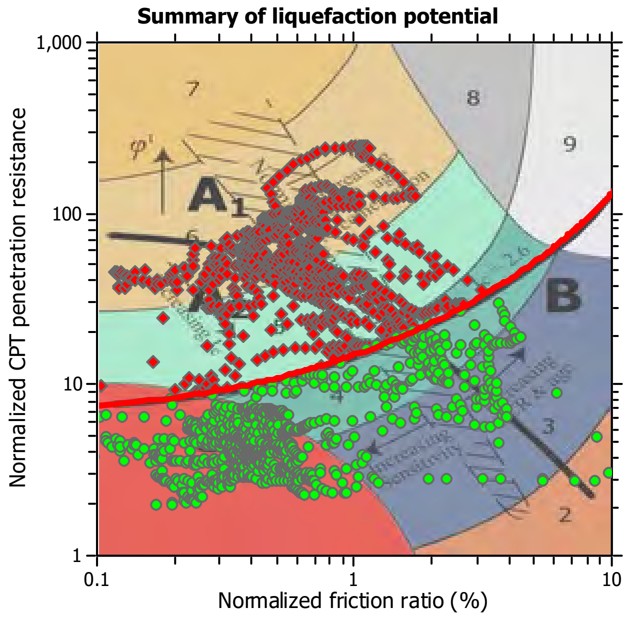
CPT file : CPT05

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.90 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	2.90 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.07	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

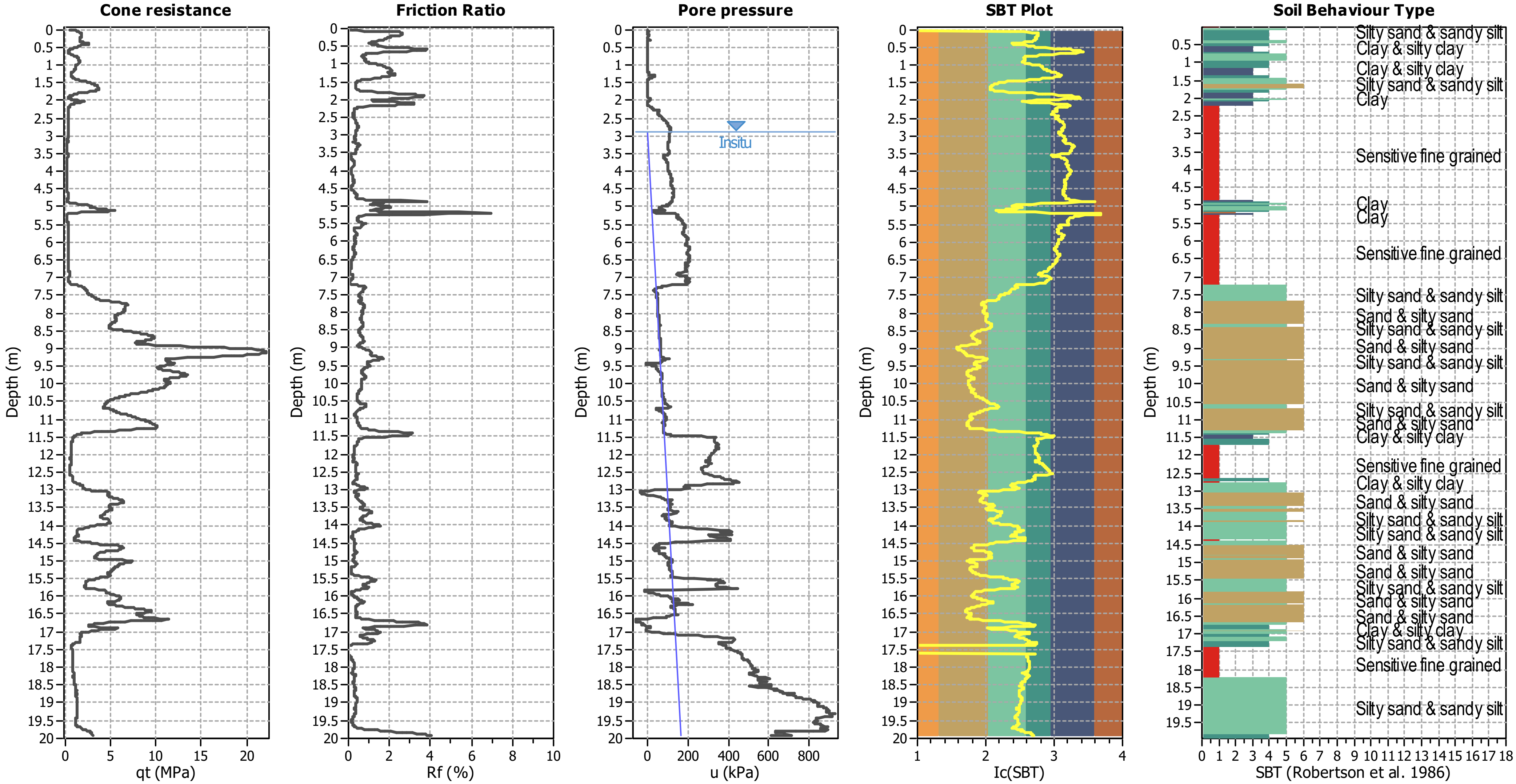






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



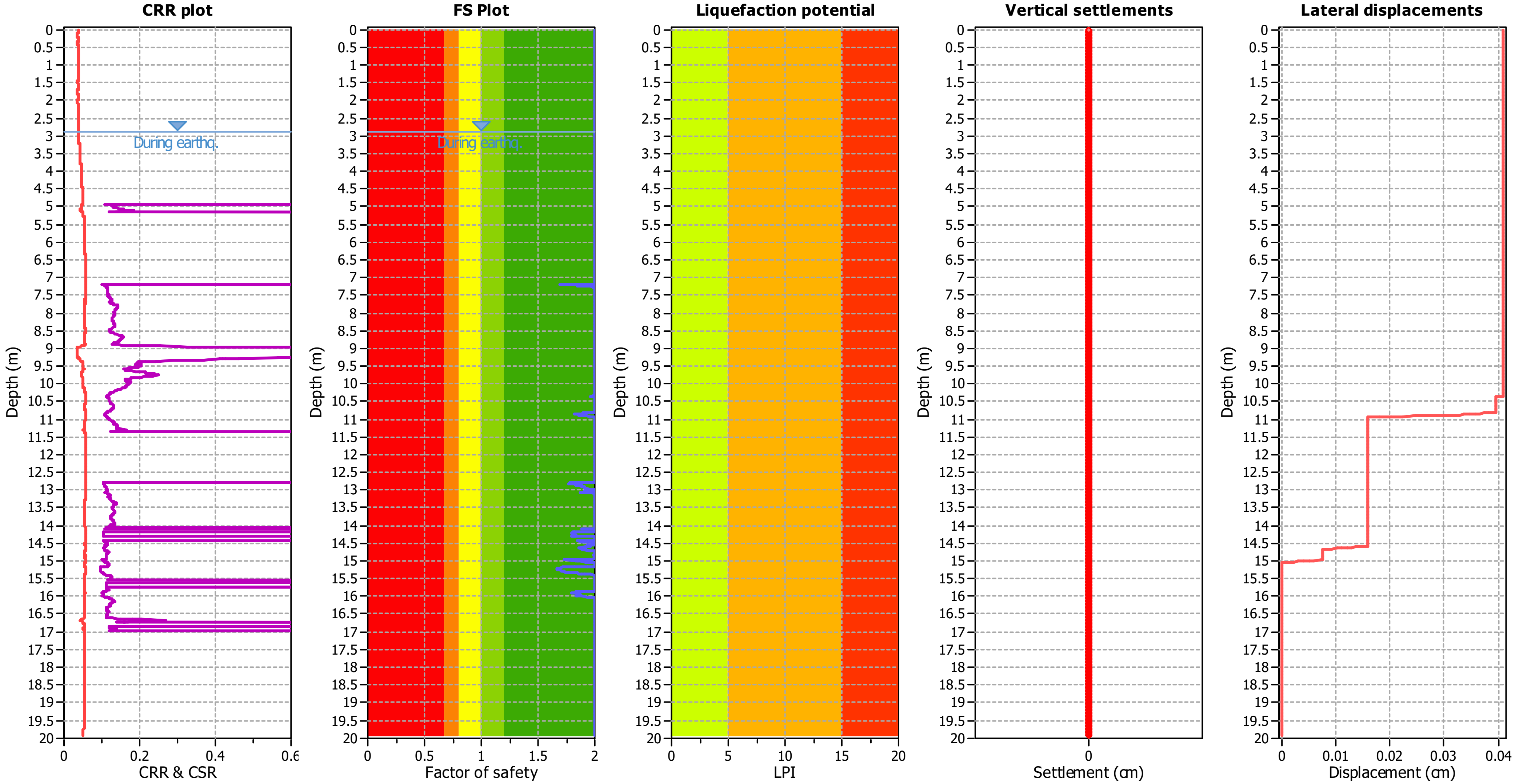
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.90 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.07	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.90 m	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained	4. Clayey silt to silty	7. Gravely sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.90 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.07	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	2.90 m	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

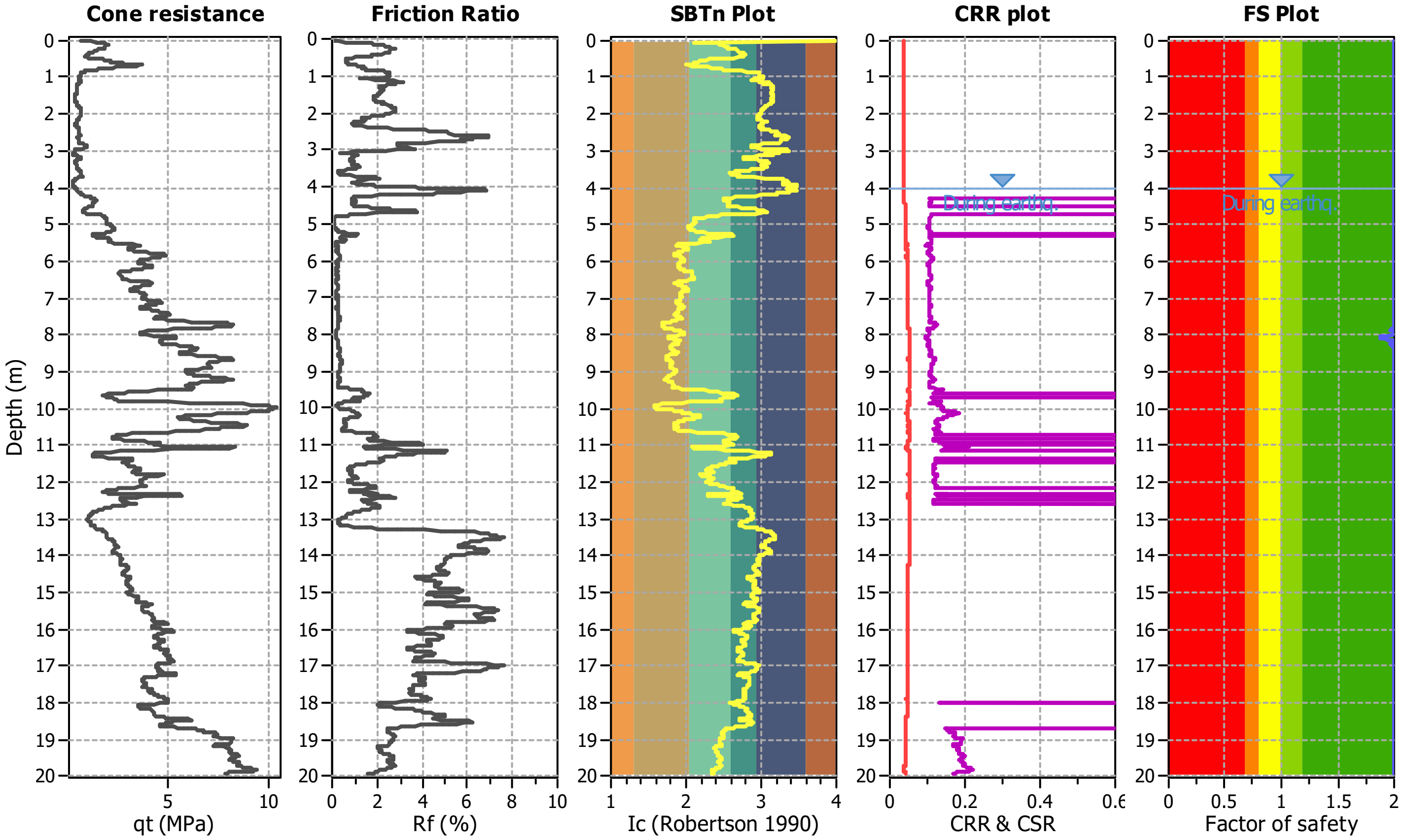
LIQUEFACTION ANALYSIS REPORT

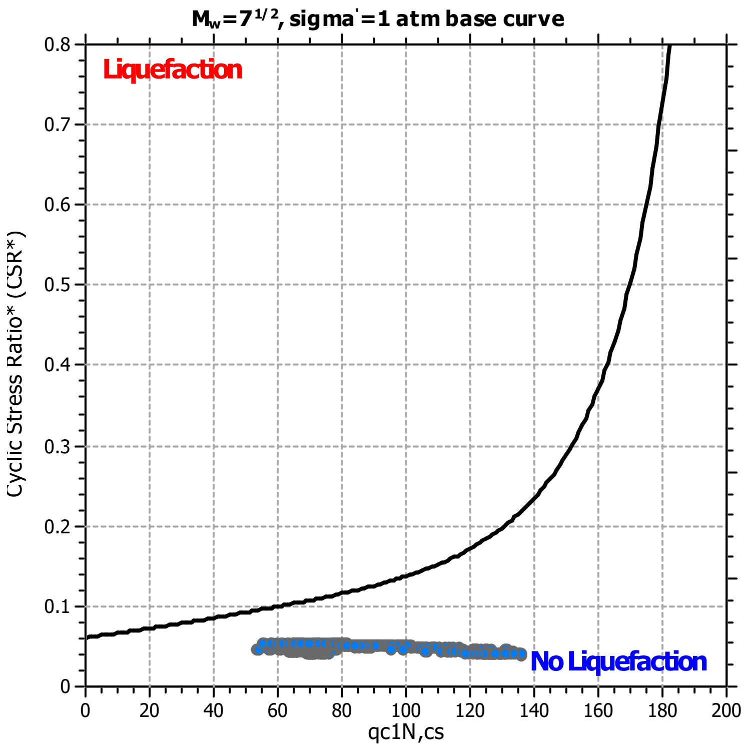
Project title : **Location :**

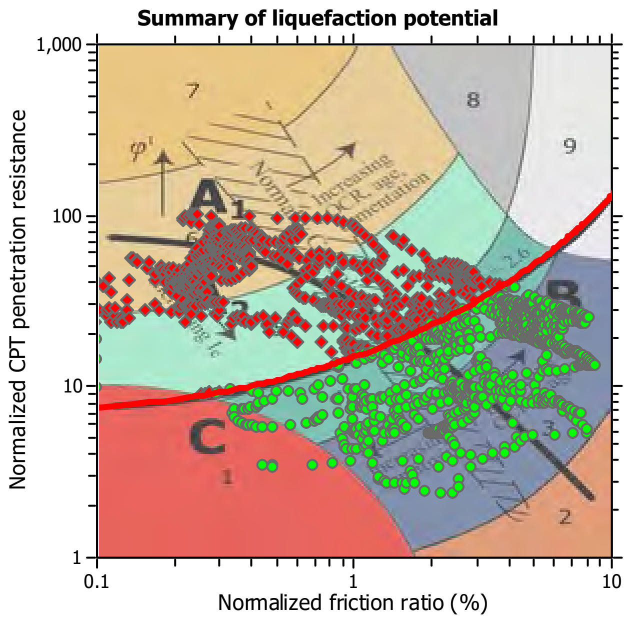
CPT file : CPT06

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	4.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	4.00 m	Fill height:	N/A		
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	No
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	N/A
Peak ground acceleration:	0.07	Unit weight calculation:	Based on SBT	K_σ applied:	Yes	MSF method:	Method based

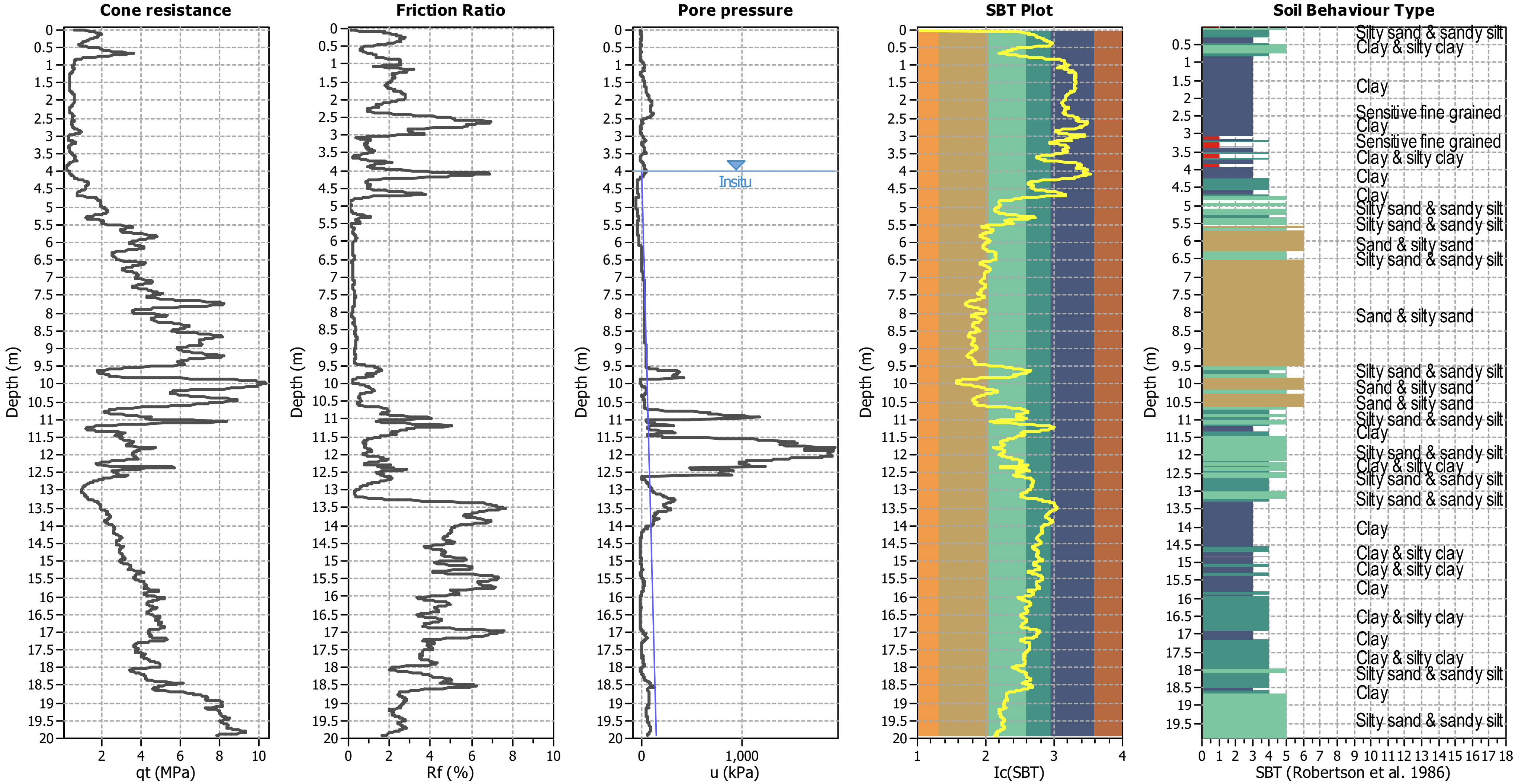






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



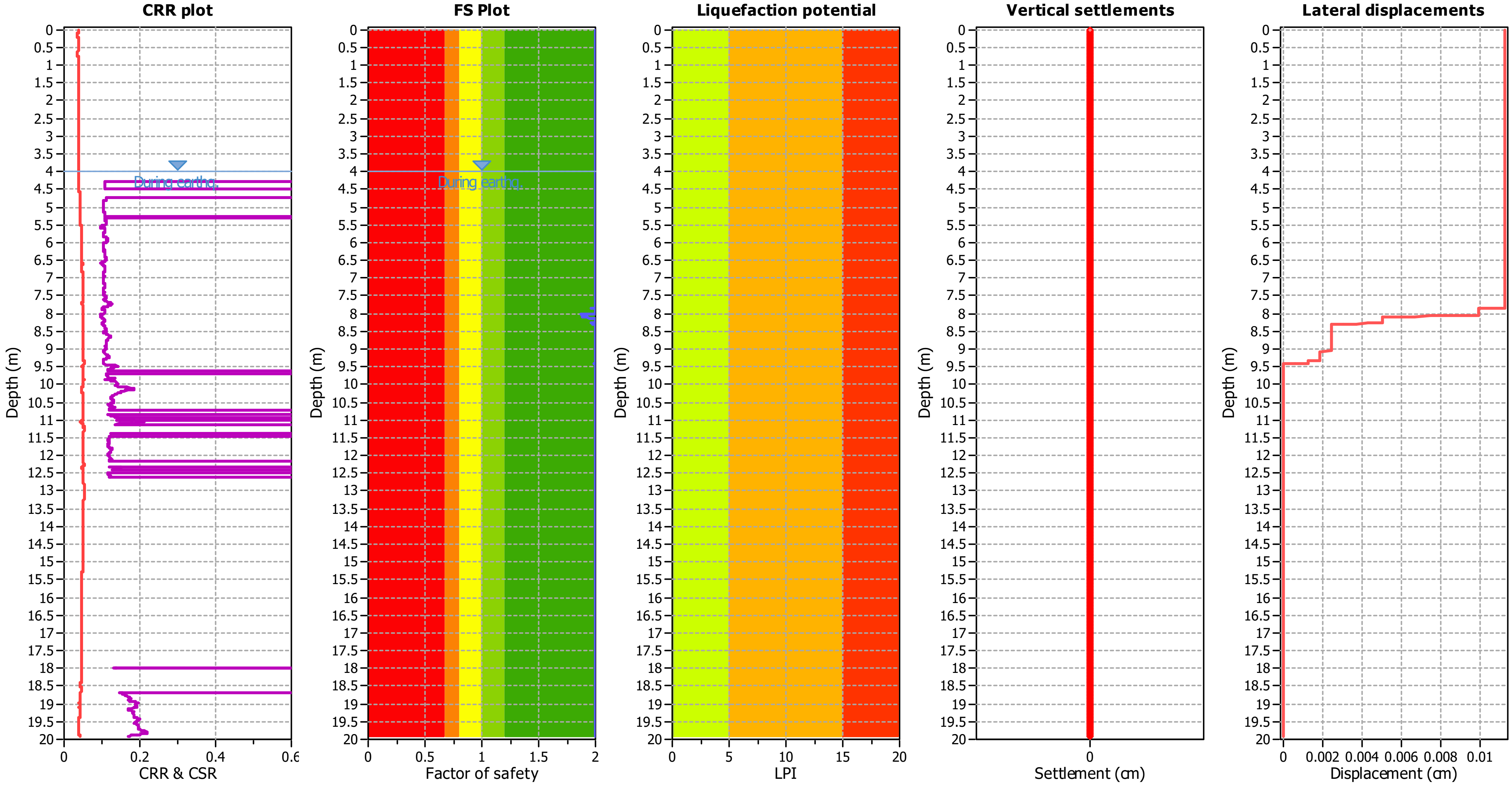
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	4.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.07	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	4.00 m	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained	4. Clayey silt to silty	7. Gravely sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	4.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.07	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	4.00 m	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

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LIQUEFACTION ANALYSIS REPORT

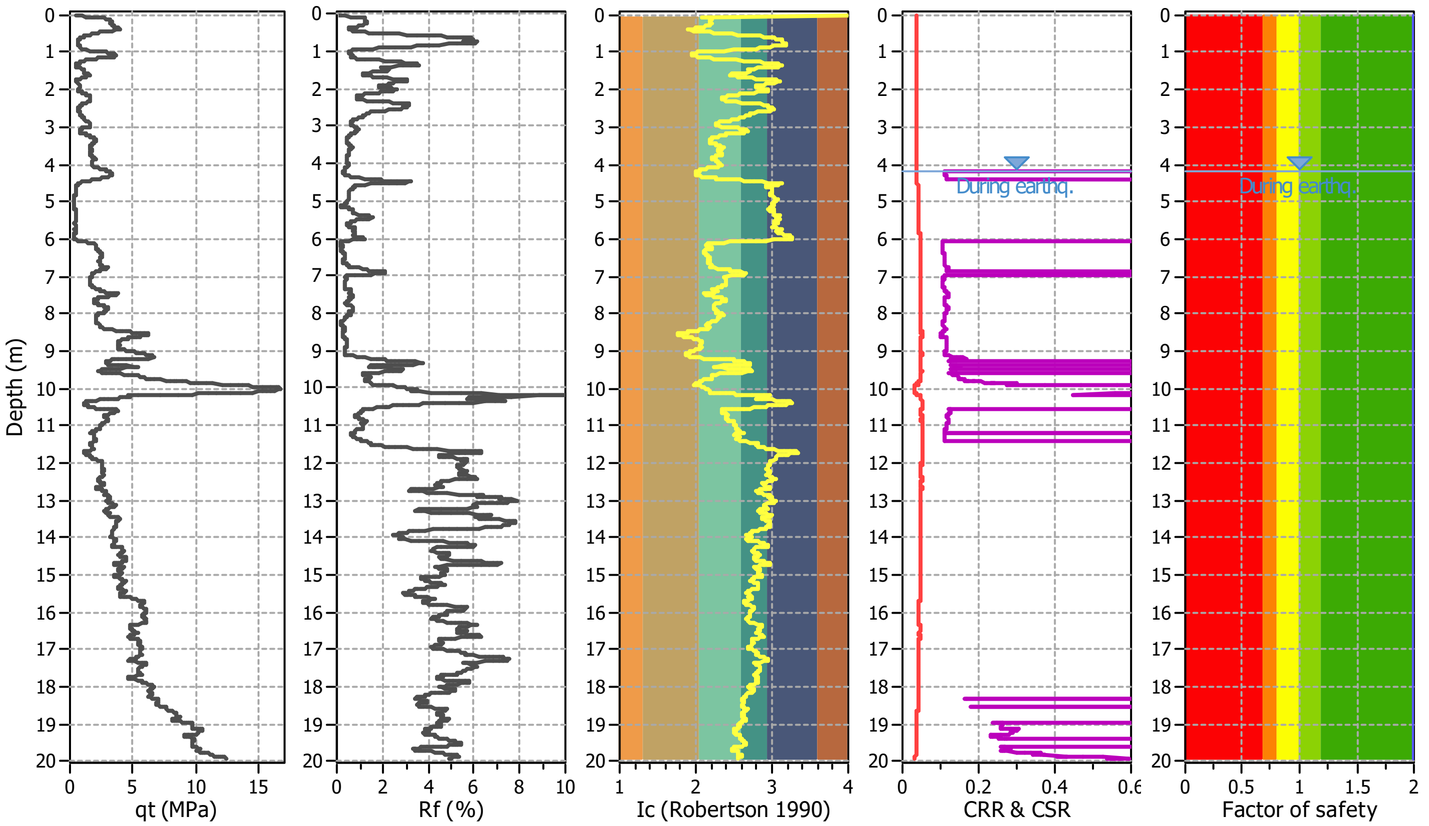
Project title : **Location :**

CPT file : CPT07

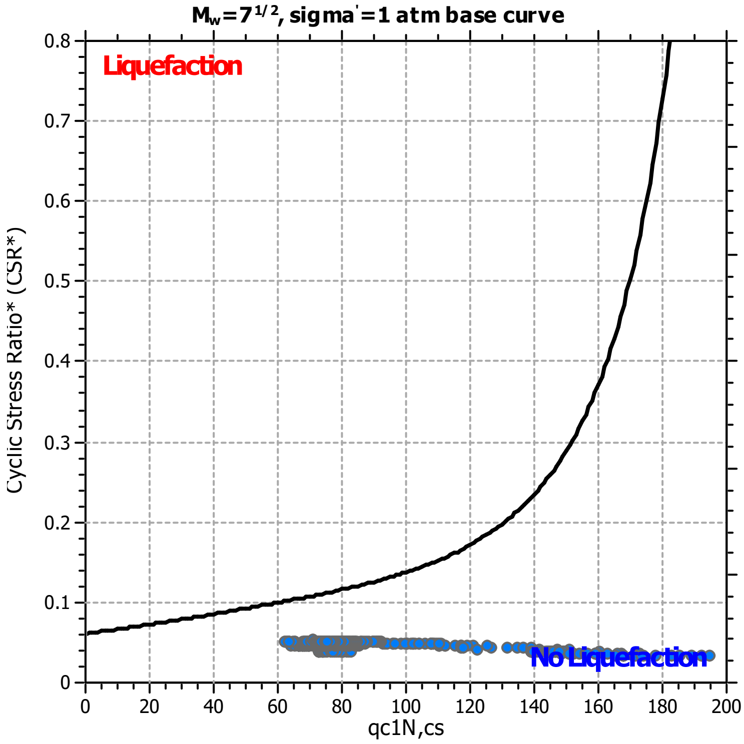
Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	4.20 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	4.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.07	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

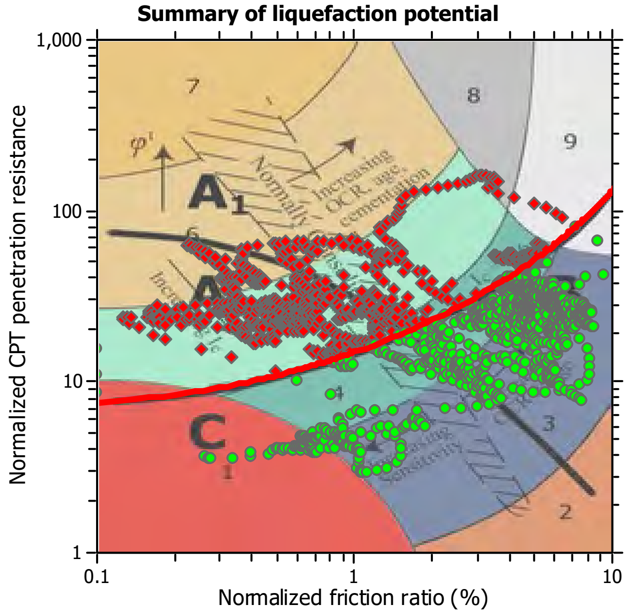
Cone resistance **Friction Ratio** **SBTn Plot** **CRR plot** **FS Plot**



$M_w=7^{1/2}$, sigma'=1 atm base curve

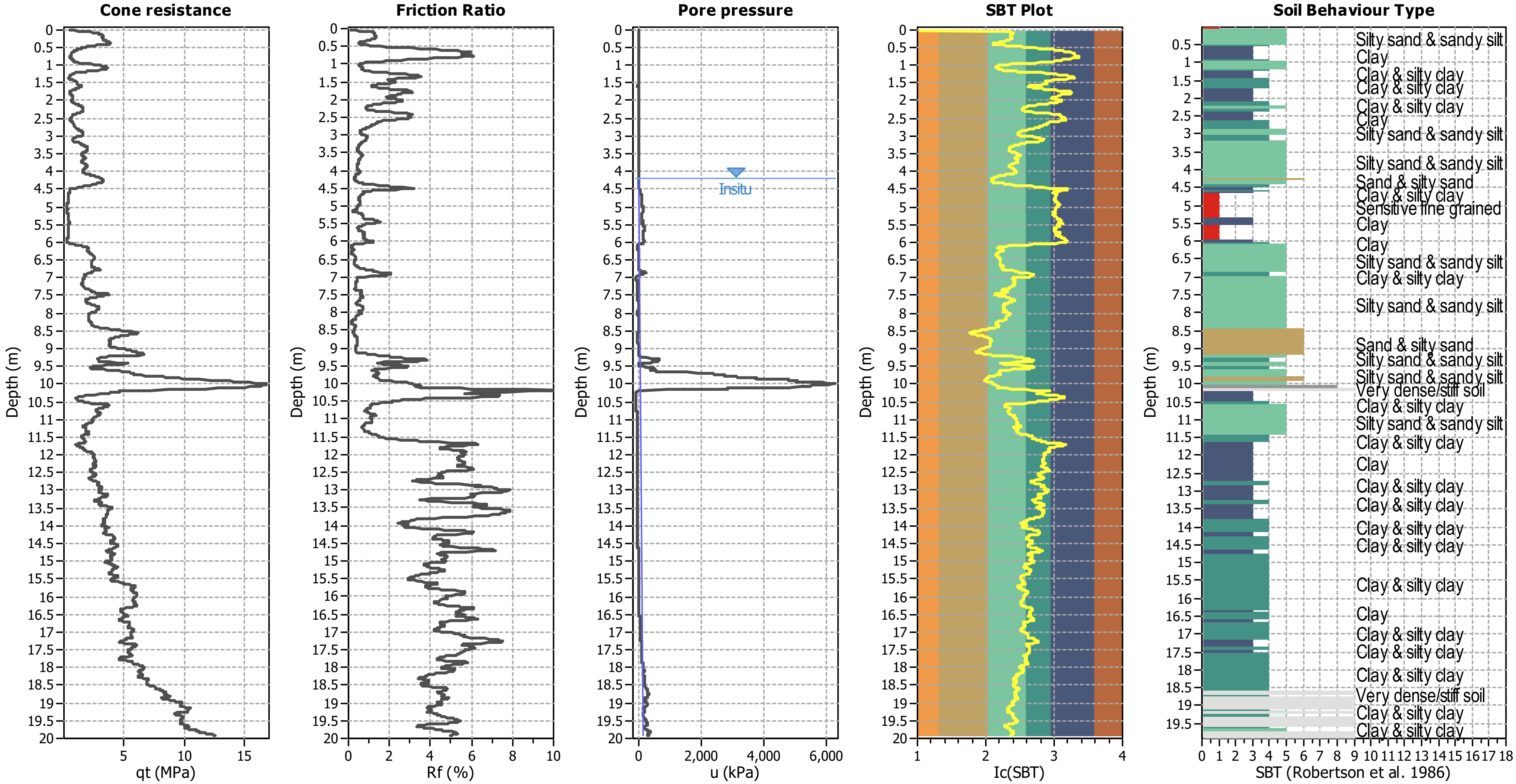


Summary of liquefaction potential



Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



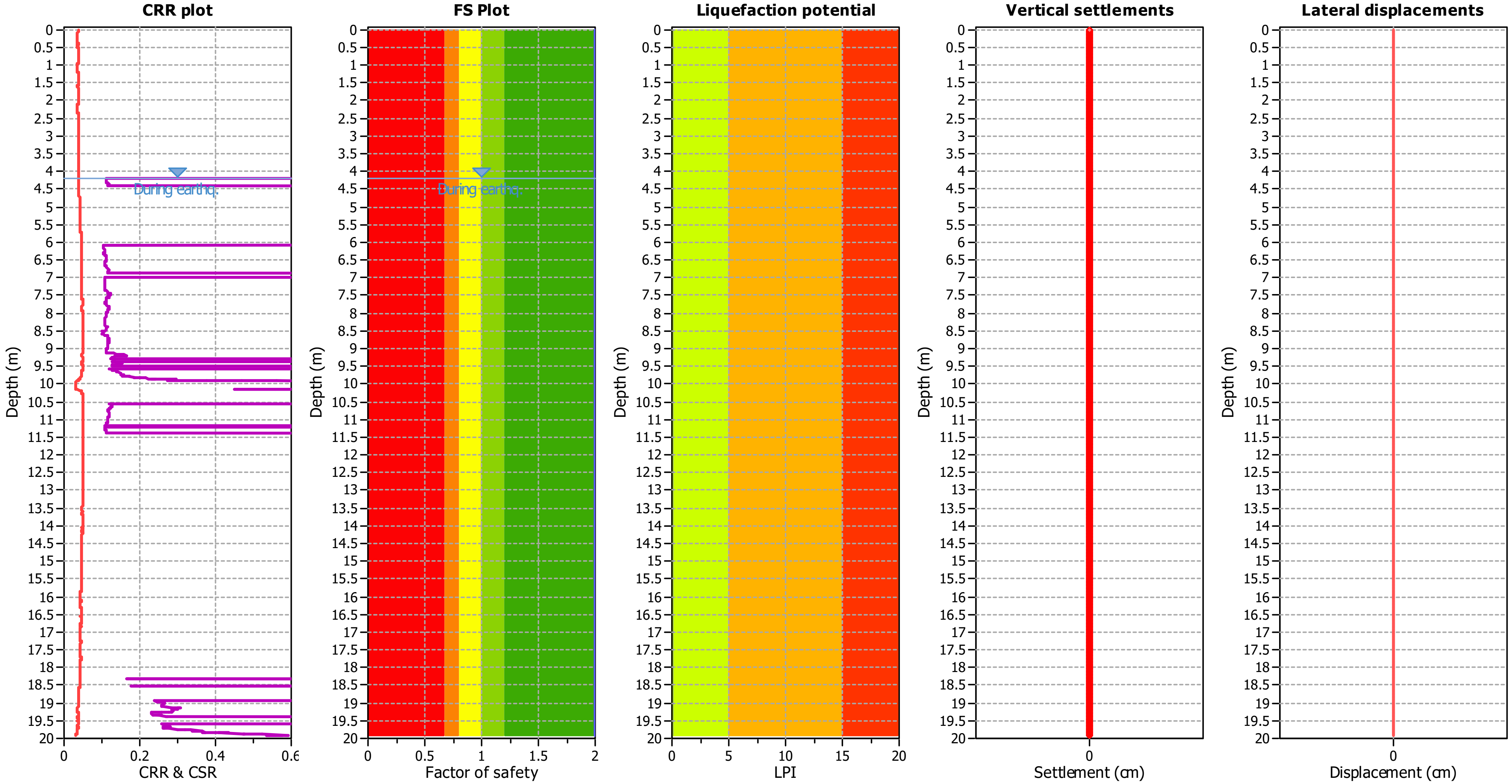
Input parameters and analysis data

Analysis method:	B&I (2014)
Fines correction method:	B&I (2014)
Points to test:	Based on Ic value
Earthquake magnitude M_w:	5.90
Peak ground acceleration:	0.07
Depth to water table (insitu):	4.20 m
Depth to GWT (erthq.):	4.20 m
Average results interval:	3
Ic cut-off value:	2.60
Unit weight calculation:	Based on SBT
Use fill:	No
Fill height:	N/A
Fill weight:	N/A
Transition detect. applied:	No
K_σ applied:	Yes
Clay like behavior applied:	Sands only
Limit depth applied:	No
Limit depth:	N/A

SBT legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravely sand to sand
- 8. Very stiff sand to
- 9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	4.20 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.07	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	4.20 m	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

LIQUEFACTION ANALYSIS REPORT

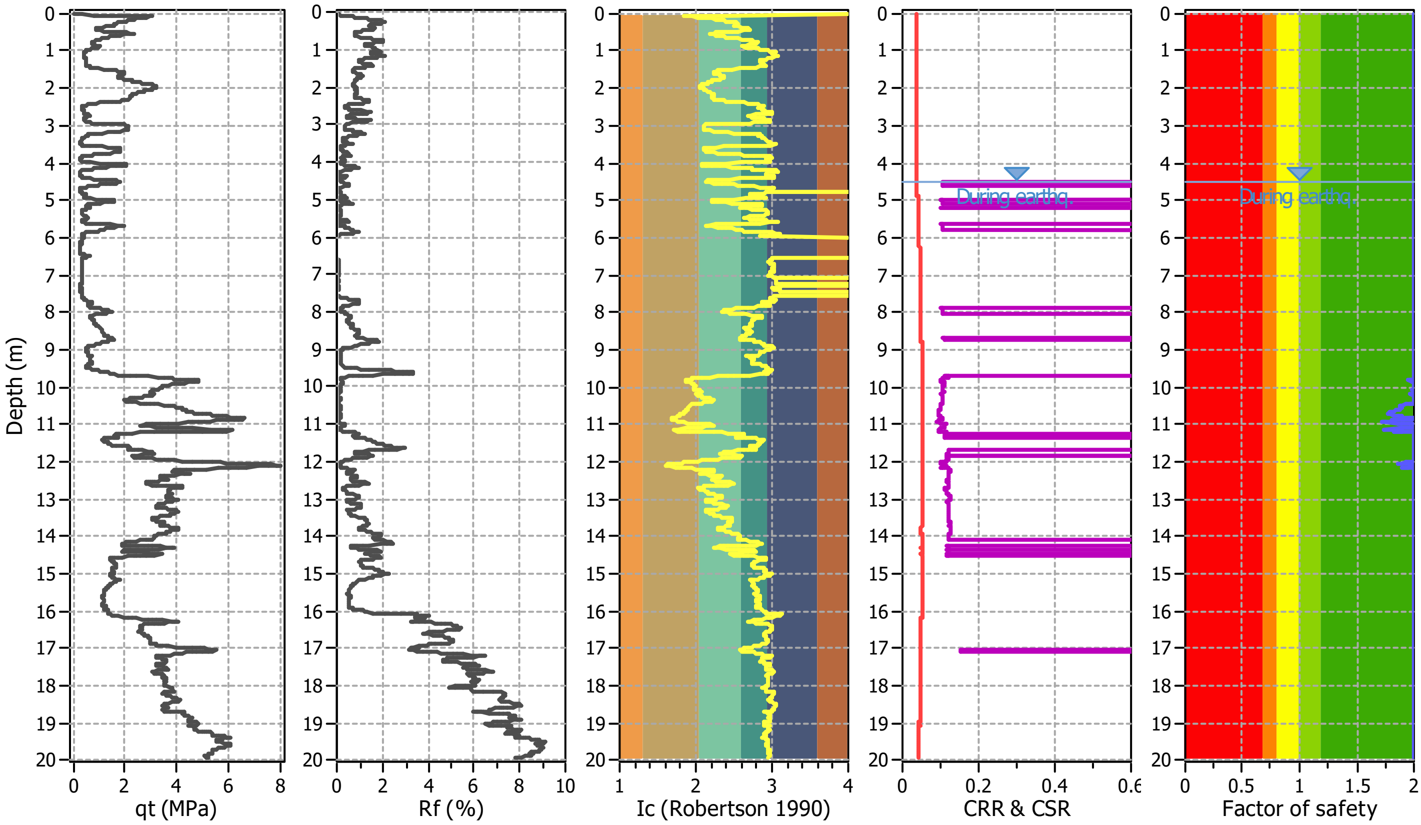
Project title : **Location :**

CPT file : CPT08

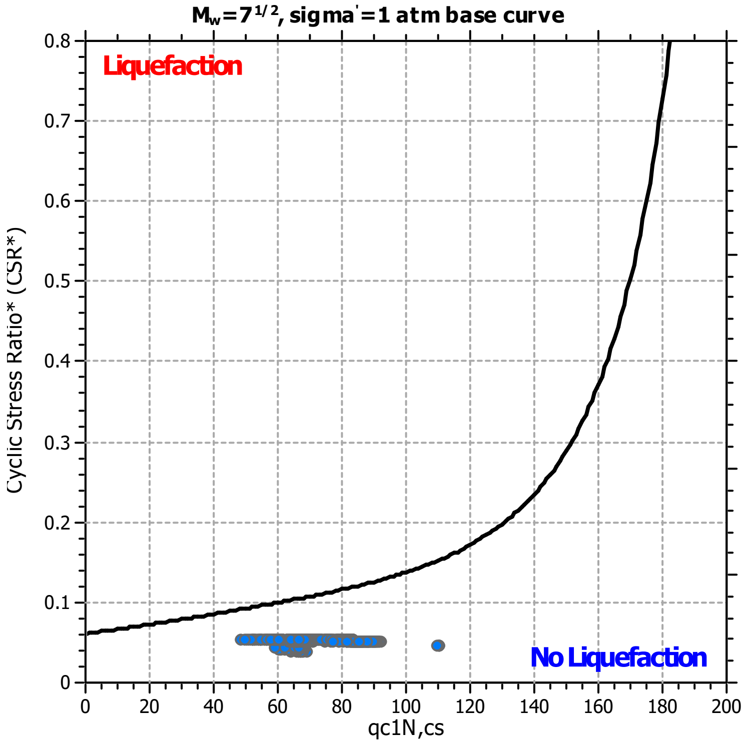
Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	4.50 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	4.50 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.07	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

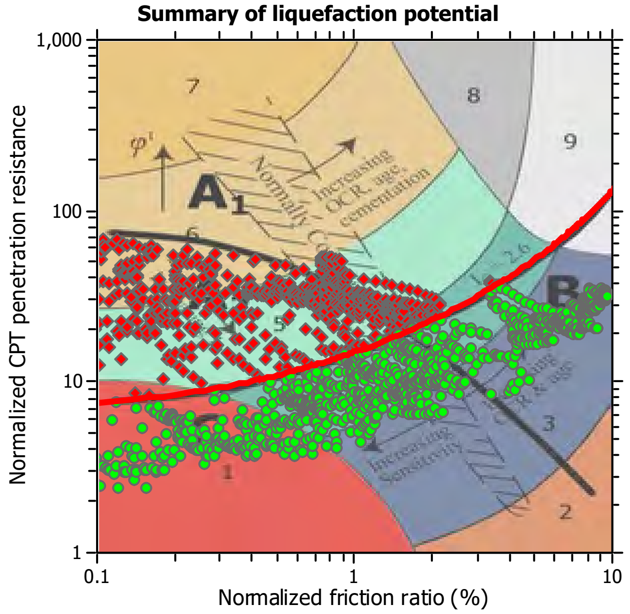
Cone resistance **Friction Ratio** **SBTn Plot** **CRR plot** **FS Plot**



$M_w=7^{1/2}$, sigma'=1 atm base curve

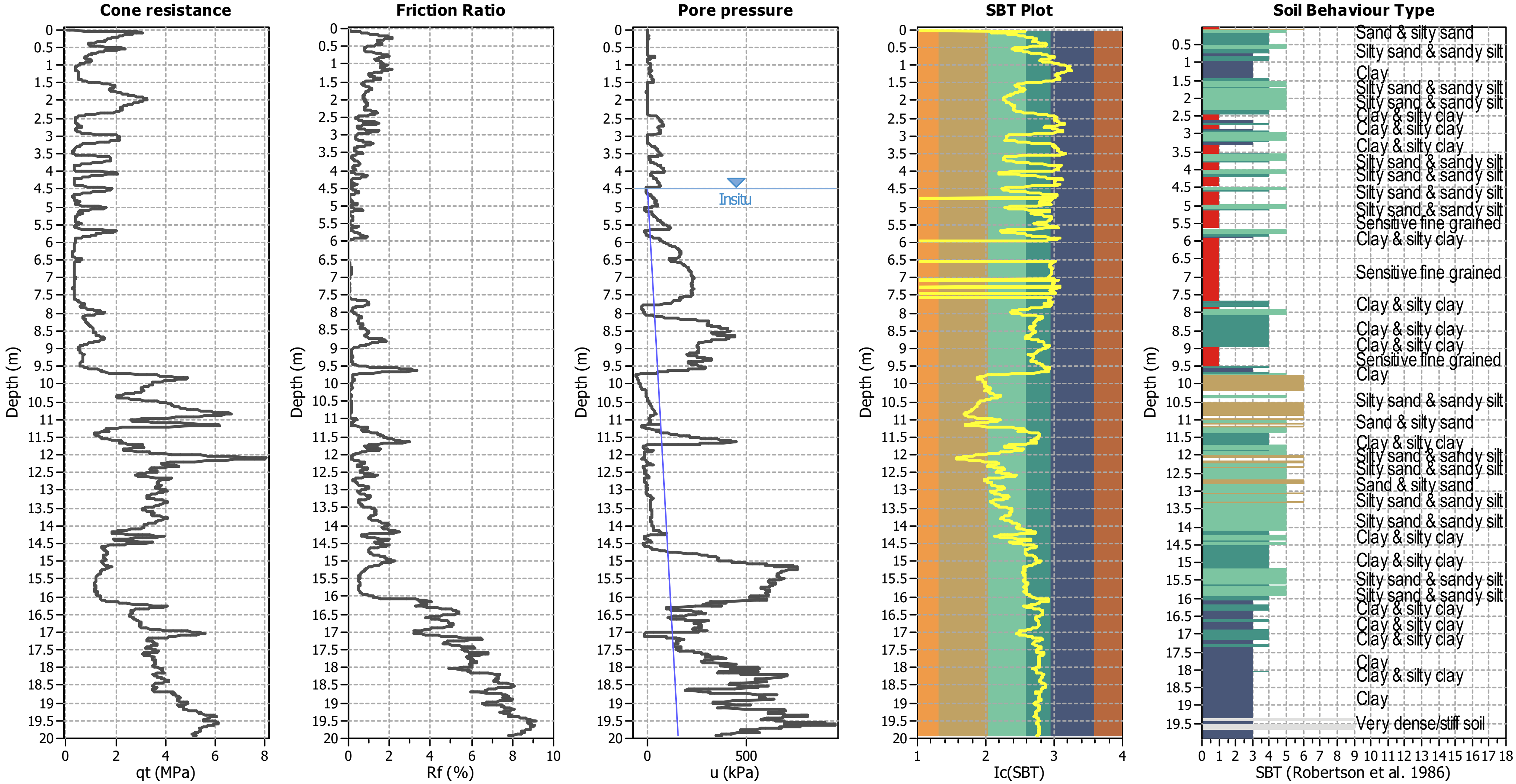


Summary of liquefaction potential



Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



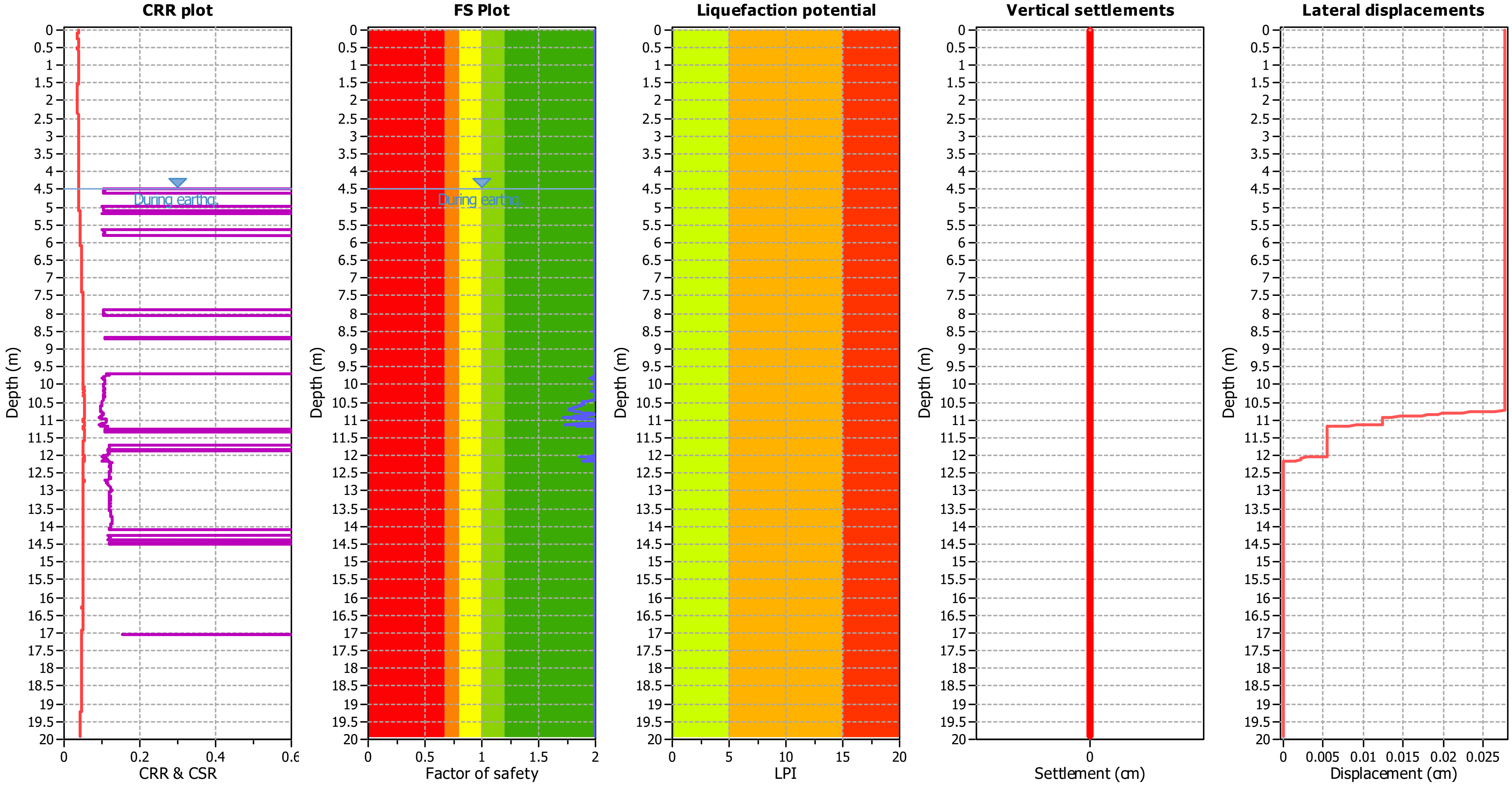
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	4.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.07	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	4.50 m	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	4.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.07	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	4.50 m	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

LIQUEFACTION ANALYSIS REPORT

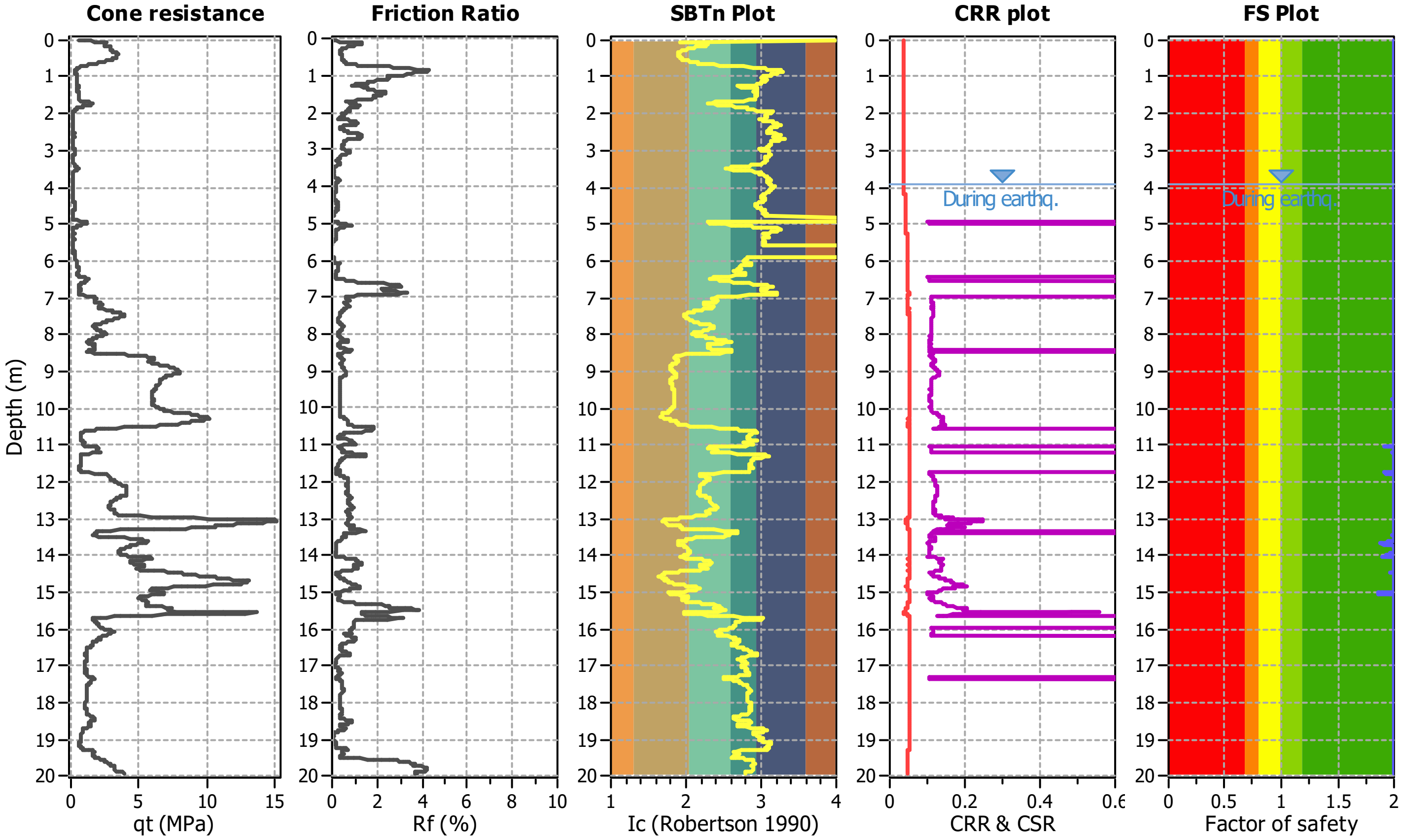
Project title : **Location :**

CPT file : CPT10

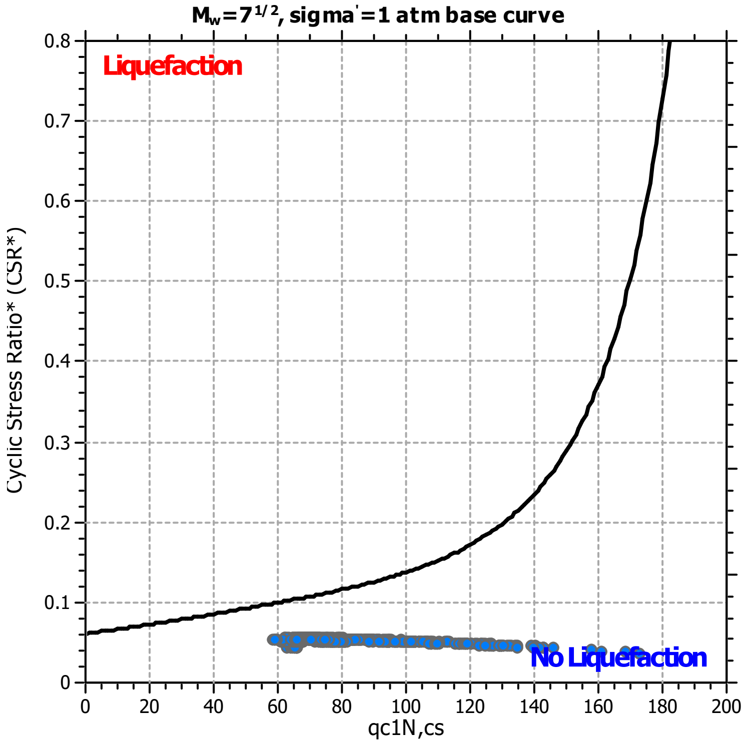
Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	3.90 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	3.90 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.07	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

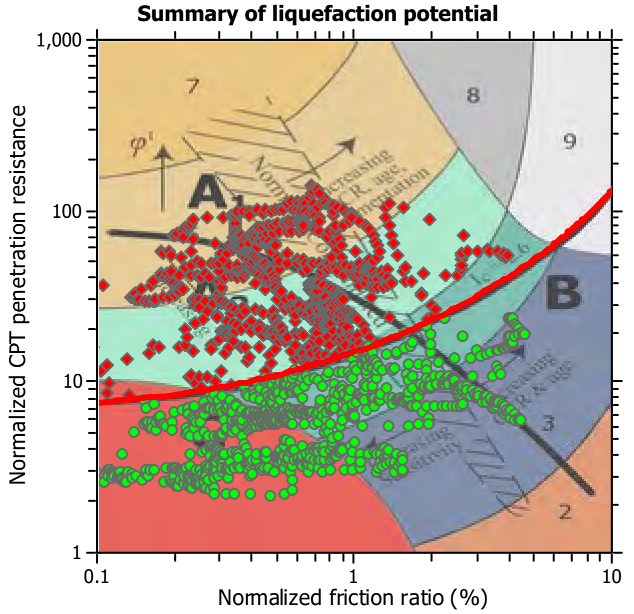
Cone resistance **Friction Ratio** **SBTn Plot** **CRR plot** **FS Plot**



$M_w=7^{1/2}$, sigma'=1 atm base curve

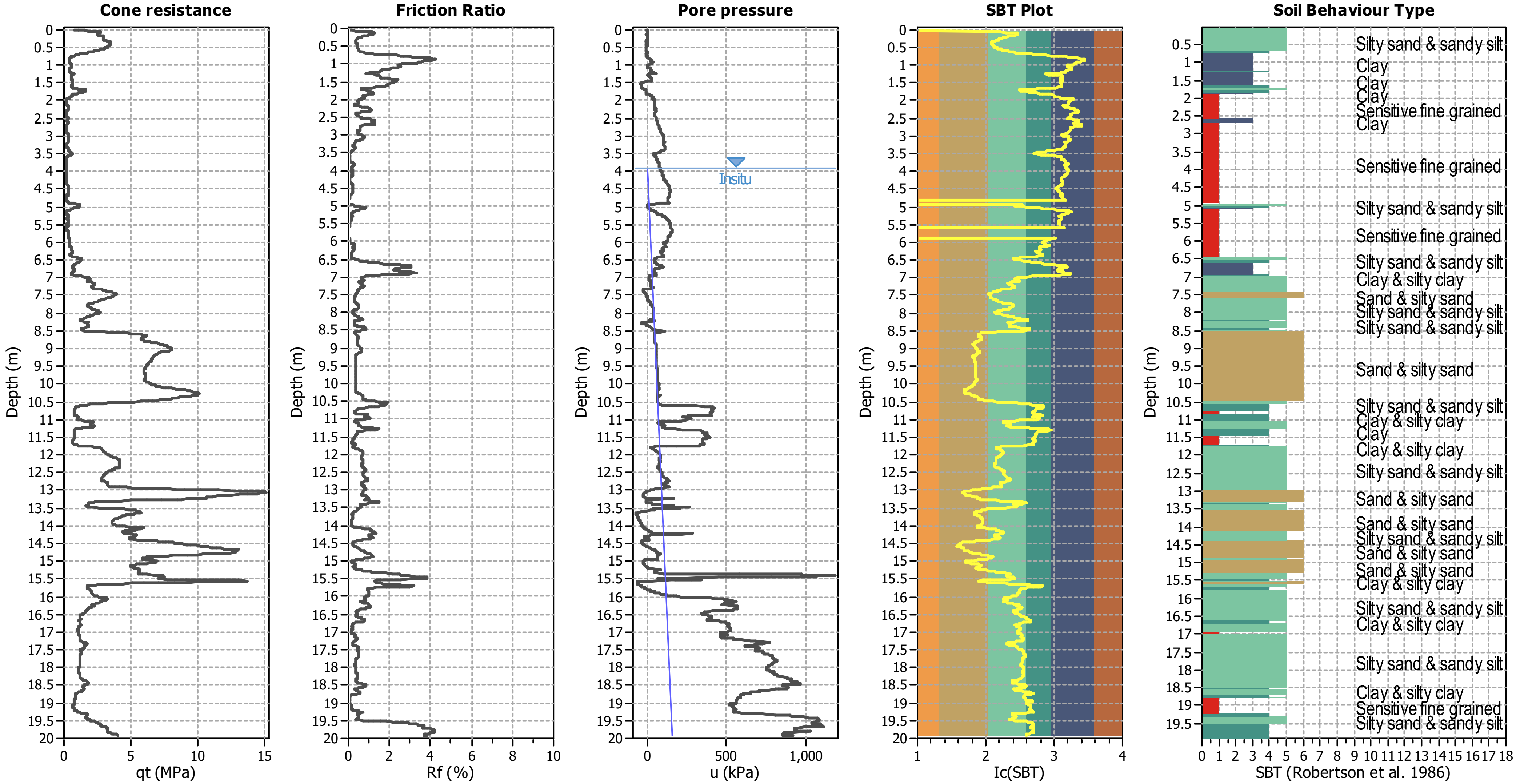


Summary of liquefaction potential



Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



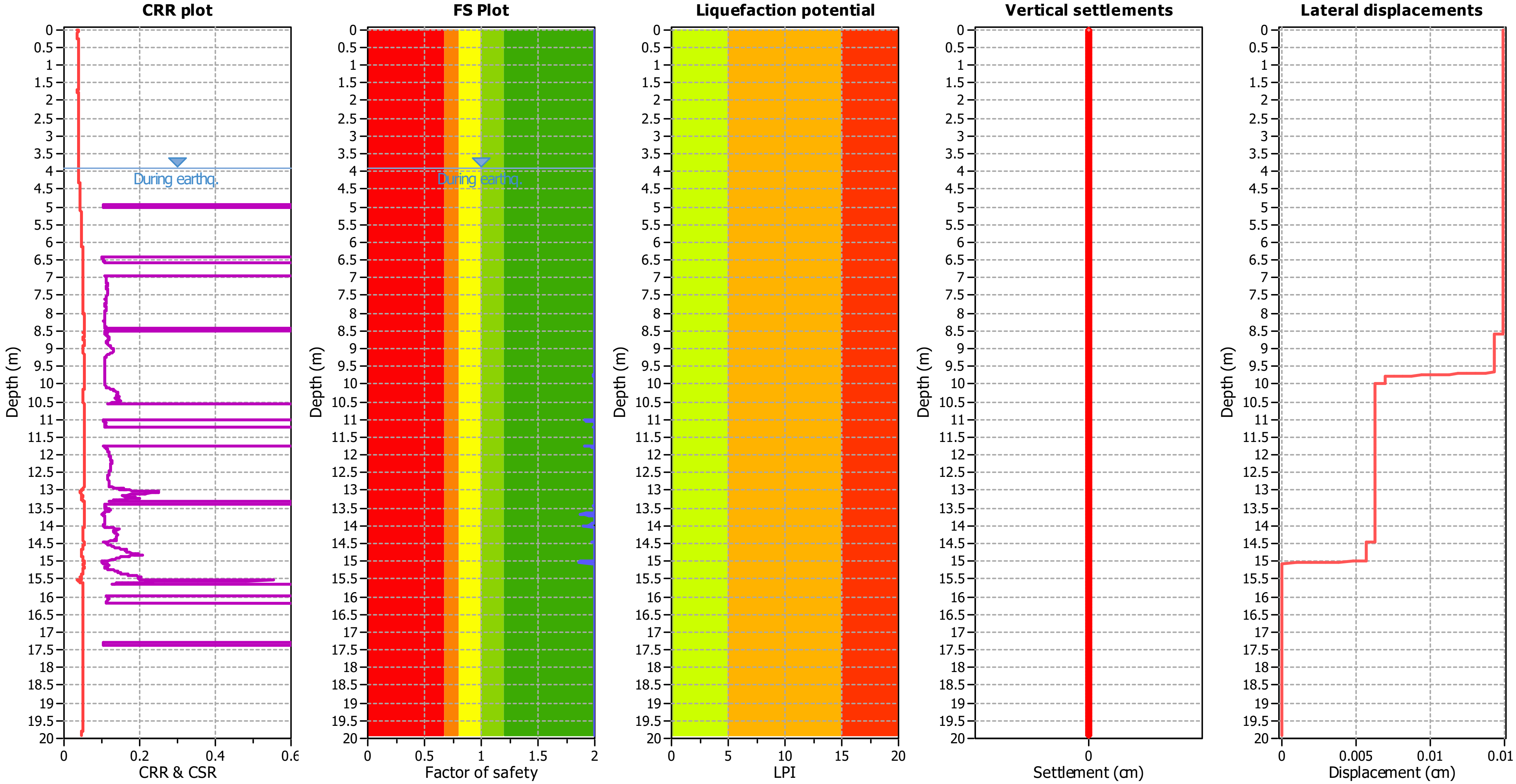
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.90 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.07	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	3.90 m	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.90 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.07	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	3.90 m	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

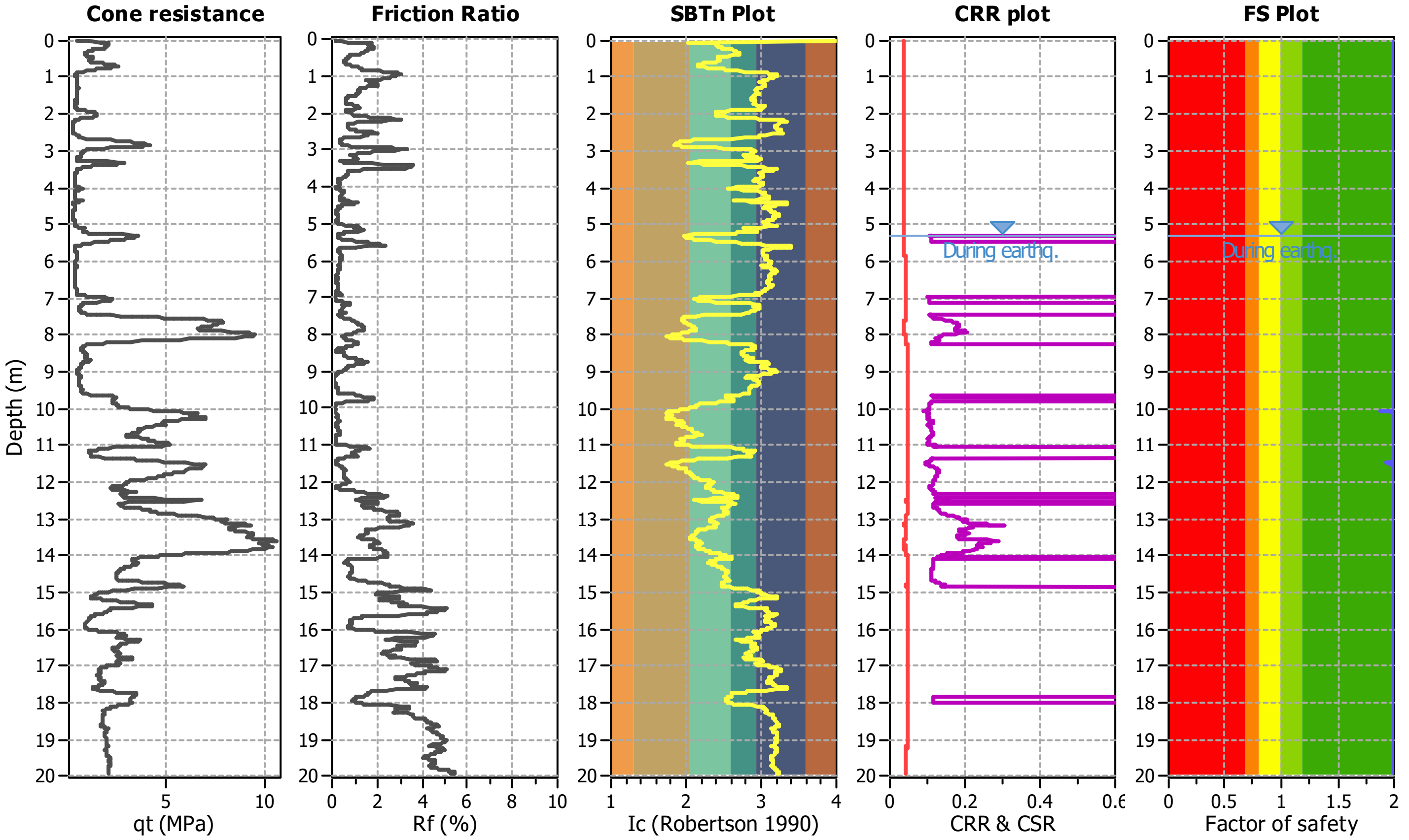
LIQUEFACTION ANALYSIS REPORT

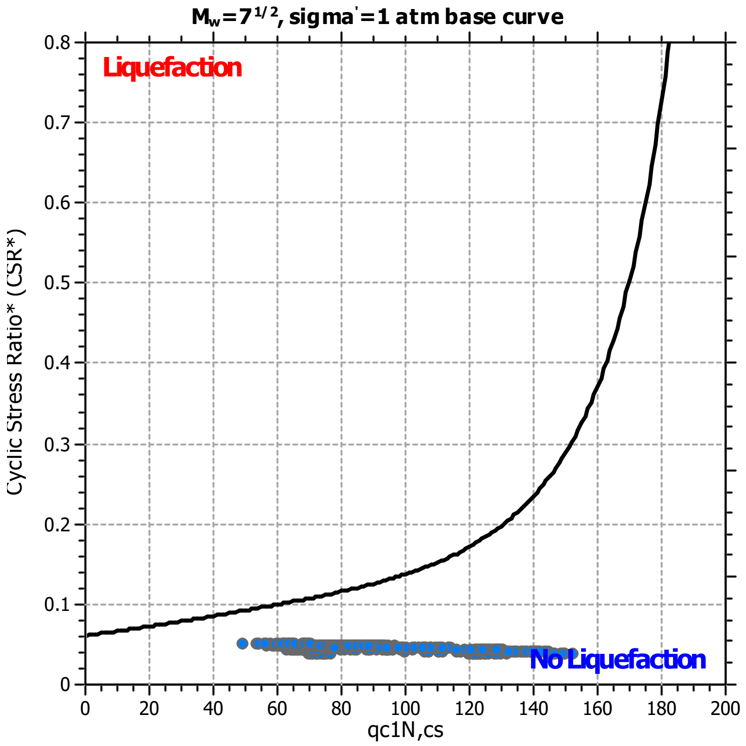
Project title : **Location :**

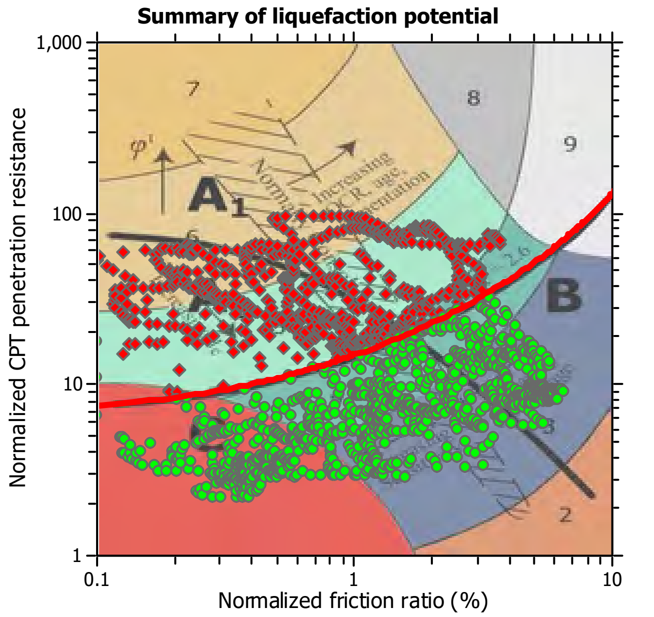
CPT file : CPT09

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	5.30 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	5.30 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	5.90	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.07	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

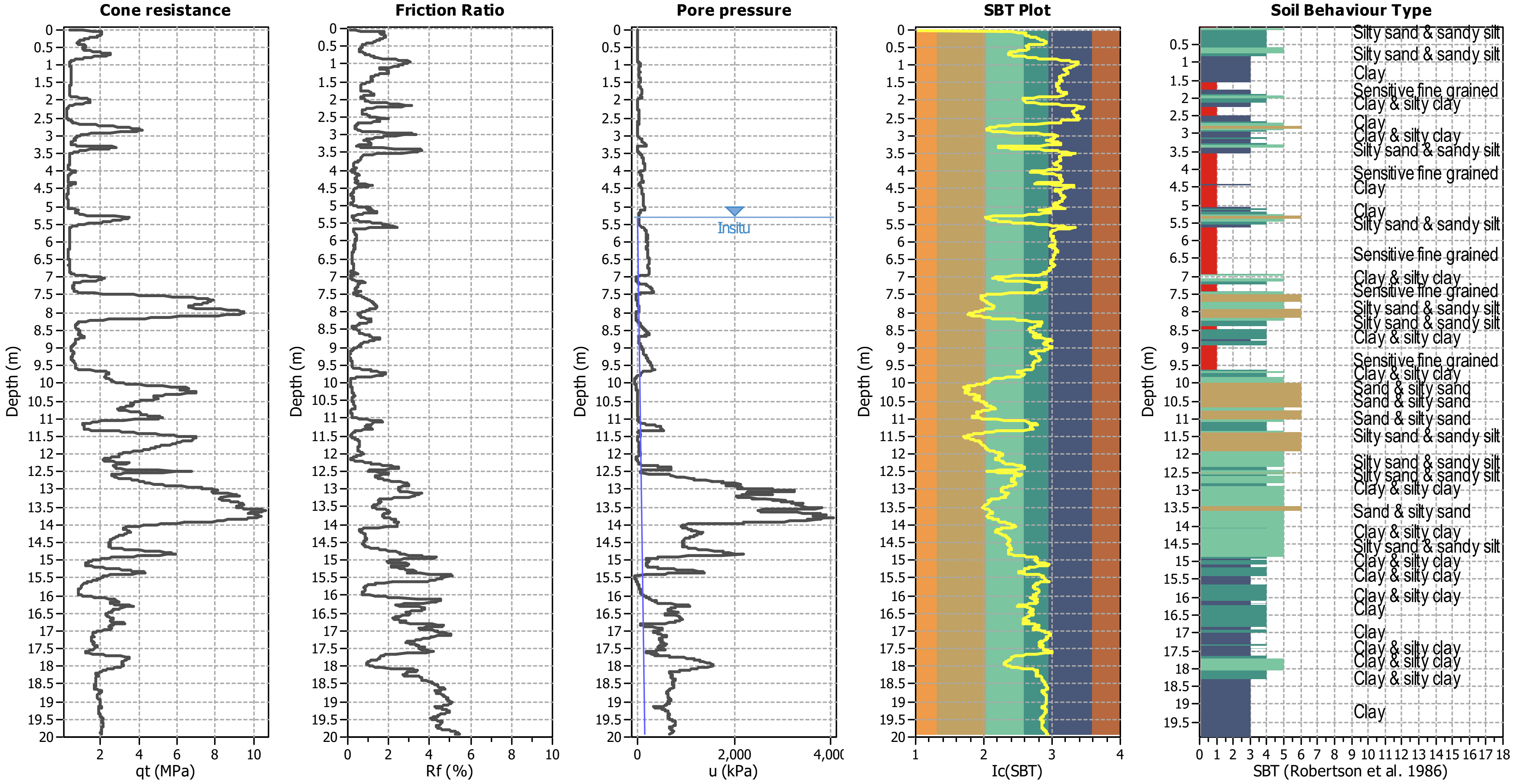






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



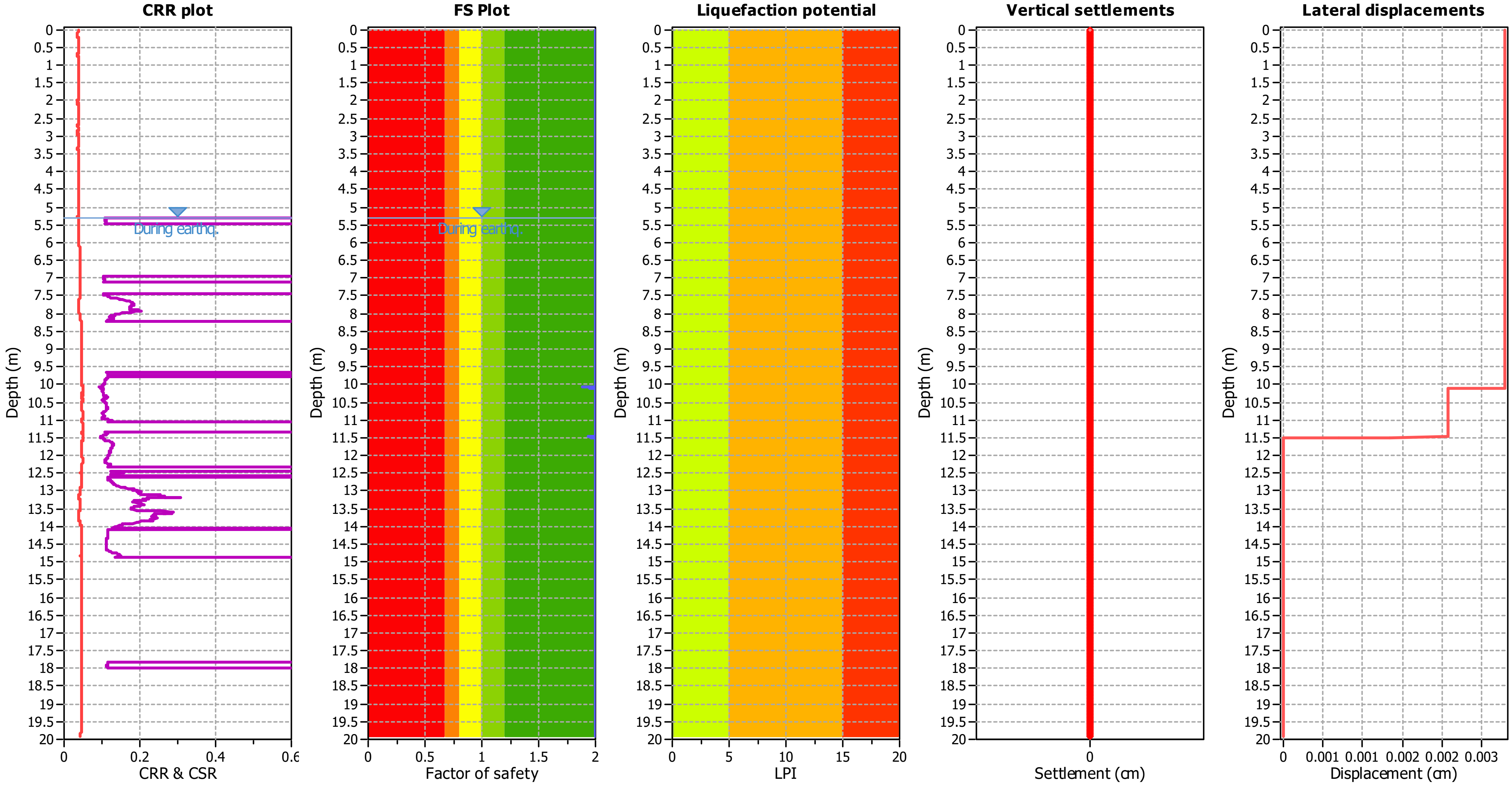
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	5.30 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.07	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	5.30 m	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	5.30 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	5.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.07	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	5.30 m	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

Appendix G: Settlement Analysis Outputs

CMW Geosciences	CLIENT: D MARSHALL	DESIGNER: EC
	PROJECT: 66 WASHER ROAD, TE PUKE	CHECKED: GS/DJM
		REVISION: 0
	TITLE: Primary and Secondary Consolidation of Soft Soil Layers	DATE: 10/12/2020
		PROJECT: TGA2019-0228

1. Consolidation Settlement (Terzaghi)

Exist Fill Density:	16	kN/m3
Soft Soil Density (Saturated):	14	kN/m3
Surcharge Density:	16	kN/m3

Layer	Original Ground RL	Water Table RL	Surcharge Top RL	Exist Fill Thickness	Soft Soil Thickness	Base Fill RL	Base Soft Soil RL	Mid-Point Soft Soil RL	Surcharge Height	Initial Eff Stress	Applied Surcharge	Comp Index C_C	Recomp. Index C_R	Initial Void Ratio e_0	Exist Over Consol.	Δe	Consol Settlement	t90 Consol	Preload Height (m)
	(mAHD)	(mAHD)	(mAHD)	(m)	(m)	(mAHD)	(mAHD)	(mAHD)	(m)	(kPa)	(kPa)				(kPa)		(m)	(m)	
CPT01	7.8	5.6	11.4	0.5	6.8	7.3	0.5	3.9	3.6	39	57.6	0.4	0.05	1.7	1	-0.1539	**0.388**	**0.35**	**2.6**
CPT02	7.3	4.5	11.1	0.5	8	6.8	-1.2	2.8	3.8	47	60.8	0.4	0.05	1.7	1	-0.1404	**0.416**	**0.37**	**2.8**
CPT03	7	4	9.2	0.8	6.6	6.2	-0.4	2.9	2.2	48	35.2	0.4	0.05	1.7	1	-0.0921	**0.225**	**0.20**	**2.2**
CPT04	8	5.5	10.1	1	6.4	7	0.6	3.8	2.1	44	33.6	0.4	0.05	1.7	1	-0.0949	**0.225**	**0.20**	**2.1**
CPT05	8	5.1	10	2	5.2	6	0.8	3.4	2	52	32	0.4	0.05	1.7	1	-0.0808	**0.156**	**0.14**	**2.0**
CPT06	10	6	11.8	1	3.2	9	5.8	7.4	1.8	52	28.8	0.4	0.05	1.7	1	-0.0735	**0.087**	**0.08**	**1.8**
CPT07	11.3	7.1	13.5	1.2	6.3	10.1	3.8	6.95	2.2	62	35.2	0.4	0.05	1.7	1	-0.0758	**0.177**	**0.16**	**2.2**
CPT08	9.9	5.4	12.3	2.4	7.9	7.5	-0.4	3.55	2.4	76	38.4	0.4	0.05	1.7	1	-0.0694	**0.203**	**0.18**	**2.4**
CPT09	8.8	3.5	12.1	0.9	9.1	7.9	-1.2	3.35	3.3	77	52.8	0.4	0.05	1.7	1	-0.0891	**0.300**	**0.27**	**2.8**
CPT10	8	4.1	10.2	0.8	6.2	7.2	1	4.1	2.2	56	35.2	0.4	0.05	1.7	1	-0.0818	**0.188**	**0.17**	**2.2**

2. Mesri Creep Settlement - (Mesri et al (1994) and Mesri & Ajlouni (2007))

Assumed C_α/C_c =	0.06	
Design Period, t =	50	yr
Future Load, $\Delta\sigma$ =	20	kPa

	Final Ground RL	Surc. Consol Achieved	Original OCR	Original σ_{vi}'	Preloaded σ_{vp}'	New Surch Base RL	New Fill Base RL	Final centre Soft Soil RL	Final Grd σ_v'	Total Final σ_{vf}'	Final OCR	Rs'	$C_c/(1+e_0)$	$C_\alpha/(1+e_0)$	Mesri et al (1994), Mesri & Ajlouni (2007)					
															t_{pr}	t_l	t/t_l	C_α''/C_α	$C_\alpha''/(1+e_0)$	Creep Settlement
	(m)	(%)		(kPa)	(kPa)	(m AHD)	(m AHD)	(m AHD)	(kPa)	(kPa)					(Yr)	(Yr)				(mm)
CPT01	8.8	90%	1.1	43	91	7.4	6.9	3.7	57	77	1.19	0.19	0.15	0.009	0.0833	0.48	103	0.20	0.002	24
CPT02	8.3	90%	1.1	52	103	6.9	6.4	2.6	65	85	1.21	0.21	0.15	0.009	0.0833	0.58	87	0.17	0.001	23
CPT03	7.0	90%	1.1	53	83	6.8	6.0	2.8	49	69	1.19	0.19	0.15	0.009	0.0833	0.51	98	0.19	0.002	22
CPT04	8.0	90%	1.1	49	77	7.8	6.8	3.7	45	65	1.18	0.18	0.15	0.009	0.0833	0.44	114	0.22	0.002	25
CPT05	8.0	90%	1.1	57	84	7.8	5.8	3.3	52	72	1.16	0.16	0.15	0.009	0.0833	0.38	131	0.25	0.002	24
CPT06	10.0	90%	1.1	57	82	9.9	8.9	7.4	52	72	1.14	0.14	0.15	0.009	0.0833	0.28	176	0.34	0.003	22
CPT07	11.3	90%	1.1	68	98	11.1	9.9	6.9	63	83	1.19	0.19	0.15	0.009	0.0833	0.48	104	0.20	0.002	22
CPT08	9.9	90%	1.1	83	116	9.7	7.3	3.4	76	96	1.20	0.20	0.15	0.009	0.0833	0.54	92	0.18	0.002	24
CPT09	9.3	90%	1.1	84	129	8.5	7.6	3.2	86	106	1.22	0.22	0.15	0.009	0.0833	0.62	80	0.15	0.001	24
CPT10	8.0	90%	1.1	62	92	7.8	7.0	4.0	57	77	1.19	0.19	0.15	0.009	0.0833	0.50	100	0.19	0.002	21

3 Harington Street, Tauranga, 3110
0274 325 154

MOMENTUM
PLANNING AND DESIGN

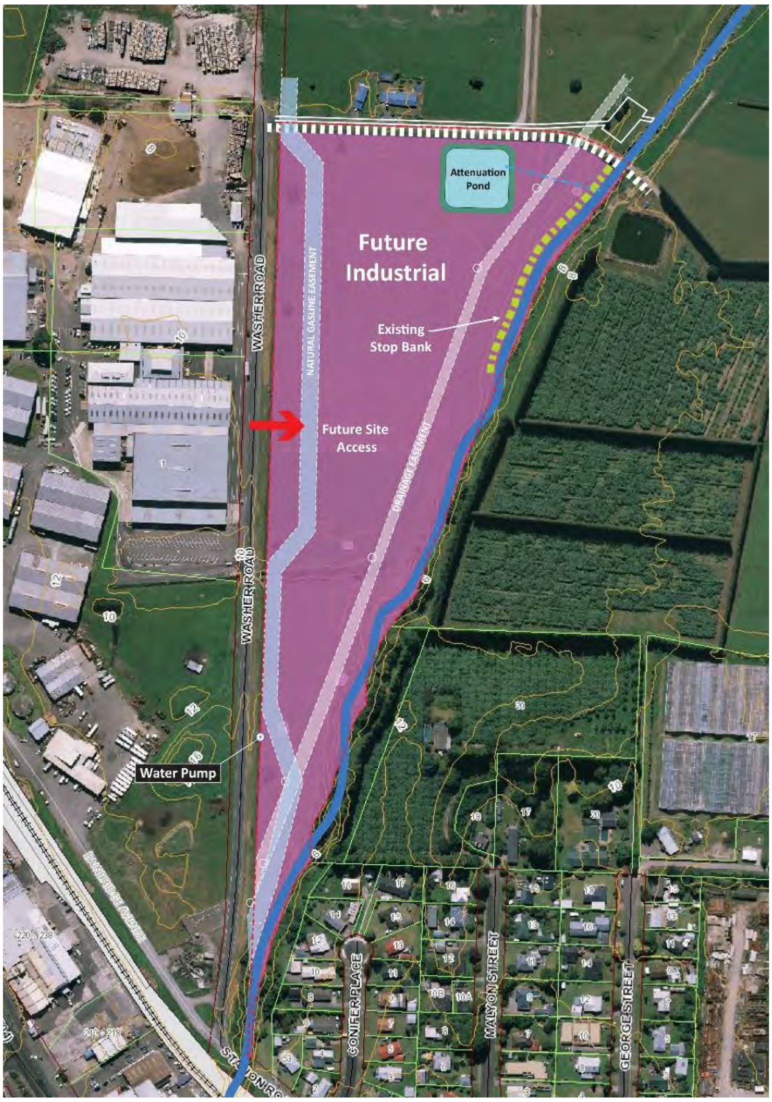
14 May 2019

Waitaha Iwi
General Manager: Vivienne Robinson
Address: 2 Dunlop Road, Te Puke
By email:vivienne@waitaha-iwi.org.nz

Kia Ora Vivienne,

I hope the first half of the year is treating you well.

Our company is preparing an application for a District Plan Change, related to a portion of land located on David Marshall's Farm, at 66 Washer Road, Te Puke. Refer to subject area below.



The plan change seeks to re-zone the area identified above, from rural zone, to the industrial zone. This will facilitate industrial activities on site, like those that already exist on the opposite side of Washer Road.

To accommodate industrial uses the land identified in purple, will need to be raised approximately 0.3m, so that buildings will have a finished floor above flood inundation levels.

Flood displacement from raising the ground level will be dealt with on site by way of a storm water retention pond, which will attenuate flood waters and discharge treated stormwater at a slow rate back into the Ohineangaanga stream.

The neighbouring stream, which runs along the eastern boundary of the site, is recognised as ecologically significant and will be protected on that basis, by establishing appropriate setbacks and maintaining/restoring native planting to enhance ecological values for this section of the stream.

There are no records of archaeological sites on the property.

Given the above, does Waitaha have any special cultural or archaeological values relevant to this site? We would like to discuss this plan change with you at your convenience so we can document Waitaha's views on the proposal.

Nga mihi

Tom Watts

Planner/Urban Designer Int.NZPI

021 442 521

tom@mpad.co.nz

www.mpad.co.nz

Tom Watts

From: Vivienne Robinson <Vivienne@waitaha-iwi.org.nz>
Sent: Wednesday, 5 June 2019 3:22 PM
To: Tom Watts

Hi Tom

Wairaha has no issues with the consent application, however we would be available to di any cultural monitoring re earthworks uf required including blessing the site prior to earthworks if you so wish.

Regards

Vivienne Robinson
General Manager
Te Kapu o Waitaha Group

3 Harington Street, Tauranga, 3110
0274 325 154

MOMENTUM
PLANNING AND DESIGN

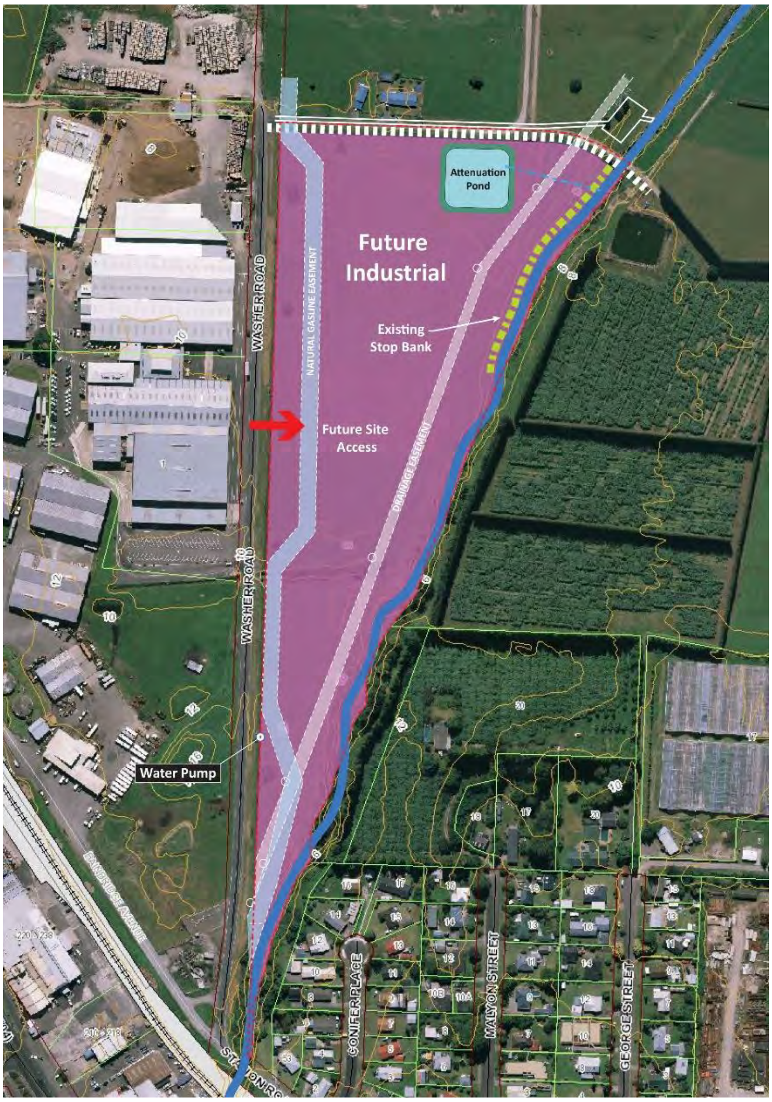
14 May 2019

Tapuika Iwi Authority Resource Management Unit
Contact Person: Hohepa Maxwell
Address: Tapuika Iwi Authority Resource Management Unit, Te Puke
By email: hohepa@tapuika.iwi.nz

Kia Ora Hohepa,

I hope the first half of the year is treating you well.

Our company is preparing an application for a District Plan Change, related to a portion of land located on David Marshall's Farm, at 66 Washer Road, Te Puke. Refer to subject area below.



The plan change seeks to re-zone the area identified above, from rural zone, to the industrial zone. This will facilitate industrial activities on site, like those that already exist on the opposite side of Washer Road.

To accommodate industrial uses the land identified in purple, will need to be raised approximately 0.3m, so that buildings will have a finished floor above flood inundation levels.

Flood displacement from raising the ground level will be dealt with on site by way of a storm water retention pond, which will attenuate flood waters and discharge treated stormwater at a slow rate back into the Ohineangaanga stream.

The neighbouring stream, which runs along the eastern boundary of the site, is recognised as ecologically significant and will be protected on that basis, by establishing appropriate setbacks and maintaining/restoring native planting to enhance ecological values for this section of the stream.

There are no records of archaeological sites on the property.

Given the above, does Tapuika have any special cultural or archaeological values relevant to this site? We would like to discuss this plan change with you at your convenience so we can document Tapuika's views on the proposal.

Nga mihi

Tom Watts

Planner/Urban Designer Int.NZPI

021 442 521

tom@mpad.co.nz

www.mpad.co.nz

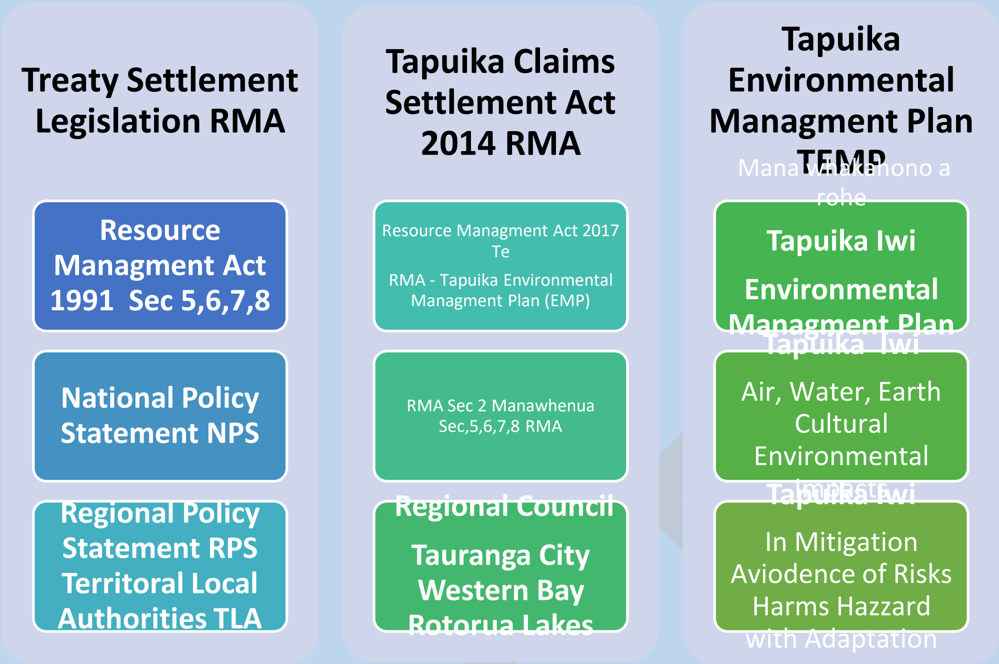
CULTURAL IMPACT ASSESSMENT CIA

ASSESSMENT ENVIRONMENTAL EFFECTS AEE

66 Washer Rd

Consent to Divide

LCL Ref 194210



TAPUIKA ENVIRONMENTAL MANAGEMENT PLAN (EMP)

The Tapuika EMP has been developed to:

► Articulate Tapuika environmental issues, aspirations and priority actions

► guide Tapuika-led environmental projects

► enable more effective participation in Local and Central Government processes

► ensure that Tapuika are proactive, instead of reactive to environmental issues

► clarify Tapuika expectations with regards to Iwi engagement consultation

► ensure partnership working together to achieve positive outcomes

The priority issues and actions within this Plan were identified during consultation with Tapuika whānau in early 2014. This Environmental Management Plan (EMP) focuses priority issues and actions within the 'Rohe o Tapuika' see mapping above

Consent to divide stormwater discharge effecting fresh water stream

***Consent** activity application notification in accordance with resource management act the activity requires consideration of the Cultural Impact and Environmental Assessment within the tribal boundary area as above*

***Consent Review of water abstraction applications** WQ P10 a current directive Regional Council **generally decline** applications take and use surface water or groundwater, where the water resource is allocated above the limits identified in, WQ P5 unless the application is:*

(a) A renewal of an existing authorised take that is:

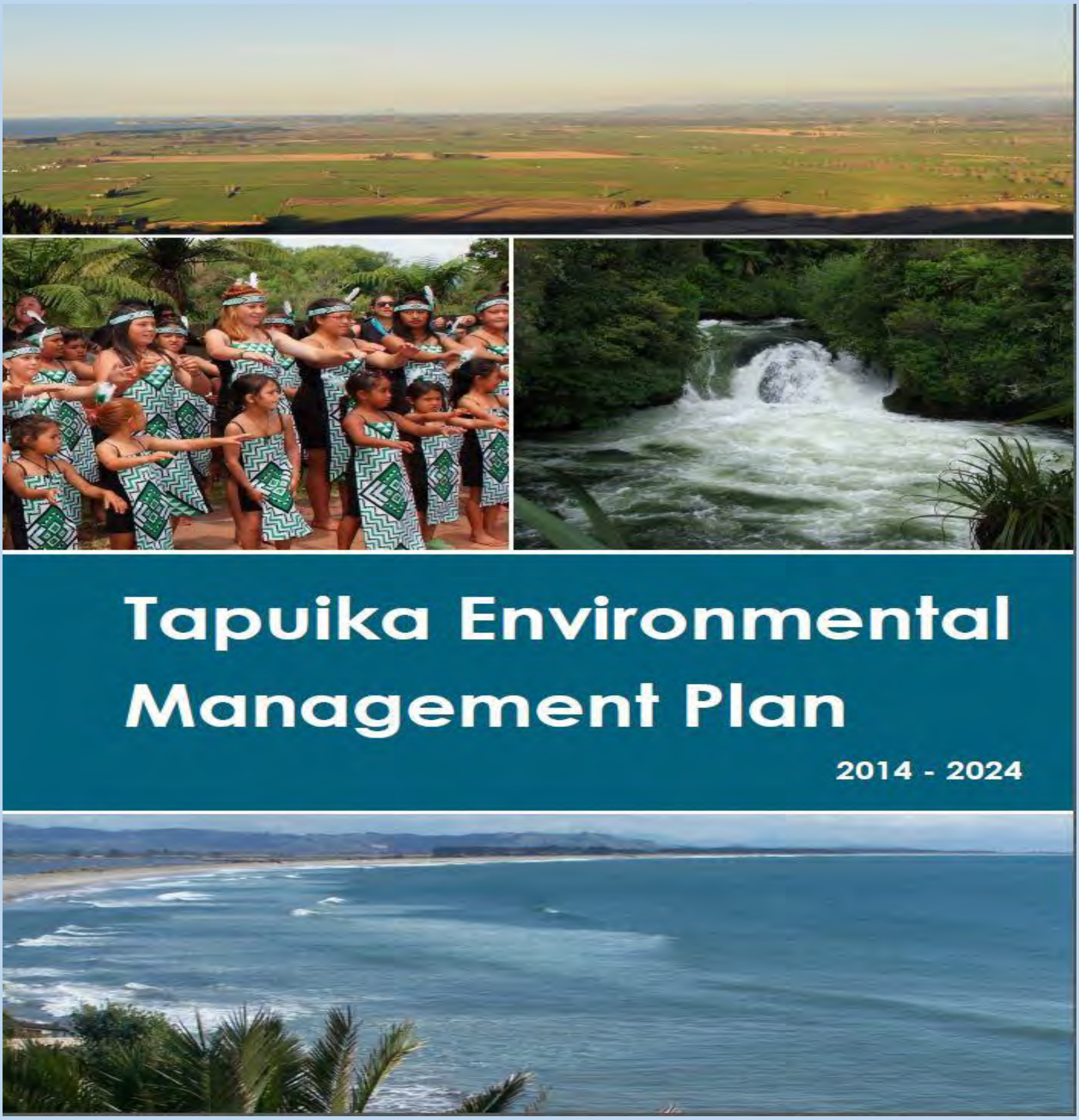
(i) At the same or lesser rate and volume of take; and

(ii) Assessed as a reasonable and efficient rate and volume of take; or

(b) For the harvesting of surface water under WQ P6; or

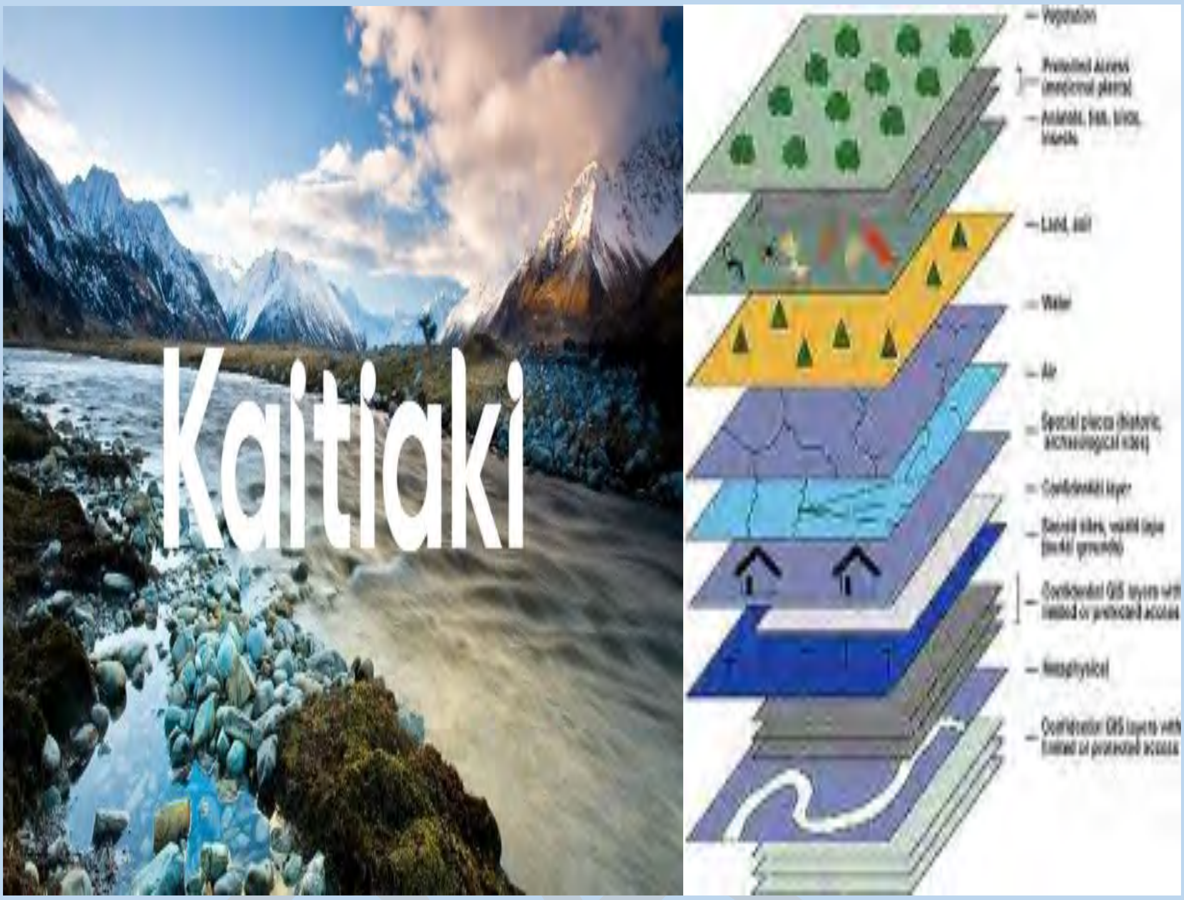
(c) For secondary allocable flow under WQ P8(a); or

(d) Supported by a detailed assessment of environmental effects



Contents:-

PART ONE Cultural Impact Assessment (CIA)



Kaitiaki guardianship role is the Tapuika Cultural Connection BOPRC **TCC and the applicant** and includes land management with cultural and environmental impacts on the environment these are critical elements of Kaitiaki Iwi Hapu Māori. Gathering both for sustenance and to provide for visitors, is an integral component of Māori life. When these resources are compromised by inappropriate development, as compromised. “Kaitiakitanga” is now part of the natural resource management

Kaitiakitanga acknowledged in legislation and is defined as follows: the exercise of guardianship *by the tangata whenua of an area in accordance with tikanga Māori in relation to natural and physical resources, and include the ethic of stewardship (section 2 RMU* **Iwi engagement - Resource management Act Sec** ***The Resource Management Act*** also provides for extensive participation with Mana whenua Iwi / Hapu Tangata, Tapuika Iwi Hapu holding mana whenua status and representation via the Tapuika Iwi Authority Te Puke

APPLICANT DETAILS

Applicant:

David Marshall seeking a private plan change consent application

Proposed industrial Development

66 Washer Rd

Lysaght Surveying Engineering

Phone: 021442521

Email: tom@mpad.co.nz

Applicant Consultancy:

Tom Watts Momentum Planning

Phone: Mobile 021 1442521

APPLICANT Activity:

Lysaght Consultants Ltd (LCL) was engaged by David Marshall to provide a high-level engineering servicing review for a Private Plan Change consent application for a proposed Industrial Development at 66 Washer Road, Te Puke.

The scope of the review included;

- Flood Levels
- Stormwater Discharge
- Wastewater Reticulation
- Potable and Fire Fighting Water Provisions

The review was undertaken in general accordance with the requirements of Western Bay of Plenty District Council's (WBOPDCs) Development Code (DC), NZS 4404:2012, relevant NZ Standards and standard engineering practice.

SITE DESCRIPTION

Table 1 Site Description

Site Location:	66 Washer Road, Te Puke PT Lot 1 DP25471

Description & Topography:	The site is bounded by the Ohineangaaanga Stream along its Eastern Boundary, Washer Rd along to the west, and pasture land to the north. The site narrows to a point on to Bainbridge Ave/Station Rd. The site consists of a relatively gentle contour, falling from a maximum RL 12.0m in the southern corner to RL 8.0 at the northern extent of the proposed rezoning area. Access from Washer Rd is flat, however the site falls steeply into the Ohineangaaanga Stream along the Eastern boundary.

Existing Structures:	The site is pasture with no buildings/structures
Proposed Development:	It is proposed to submit a Private Plan to rezone the property from Rural to Industrial land.
Surrounding Properties:	Residential dwellings to the east, industrial land to the south and west, and pasture to the north.

FLOODING

LCL contacted WBOPDC for flood level information and were advised that depths range from 100mm to 300mm across the site to a maximum elevation of RL 10.0m Moturiki Datum. This level appears extremely conservative given downstream flood plain ground levels are generally less than RL 5.0, indicating more than 5m of flood depth across the lower flood plains in a 50-year event. This issue was raised with WBOPDC but a response was not provided in time for reporting. Discussions with the original source of this flood model information (AECOM) indicated that the levels WBOPDC provided us were not appropriate for determining site flood level. For the purpose of this high-level report, and due to lack of any alternative information, we have adopted the RL10.0m level suggested by WBOPDC. We recommend that a more detailed assessment be undertaken in the future prior to setting of minimum platform levels. A reduction in the flood levels will significantly impact on fill quantities required to meet design freeboard requirements.

LCL developed a 3D fill model for the site with a platform level of RL 10.5m to provide a preliminary freeboard allowance of 0.5m. The fill extends from the western side of the drainage easement to Washer Road (Refer to Drawing 194210-100-SCH). We note that agreement will need to be gained from gas service providers before filling over the Natural Gas easement adjacent to Washer Rd (as well as several other small easements across the site).

Table 2 - Flood Impact Calculation

Fill required to meet RL 10.5m across site	72,000m³
Displaced flood volume for flood to RL 10.0 due to filling	51,000m³
Downstream flood plain based on District Plan	42.75 km²
Indicative Increase in downstream flood depth due to site filling	1.2mm

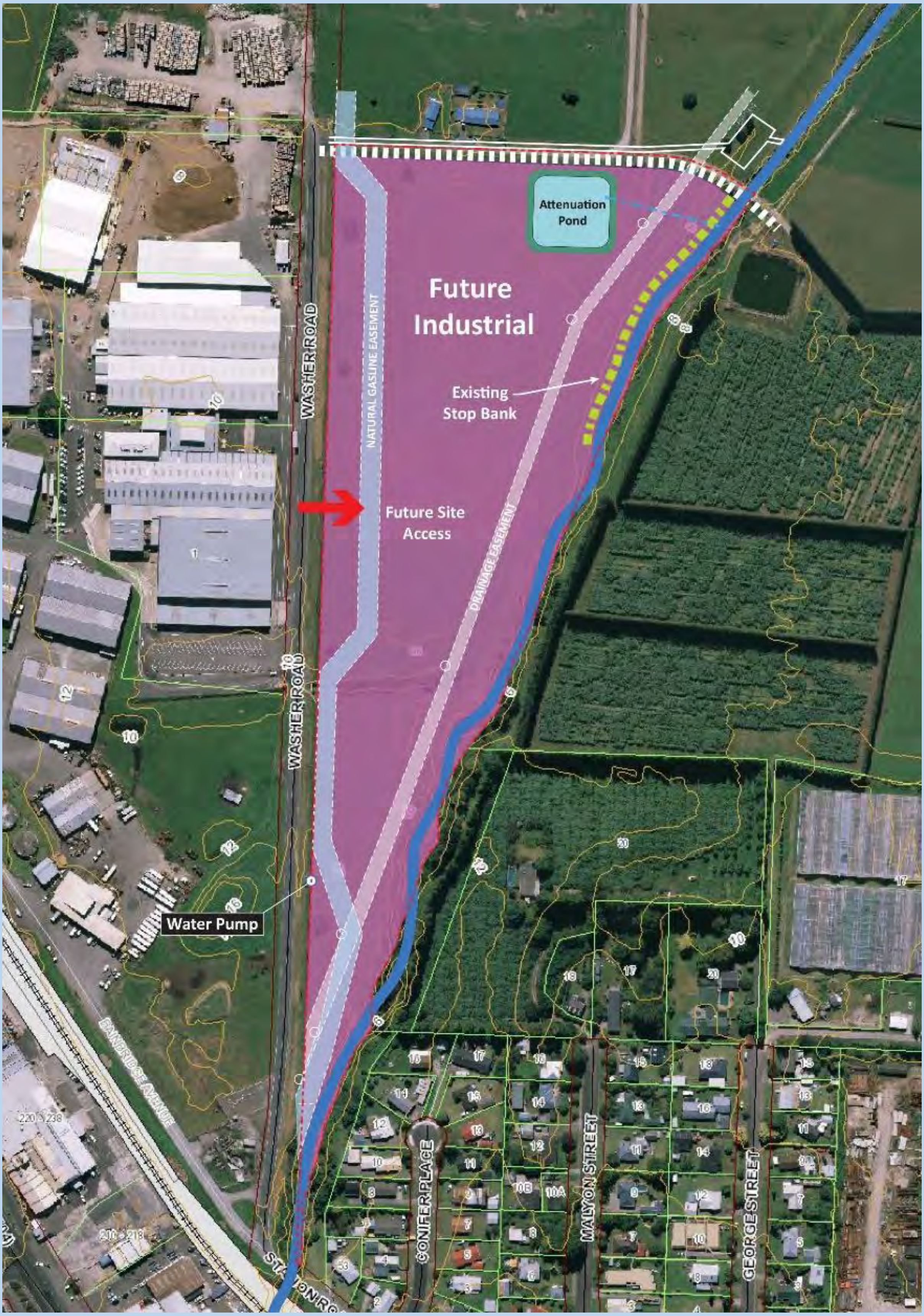
STORMWATER

There is no reticulated stormwater network available to the site. A new discharge point will need to be created into the Ohineangaaanga Stream adjacent to the site boundary. This will most likely consist of a culvert with headwall and stabilised discharge channel. The existing site is pastural, with discharge dispersed relatively evenly across the eastern boundary into the Ohineangaanga Stream. Existing site flows are in the order of 0.4-0.5m³/s, hence any new concentrated discharge point is likely to exceed BOPRC's 125 L/s permitted discharge rate, requiring BOPRC consents for the culvert structure and discharge rate.

The industrial nature of any future development will significantly increase site impervious area, resulting in increased runoff and generating contaminants such as sediment, metals and hydrocarbons. It is proposed to manage runoff treatment by utilising stormwater wetlands, swales, raingardens or other approved treatment devices. Indicative wetland calculations based on the BOPRC sizing requirement of 2% of catchment area equates to a 1000m² wetland. It is clear, based on this very conservative flood estimate, that the downstream effects of filling the site will be less than the +15mm allowance generally accepted by Bay of Plenty Regional Council (BOPRC)

Tapuika relies on this very conservative flood estimate, that the downstream effects of filling the site will be less than the +15mm allowance generally accepted by Bay of Plenty Regional Council (BOPRC)

An operation and maintenance manual for all stormwater devices, public or private, shall be submitted to the council and approved, prior to issue of certificates such as the Code Compliance Certificate (CCC) or Resource Management Act (RMA) s224(c) Certificate for subdivision consent. This manual shall include a detailed technical data sheet and shall state the methodology for the ongoing and long-term maintenance of the device, including


Attenuation Pond
Future Industrial
Existing Stop Bank
Future Site Access
Water Pump
WASHER ROAD
NATURAL GASLINE EASEMENT
DRAINAGE EASEMENT
CONIFER PLACE
MALYON STREET
GEORGE STREET

Tapuika Iwi Hapu Kaitiakitanga: a close relationship with water in all its forms, both spiritually and physically. Water is a taonga of huge importance to Iwi and enhancing the health and wellbeing of our waterways is a priority for many Iwi. The Resource Management Act, National Policy Statement for Freshwater and Bay of Plenty Regional Council Plan Change 9 include kaitiakitanga policies and as such the cultural effects of this application have been considered.

> Policy IW 2B of the Regional Policy Statement recognises that only tangata whenua can identify and evidentially substantiate their relationship and that of their culture and traditions with their ancestral lands, water, sites, waahi tapu and other taonga. Therefore, to understand that relationship the applicant has undertaken consultation with iwi and hapu groups identified by BOPRC as having an interest in the area.

Te Mana o Te Wai

OVERUSE AND DEPLETION OF GROUNDWATER

Groundwater is the largest source of usable, fresh water in the world. In many parts of the world, especially where surface water supplies are not available, domestic, agricultural, and industrial water needs can only be met by using the water beneath the ground.Geological Survey compares the water stored in the ground to money kept in a bank account. If the money is withdrawn at a faster rate than new money is deposited, there will eventually be account-supply problems. Pumping water out of the ground at a faster rate than it is replenished over the long-term causes similar problems.

Groundwater depletion is primarily caused by sustained groundwater pumping. Some of the negative effects of groundwater depletion:

- **Lowering of the Water Table**

  Excessive pumping can lower the groundwater table, and cause wells to no longer be able to reach groundwater.

- **Increased Costs**

  As the water table lowers, the water must be pumped farther to reach the surface, using more energy. In extreme cases, using such a well can be cost prohibitive.

- **Reduced Surface Water Supplies**

  Groundwater and surface water are connected. When groundwater is overused, the lakes, streams, and rivers connected to groundwater can also have their supply diminished.

- **Land Subsidence**

  Land subsidence occurs when there is a loss of support below ground. This is most often caused by human activities, mainly from the overuse of groundwater, when the soil collapses, compacts, and drops.

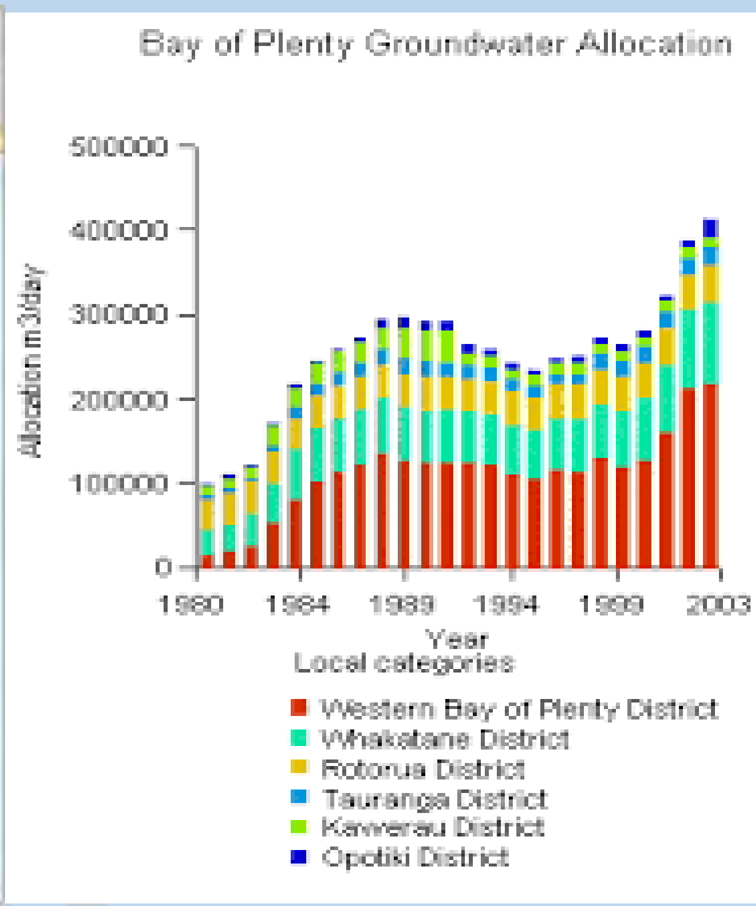
- **Water Quality Concerns**

Excessive pumping in coastal areas can cause saltwater to move inland and upward, resulting in saltwater contamination of the water supply.

We rely on groundwater - it's the water we drink, the water that grows our food, the water that helps recharge our lakes and rivers.

While some groundwater contaminants are naturally occurring, unfortunately, the majority of groundwater contamination is the result of human activity.

Calculating Readily Available Water RAW NZ and particularly the Western Bay of Plenty Region people are extracting water from aquifers more quickly than the aquifers are replenished by recharge.



In addition to draining aquifers, excessive groundwater pumping changes groundwater flow patterns around wells and can drain nearby rivers and streams. This happens because pumping changes the natural equilibrium that exists in an undeveloped aquifer with discharge balancing recharge.

When pumping starts, groundwater stores are depleted in the vicinity of the well, creating a cone of depression in the hydraulic head. If a new water source such as a river or stream is available close by, the well may capture (draw water from) that source and increase its recharge rate (Fig. 10) until this inflow matches the pumping rate. If no such source is available and pumping draws the water table down far enough, it will dry up the aquifer or deplete it so far that is it not physically possible or affordable to pump out the last stores of water.

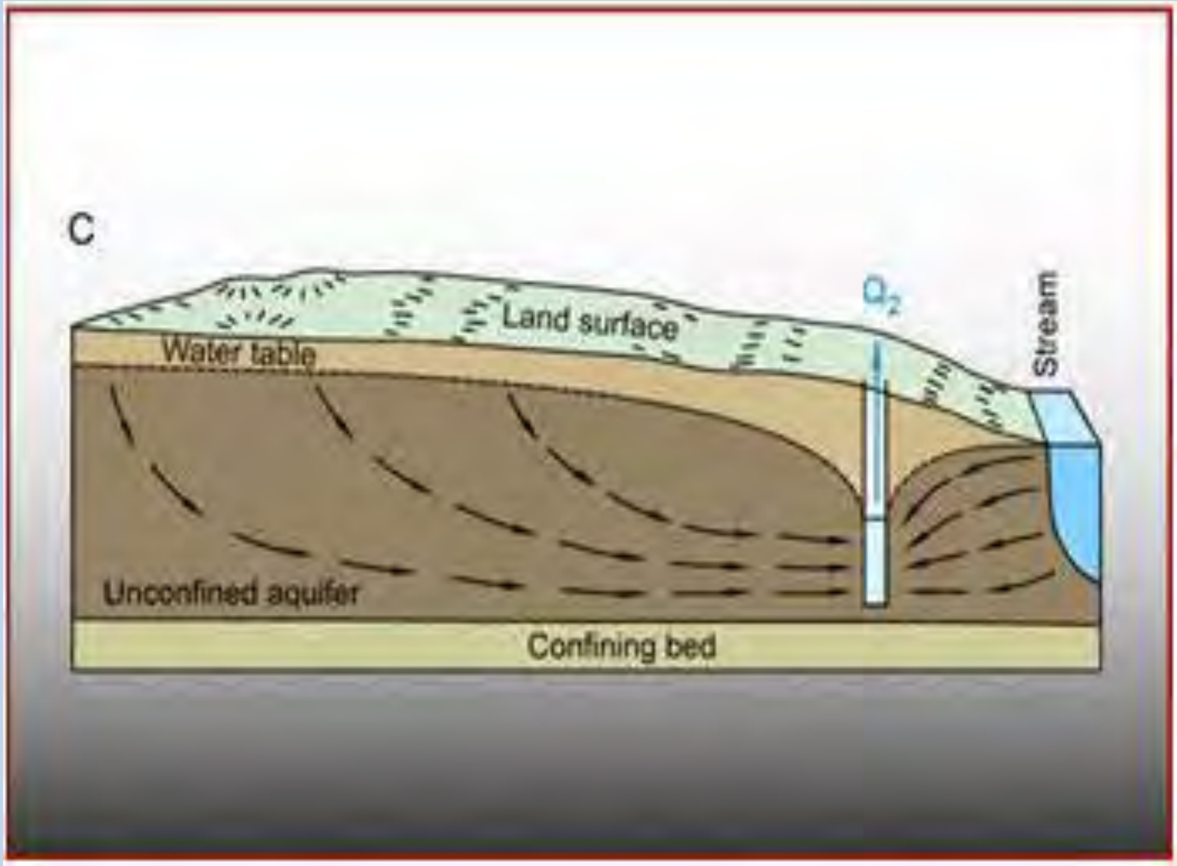
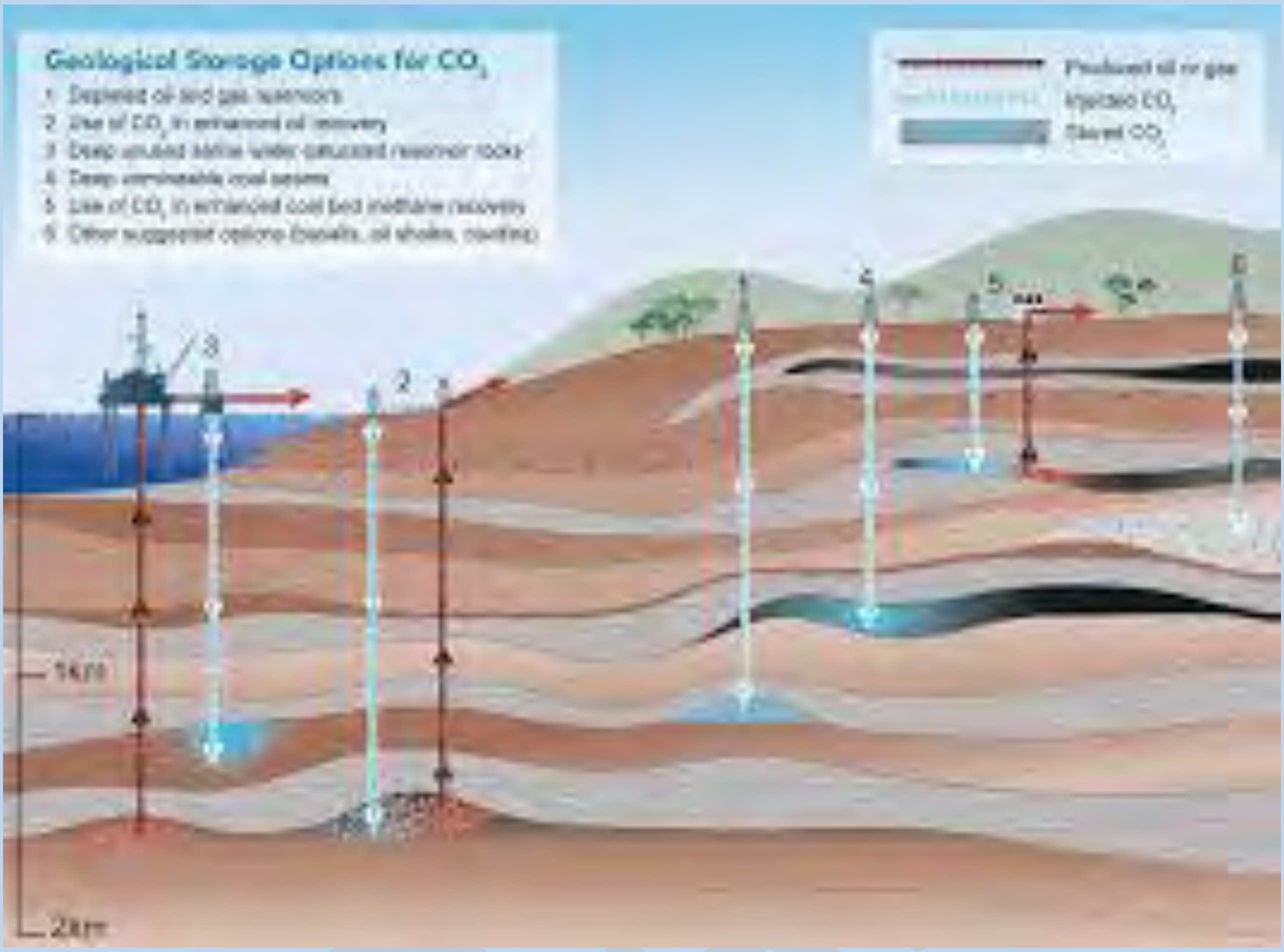


Figure 10. Effects of groundwater pumping

Pumping quickly lowers the pressure within confined aquifers so that water no longer rises to the surface naturally. Fifty years ago artesian aquifers were common, but today they have become rare because of widespread groundwater withdrawals. In unconfined aquifers, air fills pores above the water table, so the water table falls much more slowly than in confined aquifers. As aquifers are depleted, water has to be lifted from much greater depths. In some parts of the world, the energy costs of lifting groundwater from deep beneath the surface have become prohibitive. Overuse of groundwater can also reduce the quality of the remaining water if wells draw from contaminated surface sources or if water tables near the coast drop below sea level, causing salt water to flow into aquifers.

Scheduling irrigation requires an understanding of how much water your soil can hold and how much of that water your crop can use. The amount of Readily Available Water (RAW) will vary with soil type, crop, rooting depth and irrigation system. A six-stage process helps calculate the volume of Readily Available Water in cropping soils.

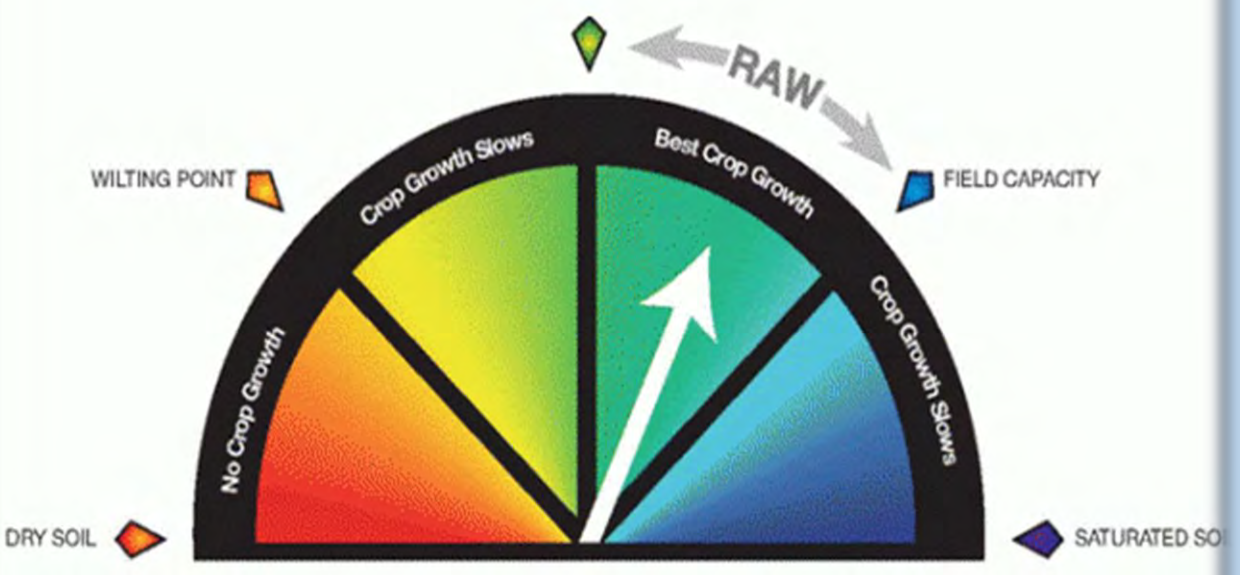


Ready available Water RAW

Water in the soil that is easily extracted by the plant is called Readily Available Water (RAW). To schedule irrigation with confidence that you are providing the crop with enough water you need to understand how much of the water your soil can hold that is available to your crop. A plant's roots get the water it needs to grow and produce a crop from the surrounding soil. This water is held by the soil with increasing strength as the soil dries out. This makes it harder for the plant to get the water and therefore affects its growth. The relationship between crop stress and the amount of water held in the soil is show in Figure 1. Some key terms relating to Readily Available Water (RAW) are field capacity and refill point. Field capacity is the maximum amount of water a soil can hold after drainage. Refill point is when the plant has used all readily available water.

Beyond refill point, as the soil dries out, the plant needs to work harder to extract water, stressing the crop. The area between field capacity and refill point is called Readily Available Water (RAW) — water in the soil that is easily extracted by the plant.

Unless you are trying to stress your crop (for example, with deficit-irrigated wine grapes), aim to maintain RAW at all times. The amount of Readily Available Water varies with soil type, crop, rooting depth and irrigation system. Follow these six steps to work out your crops RAW



igure 1 Relationship between soil water and crop stress

.

Crops Horticulture Fruit Postharvest Irrigation Calculating Readily Available Water

Steps in identifying Readily Available Water **RAW**

READY AVAILABLE WATER (RAW)

1. **Step 1: Dig a hole**
2. **Step 2: Identify the effective root zone**
3. **Step 3: Identify different soil layers**
4. **Step 4: Identify gravel/stone in each layer**
5. **Step 5: Identify soil texture(s)**
6. **Step 6: Calculate RAW**

MONITORING TRACE ELEMENTS CONTAMINANTS

Tapuika Iwi Maori seeking monitoring of trace elements and contaminants, before and at the close of the seasonal annual take Man-made contaminants were also found in untreated water sampled from the public wells, including herbicides, insecticides, solvents, disinfection by-products, nitrate, and gasoline chemicals.

Man-made contaminants accounted for about one-quarter of contaminant concentrations greater than human-health benchmarks, but were detected in 64 percent of the samples, predominantly in samples from unconfined aquifers.

"Detections of contaminants do not necessarily indicate a concern for human health because USGS analytical methods can detect many contaminants at concentrations that are 100-fold to 1,000-fold lower than human-health benchmarks," said lead scientist Patricia Toccalino. "Assessing contaminants in these small amounts helps to track emerging issues in our water resources and to identify contaminants that may warrant inclusion in future monitoring. "Scientists tested water samples for 337 properties and chemical contaminants, including nutrients, radionuclides, trace elements, pesticides, solvents, gasoline hydrocarbons, disinfection by-products and manufacturing additives.

The Kaituna River is classified as a Schedule (1) River it is an important habitat and migratory pathway for native fish species particularly Inganga native white bait and giant banded kokopu The Assement is that given the work is not being carried in the wettest part of the river the impact of existing native species will be minimized

Te Awanui o Tapuika Kaituna River The ecology and habitat at the location of the works has been heavily modified the location of works up to the 1950's held an abundance of Water cress; Kakahi; Koura and Tuna Heke The AFFCO meat works the installation of the stop banks and he removal of riparian buffer river side planting has impacted the ecology and habitat at the location of the work

RECOGNITION OF TAPUIKA TANGATA WHENUA VALUES AND VIEWS

The Treaty of Waitangi and the Resource Management Act require Local Government to take into account the unique role and distinct cultural beliefs and traditions of Maori. Tangata whenua sees the Treaty Principle of ‘He here kia mohio’ Cooperation and Consultation as the duty of Tauranga City Council to work with tangata whenua claiming manawhenua status within the catchment area. Council is obliged under the Resource Management Act to consult in an open, timely and meaningful way with those mana whenua, within a policy of promoting meaningful partnership arrangements and processes with the local iwi.
Iwi Maori view water and other natural resources as taonga (treasures) with spiritual and metaphysical properties. These spiritual values are bound together within the mauri that empowers all living things, and is fundamental to the mana (lifeblood) of iwi, hapu and whanau.

Tapuika Matauranga Maori knowledge water; as an essential element to sustaining life. Tangata whenua seeks the sharing of information on tangata whenua values and views to allow informed decision-making in respect to the discharge and management of stormwater.

Cultural Impact Assement CIA Objectives

The objectives of this CIA are:

- To document the cultural values associated with the proposed storm water
- To identify the potential effects on cultural values as a result of the proposed storm water discharge
- to recommend next steps to identify mitigation options

In meeting these objectives, the cultural impact report will:

- provide all parties with a level of confidence and understanding related to the proposed activity; the engagement to date and the consultation process going forward.
- Assist Tauranga Council to effectively take into account the iwi management plans
- Provide a foundation for future discussions between iwi affected and Tauranga City Council

Legal statutory regulatory context

Resource management Act 1991

Earthworks Land Contour Subdivision RMA

Sec 95 Affected Party's Sec 32 Information

National Policy Statement NPS

Bay of Plenty Regional Policy Statement **RPS**

Bay of Plenty Regional Water and Land Plan **WLP**

Tapuika Claims Settlement Act 2014 CSA

Statutory Acknowledgement **Area's**

Resource management Act 2017 RMA

Te Mana Whakahono a Rohe a Tapu

Tapuika Cultural Impact Assement CIA

Sec 32 Resource management Act

Consideration of the environmental economic social and cultural effects

Tapuika Assement of Environmental Effect AEE

Sec 32 Resource management Act

Consideration of the environmental economic social and cultural effects

Cultural & environmental impact activity

- **Iwi Cultural management plan impacting activity**
- **Iwi Environmental management plan impacting activity**
- **Cultural Impact Assement CIA**
- **Assessment Environmental Effect AEE**

Tapuika IWI AUTHORITY

Tapuika Statutory Acknowledgement It is essential that Councils and Central Government agencies are fully aware of their obligations with regards to this legislation. Statutory Acknowledgement Area (“SA”) **Tapuika Environmental Management Plan (EMP)**

► Statutory Acknowledgement to be recorded on RMA Documents (Regional Policy Statement, Regional Plans, District Plans).

► for resource consent applications “for an activity within, adjacent to, or directly affecting a statutory area”: – Councils to provide TIA with a summary of the a Councils must have regard to SA when deciding if Tapuika is an affected party (under section 95E of the Resource Management Act). – Environment Court must have regard to the SA when deciding if Tapuika has a greater interest than that of the general public.

► for archaeological authority applications: – Heritage NZ Pouhere Taonga must have regard to the SA. – Environment Court must have regard to the SA when deciding if Tapuika is directly affected by the decision. Deed of Recognition

► if “undertaking certain activities within an area that the deed relates to”, the Department of Conservation and/or Commissioner for Crown Lands must: – Consult with TIA – Have regard to its views concerning the association of Tapuika with the area. Kaituna River Document

► When preparing an RMA document: – Councils must recognise and provide for the vision, objectives, and desired outcomes of the Kaituna River Document.

► When making a decision under the Local Government Act 2002: – Councils must take into account the provisions of the Kaituna River Document. Whenua Rahui

► When preparing or approving a Conservation Management Strategy or Plan relating to the Whenua Rahui area, the New Zealand Conservation Authority /

Tapuika Iwi Monitoring consent as required

Notification Sec 95 Tapuika Iwi affected party

Consenting authority; Bay of Plenty Regional Council

The Application;

The application/activity / Abstraction surface water streams Rivers; shallow or confined Aquifers to subdivide the land, extend a culvert, establish storm water infrastructure, undertake riparian planting along the stream alignment, and associated earthworks.

The Applicants consent conditions

The Activity; Abstraction Earthworks Storm water Discharge

New activity consent application

The Location; Wahi Tupuna Wahi Tapu sites of Significance

Annual Audit Telementary meter readings volumes, rates, times

Term duration activity

Monitoring Data Analysis – As required

Bay of Plenty Regional Council Natural Resources Plan

Groundwater is all the water contained below the earth's surface. It comes from rainfall and river water that percolates through the ground and accumulates in underground aquifers that are confined or un confined

Section 88 Section 32 aquifer test required?

An assessment of environmental effects is required for every consent application to take groundwater1. Environment Canterbury reserves the right to determine the level of hydrogeological information required to support a consent application or comply with consent conditions on a case by case basis.

1 Under Part 6 of the RMA, Section 88 requires that applications

Guidance on the level of hydrogeological information required to support a consent application is outlined in regional council note - "What supporting information needed for my application to take groundwater – including aquifer testing" .

Section 32 RMA:

A suitably experienced professional be involved in the design and supervision of aquifer tests. This will reduce errors and oversights which may later result in problems in the analysis and review of the test. In the worst case, an inadequate test will result in a requirement to repeat the test.

Relationship Iwi Maori Tangata with water/ waterways Iwi Maori values include ***Kaitiakitanga*** as stewards and guardianship for the care of water / waterways within the Rohe. ***Mauri*** as having regard for the life force essential to the wellbeing of water / waterways within the Rohe of Tapuika

Kaituna river and catchments rohe o Tapuika

National Policy Statement for Freshwater (2011) seeks to ensure that tangata whenua values and interests are reflected in freshwater management, including decision-making. To ensure this occurs, Tapuika values and interests need to be identified and articulated.

As a starting point, the values associated with significant waterways within Te Takapu o Tapuika are provided (right). These waterways are subject to a Statutory Acknowledgement and/or Deed of Recognition under Tapuika Claims Settlement Act 2014 This information reflects the Treaty Settlement Statements of Association for cultural redress areas. Further information about mahinga kai species

Iwi Māori Classification of Water Waiora Purest form of water, with potential to give life and sustain wellbeing. Waimaori Water that has come into unprotected contact with humans, and so is ordinary and no longer sacred. This includes water that is running freely and unrestrained or is clear and lucid.

1. ***Waimaori*** has mauri.
2. ***Waikino*** Water that has been polluted, debased or corrupted. Its mauri has been altered and can cause harm.
3. ***Waipiro*** Slow moving, typical of repo (swamps). For Māori these waters provide a range of resources such as Rongoa for medicinal purposes, dyes for weaving, tuna (eels) and Manu (birds).
4. ***Waimate*** Water which has lost its mauri. It is dead, damaged or polluted. Waitai The sea, surf or tide. Also used to distinguish seawater from fresh water. 3.1.2 V

Risk Harms Hazard Management Mitigation Adaptation

Agreement Mitigation Tapuika Environmental Effect there are four indicators to show the state of fresh water in Our Society Economy and Culture with three indicators providing information on the impact of Maori

Cultural Impacts 20 Government departments and agencies makes recommendations as to reforms of "laws, policies or practices relating to health, education, science, intellectual property, indigenous flora and fauna, resource management, conservation, the Māori language, arts and culture, heritage, and the involvement of Māori in the development of New Zealand's positions on international instruments affecting indigenous rights

Tapuika Kaitiaki Concepts *Kaitiakitanga* is a broad notion which includes the following ideas: guardianship, care, wise management. However, while kaitiakitanga is a proactive and preventative approach to environmental management, this traditional management system has not always had an opportunity to address large scale environmental degradation. The long-established Māori system of environmental management is holistic. It is a system that ensures peace within the environment, providing a process of, as well as preventing intrusions that cause permanent imbalances and guards against environmental damage.

Cultural Connections the Human and the Physical World

This genealogy is a bond between humans and the rest of the physical world both "immutable and inseparable". Papatūānuku, embodied in the physical form of the earth continues to provide sustenance for all. Accordingly, Māori read more into the interpretation of kaitiakitanga than just the surface meaning of the words translated into English.

Changes effecting the Kaituna River Maketu Estuary

The Kaituna River catchment and the Kaituna Wetlands affected by dramatic changes that included the draining of Kaituna Wetlands and the Lower Kaituna converted into farming that has resulted in pollution of the fresh water system The destruction of wetland habitat The River CUT at Maketu and bells Road still discharge heavy pollution loadings of effluent direct to the Kaituna River Land use changes currently will mitigate the effect on water quality

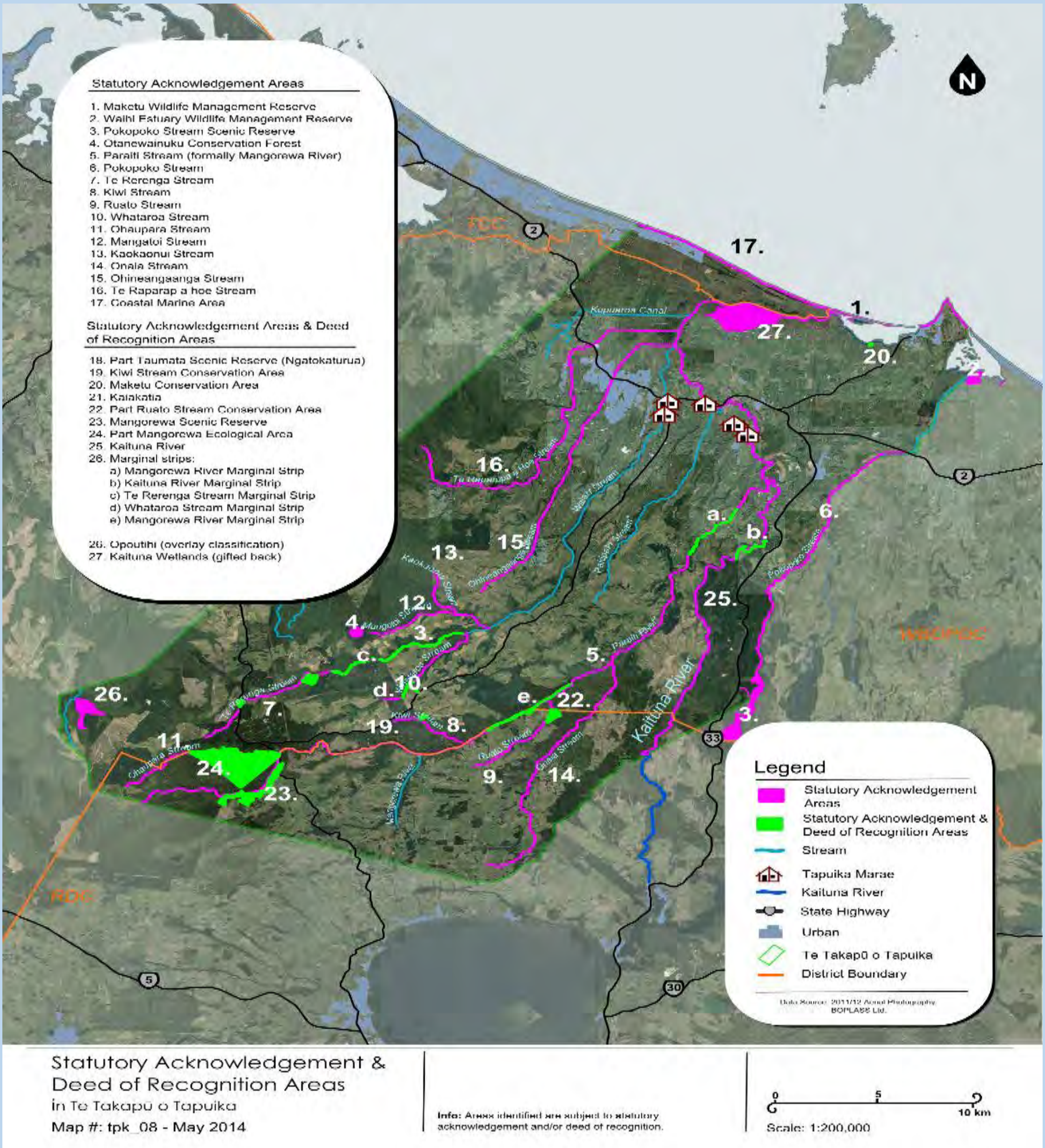
Kaituna River Te Tumu Artificial Cut Ocean outlet Artificial diversion of the natural course of the Kaituna River, this has resulted in excessive nitrogen and phospurous over load. The previous Te Puke and drainage board had been charged with draining the natural wetlands, the mitigation of flooding of the plains was followed by draining the lower Kaituna for the purpose of establishing lowland agricultural farming

Mauri The essential Life Force

> The concept of mauri has its place in the metaphysical world and can within our personal physical world's mauri possess a practical function. If we think of mauri as being protected. There are many different types of mauri that are very useful for us to reflect upon as a framework for a modern Māori person who wants to live a Māori life in a complex contemporary world. Let us consider a small number of types of mauri

Te Mana o Te Wai update Resource management Act 2017

Tapuika environmental world view is based on the principle of total interconnectedness *within, and between, the natural environment and Tapuika.*



Applicants Agreements for Mitigation Avoidance Risk and Adaptation

Tapuika environmental world In agreement to observe the completion of the of the pretreatment stormwater holding filtration riparian planting pond for the mitigation of harms hazards

Tapuika environmental world In agreement to monitor storm water discharge into the catchment including Ohineangaaanga stream; the Kaituna River

Cultural Impact Assessment	Assement Environmental Effect	Mitigation Avoidance Adaptation	Threshold Monitoring Exceedances
Storm water discharge	Issue of water quality and potential effects on fish within the stream network	Treatment of storm water prior to discharge overland into streams River	Appropriate treatment prior to discharge
Irrigation	Issue take and use of ground water within the Waiteariki Aongatete Aquifer	Cumulative Annual use and water take will not exceed 103,773 m3 Per Annum Irrigation and Frost protection	Installation of Telementary Audit meters readings on all pump head devices
Frost Protection	Annual use and take will not exceed 103,773 m3 Per Annum	Annual use and take will not exceed 103,773 m3 Per Annum Irrigation and Frost protection	Installation of Telementary Audit meters readings on all pump head devices
Earthworks	Potential effects of sediment discharge from the earthworks into the stream.	Sediment control measures in accordance with BOPRC Sediment and Erosion Guidelines	Sediment levels
Term Period of Water Take and Use	Potential effect of Depletion of the Waiteariki Aongatete Aquifer	Sustainability of the Waiteariki Aongatete Aquifer	The period will not exceed Twenty Years from the date of the granting
Tapuika iwi Monitor	Sustainability of the Waiteariki Aongatete Aquifer	Provide to Tapuika iwi Authority annual data of use and take water the Waiteariki Aongatete Aquifer	Sustainability of the Waiteariki Aongatete Aquifer review of consent conditions five years after date of start of consent

Section 32 (s32) of the Resource Management Act 1991 (RMA) is integral to ensuring transparent, robust decision-making on RMA plans and policy statements (proposals). The section requires that all advice received from iwi authorities and the response to the advice needs to be summarised

- New proposals must be examined for their appropriateness in achieving the purpose of the RMA

- The benefits and costs, and risks of new policies and rules on the community, the economy and the environment need to be clearly identified and assessed

- All advice received from iwi authorities and the response to the advice set out in support

- That the period and term of the consent not exceed 25 years with a review provision five years after the date of the granting of the consent ensures sustainability of take
- *In agreement to monitor annual water use and take monitor storm water discharge into the catchment including; the Kaituna River*

Record of Iwi consultation time / calls/ copying / follow up / correspondence out / communications / standard consultation fee $499.00 Ex GST

DATE	RMU RESOURCES RECOVERY	TOTAL

RMU INVOICE PROCESSED . . . .$499.00 excl

Support Agreements Mitigation Avoidance Risk and Adaptation

Applicants Hua Kiwi Developments Limited Partnerships – Waewaetutuki 7B2A

Applicants: Hua kiwi Developments Limited Partnership – Waewaetutuki 7B2A

Applicant Signature . . . .

Date . . . .

Iwi engagement Tapuika Iwi Authority . . . .

First Name.

Last Name.

Signature.

Date 07.06.2019

Resource management Unit P O Box 15 18 Jellicoe Street

TE PUKE

28th March 2019

Mr Reuben Fraser – Manager Consents Activity Permit

Bay of Plenty regional Council – Toi Moana

P O Box 364

WHAKATANE- 3158

The Tapuika iwi Authority *in support agreement* of Applicant**:**

David Marshall seeking a private plan change consent application

Proposed industrial Development

66 Washer Rd

Lysaght Surveying Engineering

Phone: 021442521

Email: tom@mpad.co.nz

Applicant Consultancy:

Tom Watts Momentum Planning

Phone: Mobile 021 1442521

Tapuika support follows a comprehensive Cultural Impact Assessment **(CIA)**

The Assement of Environmental Effect **(AEE)** in accordance with Resource Management Act. Sec (2)

Any enquiries regarding Tapuika Iwi engagement please feel free to call the writer at any time

Nga mihi nui

Joseph Te Rangipuatata Hohepa Maxwell

Resource Management Unit
Shop Front 18 Jellicoe Street
P O Box 15
TE PUKE

SMARTGROWTH: DEVELOPMENT TRENDS

TECHNICAL REPORT 2018

Tauranga City

Western Bay of Plenty District Council

Bay of Plenty REGIONAL COUNCIL

SmartGrowth
Building our futures together

SmartGrowth: Development Trends Technical Report 2018

Including Housing and Business, Market and Price Efficiency Indicators to meet the monitoring requirements of the National Policy Statement on Urban Development Capacity (PB6 & PB7)

Western Bay of Plenty District
Tauranga City

2017 – 2018

Prepared by:
Resource Management Team
Policy Planning and Regulatory Group
Western Bay of Plenty District Council

City and Infrastructure Planning
Growth and Infrastructure Group
Tauranga City Council

December 2018

Table of Contents

1. Executive Summary

1.1 Residential Building Activity

Sub-region

- In 2017/2018, building consents issued for new dwellings declined by 18% in the Western Bay of Plenty sub-region (the sub-region) compared to the previous year (refer Figure 1).

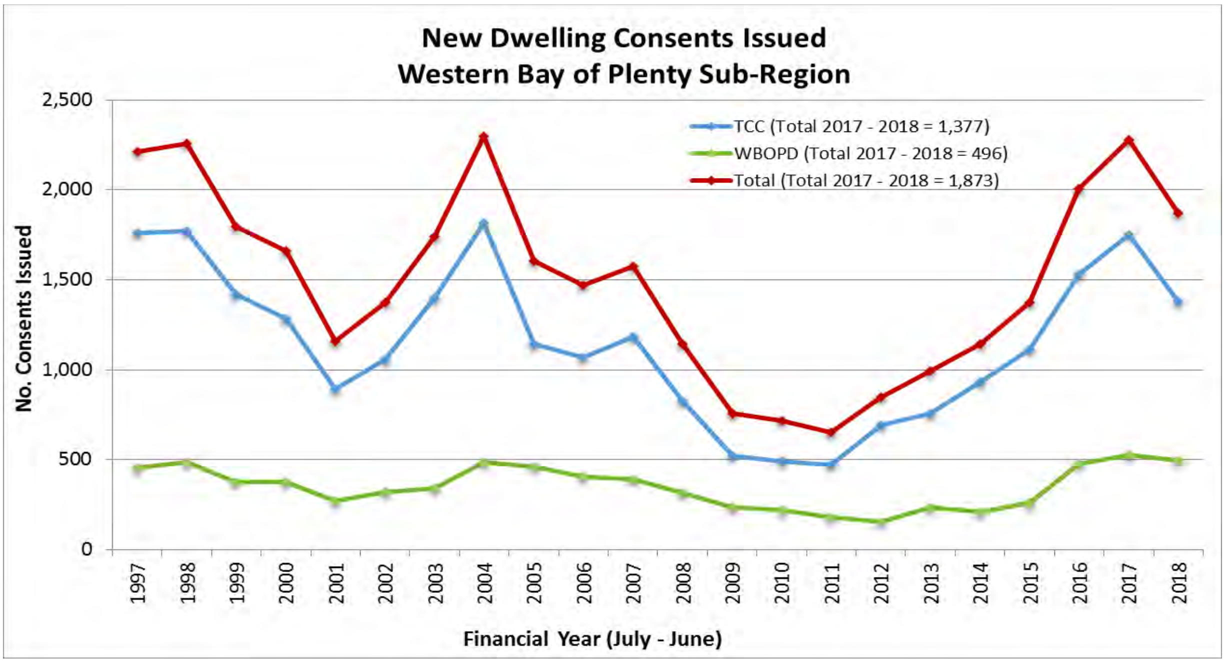
Tauranga City

- Dwelling consents issued for the 2017/2018 year declined in Greenfield Urban Growth Areas (Bethlehem, Pyes Pa West, Ohauiti, Welcome Bay, Papamoa and Wairakei) with the exception of Pyes Pa from 2016/2017 results (refer Table 1).
- The Greenfield UGA's remain the main dwelling activity areas accommodating 84% of new dwelling consents issued for Tauranga City in 2017/2018 (existing urban (Infill) areas accommodated 16% and rural areas less than 1%).

Western Bay of Plenty District - WBOPD

- In the Greenfield UGA's dwelling consents issued decreased by 5% during 2017/2018 and the rural areas decreased by 19%. Most of the dwelling consents were issued in Omokoroa UGA with an increase of 30% during 2017/2018.
- Dwelling consents issued decreased overall by 6% for Western Bay of Plenty District.

Figure 1 New dwelling consents issued, Western Bay of Plenty sub-region, 1997/2018



Dwelling consents issued in the sub-region has decreased by 18% from 2016/2017 to 2017/2018 (from 2,276 to 1,873 dwelling consents). Dwelling Consents issued for Tauranga City decreased by 21% (371 consents), while for Western Bay of Plenty District there were 32 (6%) less consents issued for the July 2017 to June 2018 period compared to 2016/2017.

1.2 Residential Subdivision Activity

Sub-region

- Subdivision development in the sub-region declined by 8% from 2017/2018 results.

Tauranga City

- The number of additional lots created declined by 10% in 2017/2018 compared to 2016/2017 and was 39% up on the last 5 year average.
- In Tauranga City 91% of additional lots were created in Greenfield UGA's in 2017/2018.

Western Bay of Plenty District

- The number of additional lots created at 224 stage in 2017/2018 is still high in Omokoroa but has decreased by 31% (or 51 consents) compared to 2016/2017, while in Katikati older subdivisions got title and increased by 30 consents compared to 2016/2017. Additional lots created decreased by 7% from 2016/2017 to 2017/2018 for the District.
- The Greenfield UGA's showed a decrease of 16%, while the rural areas showed a slower decrease of 5% in subdivision development.

Table 1 Trends Summary – Tauranga City – 2017/2018 Compared to 2016/2017

Area		Dwellings Consented	New Lots Created
Urban Growth Area	Bethlehem	↓	↓
	Pyes Pa	↑	↑
	Pyes Pa West	↓	↑
	Ohauiti	↓	↑
	Welcome Bay	↓	↑
	Papamoa	↓	↓
	Wairakei	↓	↑
Existing Urban Areas (infill/ Intensification)		↓	↓
Rural Areas		↓	↑

Table 2 Trends Summary - WBOPD – 2017/2018 Compared to 2016/2017

Area		Dwellings Consented	New Lots Created
Urban Growth Area	Waihi Beach	↑	↑
	Katikati	↓	↑
	Omokoroa	↑	↓
	Te Puke	↓	↓
	(Other than above)	↑	↑
Rural Areas	Waihi Beach & Katikati	↓	↑
	Te Puna / Minden	↑	↓
	Kaimai / Ohauiti-Ngapeke	↓	↑
	Maketu & Te Puke wards	↓	↓

1.3 Residential Development Capacity

Sub-region

- A comparison of SmartGrowth projections with actual growth at the sub-regional level indicates that the number of dwelling consents issued is 0.4% below the projection as at 30 June 2018.
- Of the total estimated yield for the Greenfield UGA's in the sub-region, 25% capacity remained as at 30 June 2018.

Tauranga City

- Tauranga City has 41 more dwellings (or 3.1%) than the SmartGrowth dwelling projection for the year ending 30 June 2018. However, the dwelling consents issued for the five-year period was down by 5% (or 342 consents) from the SmartGrowth dwelling projections to 30 June 2018.
- Remaining Greenfield UGA capacity was 28% as at 30 June 2018.
- Wairakei (Papamoa East) Greenfield UGA has the highest percentage of capacity remaining (69%), while Pyes Pa UGA the least (13%).

Western Bay of Plenty District

- In Western Bay of Plenty District 25 more dwelling consents (1.3%) were issued than projected compared to the SmartGrowth dwelling projection as at 30 June 2018.
- Remaining Greenfield UGA capacity was 17% as at 30 June 2018.
- Waihi Beach UGA has the lowest theoretical remaining capacity available with 7% or 217 dwellings, while Omokoroa UGA has the largest capacity remaining in Western Bay of Plenty District with 35% or 897 dwellings (refer to Table 5).

1.4 Residential Sales and Rents

Tauranga City

- Median sale price has increased by 4% to $631,563 in last 12 months to 30 June 2018.
- Mean rent has increased by 4.4% to $422 in last 12 months to 30 June 2018.

Western Bay of Plenty District

- Median sale price has increased by 5% to $616,446 in last 12 months to 30 June 2018.
- Mean rent has increased by 5.1% to $366 in last 12 months to 30 June 2018.

1.5 Dwelling Typology

Tauranga City

- Mean floor size of residential building consents decreased from 177m^2 in 2016/2017 to 170m^2 in 2017/2018.
- A higher proportion of dwelling consents were issued in 2017/2018 for "townhouses, flats, units and other dwellings" and less for "retirement village units", "apartments" and standalone "houses" than the last 5 year average[1].

Western Bay of Plenty District

- Mean floor size of residential building consents has decreased from 189m^2 in 2016/17 to 180m^2 in 2017/2018.

[1] Dwelling typologies are Statistics New Zealand Infoshare classifications.

- A higher proportion of dwelling consents were issued in 2017/2018 for "townhouses, flats, units and other dwellings", and less for standalone "houses" than the last 5 year average.

1.6 Business Land and Activity

Sub-region

- Vacant industrial zoned land is currently available at Oropi, Te Maunga, Owens Place, Mount Maunganui, Tauriko, Sulphur Point, Greerton, Wairakei (Papamoa East), Katikati, Omokoroa, Te Puke, Rangiuru and Paengaroa.
- Vacant commercial land in Greenfield UGA's is available at Pyes Pa West/Tauriko, Bethlehem, Papamoa and Wairakei in Tauranga City and Omokoroa in Western Bay of Plenty.

Tauranga City

- The number of building consents issued for new industrial buildings for 2017/2018 has increased compared to 2016/2017, while building consents issued for commercial buildings has declined during the same period.

Western Bay of Plenty District

- Industrial and commercial building consents are still very slow in Western Bay of Plenty District. In 2017/2018, building consents decreased compared to the previous year with four new industrial building consents and three new commercial building consents issued.

2 Introduction

Monitoring development trends in the Western Bay of Plenty District and Tauranga City assists both Councils in understanding the changing patterns of development in the sub-region. These statistics are collected as part of Councils Section 35 of the Resource Management Act 1991 obligations being a "duty to gather information, monitor and keep records".

This is the eighteenth year that development trends have been monitored for the Western Bay of Plenty sub-region. From 2007, the report has been expanded to incorporate measures related to development as required by the Bay of Plenty Regional Policy Statement (RPS), and the SmartGrowth Strategy.

The RPS requires annual reviews to be undertaken to monitor, assess and report on population distribution, dwelling yields, zoned business land, and the proportion of potential residential allotments approved. SmartGrowth requires uptake rates and land availability for both residential and business land, permanent versus holiday residences, and rural subdivision to be monitored. Also a comparison of actual growth against projected SmartGrowth dwelling growth is reported on.

The National Policy Statement on Urban Development Capacity (NPS-UDC), came into effect on 1 December 2016. Tauranga Urban Area (which relates to both Tauranga City and Western Bay of Plenty District[2]) is classified as a high growth urban area under the NPS-UDC. NPS-UDC Policy PB6 requires Councils to monitor a range of indicators on a quarterly basis including:

a) prices and rents for housing, residential land and business land, by location and type; and the changes in these prices and rents over time;
b) the number of resource consents and building consents granted for urban development relative to the growth in population; and
c) indicators of housing affordability.

From December 2017 the NPS-UDC Policy PB7 requires high growth councils to also monitor and report on price efficiency indicators. The 2018 SmartGrowth Development Trends Report incorporates a number of relevant indicators that meet NPS-UDC monitoring requirements (refer table 3), while continuing the development trends time series data. This report is produced annually for the period 1 July to 30 June. The NPS-UDC quarterly monitoring report framework is simpler and produced starting September 2017.

2.1 National Policy Statement on Urban Development Capacity Monitoring

A Technical Implementation Group (TIG) has been established by SmartGrowth, comprised of staff from the three Councils (Tauranga City Council, Western Bay of Plenty District Council, Bay of Plenty Regional Council) and other partners, to respond to requirements of the NPS-UDC.

The deliverables required by the NPS-UDC[3] include (in sequence):

- establishing a monitoring regime (Policies PB6 and PB7);
- undertaking housing and business land assessments;
- setting development capacity targets for housing in statutory (Resource Management Act) planning documents – i.e. the Bay of Plenty Regional Policy Statement, Tauranga City Plan and Western Bay of Plenty District Plan; and

[2] Western Bay of Plenty District (WBOPD) indicators are displayed for total WBOPD (urban and rural) or only the urban growth areas which include Waihi Beach, Katikati, Omokoroa and Te Puke.

[3] National Policy Statement on Urban Development Capacity: Guide on Evidence and Monitoring, Ministry of Business, Innovation and Employment and the Ministry for the Environment (MBIE), June 2017.

- developing (and consulting on) a Future Development Strategy to show how the identified targets will be met into the long term.

As indicated above, in addition to PB6 requirements, NPS-UDC PB7 requires local authorities to use indicators of price efficiency in their land and development market, to understand how well the market is functioning and how planning may affect this, and when additional capacity might be needed. MBIE has developed a number of price efficiency indicators which are incorporated into the NPS-UDC monitoring reports starting December 2017[4].

A housing and business land assessment has been completed as required by the NPS-UDC[5]. The assessment includes information about the range of business uses and dwelling types, and provides evidence based estimates of demand and feasible capacity. The NPS-UDC also requires that a 30-year Future Development Strategy (FDS) for the sub-region be developed and this is currently being progressed[6]. The FDS will drive the discussion and decision-making needed to manage the expected growth in the sub-region.

The Ministry for the Environment (MfE) and the Ministry of Housing and Urban Development (HUD) provided guides to support the implementation of the NPS-UDC, and an online dashboard that provides charts, maps and underlying data on local housing markets. This was consulted in the preparation of this report, and the dashboard used to produce a number of graphs.

The indicators particularly relevant to the NPS-UDC PB6 and PB7 monitoring requirement are outlined in Table 3. The majority of indicators have a residential focus due to the availability of residential data through the HUD/ MfE dashboard, and Council records. SmartGrowth will work with its partners to source appropriate business indicators for future PB6 quarterly monitoring reports.

Table 3 NPS-UDC PB6 and PB7 Indicators Monitored

NPS-UDC PB6	Type	Topic	Indicator	Ref
a) Prices and rents for housing, residential land and business land by location and type; and changes in these prices and rents over time	Residential	Prices	Dwelling Sales Price (Tauranga City and WBOPD's Urban Areas)	3.3
		Prices	Dwellings Sold (Tauranga City and WBOPD's Urban Areas)	3.3
		Rents	Nominal Rents Dwelling (Tauranga City and WBOPD's Urban Areas)	3.3
		Prices/ Rents	Ratio of Dwelling Sales Prices to Rent (Tauranga City and WBOPD's Urban Areas)	3.3
		Prices	Average Floor Size per Residential Building (Tauranga City and total WBOPD)	3.5
		Prices	Average Value per Residential Dwelling Consent (Tauranga City and total WBOPD)	3.5
		Type	Building Consents by Type (Tauranga City and total WBOPD)	3.6
		Rents	Detailed Geographic Data on Dwelling Rents (Tauranga City and total WBOPD)	3.8
		Location	Detailed Geographic Data on Dwelling Sale Prices (Tauranga City and total WBOPD)	3.8
	Business	Type	Building Consents by Type – Non-Residential (Tauranga City and total WBOPD)	3.7
b) The number of resource consents and building consents granted for urban development relative to the growth in population	Residential	New Lots	New Lots Created (Tauranga City and WBOPD's Urban Areas)	3.2
		Dwelling Consents	New Dwelling Consents Issued (Tauranga City and WBOPD's Urban Areas)	3.1
		Population Growth	New Dwelling Consents Compared to Dwelling Projections (Tauranga City and WBOPD's Urban Areas)	3.1
c) Indicators of housing affordability	Residential	Prices	Housing Affordability Measure (HAM) – Buy (Tauranga City and total WBOPD)	3.4
		Rents	Housing Affordability Measure (HAM) – Rents (Tauranga City and total WBOPD)	3.4
PB7 Indicators				
Indicators of price efficiency	Residential	Prices vs. Cost	Housing Price to Cost Ratio (Tauranga City and total WBOPD)	3.9

[4] The functions that relate to the NPS-UDC have been moved across from the MBIE to the Ministry of Housing and Urban Development (HUD)

[5] SmartGrowth Housing and Business Development Capacity Assessment for Tauranga City and WBOPD - Urban.

[6] Public consultation on the draft Future Development Strategy for Western Bay of Plenty sub-region has been completed.

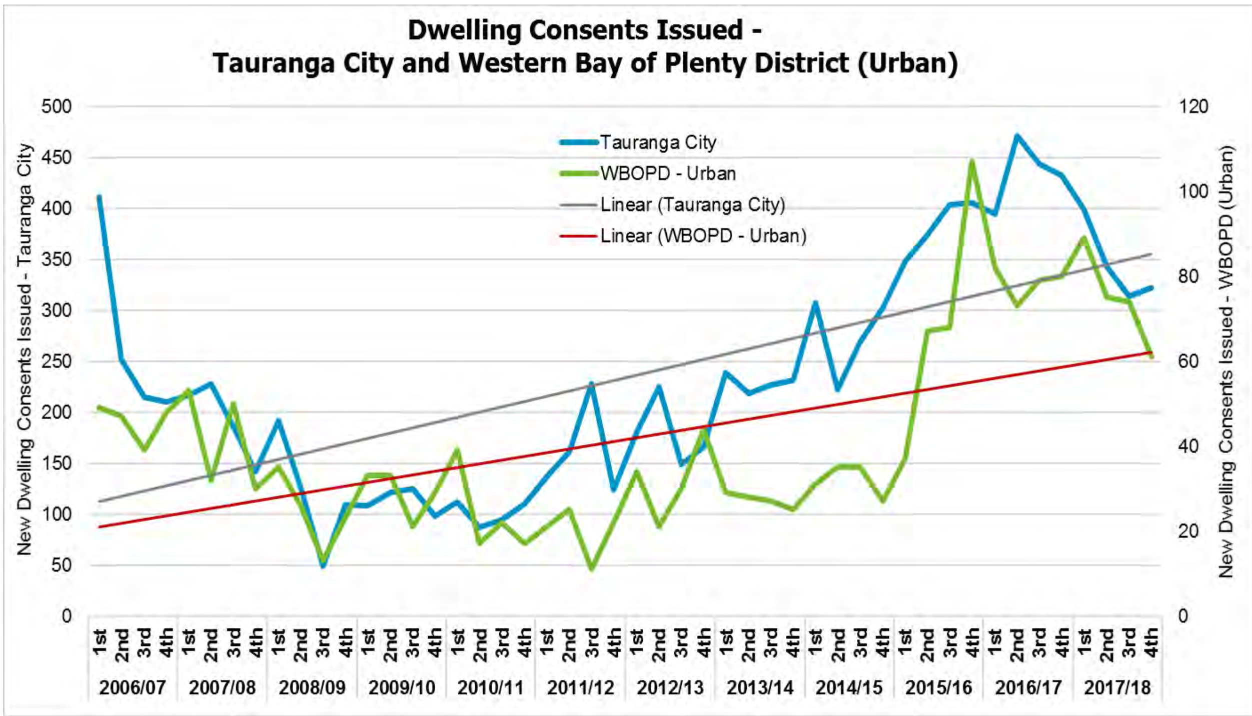
	Rural-urban	Prices & Location	Rural-urban Zone Differentials (Tauranga City)	3.9
	Residential	Ownership	Land Concentration Control (Tauranga extended urban area)	3.9

An explanation of indicators provided via the HUD/MfE guidance or dashboard is provided in Appendix 1, and referenced under the relevant indicator through the report.

3 Supply and Demand

3.1 New Dwelling Consents Issued

Figure 2 Dwelling consents issued, Tauranga City and WBOPD (urban), July 2006 to June 2018

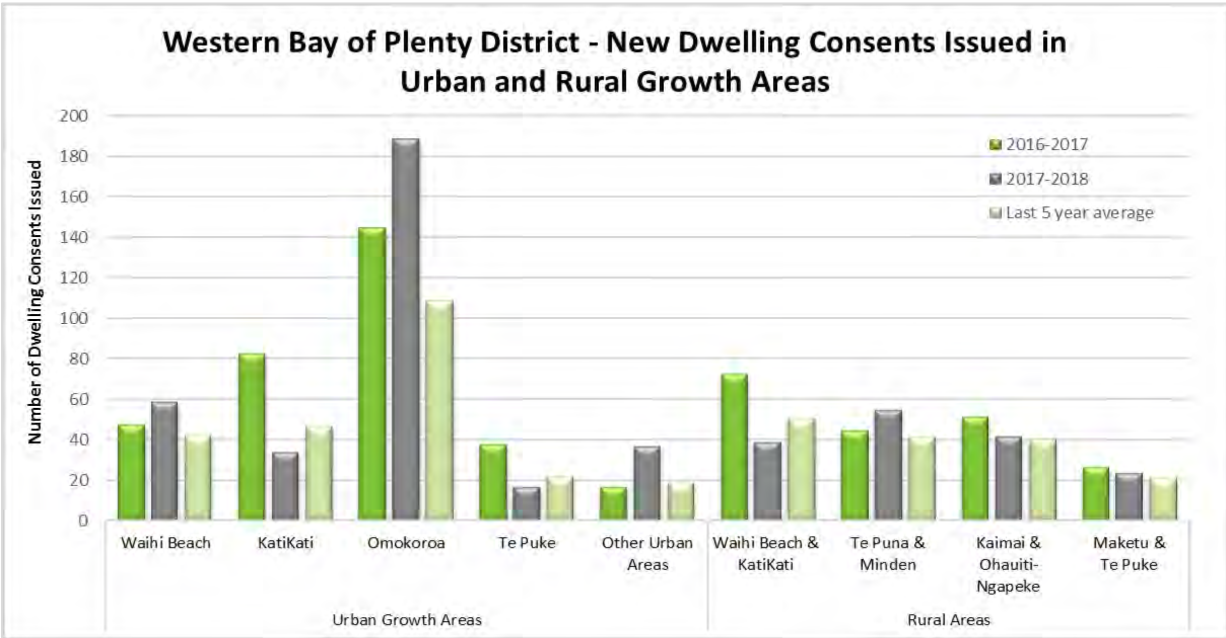


Note: A "Linear" trend line has been included in Charts 2 and 5 to show the general trend over time. "Linear" trend line – a relationship of direct proportionality that, when plotted on a graph, traces a straight line.

In WBOPD there has been variation in dwelling consents issued in the Greenfield Urban Growth Areas (UGA's) over the last 10 years. Dwelling consents issued in the urban areas decreased by 5% (or 15 consents) from 2016/2017 to 2017/2018 while dwelling consents for total WBOPD decreased by 6% (or 32 consents) for the same period. In 2007/2008 the monthly average for dwelling consents issued were 14, compared to the monthly average of 25 for 2017/2018.

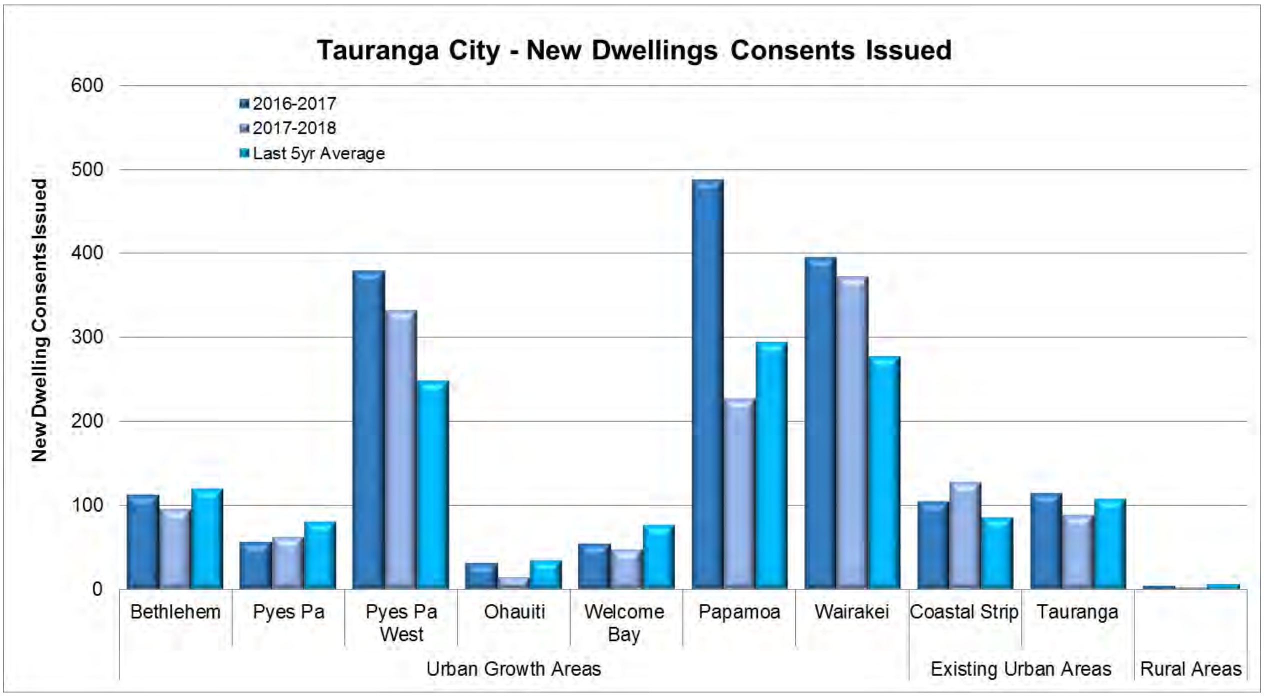
In Tauranga City building consents issued for new dwellings declined by 21% (or 371 consents) from 2016/2017 (1,748 dwelling consents issued) to 2017/2018 (1,377 dwelling consents issued). The last 5 year average was 1,340 dwelling consents. In 2008/2009 the monthly average for dwelling consents was 44, compared to a monthly average of 115 for 2017/2018.

Figure 3 Dwelling consents issued by growth area, WBOPD, 2016/2018



In the Greenfield UGA's there was a decrease in new dwelling consents issued of 5% and in the rural areas there was a decrease of 19% from 2016/2017 to 2017/2018. Dwelling consents issued increased in Omokoroa (30%), Waihi Beach (23%) and in the Pongakawa (118%) Greenfield UGA's while in the rural areas only Te Puna/ Minden increased by 22%.

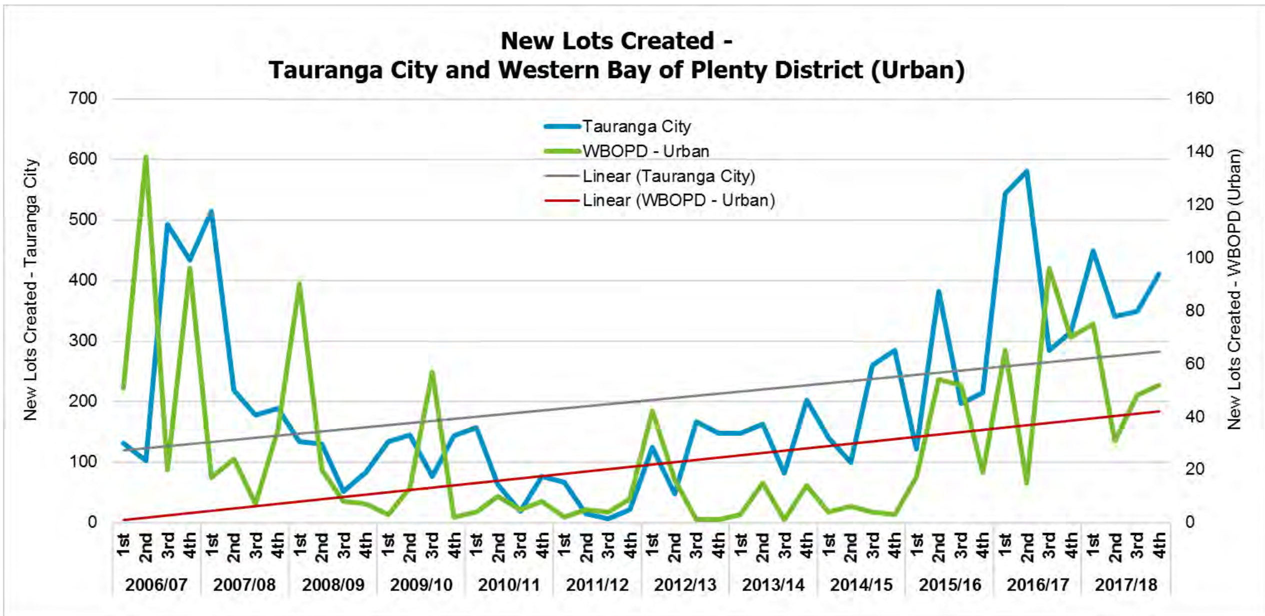
Figure 4 New dwelling consents issued by growth area, Tauranga City, 2016/2018



During 2017/2018, 84% of new dwelling consents issued occurred within Greenfield UGA's, 16% within existing urban areas, while 0.2% (3 consents) were issued in rural zoned areas. Dwelling consents issued in 2017/2018 in Greenfield UGA's (1,156 consents) were down 24% on 2016/2017 (1,522 consents) and up 1.7% on the last 5 year average (1,137 consents). Greenfield UGA's, with the exception of Pyes Pa UGA's, experienced declines in 2017/2018 from 2016/2017 results. There were 4 less dwelling consents issued in the existing urban areas in 2017/2018 compared to the previous year, and in the rural areas, 2 less dwelling consents were issued during the same period.

3.2 New Lots Created

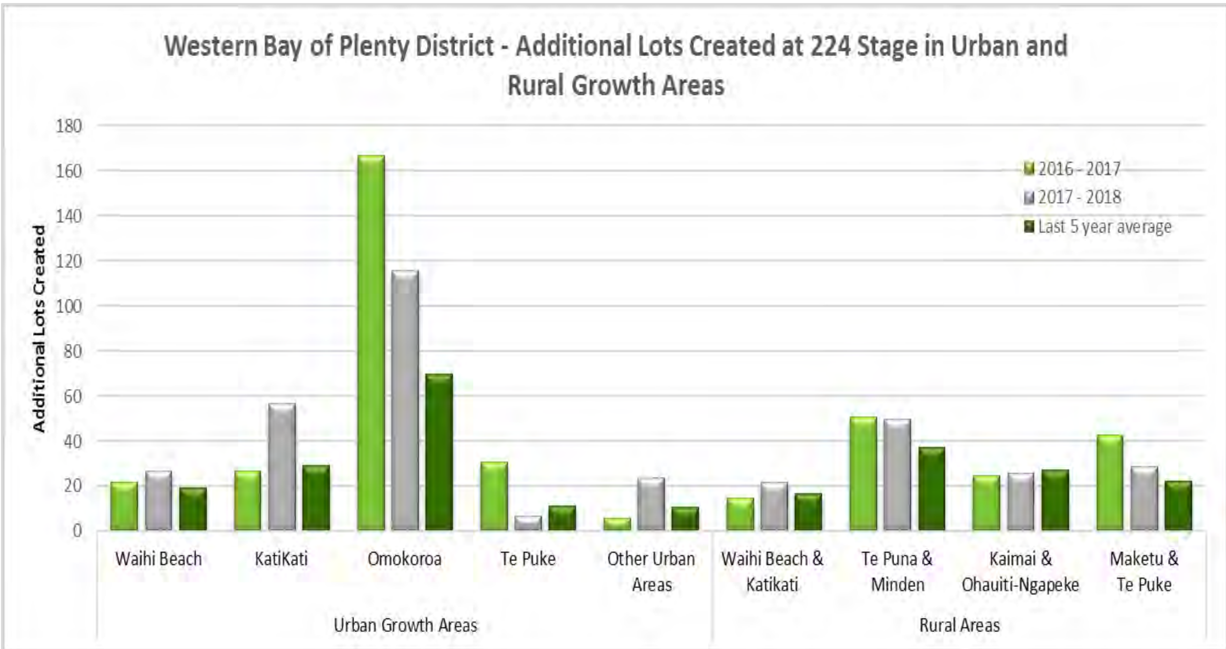
Figure 5. New lots created, Tauranga City and WBOPD (urban), July 2006 to June 2018



In WBOPD the number of new lots created in the UGA's decreased from 246 in 2016/2017 to 207 in 2017/2018. New lots created in the UGA's were the lowest in 2014/2015 with an average of 4 new lots created per quarter, compared to the average of 52 new lots created in 2017/2018.

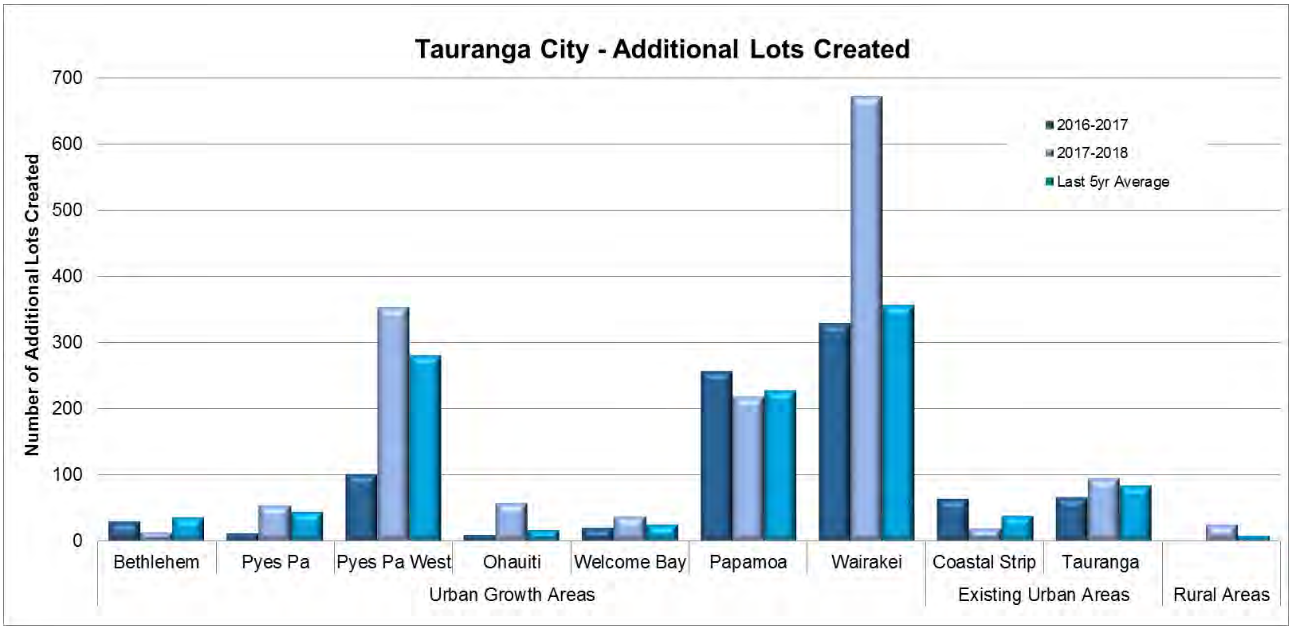
For Tauranga City new lots created in 2017/2018 (1,550 new lots created) decreased by 173 lots (10%) from 2016/2017 (1,723 new lots created). The 2017/2018 results were 39% higher than the last 5 year average of 1,116 new lots created. Over the last ten years, new lots created were lowest in 2011/2012 with a monthly average of 9 new lots created, compared to 129 new lots in 2017/2018 in Tauranga City.

Figure 6 Additional lots created by growth area, WBOPD, 2016/2018



In the Greenfield UGA's the number of additional lots created at 224 stage decreased by 16% from 2016/2017 to 2017/2018 and the rural areas decreased by 5% for the same period. Subdivision is lower in Omokoroa and Te Puke while in Katikati subdivision increased significantly (by 30 consents) for the 2017/2018 year. Additional lots created decreased in most of the rural areas from 2016/2017 to 2017/2018 except for Waihi Beach/ Katikati rural areas where additional lots increased by 47%.

Figure 7 Additional lots created growth area, Tauranga City, 2016/2018

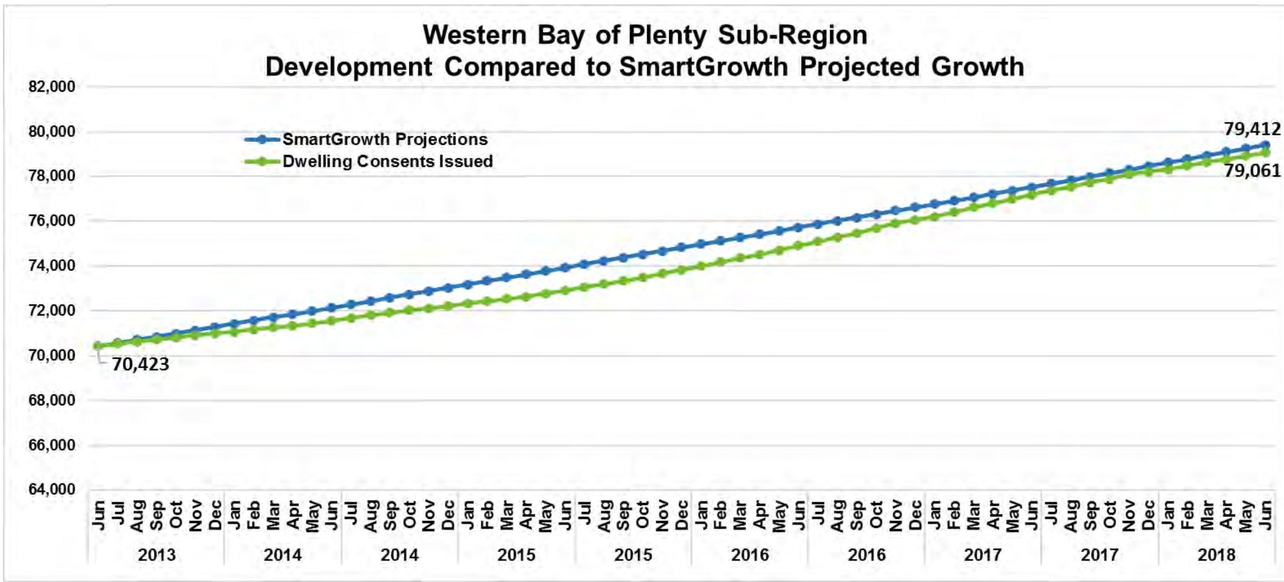


The largest number of additional lots created during the 2017/2018 financial year were within Greenfield UGAs (1,408 lots or 91%), while 116 lots were created in existing urban areas. Subdivision development declined by 11% in both Greenfield and existing UGAs in comparison with 2016/2017 results. During 2017/2018 most additional lots in Tauranga City were created within the Suburban and Wairakei residential zones (1,396 lots or 90%).

3.3 Comparison with SmartGrowth Projections

Detailed population and household projections have been produced for the SmartGrowth region by the National Institute of Demographic and Economic Analysis (NIDEA), University of Waikato[7]. NIDEA predict that population in the Western Bay of Plenty sub-region will increase from 165,910 people at 30 June 2013 to 261,248 people by 2063, while dwellings will increase from 70,423 to 121,265 over that period.

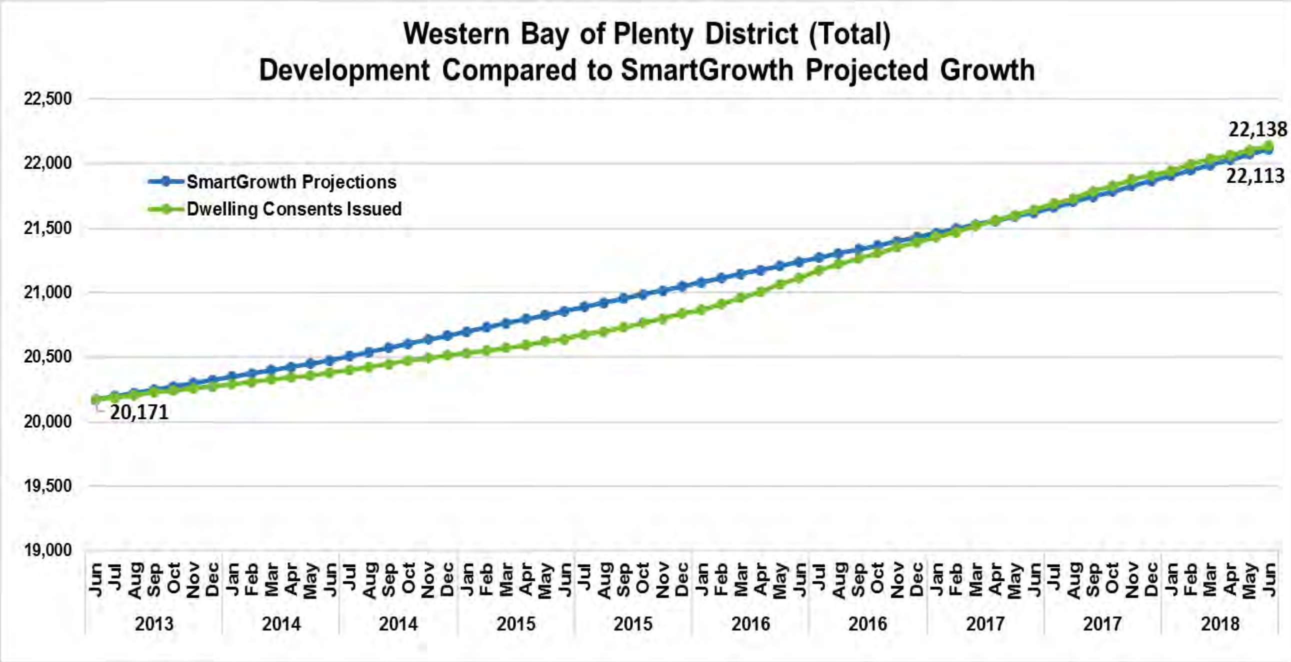
Figure 8 Dwelling consents issued compared to SmartGrowth projected growth, WBOP sub-region, 2013/2018



Dwelling consents issued for the Sub-region is very close to the dwellings projected. Between 1 July 2013 and 30 June 2018, 4% (351) less new dwelling consents were issued, than projected.

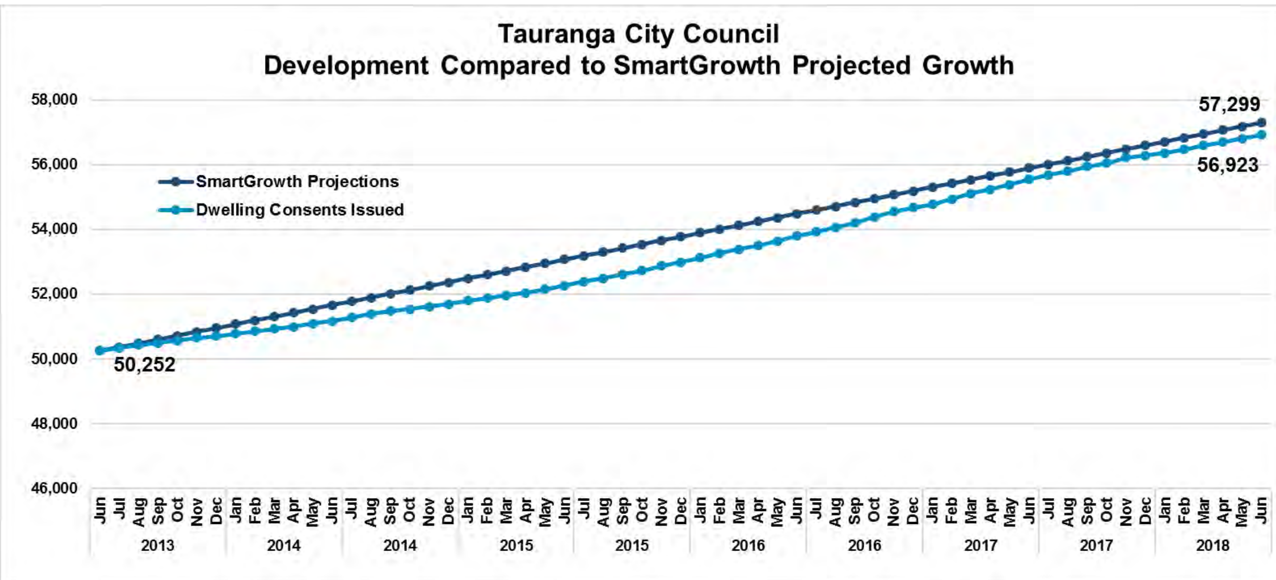
[7] The revised projections were adopted by the SmartGrowth Committee on 28 May 2014 and updated by both Councils in July 2017.

Figure 9 Dwelling consents issued compared to SmartGrowth projected growth, WBOPD, 2013/2018



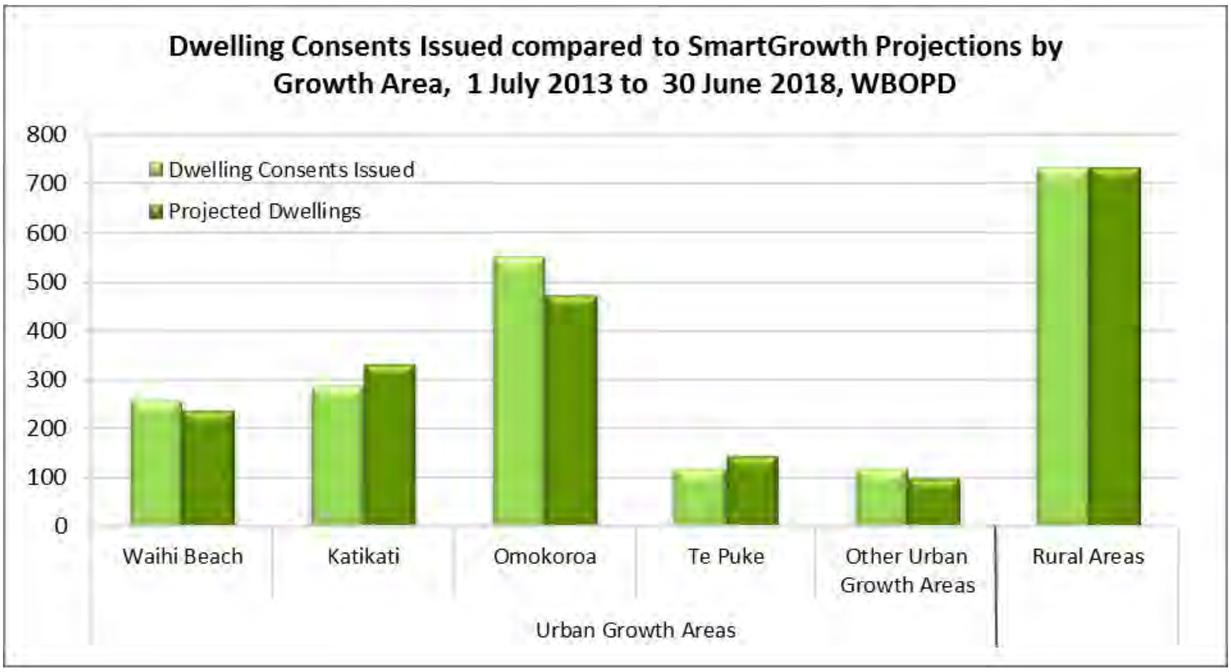
Compared to the SmartGrowth projections, 25 more consents were issued in WBOPD, between 1 July 2013 and 30 June 2018.

Figure 10 Dwelling consents issued compared to SmartGrowth projected growth, Tauranga City, 2013 /2018



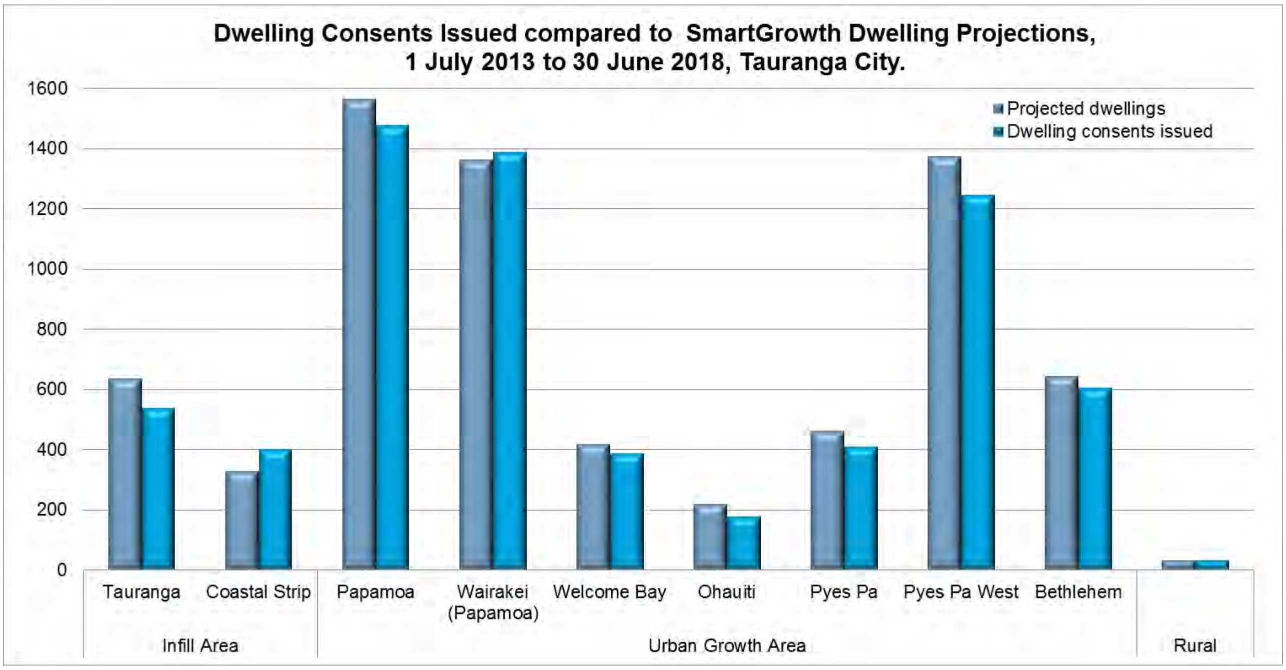
Between 1 July 2013 and 30 June 2018 376 (or 5.3%) less dwellings consents were issued than the 7,047 dwellings projected.

Figure 11 Dwelling consents issued compared to SmartGrowth projections by growth area, WBOPD, 1 July 2013 to 30 June 2018



In WBOPD, Katikati UGA has more dwellings projected (332) than new dwelling consents issued (289) from July 2013 to June 2018 and in Omokoroa UGA there were 81 less dwellings projected (472) than dwelling consents issued (553) for the same period. In the other Urban Growth Areas, Pongakawa have 24 more dwelling consents issued than projected. The projections (733 dwellings) for the rural areas are very close to the actual dwelling consents issued of 735 dwellings.

Figure 12 Dwelling consents issued compared to SmartGrowth projections by growth area, Tauranga City, 1 July 2013 to 30 June 2018



In comparison to the current SmartGrowth Projection allocation between 1 July 2013 and 30 June 2018 less dwelling consents were issued than projected. Of the UGAs, Wairakei recorded an increase (25 consents or 1.8%), while all other UGAs recorded declines ranging 6% to 19%. Overall dwelling consents issued in UGA's were 353 (or 6%) below the 6,049 dwellings projected. Dwelling consents issued in Intensification/Infill area, and Rural areas were 26 below (or 2.6% less) the 1,001 projected.

3.4 Growth Rates – Land Availability

SmartGrowth requires that uptake rates and land availability for residential development be monitored. This is based on zoned residential land across the sub-region.

Tauranga City

Of the operative Greenfield UGA's, Pyes Pa UGA has the lowest proportion of remaining dwelling capacity (13%), while Welcome Bay has the lowest remaining dwelling capacity (295 dwellings), refer to Table 4.

Papamoa UGA which has the largest expected yield, has estimated potential for a further 1,938 dwellings. The majority of these are expected to be constructed in the Maranui Street area which includes the Mangatawa Block, and at the eastern end of Doncaster Drive in the Parton Road area.

Wairakei UGA in Papamoa East was made operative in May 2011, providing further capacity for an estimated 4,480 dwellings. At 30 June 2018 it had the largest remaining dwelling capacity (3,082 dwellings) and highest percentage of capacity remaining (69%).

Other Greenfield areas have been identified for future urban development and their suitability is currently being considered through the SmartGrowth Settlement Pattern Review Project. Te Tumu in Papamoa East and Tauriko West future Greenfield UGA areas are currently being progressed through structure planning.

By June 2021 it is estimated that capacity for a further 5,544 dwellings will remain in the current operative Greenfield UGA's, which is 18% of the total estimated yield of these UGA's, falling to 1,080 dwellings (or 3% of total yield) by 2028. For the future Greenfield UGA's it is anticipated that a further 10,700 dwellings will be added to the yield by 2021, with capacity for a further 7,666 dwellings (or 72%) of this additional yield estimated to remain by 2028. If the future Greenfield UGA's were not released for development a medium term shortfall is projected.

Table 4 Growth Rate and Projected Uptake of Urban Growth Areas in Tauranga City

				Short term (3 years)		Medium Term (10 years)	
Greenfield Urban Growth Area (UGA)	Estimated Yield - Total Dwellings	June 2018 total dwellings (existing and consented)	Remaining capacity as at June 2018	Projected uptake June 2018-June 2021	Estimated remaining capacity at June 2021	Projected uptake June 2021-June 2028	Estimated remaining capacity at June 2028
Bethlehem	4,790	3,509	1,281 (27%)	368	913	603	311
Pyes Pa	2,780	2,424	356 (13%)	141	215	143	72
Pyes Pa West	2,800	1,572	1,228 (44%)	494	734	492	241
Ohauiti	1,800	1,352	448 (25%)	187	261	173	87
Welcome Bay	2,150	1,855	295 (14%)	128	167	96	71
Papamoa	12,140	10,202	1,938 (16%)	733	1,205	1,076	130
Wairakei	4,480	1,398	3,082 (69%)	1,033	2,049	1,881	168
UGA (current) Sub-Total	30,940	22,312	8,628 (28%)	3,084	5,544 (18%)	4,465	1,080 (3%)
Te Tumu (post 2021)[1]	7,700				7,700	1,747	5,953
Tauriko West (post 2021)[1]	3,000				3,000	1,287	1,713
UGA (future) Sub-Total	10,700				10,700	3,034	7,666 (72%)
Greenfields Total	41,640	22,312	8,628	3,084	16,244 (39%)	7,498	8,746 (21%)

[1] Structure planning has commenced.

Western Bay of Plenty District

Te Puke UGA has the largest design capacity in the District followed by Waihi Beach UGA of just over 3,000 dwellings. Although Waihi Beach has a large design capacity, it has the lowest remaining capacity available of 7%. Omokoroa Stage 1&2 UGA has the largest dwelling capacity remaining in the District (897 dwellings), followed by Te Puke UGA with 492 dwellings. Katikati UGA does not include the Park Road dairy farm and Tetley Road orchard, and that leaves Katikati with only 370 dwellings remaining (refer to Table 5).

A further estimated capacity of 1,267 dwellings will be available at June 2021 of which most are located in Omokoroa (613 dwellings). The overall capacity will fall to 173 dwellings (or 1% total yield) by 2028. By 2021 a further 5,269 dwellings (or 98%) will be added to the Urban Growth Areas for Omokoroa-Stage 3 and Katikati West, with a further dwelling uptake of 755 dwellings from June 2021 to June 2028. This will give enough capacity for the medium term.

Table 5 Growth Rate of Urban Growth Areas in the Western Bay of Plenty District

		Short Term (3 Years)					Medium Term (10 Years)	
Urban Growth Area	Total Capacity (Dwellings)	June 2018 total dwellings (existing and consented)	Remaining capacity at June 2018	Protected uptake June 2018 – June 2021	June 2021 total dwellings (Estimated)	Estimated remaining capacity at June 2021	Protected uptake June 2021 – June 2028	Estimated remaining capacity at June 2028
Omokoroa – Stages 1 & 2	2,576	1,679	897 (35%)	284	1,963	613	613	0
Kaitkati[1]	2,519	2,149	370 (15%)	233	2,382	137	137	0
Waihi Beach	3,230	3,013	217 (7%)	59	3,072	158	112	46
Te Puke	3,550	3,058	492 (14%)	133	3,191	359	232	127
Greenfields (current) Sub-Total	11,875	9,899	1,976 (17%)	709	10,608	1,267 (11%)	1,094	173 (1%)
Omokoroa - Stage 3 (post 2021)[2]	4,286	87	4,199	0	87	4,199	452	3,747
Katikati West (post 2021)[2]	1,070	0	1,070	0	0	1,070	303	767
Greenfields (future) Sub-Total	5,356	87	5,269	0	87	5,269 (98%)	755	4,514 (84%)

[1] Exclude Park Road Dairy and Tetley Road Orchard.
[2] Structure Plan and new Urban Growth Areas under discussion.

3.5 Occupied/Unoccupied Dwelling Ratio

SmartGrowth requires that "permanent" vs. "holiday residences" be monitored. A comparison of Census night occupied dwelling with unoccupied dwelling counts provides one indication of this. A table outlining occupied and unoccupied dwelling ratios is provided in Appendix 4 and a Census area unit map is provided in Appendix 5.

Western Bay of Plenty District

In the Western Bay of Plenty District the coastal settlements of Island View-Pios Beach and Waihi Beach show the highest ratios of unoccupied dwellings with 61% and 49% respectively signifying a high number of holiday homes in these areas, refer to Appendix 4.

Athenree and Matakana Island also indicate a relatively high proportion of non-permanent residences, each with more than 25% of homes unoccupied at Census time. Pongakawa despite being a rural area displays a reasonably high proportion of unoccupied dwellings (31%) largely due to the inclusion of the coastal settlement of Pukehina within the area unit. Maketu Community (26%), another settlement located on the Western Bay of Plenty District's coast has a similar ratio of unoccupied dwellings to Pongakawa (31%), while Katikati and Omokoroa has a smaller proportion of non-permanent residences than other coastal settlements, with 9% and 12% respectively.

Tauranga City

For Tauranga City the coastal strip Census area units of Mount Maunganui North, Omanu, Te Maunga, Papamoa Beach East, Palm Beach, and Palm Springs all registered an unoccupied dwellings proportion of 10% or greater on Census night suggesting a higher rate of holiday residence in these areas, refer to Appendix 4. These results correspond with the traditional holiday nature of the coastal strip. Outside the coastal strip only Tauranga Central, and Sulphur Point CAU's exceeded 10% unoccupied dwellings.

4 Dwelling Sale Price and Rent Trends

4.1 Dwelling Sales Price

In June 2018, both Tauranga City and WBOPD have slight increases in the 12-month average dwelling sales prices of 4% and 5.4%, respectively compared to the previous year (June 2017). It is noted that actual dwelling sales prices have stabilised in the last 12 months.

Figure 13 Dwelling sales prices, Tauranga City and WBOPD, 1993/2018

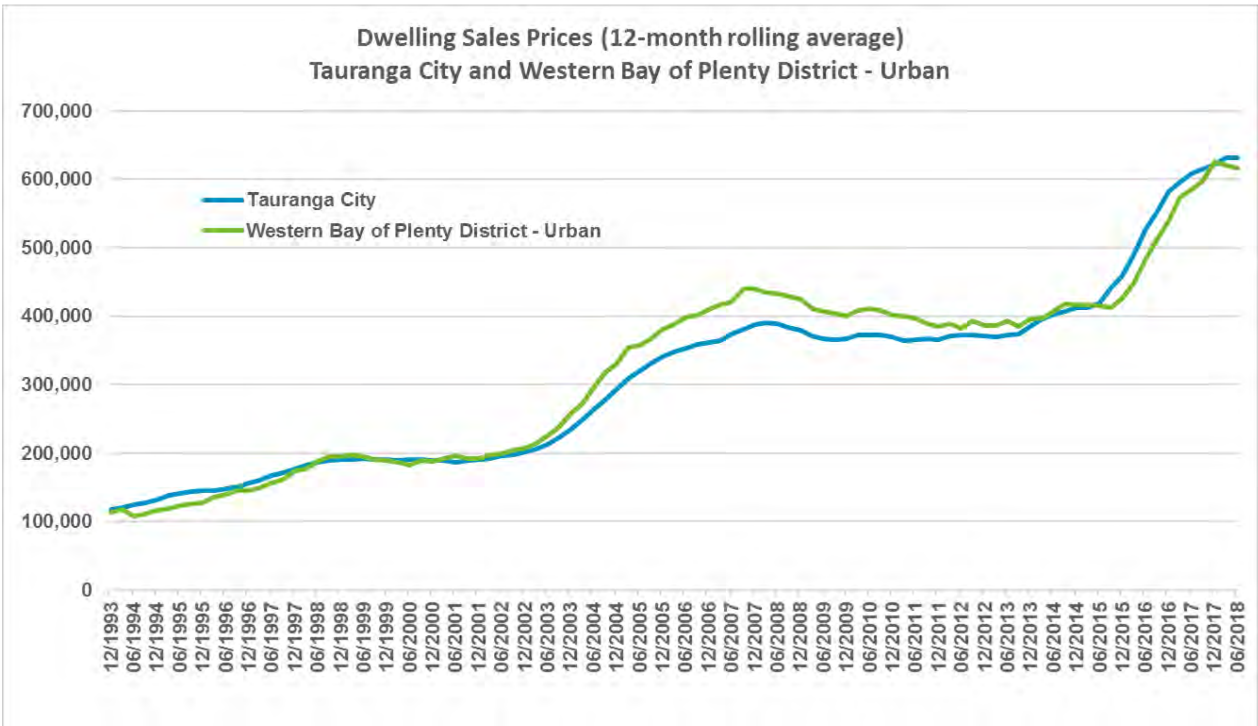


Table 6 Dwelling Sales Prices (12-month rolling average)

Dwelling Sales Price		Trend	Change	% Change
Tauranga City				
June 2018	$631,562			
March 2018	$31,312	▲	$250	0.04
June 2017	$607,625	▲	$23,938	3.9
June 2013	$372,000	▲	$259,562	69.8
June 2008	$388,625	▲	$242,937	62.5
Western BOPD – Urban				
June 2018	$616,446			
March 2018	$620,688	▼	-$4,241	-0.7
June 2017	$584,911	▲	$31,536	5.4
June 2013	$393,048	▲	$223,399	56.8
June 2008	$432,563	▲	$183,884	42.5

Figure 14 Dwelling sales prices, June 2018

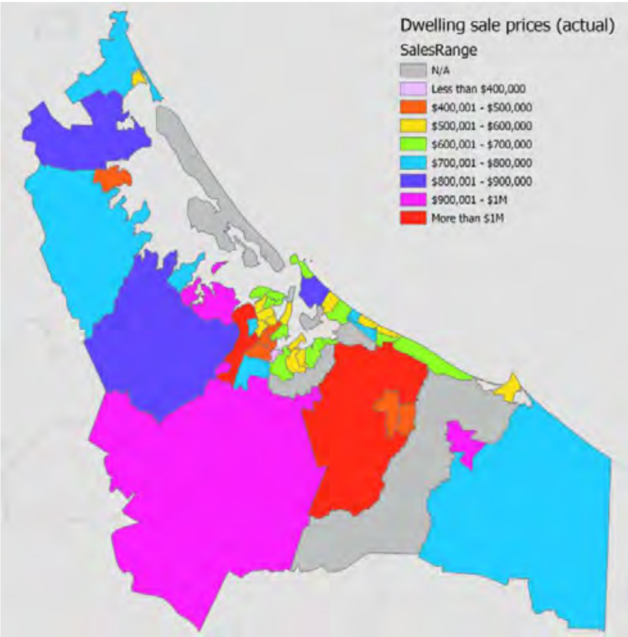
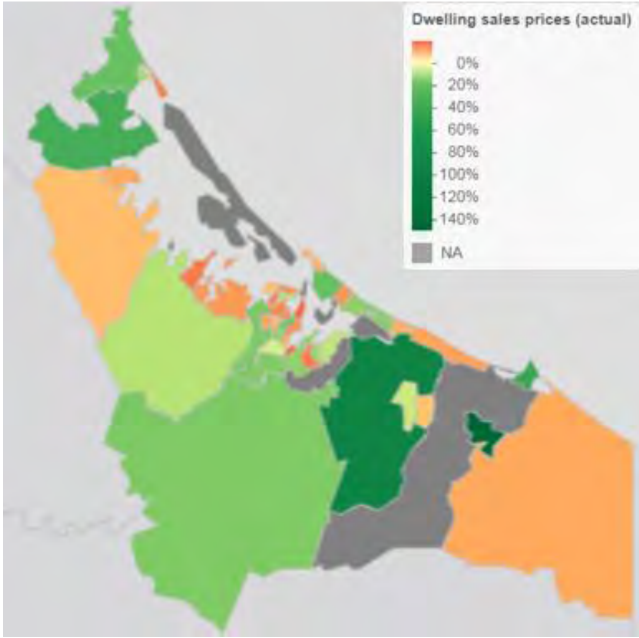


Figure 15 Change in dwelling sales prices, June 2017 to June 2018



Source: Corelogic – HUD Urban Development Capacity Dashboard

4.2 Dwelling Rents

As illustrated in the graph above and table below, dwelling rents have been increasing, with a steady increase observed from mid 2014. This aligns with an increase in sales price over this period, though the percentage increase in rents has been considerably lower than that observed for sales prices. Refer Appendix 1 for an explanation of this indicator.

Figure 16 Dwelling rents, Tauranga City and WBOPD (urban), 1993/2018

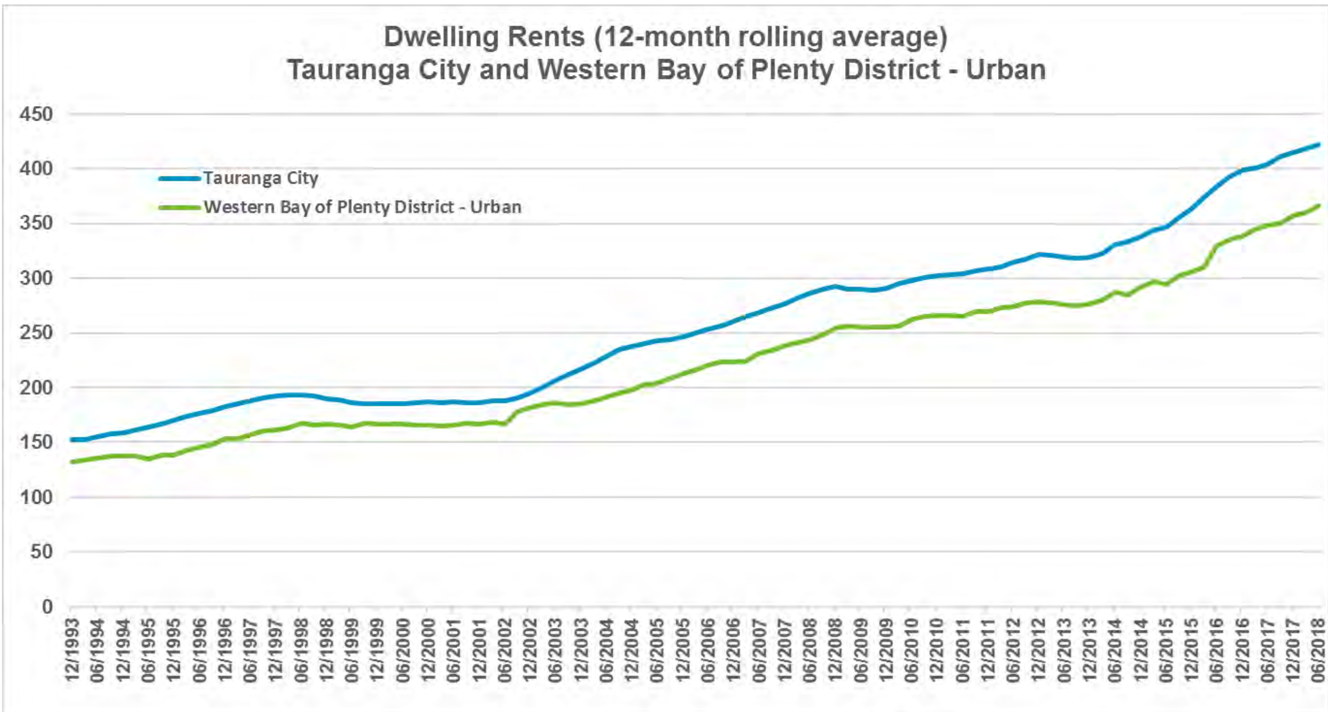
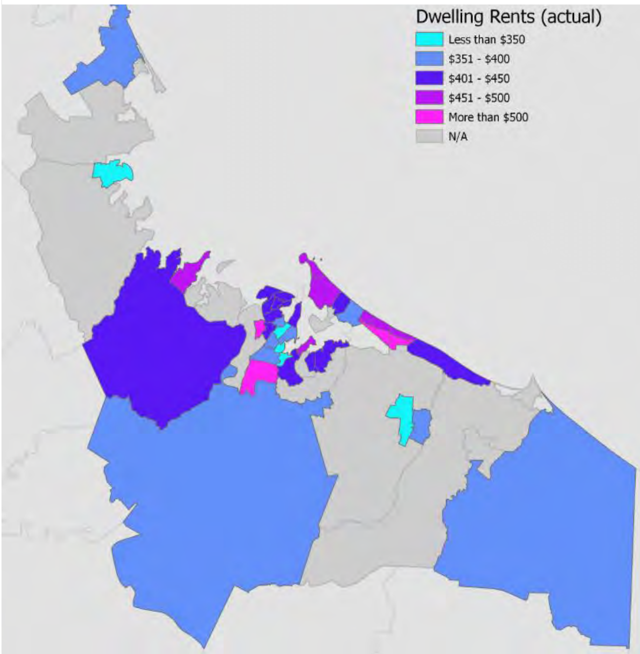


Table 7 Dwelling rents

Dwelling Rents		Trend	Change	% Change
Tauranga City				
June 2018	$422			
March 2018	$418	▲	$4	1.0
June 2017	$404	▲	$18	4.5
June 2013	$319	▲	$104	32.5
June 2008	$287	▲	$138	47.4
Western BOPD – Urban				
June 2018	$366			
March 2018	$360	▲	$6	1.7
June 2017	$348	▲	$18	5.1
June 2013	$276	▲	$90	32.7
June 2008	$244	▲	$122	50.0

Source: Corelogic – HUD Urban Development Capacity Dashboard

Figure 17 Dwellings rents, Tauranga and WBOPD, June 2018



4.3 Dwellings Sold

As shown in the graph below Tauranga City and Western Bay of Plenty District have experienced significant fluctuations in the number of dwellings sold. While there is less variation observed it is noted that the number of sales has doubled in both areas in certain quarters from lowest to highest number of sales (eg: when 2004 and 2016 (high sales) are compared with 2001 and 2009 (low sales). Tauranga City and WBOP District follow similar trends in respect to periods of higher and lower sales. The number of sales in Tauranga City in the last 12 months to June 2018 was 832 (or 21%) less than the sales in the last 12 months to June 2017. Likewise, the number of dwellings sold in WBOPD in the last 12 months to

June 2018 was 29 (or 29%) less than the sales in the last 12 months to June 2017. Refer Appendix 1 for an explanation of this indicator.

Figure 18 Dwellings sold, Tauranga City and WBOPD, 1993/2018

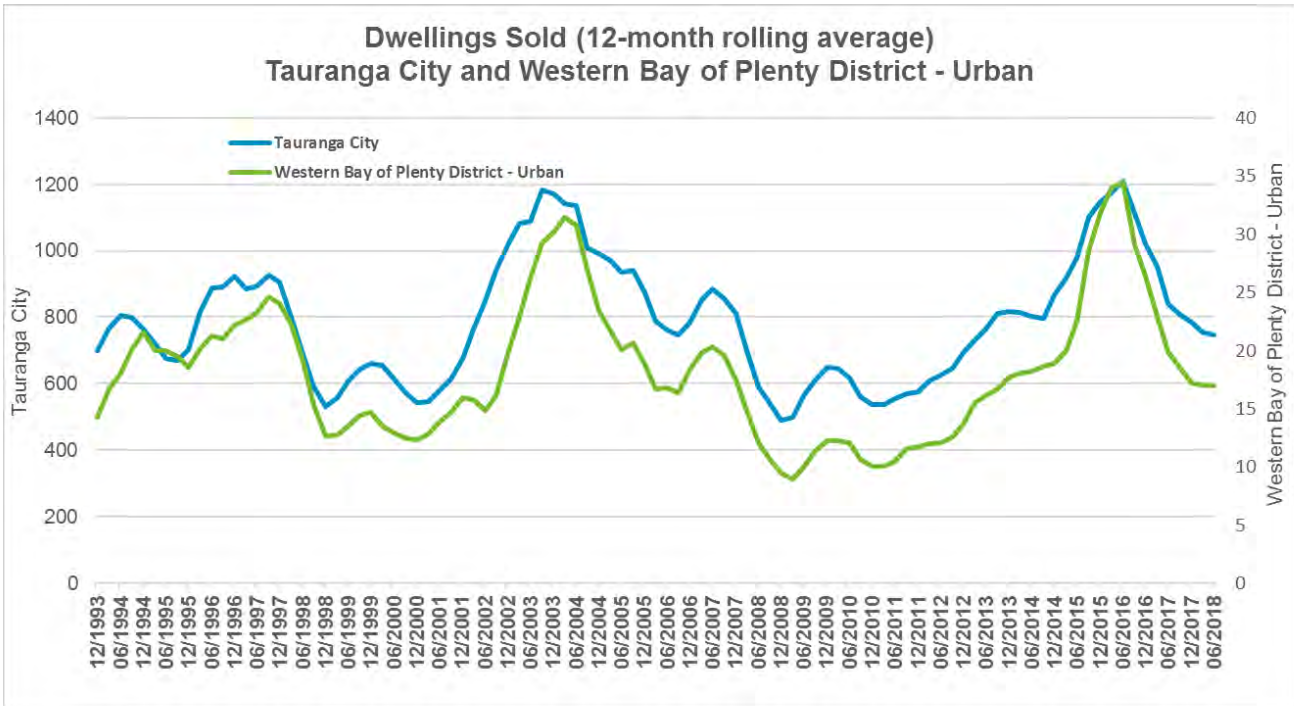
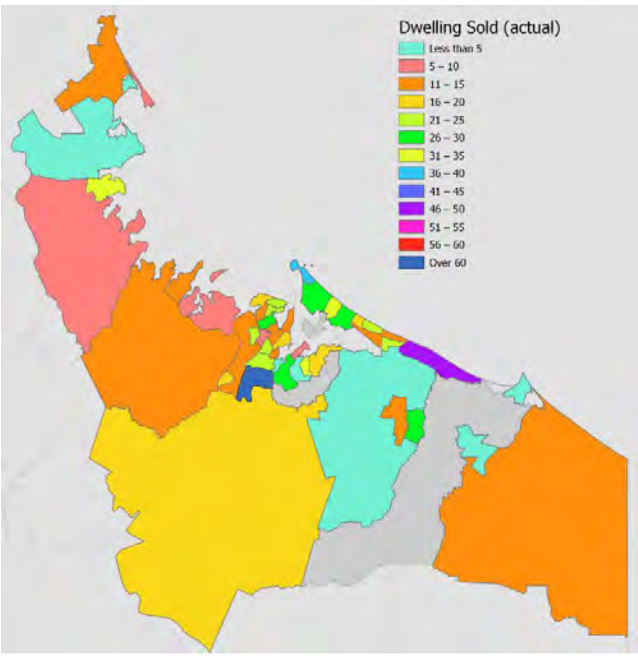
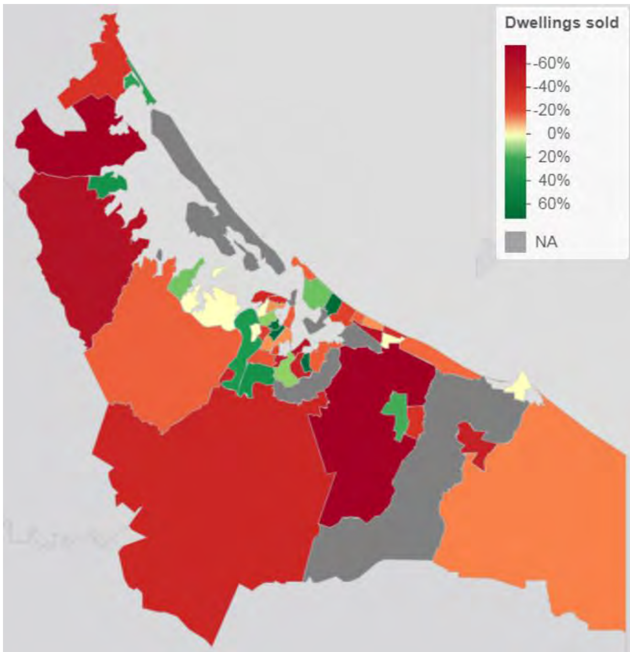


Figure 19 Dwellings sold, June 2018



Source: Corelogic – MBIE Urban Development Capacity Dashboard

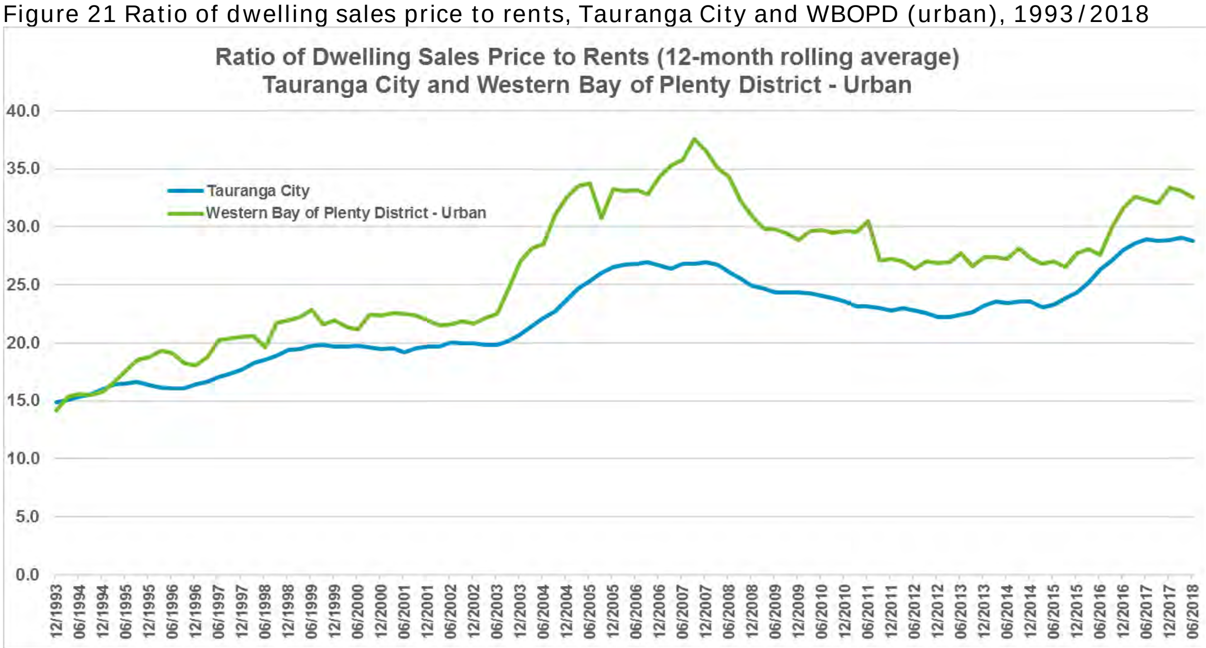
Figure 20 Percentage change in dwellings sold, June 2017 to June 2018



4.4 Ratio of Dwelling Sales Prices to Rent

As illustrated in the graph below, the ratios between house prices and rents increased in the urban areas of both local authorities between 2003 and 2008 and in the last few years (but fell noticeably for a few years following the global financial crisis). According to the HUD/MfE Guide, this is because, while both house prices and rents have increased over the last 20 years, rent increases have been flatter and have lagged house price increases, and especially so at the peaks of the cycle. Refer Appendix 1 for an explanation of this indicator.

Figure 21 Ratio of dwelling sales price to rents, Tauranga City and WBOPD (urban), 1993/2018

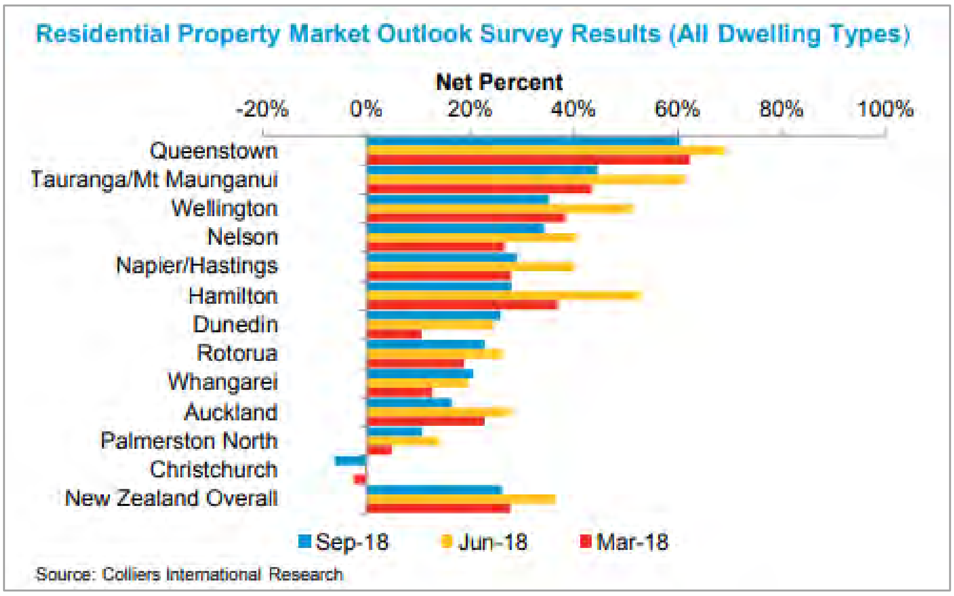


4.5 Residential Market Outlook

Colliers International runs a quarterly survey on Residential Market Outlook in a number of centres in New Zealand. In their September 2018 survey, more than 40% of the respondents (net percent of optimists minus pessimists) in Tauranga and Mt Maunganui expect the median residential price to increase over the next twelve months. This is significantly lower than the previous quarter's figure of over 60%.

As illustrated in the graph Tauranga/ Mt Maunganui was second only to Queenstown of the centres surveyed expecting residential prices to increase as at June 2018. This expectation decreased in the last quarter to September 2018.

Figure 22 Residential property market outlook, March to September, 2018



4.6 HAM – Housing Affordability Measure

4.6.1 HAM-Buy

As illustrated in the graph and table below, over the quarter and twelve months to 31 March 2017 affordability had worsened in Western Bay of Plenty District and Tauranga City. However, because of the age of this data the measure it may not be an accurate representation of current affordability levels. Refer Appendix 1 for an explanation of this indicator.

Figure 23 HAM-Buy: share of first time home buyer households below the benchmark, 2003/2017

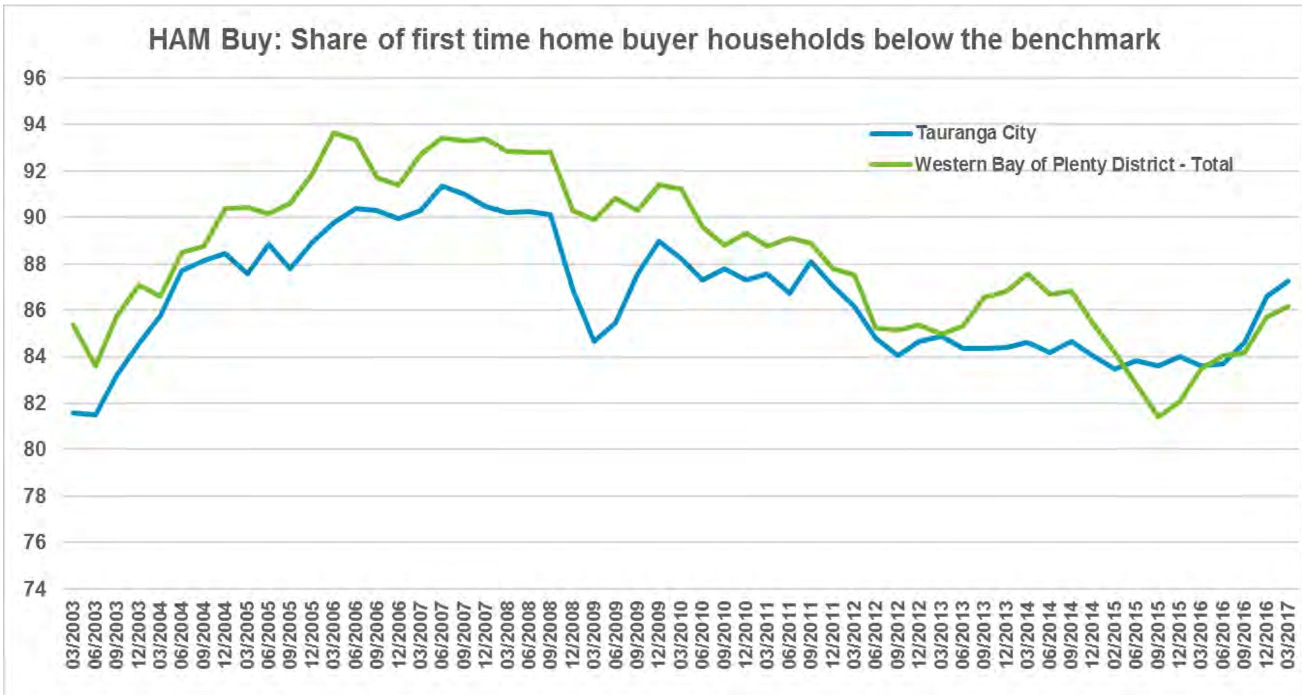


Table 8 HAM Buy

HAM-Buy		Trend	% Change
Tauranga City			
March 2017	87.3%		
Dec 2016	86.6%	🔴	0.7
March 2016	83.6%	🔴	3.7
March 2012	86.1%	🔴	1.1
March 2007	90.3%	🟢	-3.0
Western BOPD			
March 2017	86.2%		
Dec 2016	85.7%	🔴	0.4
March 2016	83.4%	🔴	2.7
March 2012	87.5%	🟢	-1.4
March 2007	92.7%	🟢	-6.6

🟢 More affordable 🔴 Less affordable

Source: Corelogic – HUD Urban Development Capacity Dashboard

4.6.2 HAM Rent

As illustrated in the graph above and table below, the HAM Rent has improved in both local authority areas in the last quarter and last 12 months to 31 March 2017. The HAM Rent was lower than HAM Buy at 31 March 2017 in both Tauranga City and WBOP District, suggesting that it was more affordable to rent than buy. Refer Appendix 1 for an explanation of this indicator.

Figure 24 HAM-Rent: share of renting households below the benchmark, 2003/2017

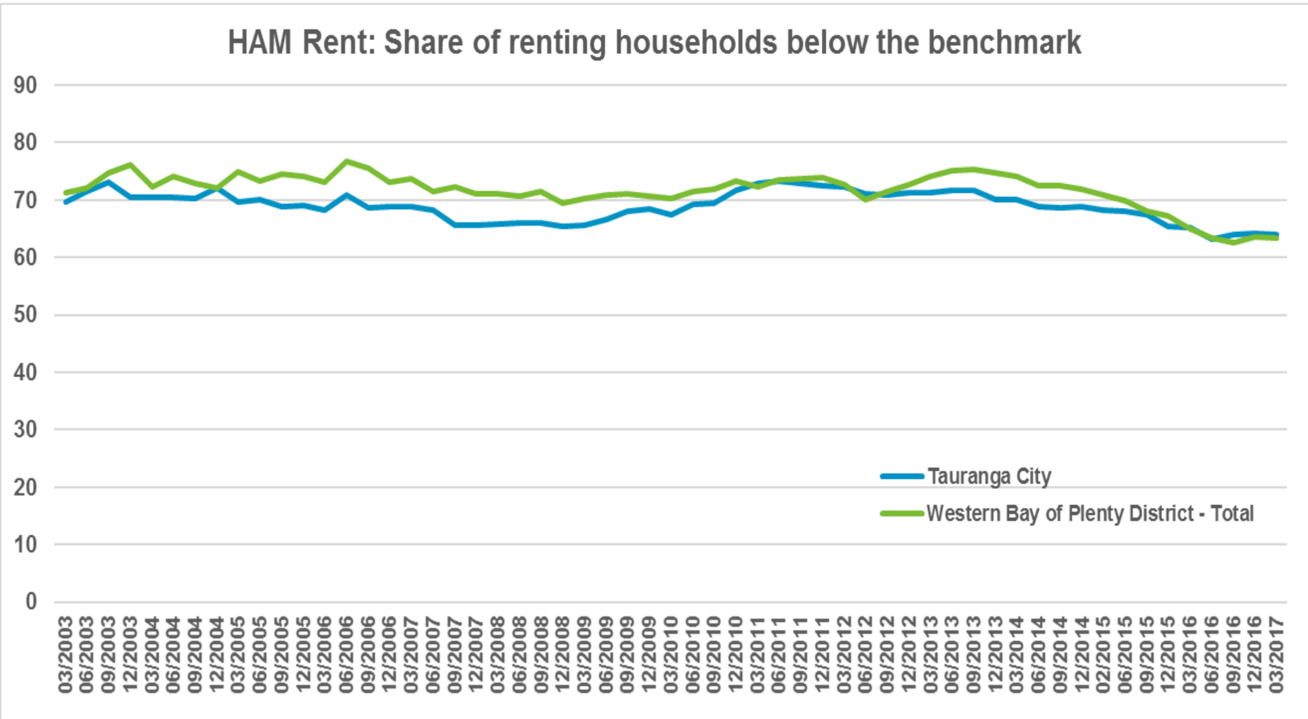


Table 9 HAM Rent

HAM-Rent		Trend	% Change
Tauranga City			
March 2017	64.1%		
Dec 2016	64.2%	●	-0.1
March 2016	65.2%	●	-1.1
March 2012	72.3%	●	-8.2
March 2007	68.9%	●	-4.8
Western BOPD			
March 2017	63.4%		
Dec 2016	63.6%	●	-0.2
March 2016	64.9%	●	-1.5
March 2012	72.7%	●	-9.3
March 2007	73.6%	●	-10.2

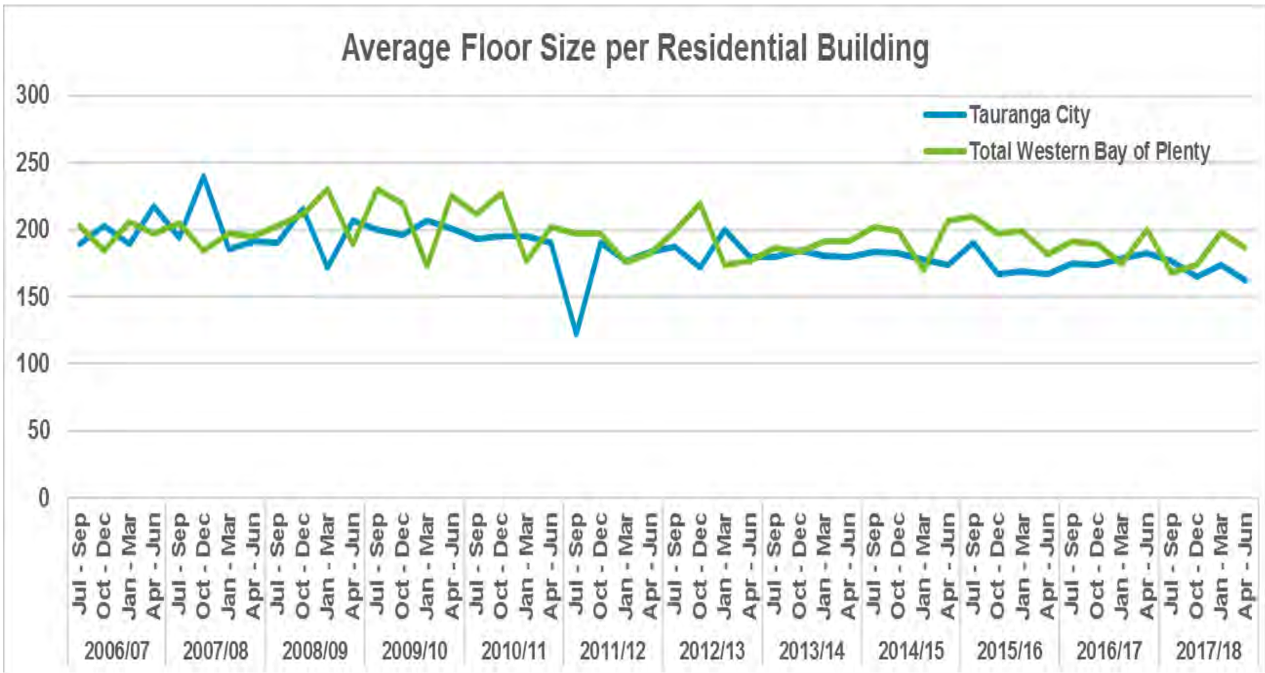
● More affordable ● Less affordable
Source: Corelogic – HUD Urban Development Capacity Dashboard.

5 Dwelling Typology

5.1 Floor Size per Residential Building

Average floor area has declined from 2007 to 30 June 2018 for both local authority areas with variation over this period as illustrated in the above graph. In the last 12 months to June 2018 average floor area for residential dwelling consents has declined in Tauranga City from 177m^2 to 170m^2, while the WBOPD average floor area decreased from 189m^2 to 180m^2.

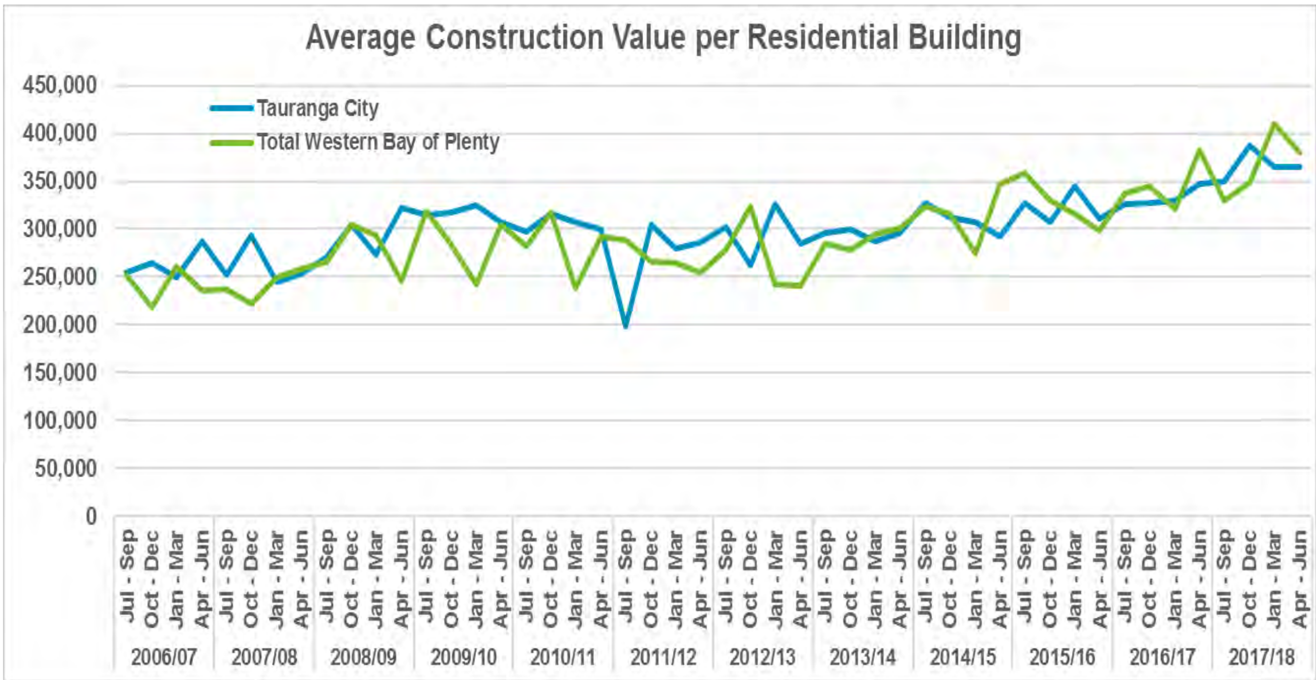
Figure 25 Average floor size per residential building, Tauranga City and WBOPD, July 2006 to June 2018



5.2 Construction Value per Residential Dwelling

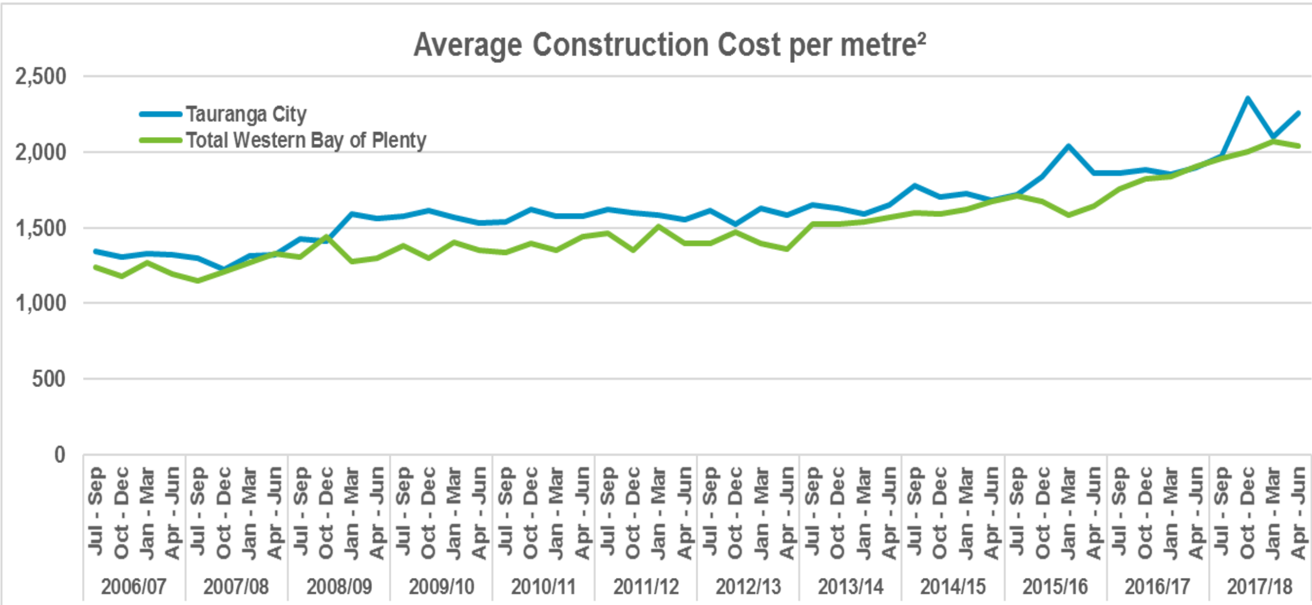
As shown in the figure below average value per residential dwelling has increased in both local authority areas from 2007 to June 2018. There have been fluctuations experienced over this 10 year period as illustrated in the below graphs. This value excludes land costs associated with new houses.

Figure 26 Average construction value per residential building, Tauranga City and WBOPD, July 2006 to June 2018



Source: Stats NZ Infoshare

Figure 27 Average construction cost per metre^2, Tauranga City and WBOPD, July 2006 to June 2018



5.3 Dwelling Consents Issued by Type

As illustrated in the graphs and table below the proportion of standalone houses has decreased in both Tauranga City and WBOPD in the last 12 months, compared to the last 5 year results though remain the main form of dwelling provision. Retirement village units were the next largest type of dwellings consented in Tauranga City in the last 12 months, while it was the townhouses, flats, units and other dwellings type in the WBOPD.

Figure 28 Dwelling consents issued by type, WBOPD, July 2006 to June 2018

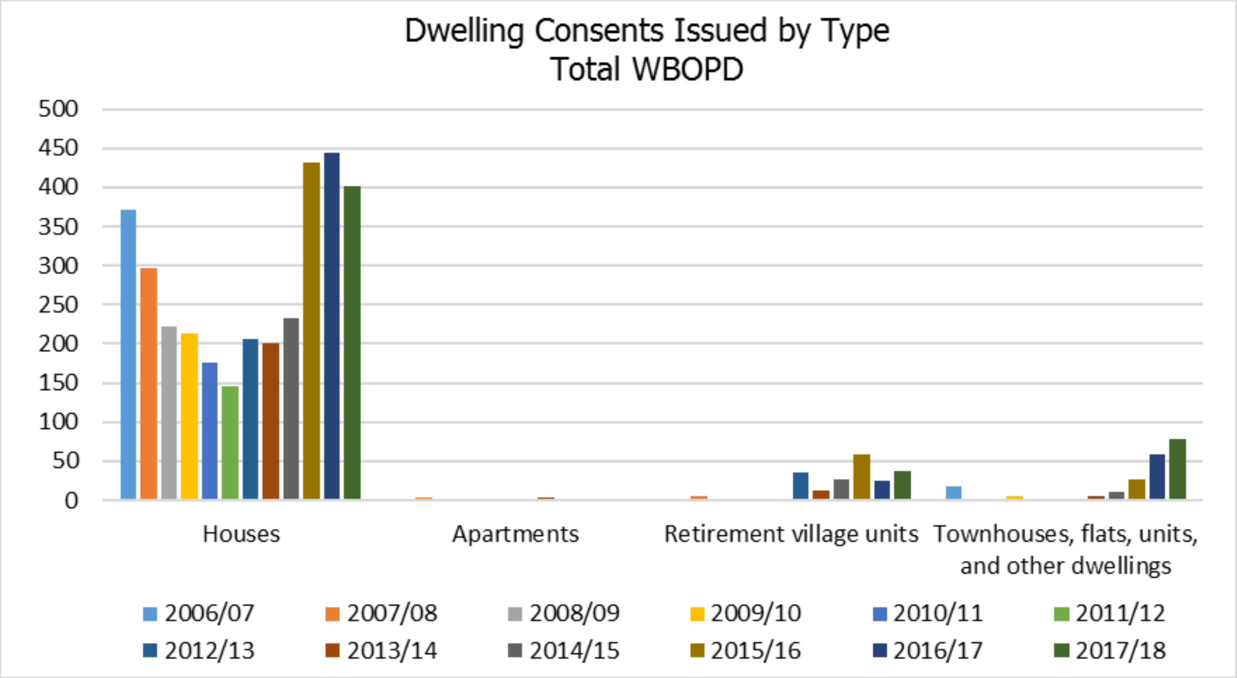
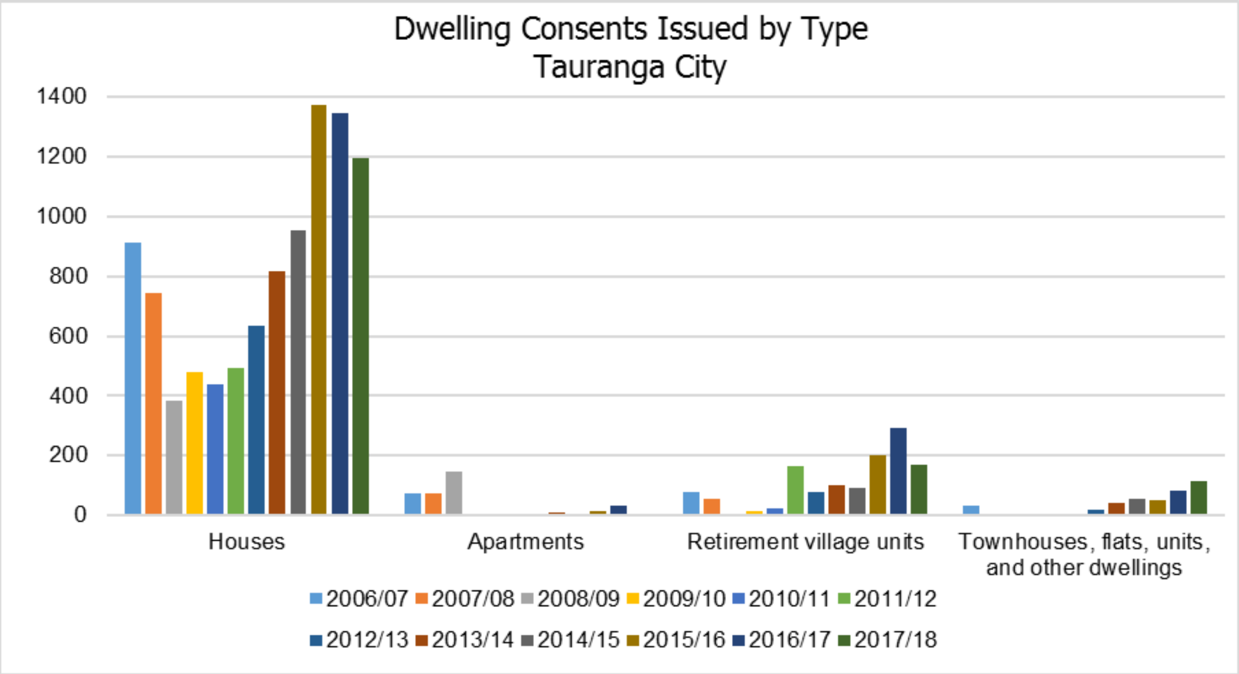


Figure 29 Dwelling consents issued by type, Tauranga City, July 2006 to June 2018



Source: Statistics NZ Info Share

Table 10 Dwelling Type

Period	Territorial Authority	Houses	Apartments	Retirement village units	Townhouses, flats, units, and other dwellings
Last 12 months	Tauranga City	80.4%	0.3%	11.4%	7.8%
	WBOPD	77.6%	0.0%	7.4%	15.1%
Last 5 Years	Tauranga City	82.0%	0.9%	12.3%	5.0%
	WBOPD	83.3%	0.1%	7.7%	8.8%

Source: Statistics NZ Info Share

6 Price Efficiency

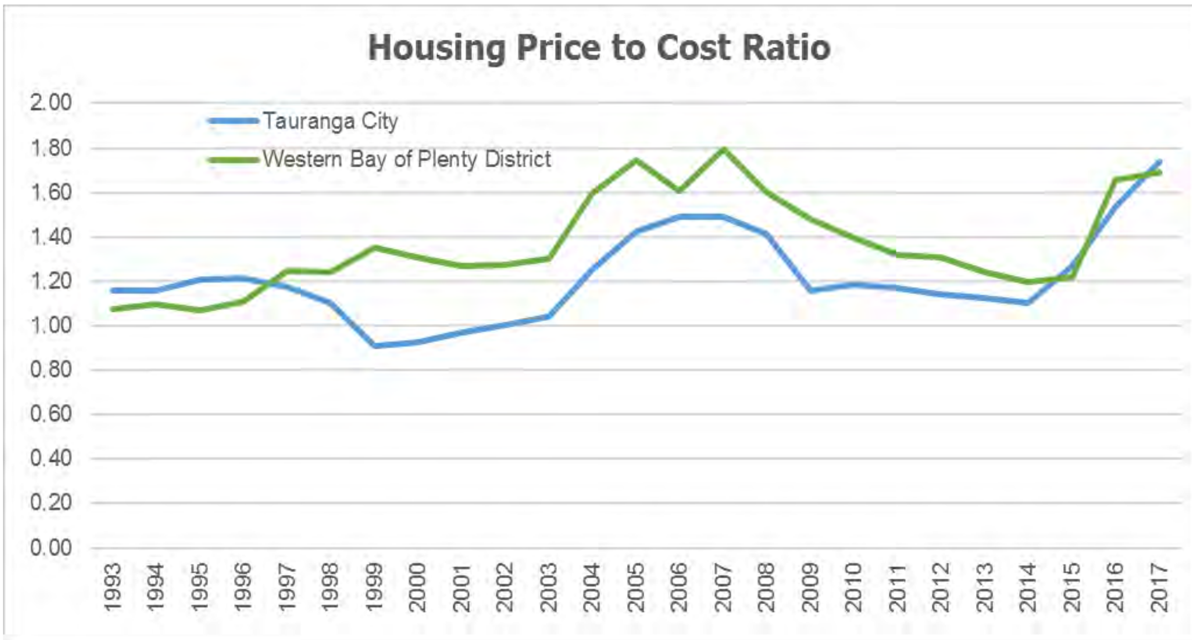
6.1 Housing price to cost ratio

Tauranga's house price to cost ratio was below the 1.5 benchmark (where the cost of the land is one-third of the house price) for 23 years from 1993 to 2015. The ratio increased at a fast rate from 1.1 in 2014 to 1.3 in 2015, and reached the record high of 1.7 as at 30 June 2017.

Similarly, WBOPD's house price ratio was below the 1.5 benchmark for ten years from 1993 to 2003. It fluctuated above 1.5 from 2006 to its highest point of 1.8 in 2007 but declined steadily to 1.2 in 2015 before climbing to its third highest point of 1.7 in the last 24 years as at 30 June 2017.

According to HUD/Mfe guidance, ratios above 1.5 may signal that the supply of sections and development opportunities is not keeping pace with demand and land prices are materially increasing prices. Refer to Appendix 1 for explanation of this indicator.

Figure 30 Housing price to cost ratio, Tauranga City and WBOPD, 1993/2017



6.2 Rural-urban zone land differentials

The value of Tauranga Urban Area's urban residential land close to the rural-urban boundary was more than twice the value of the rural residential land on the rural-urban boundary in June 2016. This is equivalent to a difference of $232 per square metre or $139,135 per section of 600m². Auckland has the highest differential ratio at 3.15 (a difference of $345 per square metre), followed by Queenstown at

3.12 (a difference of $337 per square metre). Christchurch and Hamilton have differential ratios that are a little higher than Tauranga Urban Area, at 2.23 and 2.42, respectively, although in terms of dollar value Christchurch has the least differential of $150 per square metre or $90,136 per section of 600m^2. Christchurch land values are in general lower than in Tauranga Urban Area.

According to HUD/MfE guidance, a rural-urban differential above 1 signals that zoning and/or other regulations are constraining development capacity enough to increase urban land values. It further interprets that if the differential is twice the value of adjacent non-urban land and the cost per section is above $100,000 (Tauranga City's differential is 2.02 and cost per section is $139,135), the current plans provide insufficient urban development capacity. Refer to Appendix 1 for explanation of this indicator.

Table 11 Rural-urban zone land differentials

Urban area	Ratio	Difference ($/m^2)	Difference ($/600m^2 section)
Auckland	3.15	$345	$206,722
Christchurch	2.23	$150	$90,136
Hamilton	2.42	$227	$136,213
Wellington	2.30	$201	$120,371
Queenstown	3.12	$337	$202,485
Tauranga	2.02	$232	$139,135
Whangarei	2.00	$80	$48,064

Figure 31 Tauranga: Parcel land values near rural-urban boundary

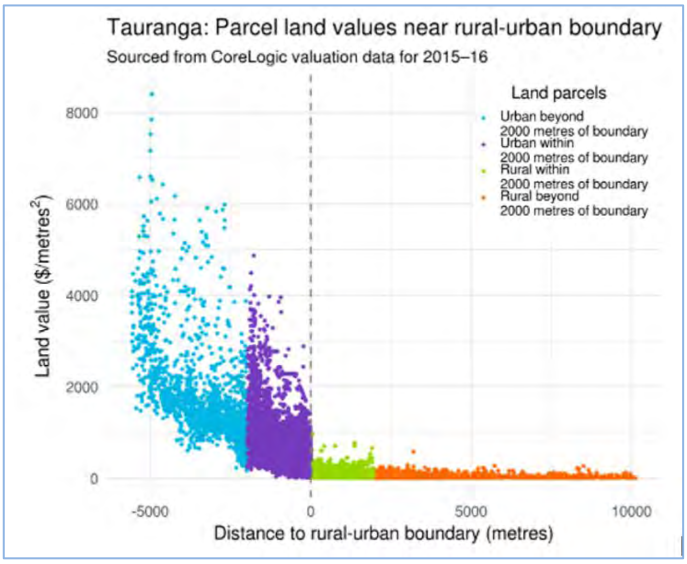
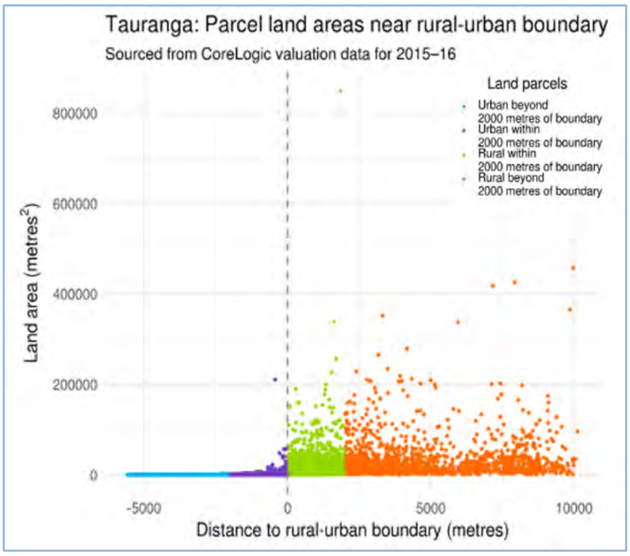


Figure 32 Tauranga: Parcel land areas near rural-urban boundary



Source: CoreLogic – HUD Urban Development Capacity Dashboard.

6.3 Land concentration control

According to HUD around 16% (777 ha) of the residentially zoned land (4,838 ha) in the Tauranga extended urban area is undeveloped with more than a quarter (27%) of this land being owned by the top five land owners, including Tauranga City Council. Excluding authority landowners (Council & Crown), undeveloped residential land accounts for 15% (712 ha) of the total residentially zoned land (4,773 ha).

Tauranga urban area has a land concentration index of 233. This index is relatively low and it shows that the residentially zoned and developable land across the whole of Tauranga extended urban area is not controlled or concentrated among few owners. According to HUD/MfE guidance, a high land concentration index means that land ownership is concentrated among few owners. Likewise a lower concentration index indicates that land holdings involve many smaller land-owners.

For more information on land concentration control, please see https://www.hud.govt.nz/assets/Urban-Development/NPS-UDC/National-Policy-Statement-on-Urban-Development-Capacity-Price-efficiency-indicators-technical-report-Land-control-indicators.pdf.

Table 12 Land concentration, Tauranga extended urban area

Item	Details
Valuation period	2015-2016
Total residential land area (ha)	4,838
Undeveloped residential area (ha)	777
Undeveloped residential area (%)	16%
Land concentration index	233
Urban area population (2017)	137,900
Population density (per residential ha)	28.5

Tauranga extended urban area covers urban areas of Tauranga City & Western Bay of Plenty District

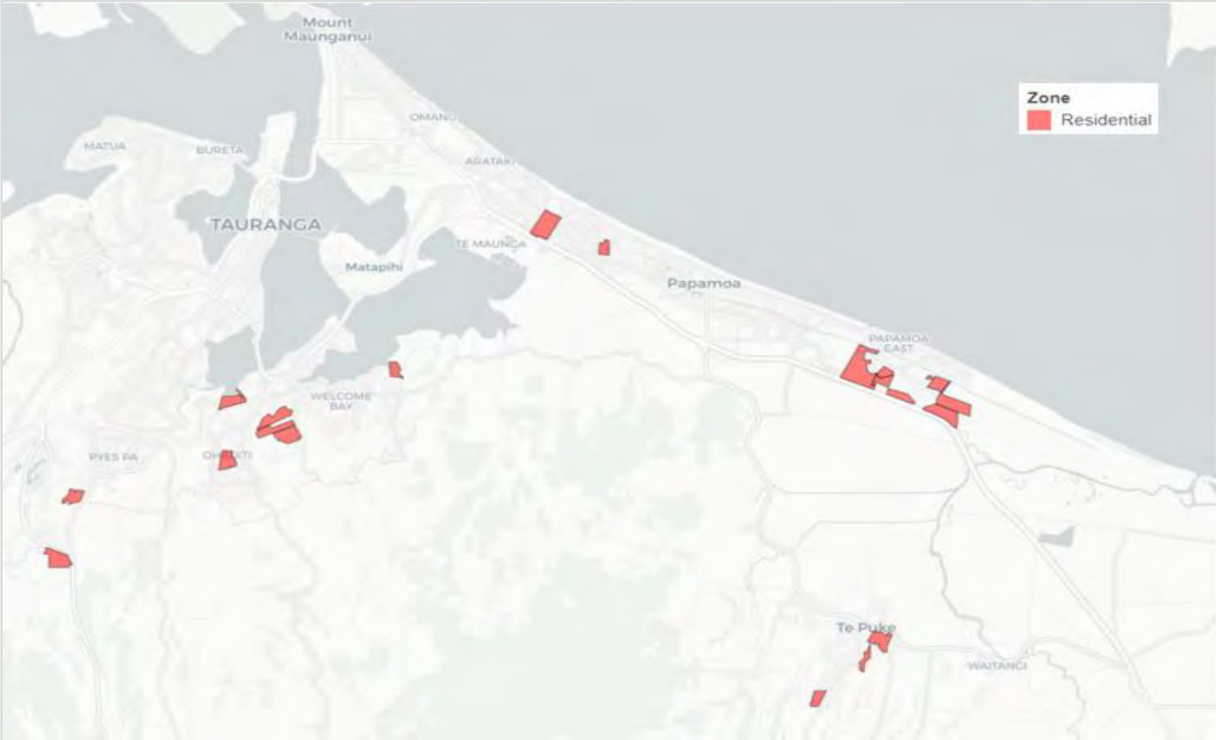
Source: CoreLogic – HUD Urban Development Capacity Dashboard.

Table 13 Largest owners of undeveloped residentially zoned land, Tauranga extended urban area

Rank	Area (has)	Number of titles	Land owner/ controlling entity	Type of entity	Market share
1	64	6	CLM Trustees Limited, Dulce May Taylor, L B D Trustees Limited	Consortium	8%
2	44	27	Bluehaven Holdings Limited	Individual entity	6%
3	39	40	Tauranga City Council	Related entities	5%
4	33	5	Port Contractors Limited	Individual entity	4%
5	32	2	The Proprietors of Mangatawa Papamoa	Individual entity	4%

Source: CoreLogic – MBIE Urban Development Capacity Dashboard.

Figure 33 Location of largest undeveloped residentially zoned land parcels, Tauranga and Te Puke[8]



Source: CoreLogic – HUD Urban Development Capacity Dashboard.

7 Business Land Trends

7.1 Zoned Business Land

SmartGrowth and the Regional Policy Statement (operative and proposed RPS) require that business land area, uptake rates and land availability be monitored in the sub-region. This is done by using zoned land as the basis for the assessment.

7.1.1 Commercial Zoned Land

Tauranga City

As at October 2018, there was 278.4 hectares of Commercial zoned land in Tauranga City. The two Parton Road commercial areas in Papamoa combined provide the largest area of 'Commercial' zoning at 39.3 ha, 2.6 ha greater in area than the Central Business District (CBD) in Tauranga Central, refer to Table 14. Smaller neighbourhood centres include Cherrywood, Bureta, and Welcome Bay. Supermarket based neighbourhood shopping centres include Bayfair, Bethlehem, Brookfield and Gate Pa. The Tauriko commercial area near the State Highway 29/36 intersection (Tauranga Crossing) is nearing full occupancy, with the construction currently on-going.

Future rezoning of land for commercial business activity is planned in Te Tumu in Papamoa East. Te Tumu is proposed to be released for both business and residential development in the latter part of the 2018-2023 planning period. A map of Commercial zoned areas is provided in Appendix 7.

[8] Te Puke is the only urban growth area in Western Bay of Plenty District, added to the Greater Tauranga Urban Map, being close to Papamoa.

Table 14 Operative and Future Commercial Zoned Land in Tauranga City

Location	Commercial Land (Ha)	
	Operative	Future
Bay Central	8.7	
CBD	36.7	
Eleventh Avenue	16.2	
Greerton	6.2	
Gate Pa	4.7	
Fraser Cove	21.7	
Bethlehem	9.4	
Brookfield	1.5	
Palm Beach	8.6	
Fashion Island	7.4	
Mount Maunganui	12.7	
Bayfair	7.7	
Owens Place	3.2	
Central Parade	1.3	
Cherrywood	0.7	
Historic Village	6.2	
Welcome Bay	1.1	
Tauriko	13.5	
Bureta	0.5	
15th Avenue	3.6	
Parton Road (2 areas)	39.3	
Judea	2.7	
Wairakei Town Centre	27.0	
Wairakei Neighbourhood Centres	6.6	
Te Tumu[1]		1.4
Other[2]	31.2	
Total	278.4	1.4

[1] The Te Tumu figure is preliminary. It is anticipated that the 60.3 ha of future Te Tumu employment land classified in Table 14 as Industrial will also provide for some commercial activity.
[2] Includes smaller parcels of Commercial zoned land which generally accommodate convenience type activities (dairies, takeaways etc) such as those areas located on Cambridge and Ohauiti roads.

Of Tauranga City's Greenfield UGA's, vacant land was identified within the Bethlehem, Papamoa (Palm Beach and Parton Road) and Papamoa East (Wairakei) commercial zoned areas, refer to Table 15.

Table 15 Uptake of Commercial Zoned Land in Tauranga City

Urban Growth Area Commercial Centres[1]	Area Zoned Commercial (ha)	Vacant Commercial Zoned Land (ha)	Percentage (%) Vacant
Bethlehem	9.36	0.39	4
Papamoa - Palm Beach	8.55	1.76	21
Papamoa - Parton Road[2]	39.28	2.36	6
Pyes Pa West - Tauriko	13.51	0	0
Papamoa East - Wairakei	33.6	33.6	100
Total	104.3	38.11	42

[1]As at October 2018. Only Commercial zoned areas with remaining vacant land in Greenfield UGAs are included in this survey.
[2] The occupied area at Parton Road commercial area includes a retirement home (7.4 ha), a stormwater pond (2.8 ha), and a camp ground (1.2 ha). A number of housing developments have recently been approved and are currently under construction in this area.

Western Bay Of Plenty

Te Puke has the largest commercial zoned land in Western Bay of Plenty District. The second largest areas of zoned commercial land are located in the urban areas of Katikati and Omokoroa with 12.7 ha and 10.12 ha respectively, refer to Table 16. In Waihi Beach the 7.39 ha of commercial land, largely consists of the Wilson Road shopping centre and an additional 1.53 ha is part of the commercial transitional zone.

Smaller neighborhood centres are located in Te Puna and Paengaroa. Other settlements in the District such as Athenree, Island View/Pios Beach, Minden, Pukehina and Maketu are serviced by comparatively small commercial areas up to 3 ha in size.

Table 16 Operative and Future Commercial Zoned Land in the Western Bay of Plenty District

Location	Commercial Land (ha)	
	Operative	Transitional[1]
Waihi Beach	7.39	1.53
Athenree	0.40	
Island View-Pios Beach	0.12	
Katikati	12.74	1.46
Omokoroa[2]	10.12	
Minden	2.21	
Te Puna	3.10	
Te Puke	14.76	
Pukehina	0.43	
Maketu	0.87	
Paengaroa	2.15	
Total	54.29	2.99

[1] Transitional Commercial zoned land is located in Waihi Beach and Katikati.
[2] Exclude the Special Housing Area which falls in the commercial zone.

7.1.2 Availability and Uptake of Industrial Zoned Land

Tauranga City

For Tauranga City, the largest area of industrial zoning is at Mount Maunganui, while the smallest area is at Sulphur Point, refer to Table 17 and Appendix 4. In May 2011 rezoning of 101.1 hectares of land for industrial purposes (Papamoa East Employment zone) was made operative at Wairakei in Papamoa East. A large proportion of employment land at Wairakei has been rezoned for residential activity following approval of a number of Special Housing Area's under the Housing Accord and Special Housing Area legislation in this locality. This has reduced the employment land by 58.6 hectares to 42.5 hectares. It is expected that loss of employment land at Wairakei will largely be provided for in the future Te Tumu urban growth area.

Table 17 Operative and Future Industrial Zoned Land in Tauranga City

Location	Industrial Land (Ha)	
	Operative	Future
Judea	23.7	
Mt Maunganui	268.0	
Greerton	12.3	
Oropi (Maleme St)	49.5	
Owens Place	6.1	
Sulphur Point	3.0	
Port Industrial	190.7	
Te Maunga	174.6	
Tauriko	251.7	
Wairakei	42.5	
Te Tumu[1]		60.3
Total	1022.1	60.3

[1]The Te Tumu figure is preliminary. It is anticipated that the 60.3 ha of future Te Tumu employment land classified in Table 14 as Industrial will also provide for some commercial activity.

Table 18 Uptake of Industrial Zoned Land in Tauranga City (as at January 2018)

Area	Vacant (ha) [1]	Partially Vacant (ha)	Total Vacant	Vacant but Not Available (ha)	Partially Vacant but Not Available	Occupied (ha)	Total Occupied (ha)	Total Area (ha)[3]
General Industrial Zoned Land[2]								
Judea	0.00	0.00	0.00	0.00	3.26	20.46	23.72	23.72
Mt Maunganui	8.01	13.83	21.84	0.82	0.00	245.40	246.22	268.05
Oropi	0.88	0.00	0.88	0.59	5.27	42.71	48.57	49.45
Greerton	0.33	0.43	0.76	0.00	0.00	11.52	11.52	12.27
Sulphur Point	0.18	0.00	0.18	0.06	0.00	2.79	2.85	3.03
Te Maunga	54.05	0.00	54.05	9.02	25.33	86.15	120.50	174.55
Owens Place	0.00	0.00	0.00	0.00	0.00	6.13	6.13	6.13
Tauriko	181.88	14.63	196.51	0.71	0.00	54.46	55.17	251.67
Wairakei[4]	30.11	0	30.11	12.37	0	0	12.37	42.48
Total	275.44	28.88	304.32	23.57	33.86	469.61	527.04	831.35
Port Industry Zone[3]								
Within Port Security Fence	0.58	0.00	0.58	0.00	0.00	156.56	156.56	157.14
Outside Port Security Fence	0.95	5.81	6.76	0.00	0.00	26.82	26.82	33.57
Total	1.53	5.81	7.34	0.00	0.00	183.38	183.38	190.71

[1] "Vacant" no structures and are largely clear of plant and material. "Partially Vacant" - up to and including 50% of the land contains structures, plant or material. "Not available" - land that is unsuitable or not available for development, due to being on unusable terrain, or designated for reserves, stormwater or future wastewater treatment use. "Occupied"– over 50% of the land contains structures, plant or material.
[2] General Industrial zoned land includes land zoned Tauriko Industry, Industry, and Papamoa East Employment.
[3] Port Industry Zone land is surveyed separately as the majority of this zone applies to the Port of Tauranga which is not accessible for survey, and its function varies from the general industrial areas.
[4] 58.58 ha of Wairakei Employment land was rezoned to Wairakei Residential zone via Tauranga City Plan Change 25 (deemed operative September 2017 – formal resolution to Council December 2017).

In Tauranga City's general industrial zoned areas vacant land was identified in most industrial areas except Judea and Owens Place - refer to Table 18. Overall 37% (or 304 hectares) of the 831.35 hectares of zoned industrial land in Tauranga City was vacant as at January 2018, with 65% (or 196.51 hectares) of this vacant land located at Tauriko industrial area.

In the Port Industry zone 4% (or 7.3 hectares) of the 190.7 hectares of Port Industry zoned land was vacant as at January 2018.

While 311 hectares was identified as vacant industrial land, it is estimated that this may fall to approximately 214 hectares as new areas are developed for industrial activity (eg: as industrial zoned land is used for road corridors and stormwater reserves). Of this 76.5 hectares of vacant land was earth-worked, serviced and ready to accommodate industrial activity as at January 2018[9].

It is noted that the development of certain industrial land is reliant on the provision of key infrastructure and/or works. The release of future stages at Tauriko requires completion of stormwater ponds and a number of roading projects. Development of industrial land at Wairakei requires construction of Te Okuroa Drive, and the completion of other key infrastructure projects. Te Maunga is subject to flood

[9] See the 2018 Tauranga City Industrial land Survey report, October 2018, for more information. The next survey of industrial land is programmed for January 2019.

hazard in certain areas which may require substantial earthworks to raise building platforms depending on the industrial use proposed.

Western Bay of Plenty District

The town in the Western Bay of Plenty District with the largest amount of Industrial land is Te Puke with 154 ha zoned, refer to Table 19. In Te Puke West an additional 72 ha of Industrial land is zoned to meet future needs in the town and is expected to yield an additional 45 ha. Katikati also contains a significant area of Industrial land with 63.12 ha zoned at present. Omokoroa has been identified as an area that will require Industrial land and 29.60 ha has been identified in Stage 2 of the Omokoroa Structure Plan which is now operative.

In the western end of the District the Te Puna Rural Business Zone contains 30.58 ha while Rangiuru in the eastern end contains 145 ha of Industrial land zoned in preparation for the Rangiuru Business Park.

Table 19 Operative and Future Industrial Zoned Land in the Western Bay of Plenty District

Location	Industrial Land (ha)	
	Operative	Future
Waihi Beach	25.56	
Katikati	63.12	
Te Puna	30.58	
Omokoroa	29.60	
Te Puke	153.95	
Rangiuru	145.0	
Paengaroa	9.57	
Maketu	0.11	
Total	544.04	0.00

Industrial land in Te Puke includes 72 Hectares from Plan Change 70 which is dependent on roading and infrastructure upgrades.

In the Western Bay of Plenty District, vacant areas of available (able to be built on now) industrial land exist in Katikati, Omokoroa, Te Puke, and Paengaroa. Of the 581.32 ha of industrial land in Western Bay of Plenty District, 28.6% (166.27 ha) is vacant and 21.1% is occupied, with the largest uptake in Te Puke of 61.27 ha.

Table 20 Uptake of Industrial Zoned Land in the Western Bay of Plenty District

Industrial Zone - 2018						
Area	**Vacant (ha)**	**Partially Vacant (ha)**	**Total Vacant (ha)**	**Not Available (ha)**	**Total Occupied (ha)**	**Total Area (ha)**
Waihi Beach	0	0	0	25.56	0	25.56
Katikati	20.68	3.73	24.41	14.82	23.89	63.12
Te Puna	0	0	0	30.58	0	30.58
Omokoroa	19.76	6.64	26.40	0	3.20	29.60
Te Puke	23.32	5.80	29.12	63.56	61.27	153.95
Rangiuru[1]	81.92	0	81.92	157.87	29.04	268.83
Paengaroa	1.09	3.21	4.3	0	5.27	9.57
Maketu	0.11	0	0.11	0	0	0.11
TOTAL	146.89	19.38	166.27	292.39	122.66	581.32
%	25.27%	3.33%	28.60%	50.30%	21.10%	100.00%

[1] Include AFFCO as part of Total Occupied

7.2 Business Land/Population Ratio

SmartGrowth requires that the business land to population ratio be monitored, refer to Table 21. The 'business land' ratio has been split into "Industrial" and "Commercial" zoned land. For the sub-region land zoned industrial is considerably higher in total to that zoned commercial resulting in more industrial land per resident reflecting the more expansive nature of this type of business activity.

Table 21 Ratio of Industrial and Commercial Zoned Land per Person in the Western Bay of Plenty Sub region

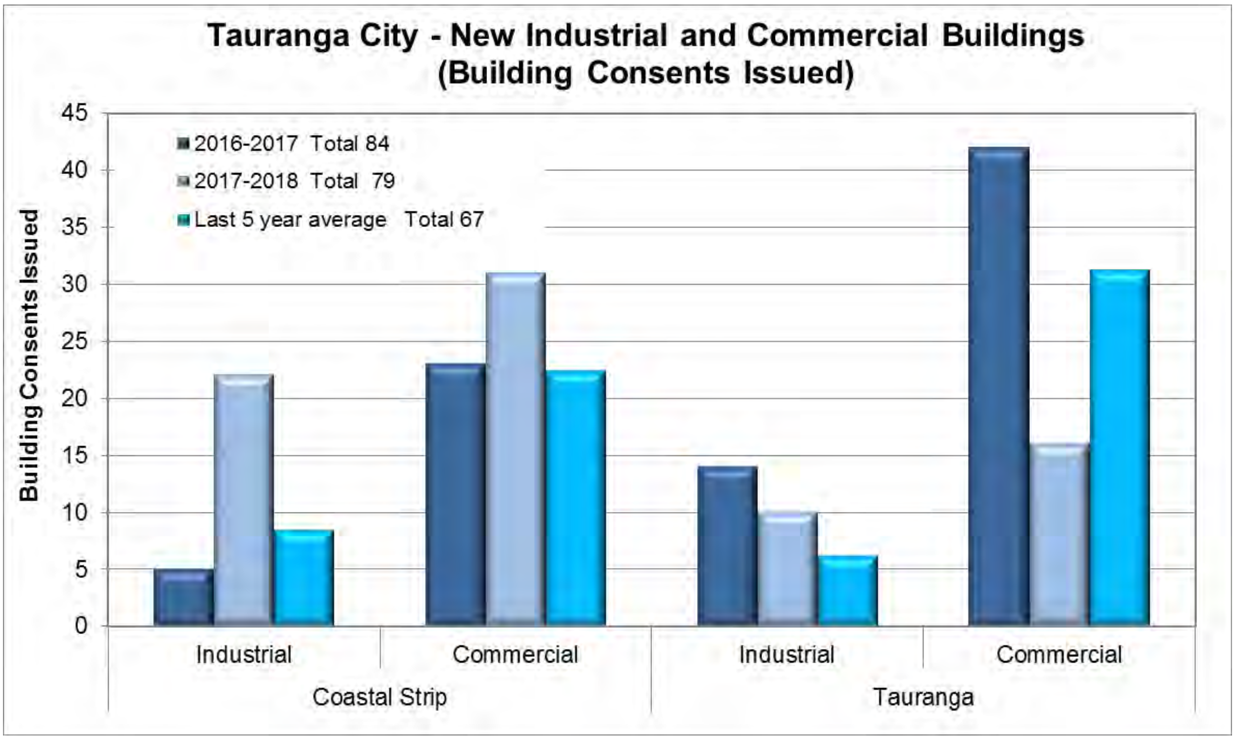
Territorial Authority	2018 Projected Population	Industrial Land (ha)	Area (ha) Industrial Land per resident	Commercial Land (ha)	Area (ha) Commercial Land per resident
Tauranga City	134,600	1022.06	0.0080	278.4	0.0021
Western Bay of Plenty District	49,285	581.32	0.0118	61.16	0.0012
Total	183,885	1,603.38	0.0087	339.56	0.0018

7.3 Industrial and Commercial Building Consents Issued

Tauranga City

The number of building consents issued for new industrial and commercial buildings declined by 6% (or 5 buildings) in 2017/2018 compared to 2016/2017 results. This, however, was higher than the 5 year average. Increases are noted in the coastal strip where there is an increase of 89% (or 25 buildings). In the Tauranga area, there were 30 less buildings consented in 2017/2018 compared to previous year.

Figure 34 New industrial and commercial buildings, Tauranga City, 2016/2018



Western Bay of Plenty District

Building consents for commercial and industrial buildings were still very slow in Western Bay of Plenty District with four new building consents issued for industrial buildings and three for commercial buildings over the 2017/2018 period.

Table 22 Consents for Industrial and Commercial Buildings in the Western Bay of Plenty District

Year	Industrial Building Consents	Commercial Building Consents
01/7/2012 - 30/6/2013	0	0
01/7/2013 - 30/6/2014	0	0
01/7/2014 - 30/6/2015	0	0
01/7/2015 - 30/6/2016	4	2
01/7/2016 - 30/6/2017	6	5
01/7/2017 - 30/6/2018	4	3
5 Year Average	2.8	2.0

7.4 Non-Residential Building Consents Issued by Type

As illustrated in the graphs below there is considerable variation between non-residential building consents issued in each local authority area. Building consents for Farm buildings are much higher in the WBOPD due to the more rural nature of activities in this area. In Tauranga City commercial buildings and factories, industrial and storage buildings are most significant.

In both areas the number of building consents issued has been relatively high from July 2014 to June 2018. The highest number of non-residential building consents since 2006 was recorded in 2006/2007 at 215 and 169, for WBOPD and Tauranga City, respectively.

Figure 35 Non-residential building consents, WBOPD (total), 2006/2018

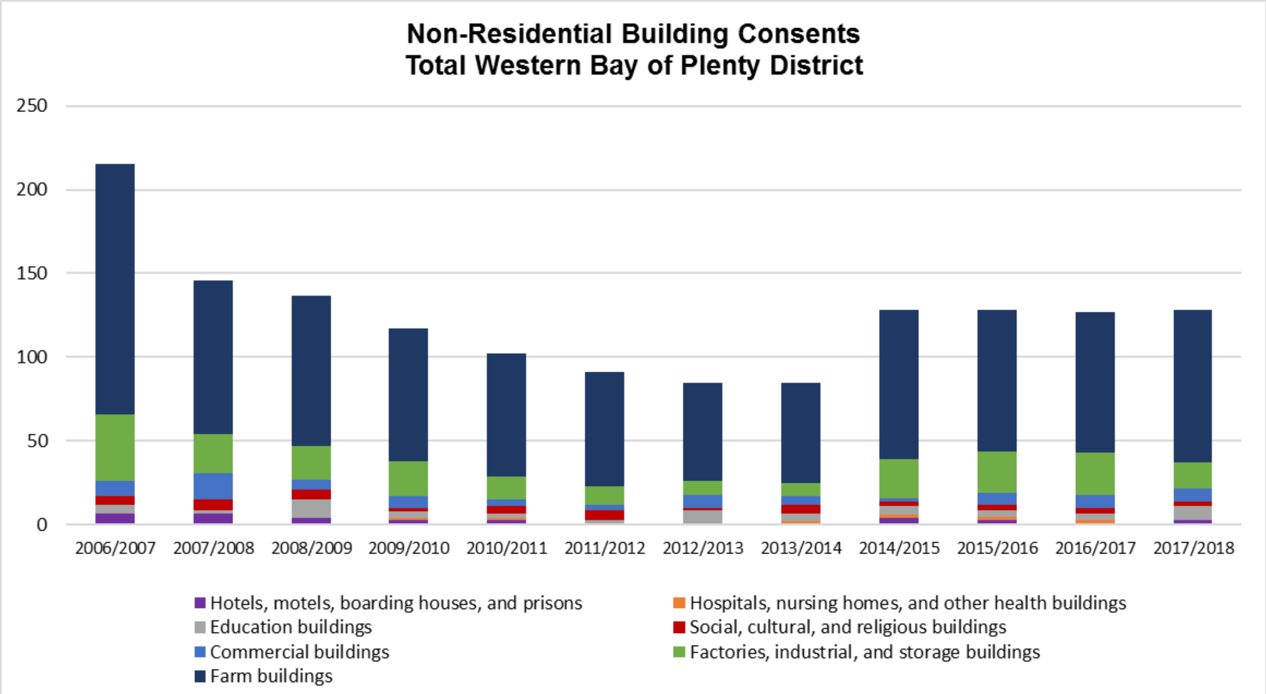
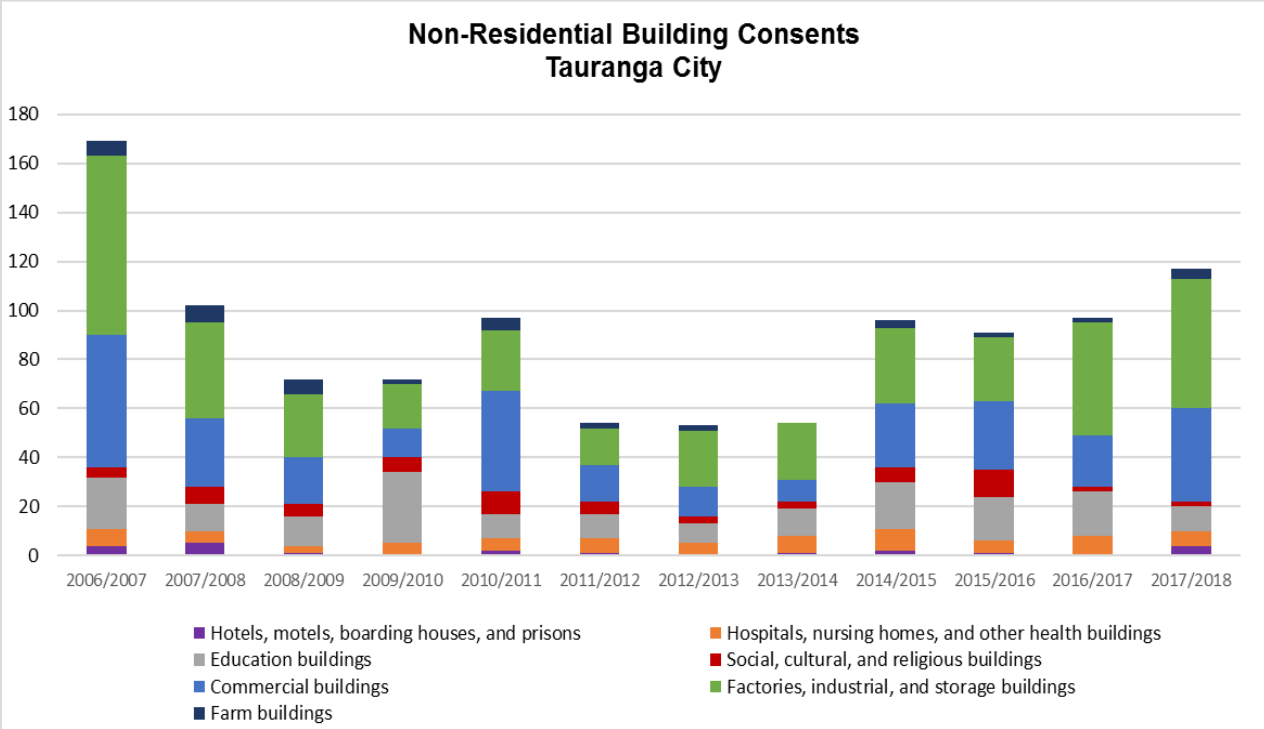


Figure 36 Non-residential building consents, Tauranga City, 2006/2018



Source: Statistics NZ Infoshare

7.5 Non-Residential Building Consents by Construction Value

The following graphs show that the change over time in total construction value and number of consents follows a similar trend line for both Tauranga City and WBOPD. A number of high value non-residential building consents has increased the total value above the number of consents from July 2014 to June 2018.

Figure 37 Non-residential building consents and average construction value, WBOPD, 2006/2018

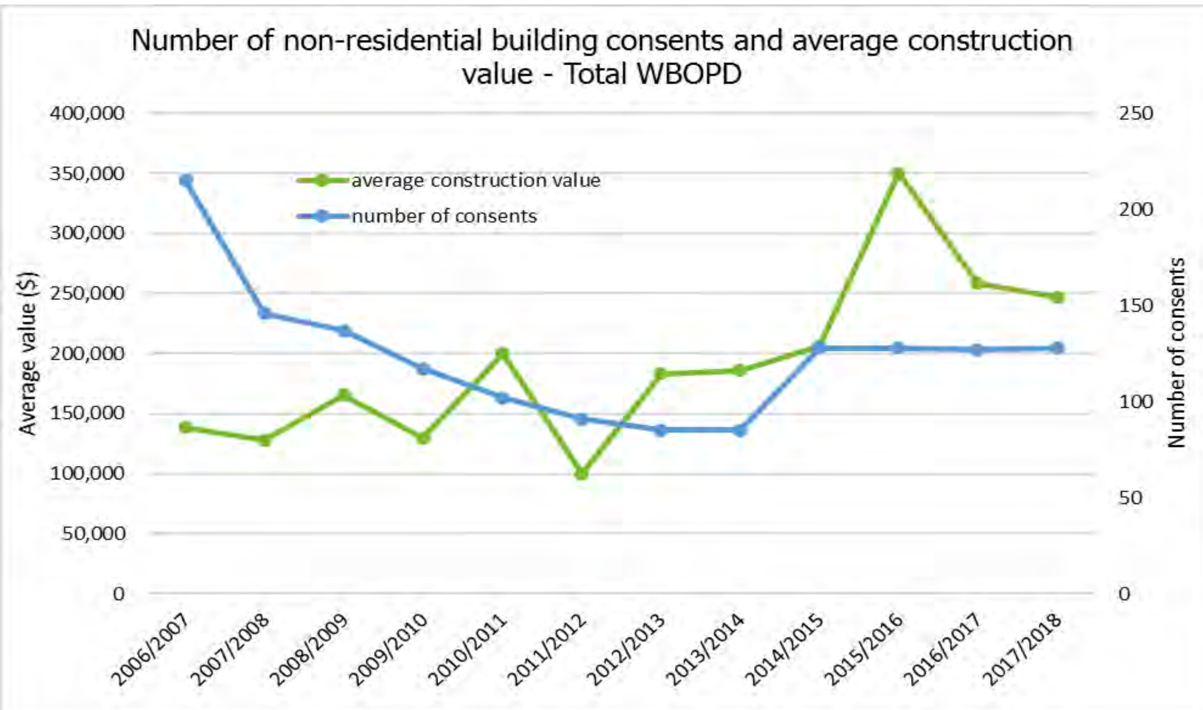
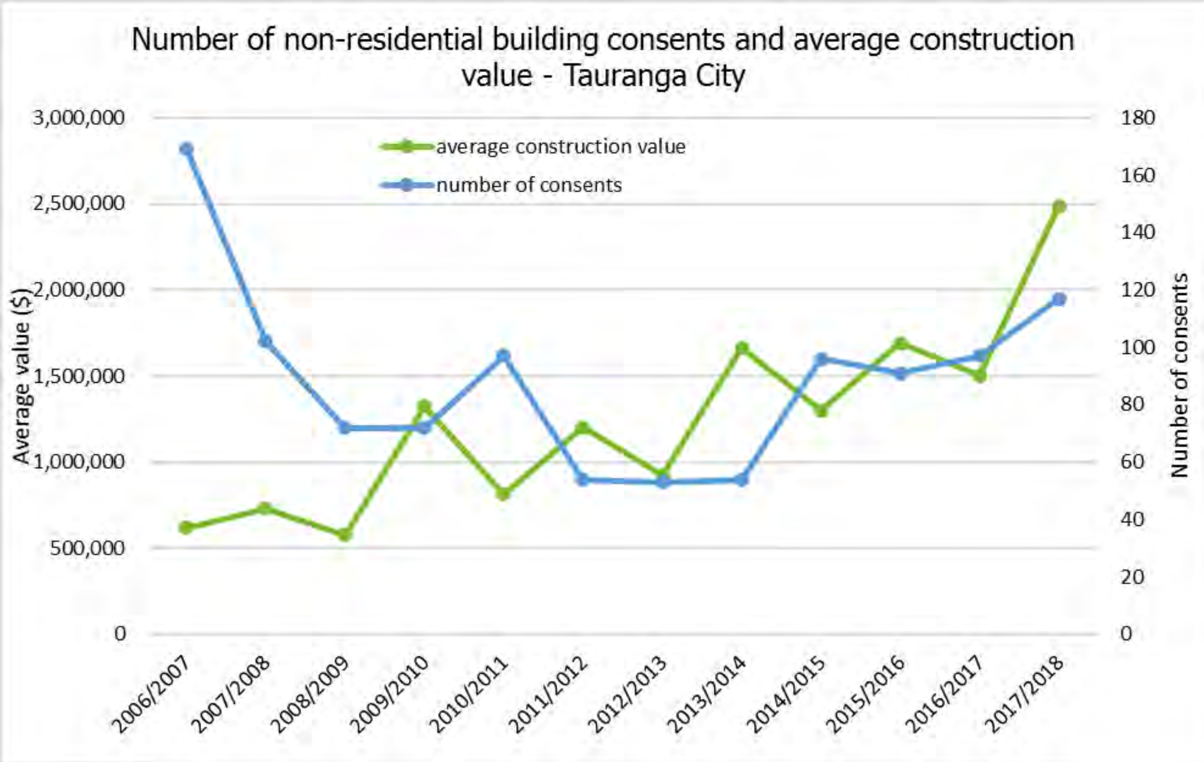


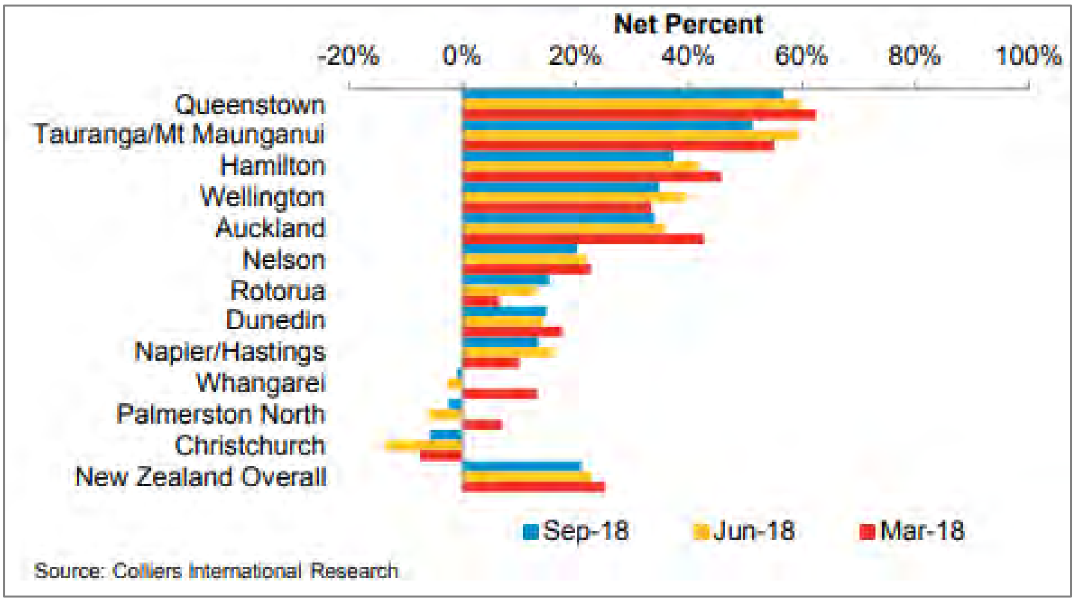
Figure 38 Non-residential building consents and average construction value, Tauranga City, 2006/2018



7.6 Commercial Property Market Outlook

Collier's International Research revealed that among the commercial centres in New Zealand, Tauranga/Mt Maunganui consistently occupied the second spot for commercial property investors' confidence for nine consecutive quarters based on the results of their quarterly commercial property investor confidence survey. In 2018, Tauranga/Mt Maunganui achieved a confidence rating of 51% during the September quarter and nearly 59% during the June quarter.

Figure 39 Commercial property investor confidence survey results, March to September, 2018



This confidence rating is manifested in the strong growth for commercial building consents. The value of building consents issued for commercial buildings in the last 12 months to 30 June 2018 was a record high at nearly $161 million, five times the previous year's level of $29 million. This is more than half (55%) of the value of all non-residential building consents issued during the reference period, which is also a record high at $291 million.

7.6.1 Tauranga Central Business District

According to Priority One, Tauranga central business district is expected to have a new look and feel, with around $350 million in private and public sector developments in the next few years. This includes the $100 million redevelopment of Farmers building that features new high rise building, with a mix of retail, food and beverage, residential properties that include townhouses and apartments, and car parking. It is expected that the retail, food and beverage and car parking components will open in mid-2020 and the residential properties will be completed in 2021. Construction of the $39 million University of Waikato-Tauranga campus is nearing completion and expected to open next year.

Tauranga CBD is changing from mostly retail to a mixed-use development consisting of residential/accommodation, entertainment, education, events, sport, tourism, office, arts and culture, and recreation and fitness facilities.

7.6.2 Bayfair Commercial Centre

The Bayfair commercial centre expansion, estimated to cost around $115 million is on-going, and will host about 50 new stores, of which Countdown is one. Most of the stores are expected to open before Christmas, with the rest opening before end of next year.

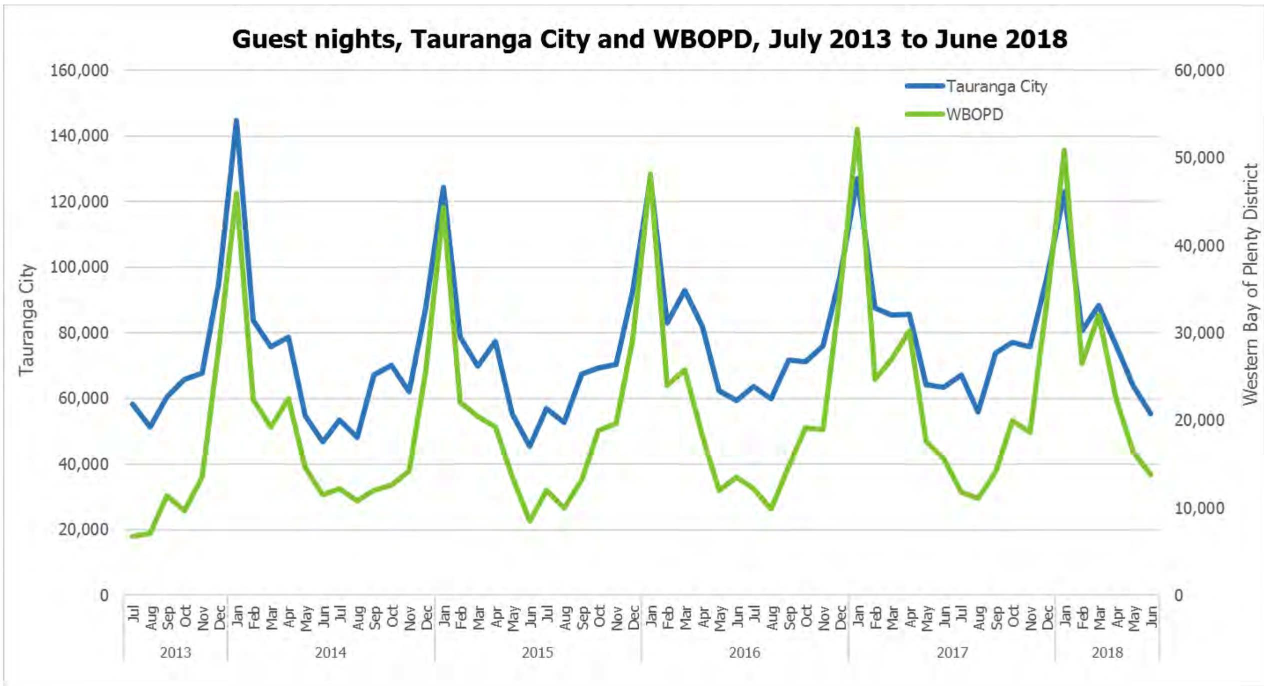
7.6.3 Tauranga Crossing

Tauranga Crossing shopping centre in Tauriko (Stage 1) opened in September 2017 providing a home to more than 20 specialty stores. Farmers also relocated to the lifestyle shopping centre this year in view of the construction of its building in the Tauranga CBD. Stage 2 will include around 90 specialty shops, eateries and cinema, with Stage 2a completed and opened in October 2018, while Stage 2b is expected to open in April 2019.

7.6.4 Accommodation and Retail Market

The graph below shows that December to February are the peak months for the commercial accommodation sector, with the highest number of guests arriving and staying in commercial accommodation (including hotels, motels/apartments, backpackers, holiday parks) in January each year. December and January are also the period when retail sales in the region are at its peak.

Figure 40 Guest nights in commercial accommodation, Tauranga City and WBOPD, July 2013 to June 2018



Source: Stats NZ Accommodation Survey

8 Current and Future Monitoring Reports

As indicated in Section 2 of this report the SmartGrowth Development Trends report continue to report on key SmartGrowth, RPS and NPS-UDS indicators on an annual basis. For the three quarters in between the annual reports, a simpler quarterly monitoring report is prepared to meet the NPS-UDC requirements starting from September 2017.

From December 2017, the indicators of price efficiency have been added to quarterly monitoring as required by NPS-UDC Policy PB7. The quarterly monitoring reports provide SmartGrowth a tool to use in improving its understanding of housing and business markets. SmartGrowth is committed to improving these monitoring documents over time.

Appendix 1

Explanation of HUD/ MfE Indicators for the National Policy Statement on Urban Development Capacity[10].

Dwelling sales prices (actual) – (SGDT Ref: Section 4.1)

Technical notes

Prices are presented in nominal terms; that is, they have not been adjusted for general inflation. Median prices are heavily influenced by the sale of existing stock, as new builds comprise a small proportion of total sales in any given period. They are also affected by the composition of sales, including the size and quality of dwellings, as well as type (houses, apartments etc.), which may vary by area and over time. This median price series is not adjusted for size and quality of dwellings.

Interpretation

This indicator shows the median prices of residential dwellings sold in each quarter. It provides a broad and recognisable picture of absolute price levels and is therefore a useful starting point for analysing price trends. Significant dwelling price growth can increase the feasibility of new developments (eg suburban apartments). On the other hand, rapid price increases can fuel land banking, where landowners expect continued future increases.

In general, if dwelling prices are rising, we would expect to see dwelling building consent numbers rise in response. If prices are rising without evidence of growth in consents, it may indicate a constraint on supply and should motivate further investigation.

Variations in prices between different areas may reflect a range of factors, including differences in demand for housing due to different wage levels or different levels of consumer and natural amenities; or imbalances between demand and supply due to constraints on housing development. Where price differences persist over long periods of time and coincide with similar rates of housing supply, they are more likely to reflect differences in demand.
Price trends reflect many different forces acting in the market, including but not limited to the effect of urban planning policies. Developing a narrative about which factors are driving price trends is challenging but can provide useful insights for a local authority's planning response to these trends.

Nominal dwelling rents – (SGDT Ref: Section 4.2)

Technical notes

This indicator reflects nominal mean rents as reported in bonds lodged with HUD, in dollars.

The data is for private bonds (private landlords) and hence excludes social housing.

The mean used is the geometric mean. The reason for using this mean is that rents cluster around round numbers, and tend to plateau for months at a time (spiking up by say $10 or $20 at a time). This makes analysis of time series difficult and using the geometric mean is a way of removing this clustering effect.

There are a number of caveats on these data series:

- Property type is self-reported so can be inconsistent, particularly the distinction between apartment and flat as there is no clear separation between these categories.
- It captures bonds at the time of lodging (typically at the start of a tenancy), so doesn't reflect subsequent changes in these rents. It will therefore tend to understate the rent over the term of a tenancy.

Interpretation

Like the median dwelling sale price indicator shown in Figure 13, this measure provides a broad and recognisable picture of absolute rent levels, and should therefore be the starting point for analysing trends in rents. In general, strong and persistent growth in rents indicates, even more strongly than house price increases, that housing supply is insufficient to meet demand.
This is because rents tend to be more sensitive to income levels than dwelling prices, and on average, renters also have lower incomes than home owners. For this reason, rent increases tend to follow incomes more closely than house prices and are less volatile.

Estimates of mean rents at a local level may be affected by the composition of rental stock (ie the size and type of rental dwellings). This does not vary markedly between territorial authority areas. However, there may be significant differences between suburbs that may make a 'like for like' comparison difficult. For instance, the Auckland city centre has a high proportion of one bedroom apartments while other suburbs are dominated by three-bedroom

10 National Policy Statement on Urban Development Capacity: Guide on Evidence and Monitoring, Ministry of Business, Innovation and Employment and the Ministry for the Environment, June 2017

stand-alone houses. More disaggregated data on rent trends for different types of rental accommodation is available on the HUD website.

The rental stock is typically of lower quality and less well maintained than owner-occupied dwellings. This means that comparing average prices with average rents may be misleading as the characteristics of the average rental property are likely to be different than the characteristics of the average dwelling sale.

The chart above presents geometric median rents for five high-growth urban areas. It shows that:

- The cost of renting is highest in Auckland and lowest in Hamilton, which is consistent with differences in median sale prices between cities
- Rents in Christchurch rose rapidly after the 2011 Canterbury Earthquake, due to the shortage of housing resulting from earthquake damage, but they have fallen since the start of 2016.

To assist in interpreting data on rents, information on the share of households living in rented accommodation versus owner-occupied housing, and the characteristics of those households, is available on Statistics New Zealand's website.

Ratio of dwelling sales prices to rents – (SGDT Ref: Section 4.4)

Technical notes

This indicator shows the ratio of nominal median dwelling prices to nominal (geometric) mean rents. The geometric mean is used to help smooth the data by removing the "clustering effect" (where rents cluster at round number amounts).

House prices relate to the whole housing stock in the selected area, not just the rented stock. As owner-occupied housing tends to be of better quality and of higher value than rented stock–this ratio tends to over-state house prices (relative to the median price for rented housing only).

This relationship between rents and house prices is often expressed as a rental yield to investors using the same data, which is calculated by mean rents divided by the median house price.

Interpretation

This indicator reflects the relationship between median house prices and mean rents in the same geographical area.

The higher the house price/rent ratio:

- *The greater the gap between renting and buying*. A ratio of 30 indicates that the price of a median house is 30 times the mean annual rent paid. High ratios will tend to reduce home ownership rates due to it being more attractive or affordable for many to rent than to buy a dwelling.
- *The lower the average yield to an investor from renting out a dwelling*. Investors vary in their motivations for purchasing rental properties, and in the types of properties they are interested in owning. Income-focused investors will seek to maximise rental yields while others may be more motivated by the expectation of capital gains over the longer term. When increases in rents don't keep pace with house prices, investors increasingly rely on capital growth as a source of returns rather than rental yield.

Further analysis of trends in home buyers may assist the interpretation of this measure. CoreLogic has a "buyer classification" that disaggregates sales according to whether the purchasers are first home buyers, existing owner 'movers', or investors. This data also records where investors are based or movers are from, so is a useful indicator of the impacts of one local area on another.'

Housing affordability indicators – (SGDT Ref: Section 4.6)

Technical notes

HAM Buy and Rent measures have been released as an 'experimental' series that will eventually be turned into official statistics on housing affordability.

These measures use data on household incomes and rents from Statistics New Zealand's Integrated Data Infrastructure, Corelogic sales price information, and mortgage interest rates.

For potential home-owning households, HAM Buy calculates what their residual income would be after housing costs if they were to buy a modest (ie lower quartile) first home in the area in which they currently live. For renting households, HAM Rent calculates what their residual income would be after paying the rent.

Households are then classified as being either above or below a 2013 National Affordability Benchmark. This is set as the median affordability for all homeowners and renters, nation-wide, in June 2013.

HAM measures are available for territorial authorities, and also for Auckland wards. At the time this guidance was released, they were only available through the first quarter of 2016, ie with a one-year lag. This indicator will be updated to be more timely in future releases. For further information, refer to HUD's website.

Interpretation

The HAM indicators provide a picture of national and regional housing affordability trends, bringing together the impact of changes in house prices or rents, mortgage interest rates and incomes.

The indicators calculate how much money households have left over after paying for their housing costs. For renting households, HAM Rent reflects how much money is left over after paying rent for an appropriately sized dwelling in the area in which they currently live. For the population of potential first home buyers, HAM Buy reflects how much money they would have left over if they were to transition from renting to home ownership by purchasing a modest home in the area in which they currently live.

These residuals are then compared with a 2013 National Affordability Benchmark, which is the national average for all renting and home-owning households. Because renting households typically have lower incomes relative to housing costs than home owners, more than half of them fall below the 2013 National Affordability Benchmark.

A higher number on the charts indicates a lower level of affordability, as it indicates that more households fall below the affordability benchmarks, and vice versa.

It is most appropriate to use HAM Buy and HAM Rent to understand trends in housing affordability in a particular area. If the share of households that do not meet the affordability benchmark is rising, it indicates that housing is becoming less affordable in an area. Comparisons between cities may be less meaningful.

Differences in the level of HAM indicators between cities could reflect a combination of factors. For instance, Auckland and Wellington have lower HAM Rent indicators than other cities (indicating better rental affordability) in spite of the fact that rents in these cities are generally higher. This reflects the fact that renting households in these cities also have higher incomes.
Given evidence that dwelling sale prices in several cities have risen significantly from 2016, it seems likely that home buyer affordability will have deteriorated. This should be picked up as the indicator is updated.

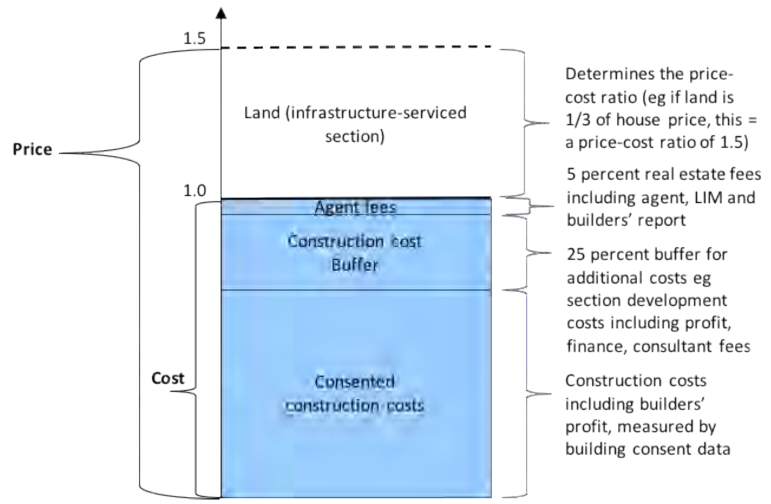
Price-Cost Ratio – (SGDT Ref: Section 6.1)

The price-cost ratio measures the relative contribution to house prices of:

- construction costs and purchase costs such as real estate agency fees
- land (infrastructure-serviced sections).

The ratios are developed by comparing the price of each house sold with the relevant building consent values, plus a 25 per cent "construction cost buffer", and 5 per cent for real estate fees and other costs of buying a home. The amount left over is the imputed cost of land (the section). The results for each house are aggregated for urban areas. The price-cost ratio is 1.5 when the cost of a section comprises one third of the house price as illustrated below.

The components of the price-cost ratio



The price-cost indicator provides a general indication of how responsive land markets are to demand, relative to construction activity.

When there are enough infrastructure-serviced sections to meet demand, land should be a minor component of the cost of a home. The price of a home should mostly reflect the cost to build it. Construction and land prices might both increase commensurately with growth in demand.

But when there is a shortage of sections for some reason, land prices can push house prices far beyond construction costs. So the gap between house prices and construction costs – the *price-cost ratio* – can be used as a general indicator of the flexibility of land markets to accommodate new homes.

The price-cost ratios calculated for high and medium growth urban areas suggest that:

- Ratios below 1 might occur in places or times where there is no growth, with houses selling below the construction cost to replace them.
- Ratios between 1 and 1.5 (that is, where the cost of an infrastructure serviced section comprises up to one-third of the price of a home) are common where the supply of land and development opportunities are relatively responsive to demand. All New Zealand urban areas had price-cost ratios of between 1 and 1.5 about 20 years ago when land and housing markets delivered more affordable housing, and these ratios are still common in places where homes are cheaper.
- Ratios above 1.5 signal that the supply of sections and development opportunities is not keeping pace with demand and land prices are materially increasing house prices.

Rural-urban differentials – (SGDT Ref: Section 6.2)

Land price differentials quantify the difference in values of land either side of a boundary between one set of land-use regulations and another set of land-use regulations. These differentials can be expressed as ratios and as dollar differences.

The rural-urban differential is a specific type of differential. It compares the value of land zoned for residential urban development with the value of land zoned for non-urban development (primarily "peri-urban" land).

Rural-urban differentials show the costs to households of land use regulations that constrain development across the city and at the city boundary. The differentials do not account for any of the benefits of land use regulation. But using the dollar values in the dashboard can help local authorities evaluate both.

When costs are high, this indicates that insufficient development capacity is materially affecting the prices of residential sections and therefore homes. The rural-urban differential provides information about whether development capacity is *currently* sufficient. This should be considered alongside household growth forecasts and development feasibility modelling in the housing and business development capacity assessment.

Differentials can also be calculated to assess the impact of zoning for different activities or to assess the impact of different regulations within a zone (eg, restrictions on density, height etc.) These various types of differentials are illustrated in the figure below: (i) rural-urban differentials, (ii) industrial zone differentials, and (iii) differentials between properties subject to different regulations in the same zone.

Interpretation

Rural-urban differentials measure the impact on urban residential section values (and therefore costs to households) of land use regulations that constrain urban development capacity. The availability of infrastructure and the way it is funded may also have some impact.

Such regulations include zoning and restrictions on density, (height limits, section coverage etc.), to avoid, remedy or mitigate the effects of urban development. These make trade-offs between minimising environmental effects and development. They affect the size of the city, how much land is allocated to different uses and the density of land uses.

Significant and/or increasing rural-urban differentials signal that these regulations, while they may exist for positive reasons, also have high or increasing costs. This can be the case when there is rapid growth in demand for housing and land use regulations are not adjusted commensurately. A high differential indicates that these regulations have been overly constraining supply and there is a need to provide more development capacity.

The logic underpinning rural-urban differentials is:

- Prices for different properties vary by location reflecting the demand/supply balance for land and housing with particular attributes, such as proximity to the coast and town centres.
- In a well-functioning land market (one where overall supply can increase responsively to demand) similar properties will have similar values. Adjacent land parcels are likely to be more similar. Large differences (jumps) in prices for similar adjacent land that cannot be explained by differences in their underlying characteristics indicate that something else is distorting prices.
- If discontinuities in prices for similar land are observed at the edges of zones that allow urban development on one side but not on the other side, then it is reasonable to infer that the regulatory constraint on development is increasing prices.

A rural-urban differential above 1 signals that zoning and/or other regulations are constraining development capacity enough to increase urban land values. The dollar per hectare difference between urban and non-urban land can be divided by the typical number of sections per hectare, to produce an estimate of the cost per section (or per household).

If the differential shows that urban land is worth, say, twice the value of adjacent non-urban land, and there is a per section cost of more than $100,000, it seems clear that current plans provide insufficient urban development capacity.

The NPS-UDC requires local authorities to address this situation by providing additional capacity and enabling development where people would like to live. This might include closer to the city centre as well as at the city fringe.

While a rural/urban differential signals the extent to which development capacity constraints are affecting land prices, it does not identify which regulations are causing this. It may be due to restrictions on densities, insufficient residential zoning compared to other uses, or limits to urban expansion.

Using rural-urban differentials

The differential is expressed both as a ratio (ie, urban land is valued at X times the value of non-urban land), and as a dollar amount per hectare (the dollar difference between urban and rural land). These measures have different uses. The ratio is easier to remember, while the dollar difference is useful for quantifying the costs of regulations, e.g. in Section 32 analyses. Ratios and dollar differences might not move in the same direction over time. If both urban and non-urban land values are increasing, the dollar difference might also increase but the ratio might stay the same. Both measures are best used in tandem.

Care needs to be taken when comparing rural-urban differentials between cities. Prices for land (both rural and urban) vary between locations according to their relative demand/supply, and the differentials do not adjust for this. For example, rural land outside of the Auckland region can be twice as expensive as rural land close to other urban centres, and urban land prices are also much higher, reflecting the value of locating in, or near, a much larger city. The higher land values of both might produce a more significant dollar difference between rural and urban land in Auckland than is observed elsewhere.

Land ownership concentration – (SGDT Ref: 6.3)

The land concentration control indicators provide information about how concentrated the ownership of undeveloped residentially zoned land is in different urban places. They indicate whether the decisions of a few individual land owners have the potential to significantly affect the supply and price of land for residential development, and hence affect housing supply.

The geographic starting point for land concentration indicators was the 'extended urban area' – which comprises the full area of territorial authorities that have jurisdiction over an area as defined by Statistics New Zealand in 2017. The Tauranga extended urban area includes the areas of Tauranga City and Western Bay of Plenty District.

Three sets of information are provided for an extended urban area:

1. A table showing the total area of land zoned in the District Plan for urban residential development and the proportion of this that is 'undeveloped', alongside Stats NZ estimates of population for urban areas and zones.
2. An index of land concentration control of undeveloped land that is zoned for urban residential development. This index produces a single number from close to zero (highly distributed ownership where each parcel is the same size and is owned by different entity) and 10,000 (where all of the land would be owned by one entity.
3. A table identifying the largest owners of undeveloped land zoned for residential development, the number of cities and total area of land that they each own, and their share of the market; and a map of there the parcels are located.

Land concentration control indicators use three sources of data:

- CoreLogic's rating valuation data, which provides information on the zoning of individual sites within urban areas, existing land use, building floor area and property valuations, which are used to estimate capital/land value rations
- Land Information New Zealand's (LINZ) land parcels and titles database, which provides information on parcel sizes and the names of people and/or companies listed as owners on the title
- Companies Office data on companies and their shareholders and holding companies, which can be matched to land title data to identify owners that are related via company structures.

The land ownership concentration indicators are designed to be used as a package. Together they indicate:

- how much undeveloped land is currently zoned for residential development in a local area (compared to other places)
- whether or not this land is held by a few land-owners that could have a disproportionate impact on its availability for development, and therefore on prices
- whether land that might be zoned for urban residential development in the future would be concentrated in the lands of a few land-owners, leading to an uncompetitive situation in future
- where is the land owned by the most significant land-owners.

The indicators indicate whether concentrated land ownership can help explain high or increasing price-cost ratios up until now and provides a picture of what could happen in the future. This can help inform future development strategies that identify the location and timing of rezoning and infrastructure provision.

Appendix 2

Explanation of Development Terms

"Urban" refers to subdivisions or dwelling consents in:

Western Bay of Plenty District - Residential, Future Urban, Commercial, Industrial, or Multi zones.

Tauranga City – Suburban Residential, High Density Residential, City Living, Wairakei Residential, Papamoa East Employment, Town Centre Core (Wairakei), Town Centre Fringe (Wairakei) Marae Community (Urban), Rural-residential, Commercial and Industry zones.

"Rural" refers to subdivisions or dwelling consents in:

Western Bay of Plenty District - Rural, Rural-residential or Lifestyle zones.

Tauranga City – Rural, Rural Marae Community), and Te Tumu Future Urban zones.

Other terms used:

Western Bay of Plenty District – "Other urban areas" refers to minor urban areas such as Maketu, Pukehina, Paengaroa, Tanners Point, Kauri Point etc.

Tauranga City – "Coastal Strip" refers to Mt Maunganui-Papamoa, specifically the area units of Mt Maunganui North, Omanu, Matapihi, Arataki, Te Maunga, Pacific View, Palm Beach, Gravatt, Papamoa Beach East, Palm Springs, and Doncaster. "Tauranga" refers to all other area units in Tauranga City.

Greenfield UGA – Greenfield Urban Growth Area.

SP – Structure Plan.

Subdivision Process

Subdivisions go through a staged approval process that can last up to eight years.

Stage 1 Subdivision Plan

Subdivision is approved by the Council under section 104 of the Resource Management Act 1991 (RMA). This approval has a legal life of up to 5 years.

Stage 2 Survey Plan

This is approved under section 223 RMA. This approval has a legal life of up to 3 years.

Stage 3 Final Approval

Occurs under section 224 RMA. This is confirmation that all conditions of the subdivision consent have been complied with. After the Council issues a Section 224 Certificate individual property titles can be issued, once the subdivision proceeds to title issue under the Land Transfer Act. It is assumed for monitoring purposes that all Section 224 Certificates proceed to title issue.

A distinction is made between subdivisions approved and additional lots created at the Section 224 Certificate stage. The number of subdivisions approved does not necessarily indicate the likely future number of new lots created in the District, and hence the demand for services.

A more accurate indicator of growth is additional lots created at Section 224 approval stage. For monitoring purposes, this figure is used to interpret land uptake rates (along with dwelling consent data) and vacant land supply. In the Western Bay of Plenty District the ratio of urban land uptake in Greenfield UGA's to rural subdivision is expected to increase as infrastructure is improved at Waihi Beach, Katikati, Omokoroa and Te Puke.

In Tauranga City, the uptake of urban land in Greenfield UGA's is calculated from Section 224/new title information to indicate the proportion of planned capacity that has been "urbanised". The predictive value of this measure is reduced in the infill area primarily in areas where unit title developments are more common (such as Mount Maunganui and Tauranga Central) as these are issued at the time of, or after, the building consent has been approved.

Before a subdivision reaches final approval stage, variations to the original application can be submitted to the Council. Either a variation or the original application may go through to final approval stage. For this reason variations are not included in the total subdivisions approved, so as not to count them twice.

Subdivisions are only indicative of development where additional lots to the original title or titles are created. For this reason all subdivisions reported on do not include resource consent approvals for boundary adjustments or access ways etc. that do not result in additional lots being created.

Building Consent Issue for Dwellings

Western Bay of Plenty District

In the Western Bay of Plenty District, building consents issued for new dwellings provide a good indicator of growth rates in different areas. It should be noted that where dwelling consents are referred to in this report, the figures include consents for new and resited dwellings, but not for additions or alterations to existing dwellings.

Tauranga City

Building consents issued for new dwellings make up about 45% of all building consents issued. New dwellings are recorded in a similar manner to the Western Bay of Plenty District, including new dwellings, relocated dwellings and conversions of existing buildings to dwellings; it does not include additions or alterations to existing dwellings. Where dwellings are demolished or removed from a site, or changed in use to a non-residential activity, they are deducted from the "new dwelling" count to produce an "additional dwelling" count for comparison with the SmartGrowth dwelling projections in Section 3.3 of this report.

Residential Growth Areas

Western Bay of Plenty District

These areas are the settlements of Waihi Beach (including Island View, Pios Beach, and Athenree), Katikati, Omokoroa and Te Puke. These areas have been identified as the urban growth centres for the District in the Western Bay of Plenty District Council.

All residential growth areas in the District; Te Puke, Katikati, Waihi Beach and Omokoroa, are now serviced by comprehensive sewerage schemes while the communities of Maketu/Little Waihi and Pukehina are currently served by septic tanks. Plans for a wastewater collection, treatment and disposal system or transfer pipeline for these areas are currently progressing.

The Western Bay of Plenty District Plan contains different subdivision standards in recognition of the ability of areas to accommodate future growth. This is dependent upon infrastructure availability, particularly wastewater disposal.

- For unsewered urban areas, a minimum net lot size of 1600m^2 is required to subdivide, as the minimum net lot size is 800m^2. To allow for access ways, 1800m^2 is used for monitoring purposes for subdivision potential.
- For sewered urban areas, a minimum net lot size of 700m^2 is required to subdivide, as the minimum net lot size is 350m^2. To allow for access ways, 800m^2 is used for monitoring purposes for subdivision potential except in Omokoroa where a minimum lot size of 400m^2 is permitted in Stage 1 and a minimum of 600m^2 is allowed in the existing village.

For monitoring purposes, the future growth potential of areas is limited largely by the sewerage systems available.

Tauranga City

The Greenfield UGA's are the developing suburbs of Bethlehem, Pyes Pa, Pyes Pa West (the Lakes), Ohauiti, Welcome Bay, Wairakei (Papamoa East) and Papamoa. The Greenfield UGA's are part of a comprehensive infrastructure planning approach to "greenfield" urban development. Areas outside the identified Greenfield UGA's do not have services supplied to them. In this way the Council manages the uptake of land for development.

The other significant areas of urban development is infill development in established residential areas, and residential intensification (currently limited to the Mount Maunganui High Density Residential zoned area northwest of Banks and Salisbury avenues, and the City Living zoned areas surrounding the Tauranga CBD) within established residential areas of Tauranga.

Vacant Land

Vacant residential land is generally identified in the sub-region as either *infill* or *greenfield*. Monitoring infill subdivisions tells us the rate of land uptake within established residential areas. Infill subdivisions are expected to continue to accommodate a substantial proportion of projected growth, especially close to main commercial areas.

In Western Bay of Plenty District, a subdivision yield of 11 sections per hectare is used for determining the development potential of residential greenfield areas. This figure is reflective of current development patterns. In Tauranga City, the yield varies from 9 to 15 sections per hectare in response to physical constraints (e.g. topography) and to the strategic intent for each Greenfield UGA structure plan.

Western Bay of Plenty District

Vacant residential land is identified in the Western Bay of Plenty District as either *infill* or *greenfield* determined by the size of the land parcel. This is reported on for the residential growth areas in the District.

Residential infill	existing urban areas of Western Bay District where a land parcel is 800m^2 or with the potential to enable subdivision to a minimum lot size of 350m^2. Except in Omokoroa where a minimum lot size of 400m^2 is permitted in Stage 1 and a minimum of 600m^2 is allowed in the existing village.

Residential greenfield any land parcel which is subdivided within Greenfield UGAs (constituting "traditional" rezoning of rural land to residential, and subdivision and development for residential purposes).

In the Western Bay of Plenty District a practical figure of potential infill development is calculated by taking the number of developed lots over $800m^2$ (sewered) and $1800m^2$ (unsewered) in a residential zone and multiplying this figure by 56%[1].

Tauranga City

Vacant residential land is classified in Tauranga City as either Infill, Rural Infill or Greenfield UGA Within the infill areas some residential intensification is expected within identified Residential Intensification Areas and within general residential infill/ intensification areas where appropriate.

Residential Intensification Areas currently this classification is applied to development within the High Density Residential zoned area in Mount Maunganui North, and City Living and City Centre zoned areas where greater density is permitted.

Residential infill/ Intensification existing urban areas of Tauranga zoned Suburban Residential where a land parcel is 650 m^2 or with the potential to enable subdivision to a minimum lot size of 325 m^2*.* Includes residential growth in other zones within the infill area such as in Commercial Business zoned areas.

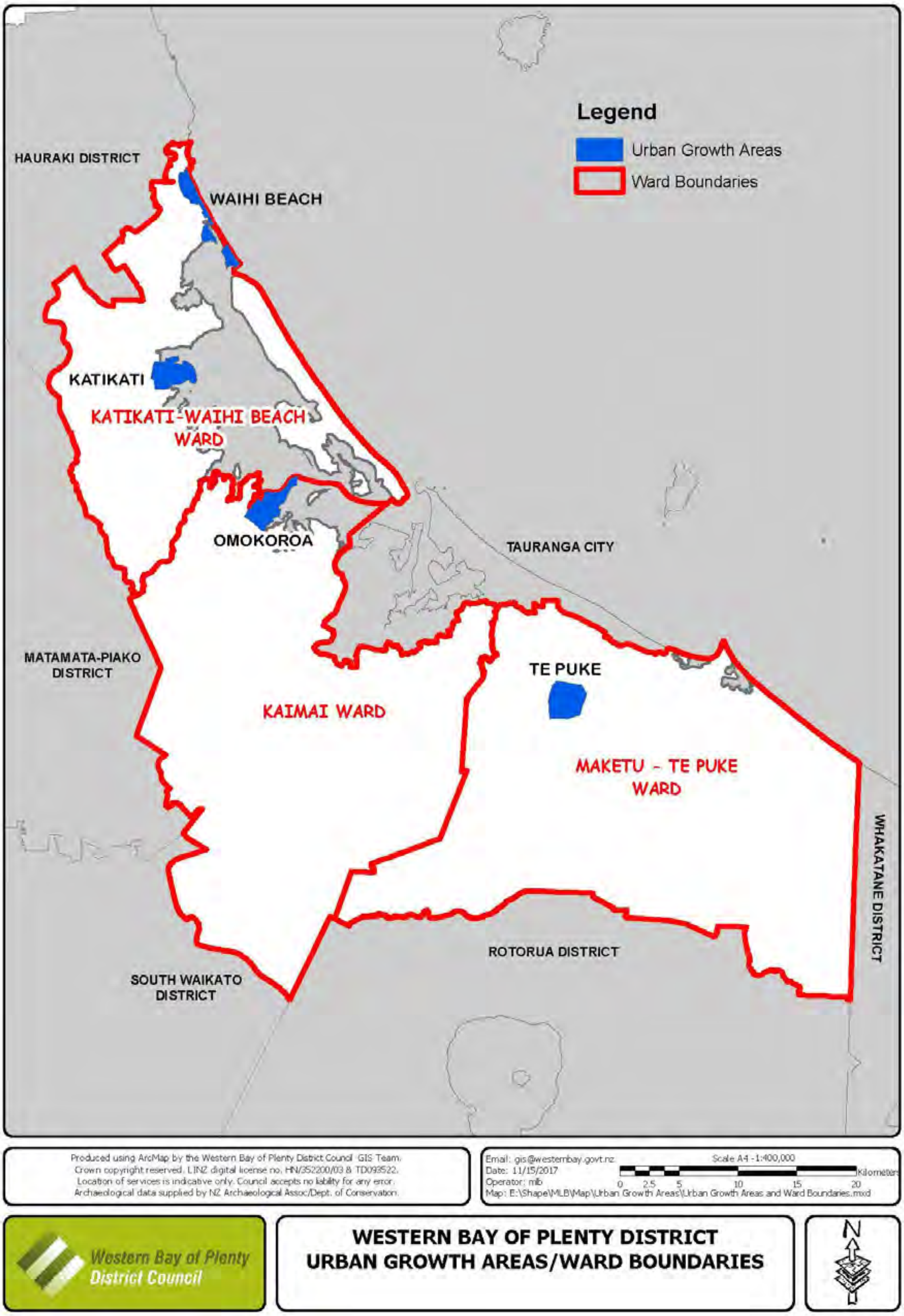
Rural Infill Areas of Tauranga City with Rural zoning outside the Greenfield UGA's

Residential Greenfield UGA's any land parcel which is subdivided within Greenfield UGA's (constituting "traditional" rezoning of rural land to residential, and subdivision and development for residential purposes).

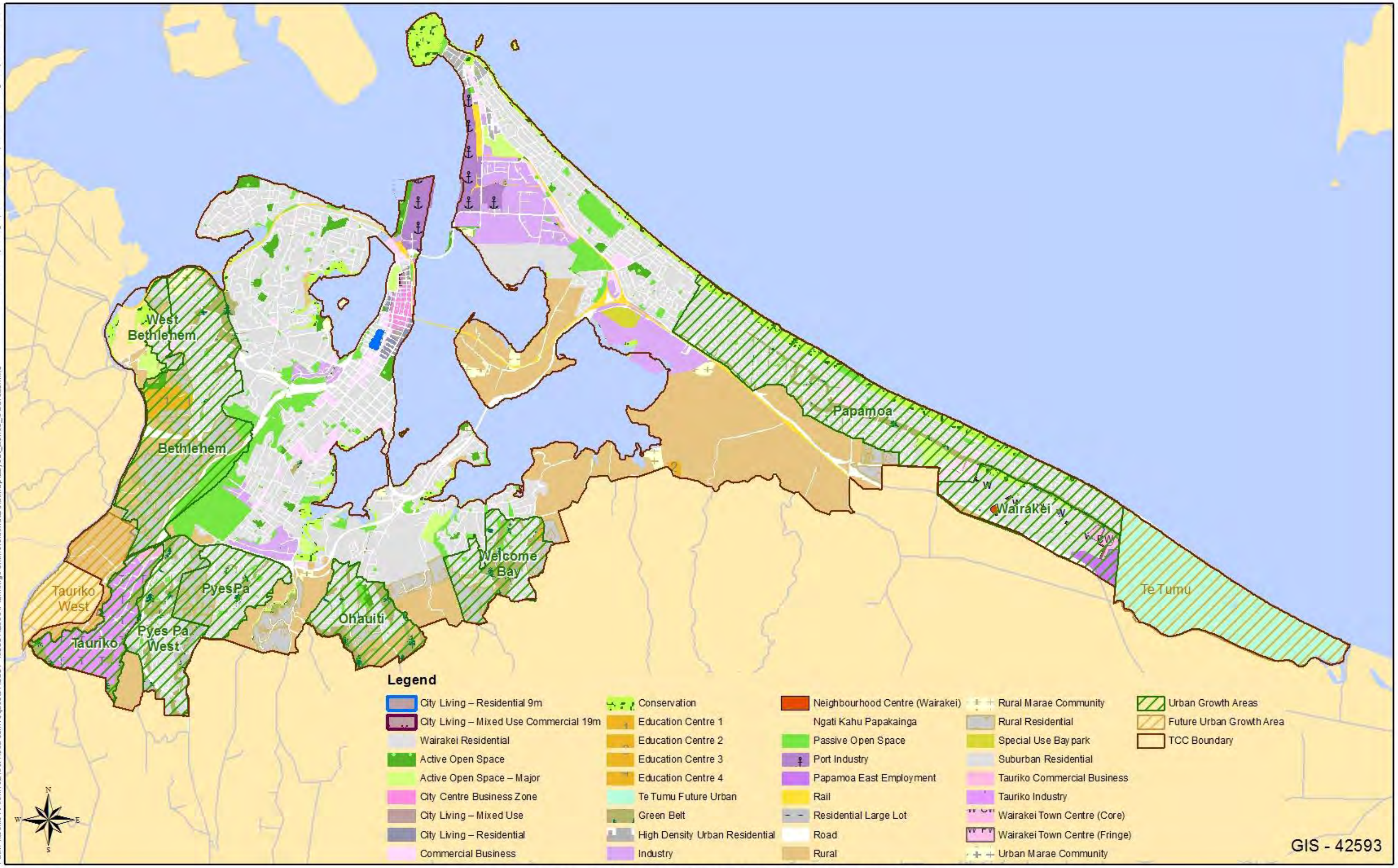
[1] Theoretical calculations assume that every developed lot has only one dwelling, and that it is positioned in such a way that there is enough spare land to locate an additional dwelling. This of course is incorrect and a theoretical figure is produced when all of these properties are calculated. To obtain a more realistic figure of properties that could be further developed, the theoretical figure is multiplied by 56% to give a practical figure. This percentage was obtained through a desktop analysis of aerial photographs of Waihi Beach in late 1998. A sample area was examined to obtain a realistic number of developed properties that had potential for further development, without shifting the existing dwelling, and a comparison made back to the theoretical figure calculated for that exercise.

Appendix 3

Western Bay of Plenty District Development Map



Tauranga City Development Map



PLANNING ZONES AND URBAN GROWTH AREAS

- Tauranga City Council -

0 1.25 2.5 5 7.5 10 Kilometers

Tauranga City

Appendix 4

Dwelling Occupancy By Census Area Unit – Western Bay of Plenty District and Tauranga City.

Western Bay of Plenty District (2013 Census)

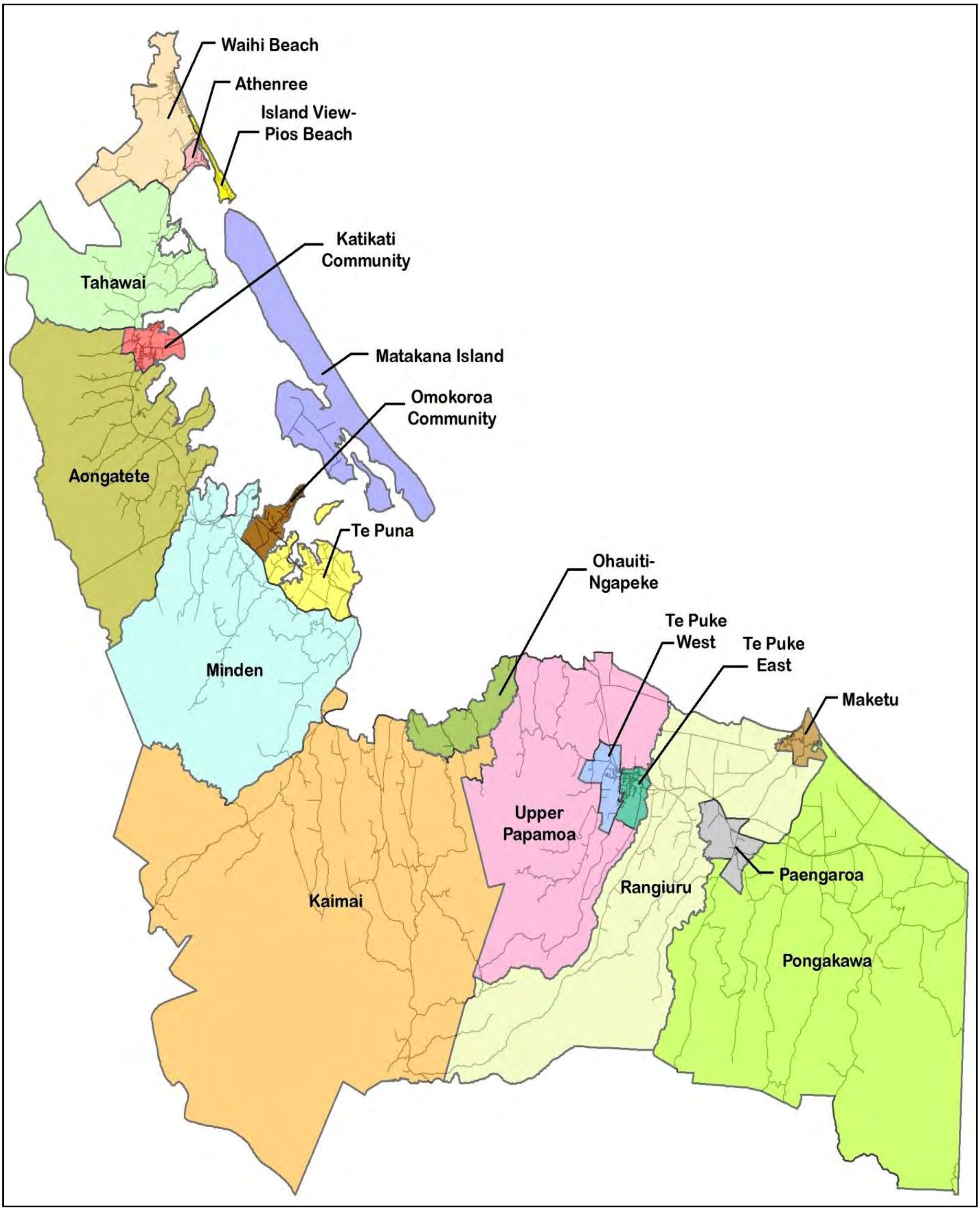
Census Area Unit	Population	2013 Occupied Dwelling Count	2013 Unoccupied Dwelling Count	2013 Total Dwelling Count	Unoccupied/ Total Ratio (%)
Waihi Beach	1,935	888	858	1,746	49
Athenree	672	267	105	372	28
Island View-Pios Beach	543	249	387	636	61
Matakana Island	255	87	45	132	34
Katikati	4,059	1,686	174	1,860	9
Tahawai	1,707	708	87	795	11
Aongatete	2,832	1,113	117	1,230	10
Omokoroa	2,547	1,071	147	1,218	12
Te Puna	2,439	918	54	972	6
Minden	4,401	1,662	111	1,773	6
Kaimai	5,286	1,956	123	2,079	6
Ohauiti-Ngapeke	711	279	18	297	6
Upper Papamoa	2,166	813	57	870	7
Maketu	1,047	405	144	549	26
Paengaroa	906	339	21	360	6
Rangiuru	2,097	747	78	825	9
Pongakawa	2,595	1,002	441	1,443	31
Te Puke	7,494	2,748	189	2,937	6
TOTAL	43,692	16,938	3,156	20,094	16

Tauranga City (2013 Census)

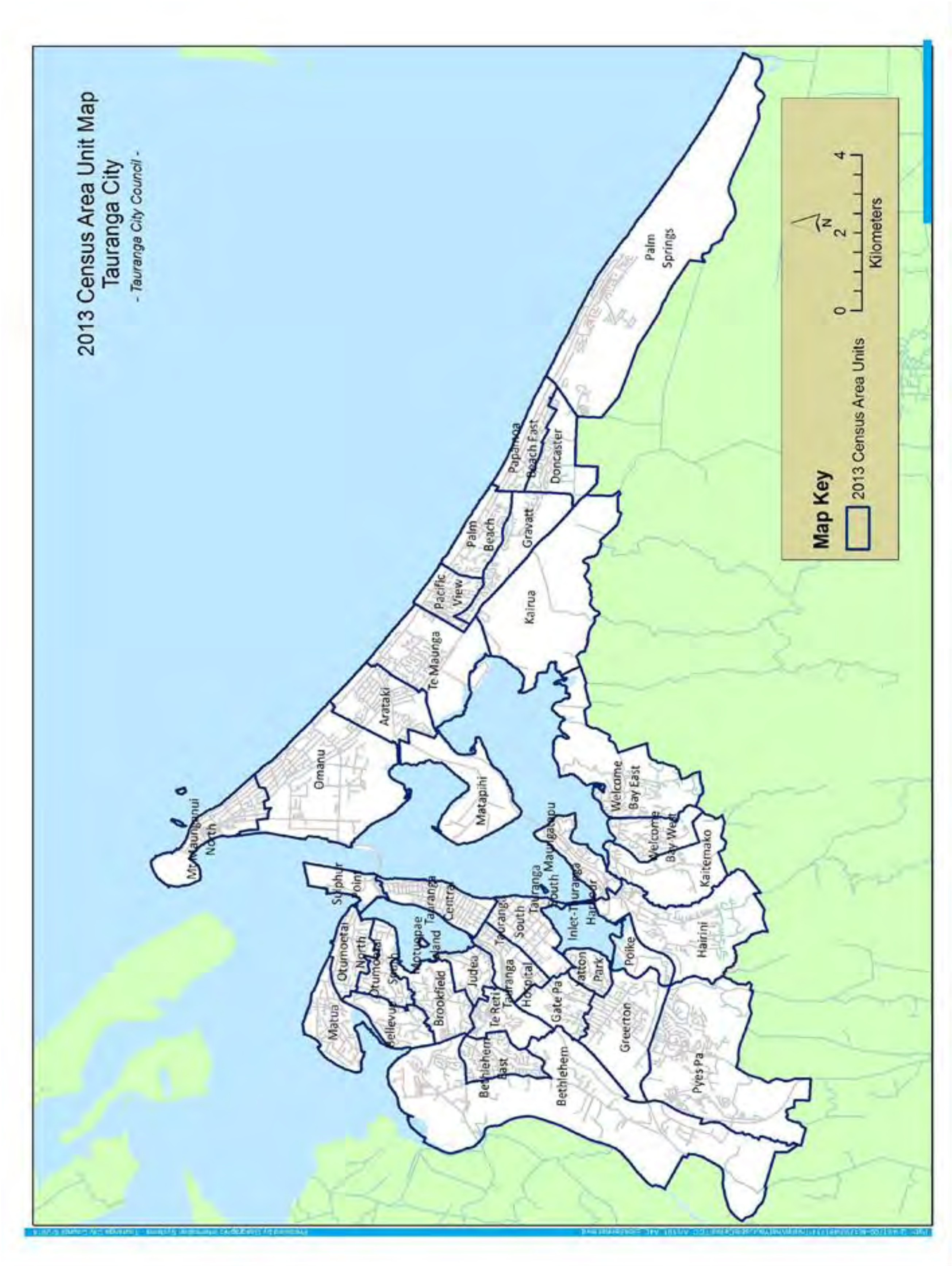
Census Area Unit	2013 Occupied Dwellings	2013 Unoccupied Dwellings	2013 Total Dwellings	Unoccupied/ Total Ratio (%)
Papamoa Beach East	1,269	147	1,416	10
Palm Springs	1,563	294	1,857	16
Doncaster	927	66	993	7
Matapihi	222	12	234	5
Inlet-Tauranga Harbour	9	-	0	0
Waikareao Estuary	-	-	0	0
Motuopae Island	-	-	0	0
Kairua	147	6	153	4
Bethlehem East	1,332	60	1,392	4
Bethlehem	1,353	102	1,455	7
Pacific View	1,125	117	1,242	9
Palm Beach	1,410	180	1,590	11
Gravatt	1,224	87	1,311	7
Mt Maunganui North	1,992	921	2,913	32
Omanu	2,133	357	2,490	14
Tauranga City-Marinas	51	3	54	6
Arataki	2,085	216	2,301	9
Te Maunga	2,199	234	2,433	10
Matua	2,067	111	2,178	5
Bellevue	1,248	51	1,299	4
Otumoetai North	1,767	147	1,914	8
Otumoetai South	1,413	78	1,491	5
Brookfield	1,920	108	2,028	5
Te Reti	594	39	633	6
Judea	975	78	1,053	7
Gate Pa	1,128	63	1,191	5
Greerton	1,830	105	1,935	5
Pyes Pa	2,145	141	2,286	6
Yatton Park	840	75	915	8
Poike	267	6	273	2
Hairini	2,280	123	2,403	5
Maungatapu	1,092	75	1,167	6
Tauranga Hospital	777	51	828	6
Tauranga South	1,926	135	2,061	7
Tauranga Central	1,041	123	1,164	11
Sulphur Point	15	3	18	17
Kaitemako	495	27	522	5
Welcome Bay West	1,221	51	1,272	4
Welcome Bay East	1,278	87	1,365	6
Total	45,366	4473	49,839	9

Appendix 5

Western Bay of Plenty District Census Area Unit Map

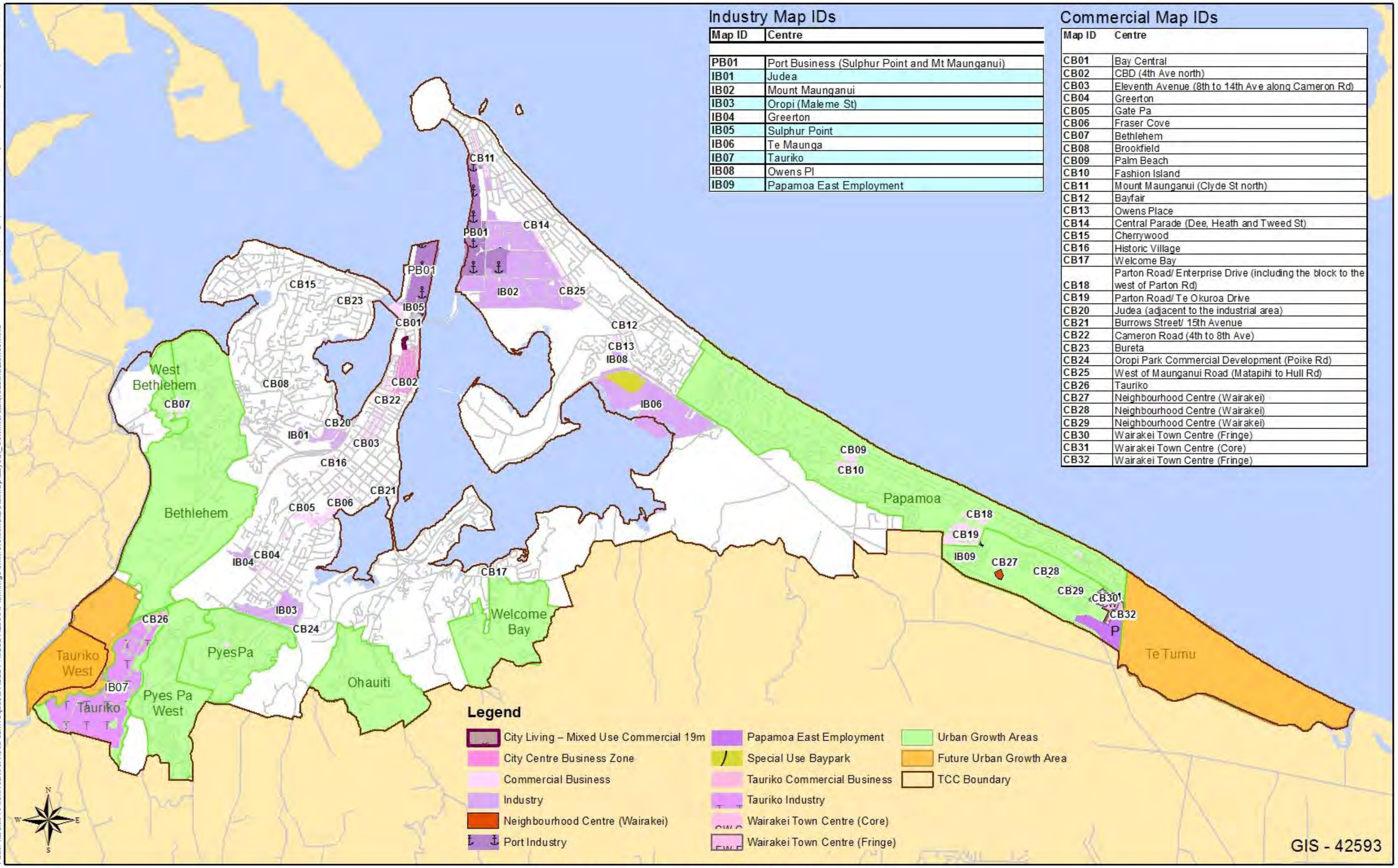


Tauranga City Census Area Unit Map (2013 Census)



Appendix 6

Tauranga City Commercial and Industry Zoned Areas



Industry Map IDs

Map ID	Centre
PB01	Port Business (Sulphur Point and Mt Maunganui)
IB01	Judea
IB02	Mount Maunganui
IB03	Oropi (Maleme St)
IB04	Greerton
IB05	Sulphur Point
IB06	Te Maunga
IB07	Tauriko
IB08	Owens Pl
IB09	Papamoa East Employment

Commercial Map IDs

Map ID	Centre
CB01	Bay Central
CB02	CBD (4th Ave north)
CB03	Eleventh Avenue (8th to 14th Ave along Cameron Rd)
CB04	Greerton
CB05	Gate Pa
CB06	Fraser Cove
CB07	Bethlehem
CB08	Brookfield
CB09	Palm Beach
CB10	Fashion Island
CB11	Mount Maunganui (Clyde St north)
CB12	Bayfair
CB13	Owens Place
CB14	Central Parade (Dee, Heath and Tweed St)
CB15	Cherrywood
CB16	Historic Village
CB17	Welcome Bay
CB18	Parton Road/ Enterprise Drive (including the block to the west of Parton Rd)
CB19	Parton Road/ Te Okuroa Drive
CB20	Judea (adjacent to the industrial area)
CB21	Burrows Street/ 15th Avenue
CB22	Cameron Road (4th to 8th Ave)
CB23	Bureta
CB24	Oropi Park Commercial Development (Poike Rd)
CB25	West of Maunganui Road (Matapihi to Hull Rd)
CB26	Tauriko
CB27	Neighbourhood Centre (Wairakei)
CB28	Neighbourhood Centre (Wairakei)
CB29	Neighbourhood Centre (Wairakei)
CB30	Wairakei Town Centre (Fringe)
CB31	Wairakei Town Centre (Core)
CB32	Wairakei Town Centre (Fringe)

COMMERCIAL AND INDUSTRIAL AREAS

- Tauranga City Council -

0 1.25 2.5 5 7.5 10 Kilometers

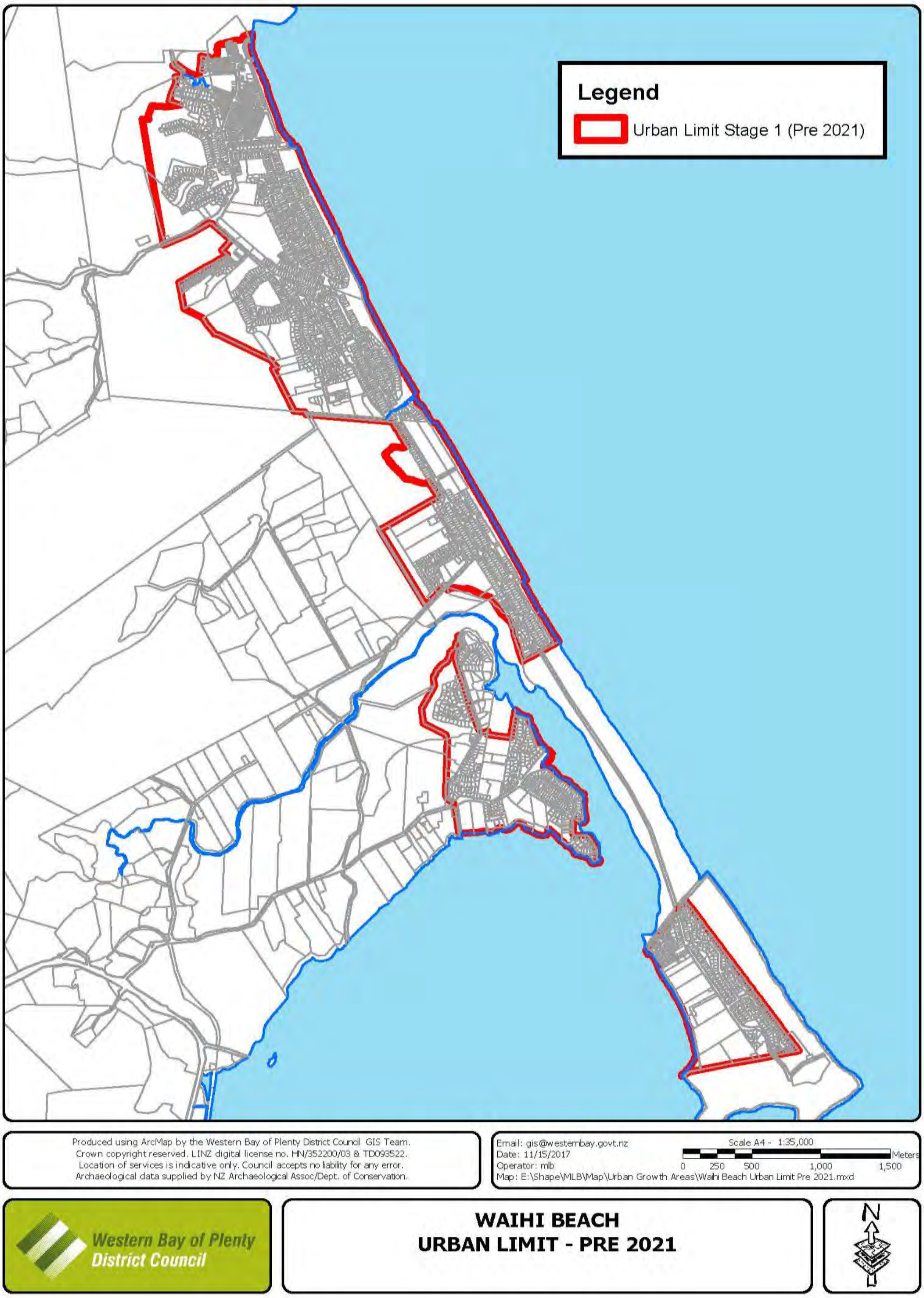
Information shown on this plan is indicative only. The Council accepts no liability for its accuracy and it is your responsibility to ensure that the data contained herein is appropriate and applicable to the end use intended.

Tauranga City

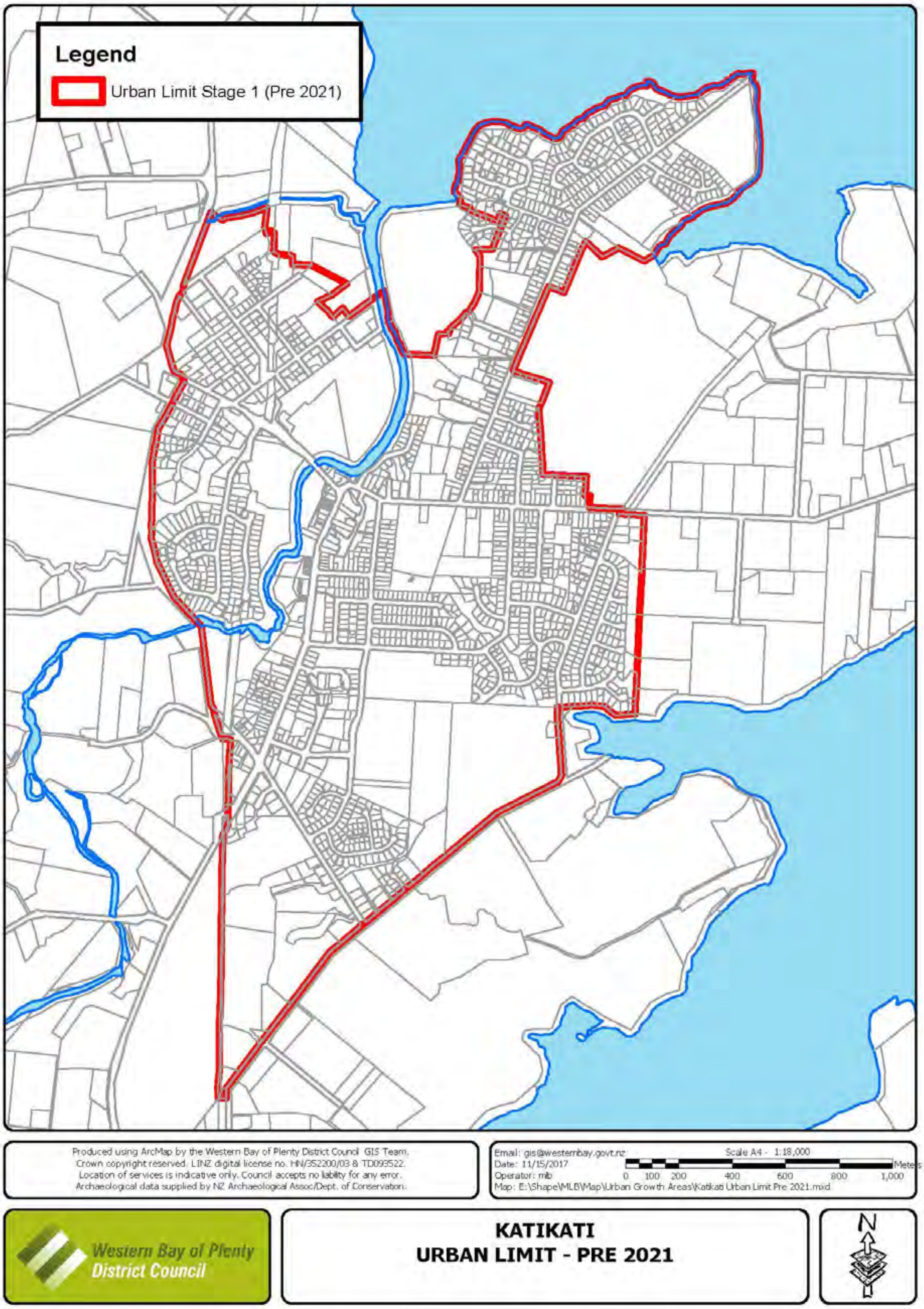
Appendix 7

Western Bay of Plenty District Stage 1 Areas For Urban Growth Area Sequencing

Waihi Beach



Katikati



Legend
Urban Limit Stage 1 (Pre 2021)
Produced using ArcMap by the Western Bay of Plenty District Council GIS Team.
Crown copyright reserved. LINZ digital license no. HN/352200/03 & TD093522.
Location of services is indicative only. Council accepts no liability for any error.
Archaeological data supplied by NZ Archaeological Assoc/Dept. of Conservation.
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Operator: mlb
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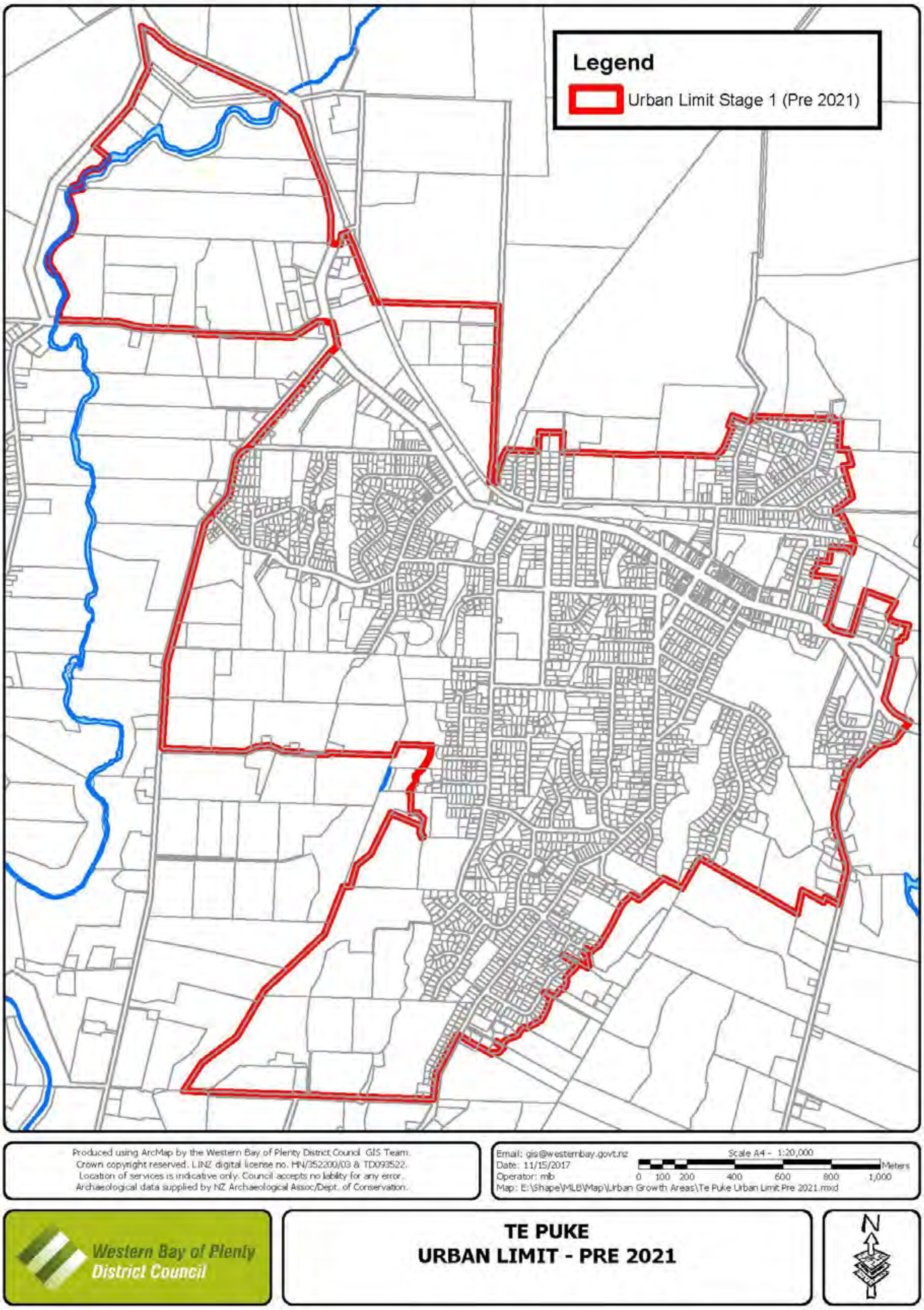
Meters
Western Bay of Plenty District Council
KATIKATI
URBAN LIMIT - PRE 2021
N

<u>Te Puke</u>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Urban Limit Stage 1 (Pre 2021)
Produced using ArcMap by the Western Bay of Plenty District Council GIS Team.
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Location of services is indicative only. Council accepts no liability for any error.
Archaeological data supplied by NZ Archaeological Assoc/Dept. of Conservation.
Email: gis@westernbay.govt.nz
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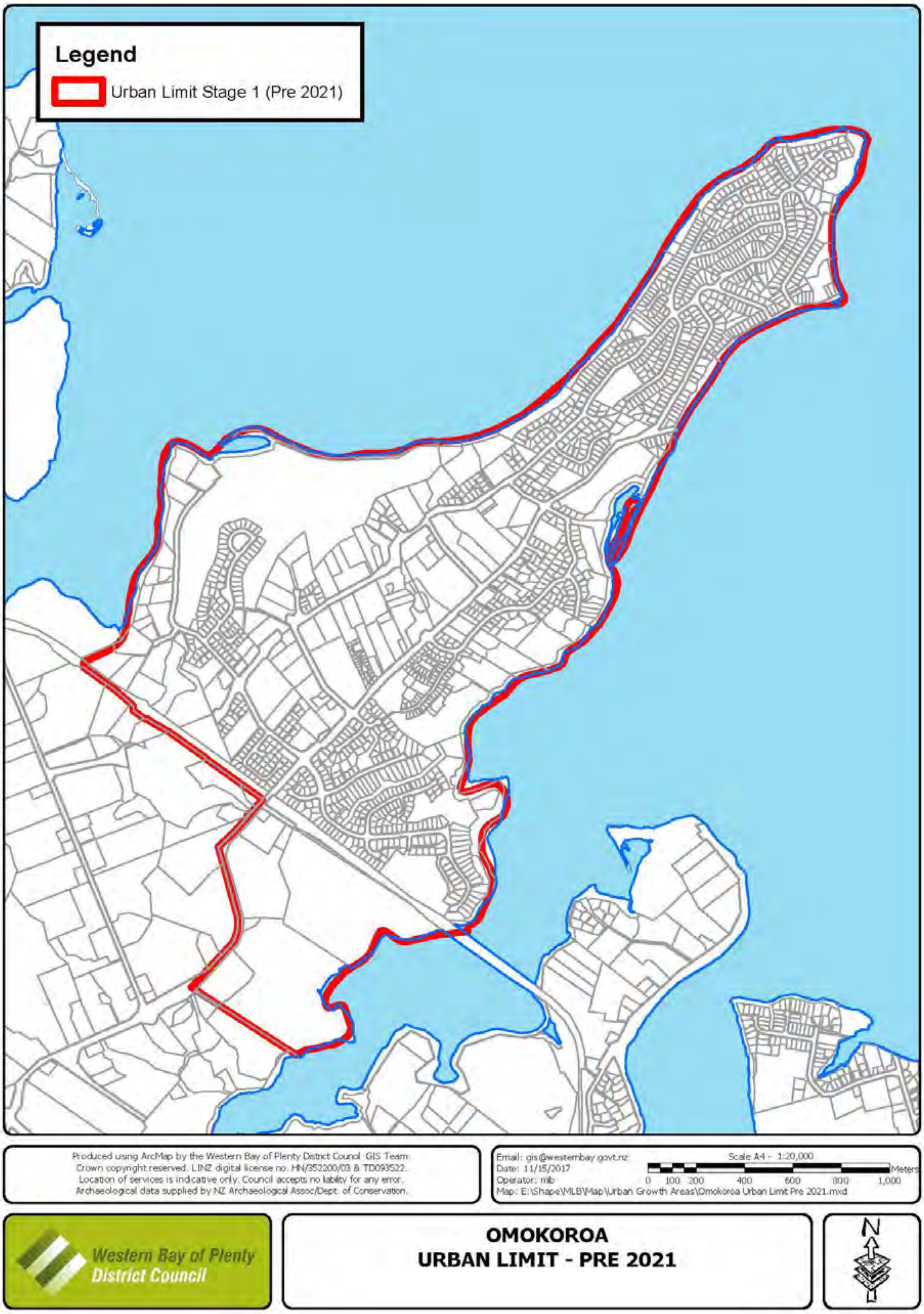
Western Bay of Plenty District Council
TE PUKE
URBAN LIMIT - PRE 2021
N

Omokoroa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Urban Limit Stage 1 (Pre 2021)
Produced using ArcMap by the Western Bay of Plenty District Council GIS Team.
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Location of services is indicative only. Council accepts no liability for any error.
Archaeological data supplied by NZ Archaeological Assoc/Dept. of Conservation.
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Operator: mlb
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Scale A4 - 1:20,000
0 100 200 400 600 800 1,000
Meters
Western Bay of Plenty District Council
OMOKOROA
URBAN LIMIT - PRE 2021
N

SmartGrowth
Building our futures together

Bay of Plenty
REGIONAL COUNCIL

Western Bay of Plenty
District Council

Tauranga City

PEOPLE • PLAN • PROGRESS

Western Bay of Plenty District Council

INDUSTRIAL LAND SURVEY 2012

Introduction

In the Western Bay of Plenty District there is currently 605.26 hectares of Industrial zoned land located in eight general areas. These areas are Katikati, Te Puna, Omokoroa, Waihi Beach, Te Puke, Maketu, Paengaroa, and Rangiuru**.** The total amount of Industrial zoned land has increased by 25.58 ha in the past year with land becoming operative in Waihi Beach.

This report summarises the amount of vacant and occupied industrial land and assesses the availability of vacant land in the Western Bay of Plenty District. This is the fifth Industrial Land Survey undertaken by the Western Bay of Plenty District Council.

Methodology

Updated research for this report was conducted in March 2012. The original comprehensive survey was carried out in November 2007 and updated in November 2008, November 2009 and November 2010. The study assessed industrial zoned sites as defined under the District Plan (Appendix 1, 2, 3, 4, 5, 6, and 7). This included the currently not available land at Rangiuru and Te Puna (Appendix 7 and 8)

Reserves and designated parcels have been included in the study; however, they have been placed in the vacant but not available category.

The land at Te Puna, Te Puke West and Rangiuru Business Zone has been classified as Not Available in this survey as although the zones are operative certain infrastructure conditions need to be met before it can be utilised for industrial purposes.

The following methodology was used:

1. Aerial maps (A3 size) for all industrial zones were prepared by Geographic Information Services (GIS) and industrial zoning boundaries, parcel boundaries, pin numbers, and vacant areas identified by the council's Ozone system were superimposed on to them.
2. A field survey took place and every industrially zoned parcel was assessed, with each parcel of industrial land or a percentage thereof categorised as either occupied or vacant. Every industrial zoned parcel was categorized under a relevant category as describe:

   - "Occupied" Industrial Land – Industrially zoned sites that contain structures/ material or there is a business resident on the site where the land is occupied.
   - "Vacant" Industrial Land – Industrially zoned sites that contain no structures on an area. Land used for livestock grazing or orchards have been classed as vacant or where a site is being advertised as available for occupation.
   - "Vacant but Not Available" Industrial Land – Industrially zoned sites that contain no structures and are largely clear of plant and material, but are unsuitable or not available for development, due to being on unusable terrain, in need of infrastructure – i.e. roading, or designated for reserves.

The "Vacant but Not Available" category provides an indication of the amount of industrial zoned land that is not available for use, thus giving a more precise account of actual vacant land.

Each parcel was given a percentage of use which was rounded to the nearest 10%. This was done for each of the seven industrially zoned areas.

Due to the methodology of this research the nature of the business/activity onsite has not been classified. Therefore land which is currently zoned industrial which has a rural or residential activity, such as a residential property on site has been identified as Occupied except in the case of Orchards where the land is indentified as Vacant.

In the Katikati industrial zone three parcels included areas of industrial and residential land. The size of the industrial areas were calculated by GIS and included within the study. The same was done for Omokoroa as many parcels had small amounts of the total size zoned Industrial.

Results

The industrial land for each category is provided in Table 1 below.

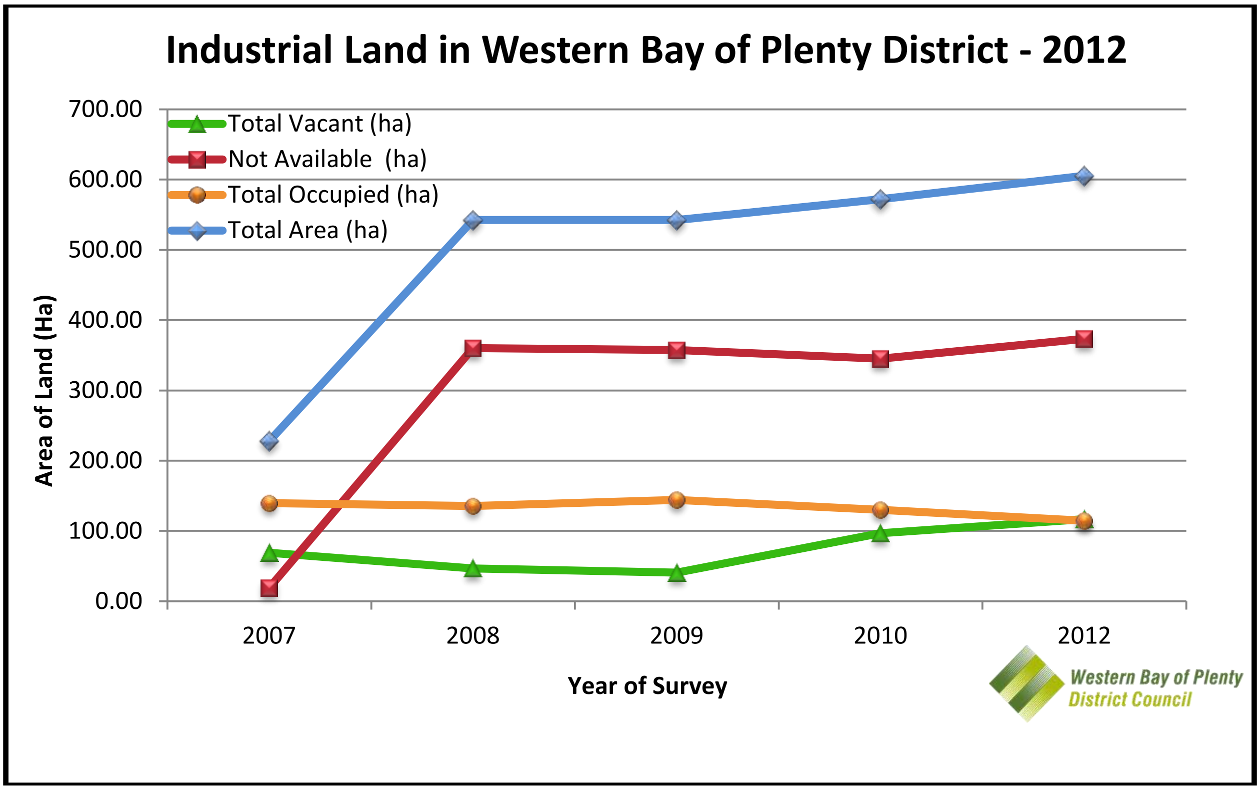
Table 1: Industrial zoned land in the Western Bay of Plenty District

Area	Total Vacant (ha)	Not Available (ha)	Total Occupied (ha)	Total Area (ha)
Katikati	41.16	4.32	21.42	66.90
Te Puna	0	30.58	0	30.58
Omokoroa	31.85	0	3.79	35.65
Waihi Beach	0	25.58	0	25.58
Te Puke	25.11	79.81	61.30	166.22
Rangiuru	17.62	233.23	25.98	276.83
Paengaroa	1.10	0.00	2.30	3.40
Maketu	0	0.11	0	0.11
TOTAL	116.85	373.63	114.79	605.26
%	19.30%	61.73%	18.97%	100.00%

The purpose of this research was to gain an insight into how much industrial land is vacant and available for development or occupation by new businesses in the Western Bay of Plenty District.

Currently there are 605.26 hectares of industrially zoned land in the Western Bay of Plenty. There are 116.85 hectares of Vacant sites (where up to and including 50% of a site is vacant); this is 19% of the total industrial zoned area in the Western Bay of Plenty District.

Graph 1*: Industrial Land Availability 2007 – 2012*



Industrial Land Uptake

Table 2 below provides an indicative measure of the uptake of industrial land. The results of this table are based on new building consents issued for industrial activities on industrial zoned parcels. This methodology does not include where businesses have occupied already vacant structures on a site.

Table 2: Building Consent issued for Industrial Activities

Year	Industrial Building Consents
1/7/06 - 30/6/07	10
1/7/07 - 30/6/08	13
1/7/08 - 30/6/09	3
1/7/09 - 30/6/10	5
1/7/10 - 30/6/11	7
5 Year Average	7.6

Conclusions

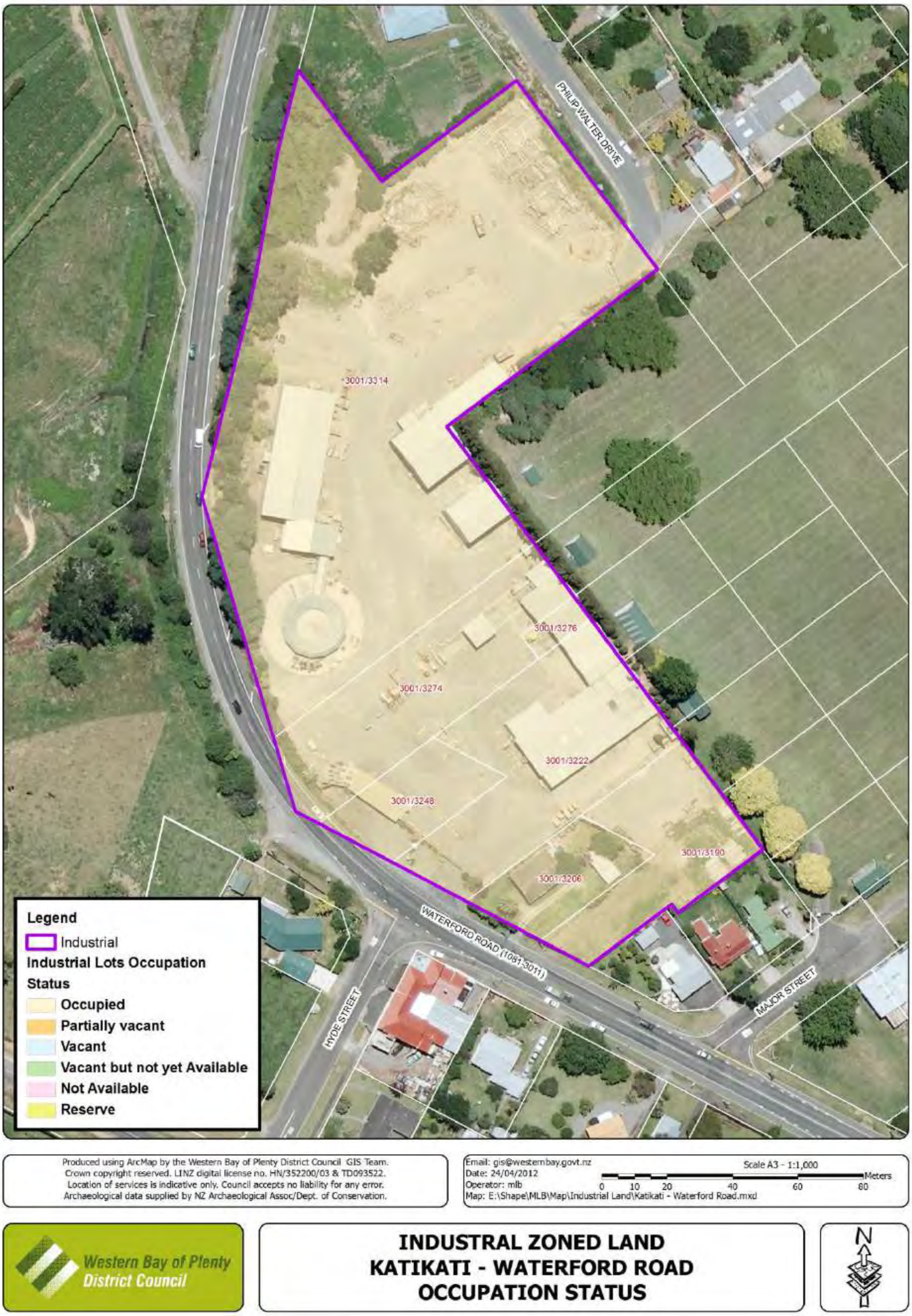
Land in Omokoroa is now available for development but Te Puke West, Rangiuru Business Zone and Te Puna Business Zone are all still on hold. Three parcels at Te Puke West have been reclassified as available which were previously classed as not available.

The percentage of vacant land available has risen from 11.68% to 19.30% in the last twelve months due to some of the Industrial areas being under utilized and occupied ineffectively. There has also been a variation in the methodology with Orchards now classed as Vacant industrial land rather than Occupied.

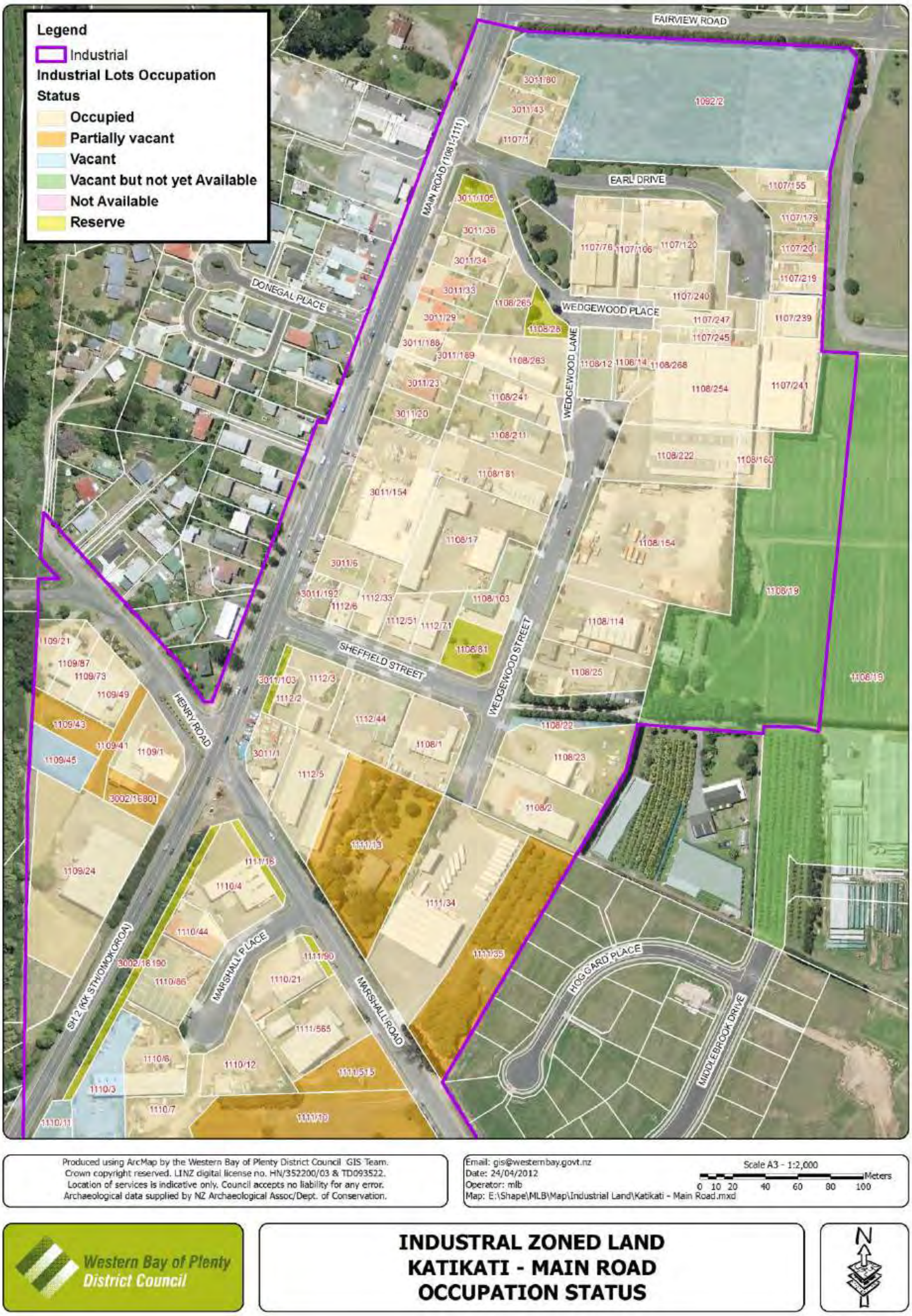
Building consents for Industrial activities on Industrial parcels have risen from 5 in 2009/2010 to 7 in 2010/2011. In last year's Industrial Survey these figures were wrongly presented with all activities on industrial parcels listed. The figures in Table 2 are only indicative of industrial activities where a new consent is required; they do not take into account where an existing premise is taken over.

Appendix 1-8 shows the status of all parcels in the Western Bay in aerial format. Appendix 9 is the historic survey tables.

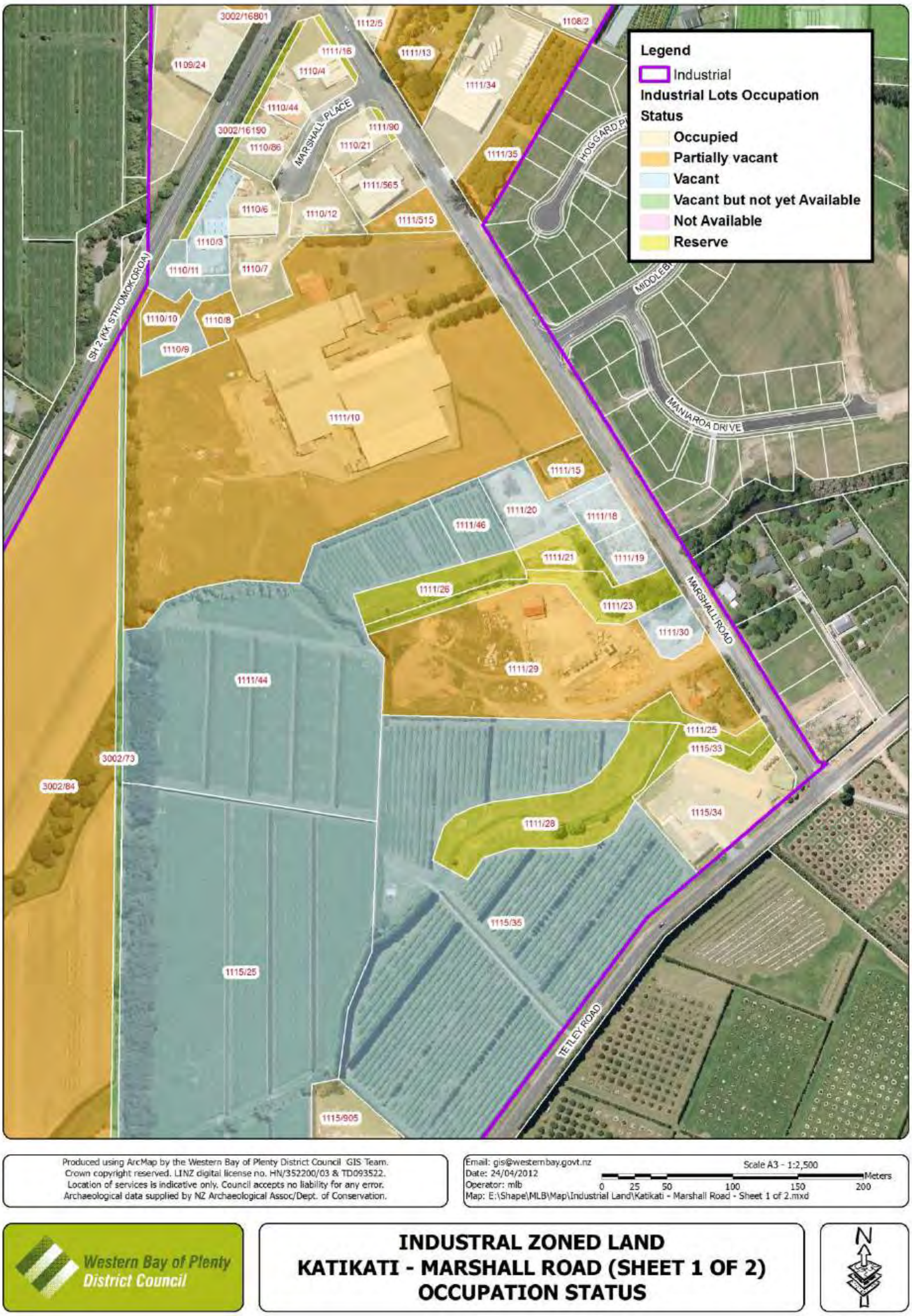
__Appendix 1:__ Industrial Zoned Land – Katikati (Waterford Road)



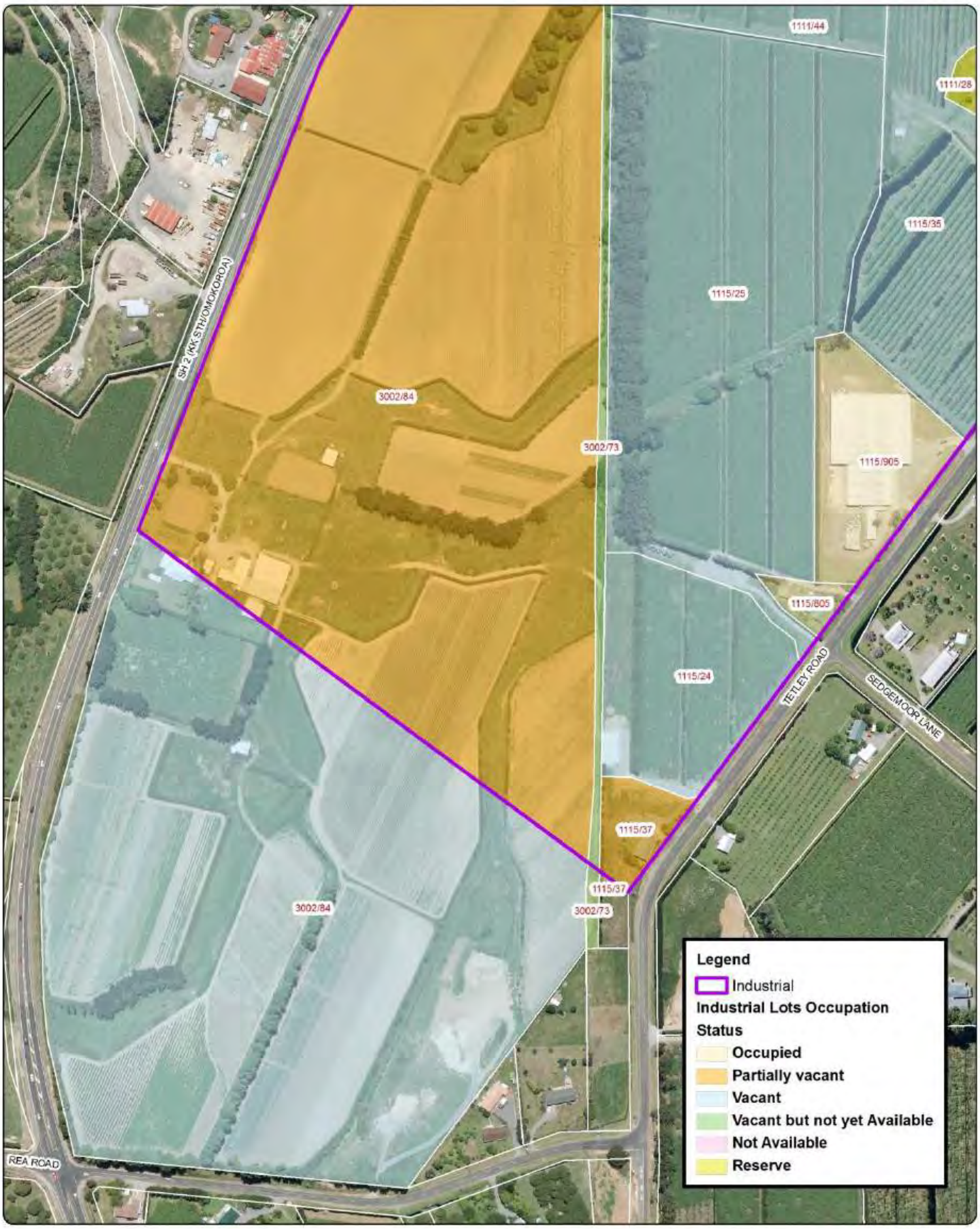
<u>Appendix 2:</u> Industrial Zoned Land – Katikati (Main Road)



<u>Appendix 3:</u> Industrial Zoned Land – Katikati (Marshall Road – 1 of 2)



<u>Appendix 4:</u> Industrial Zoned Land – Katikati (Marshall Road – 2 of 2)



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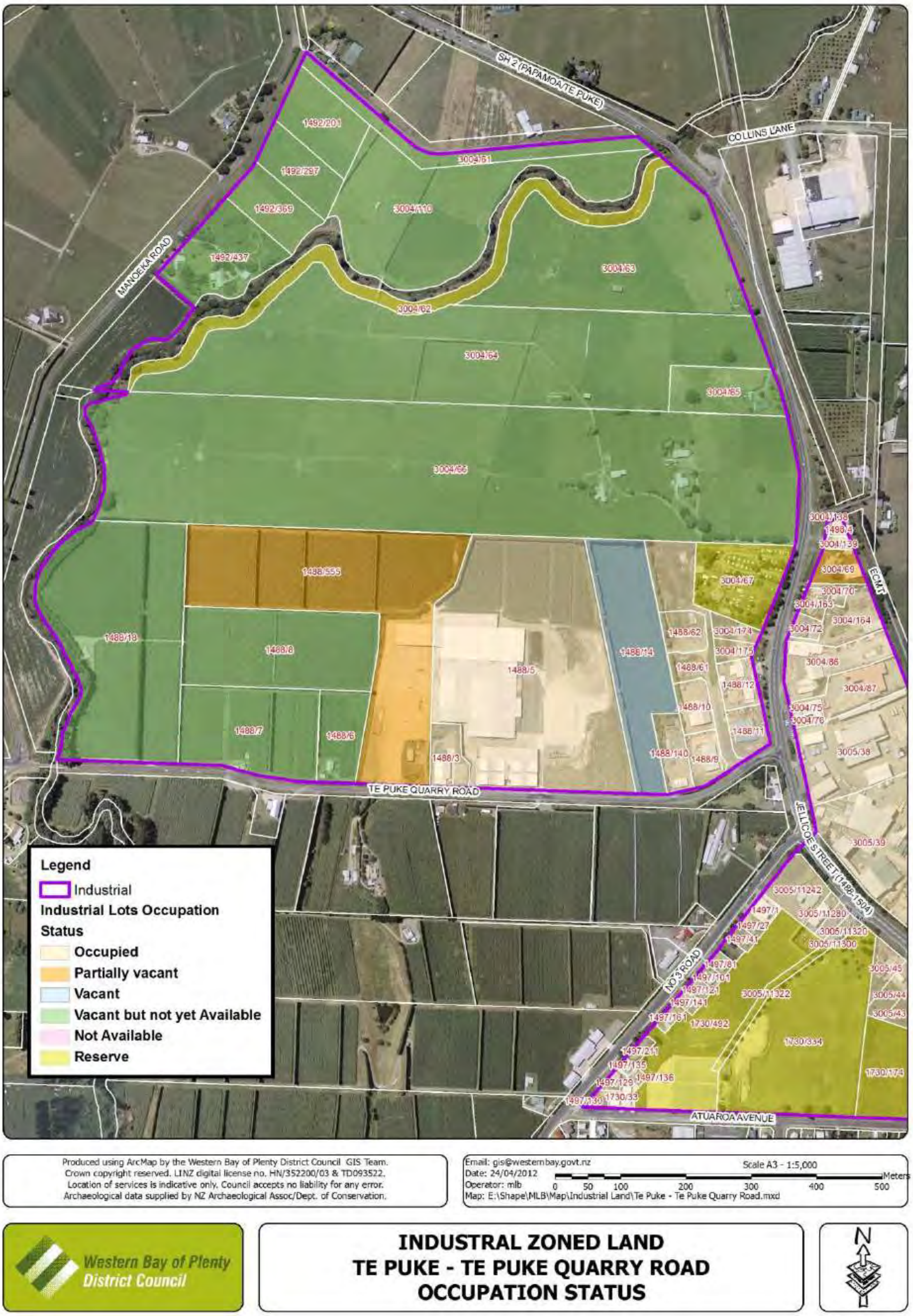
Western Bay of Plenty District Council

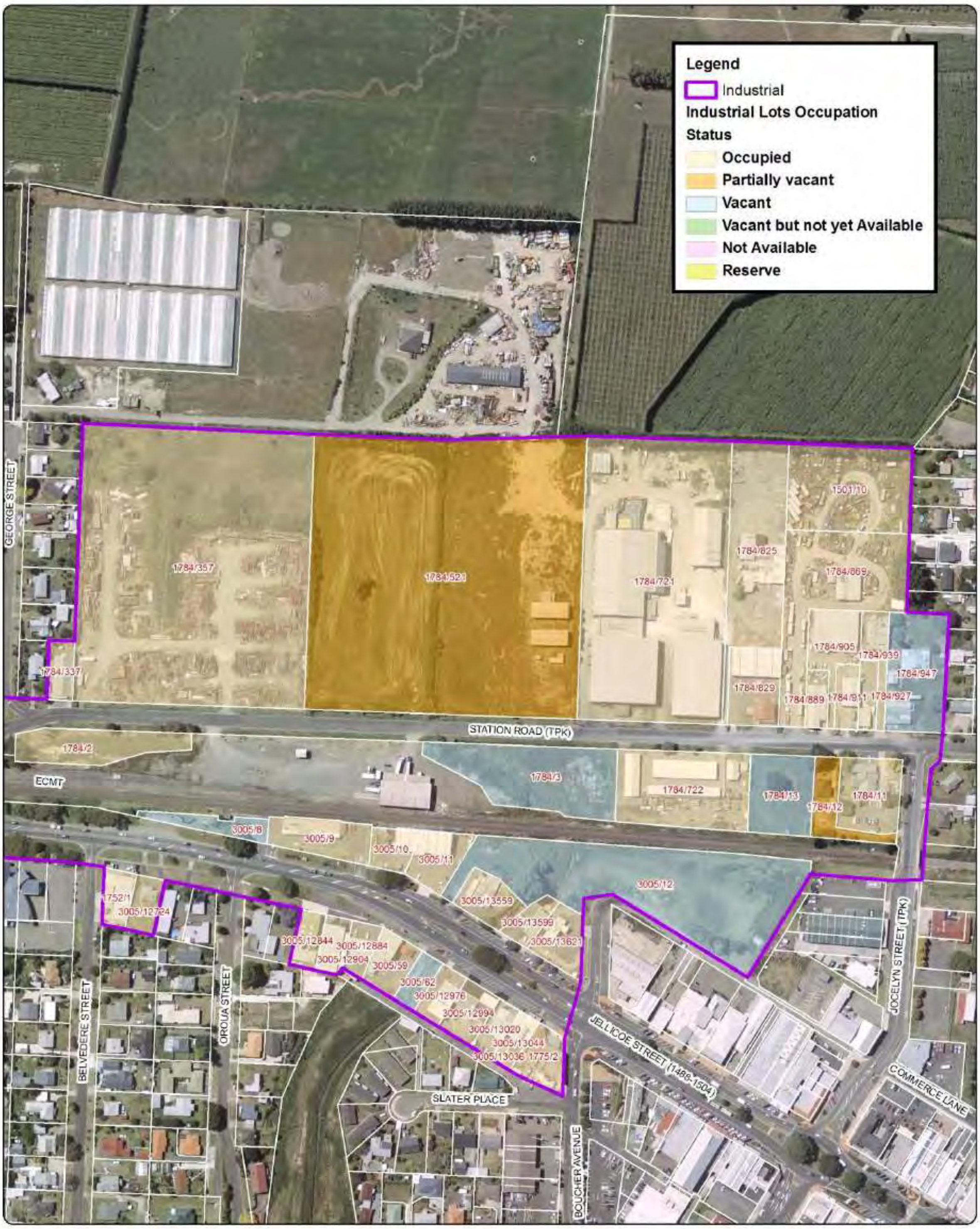
INDUSTRAL ZONED LAND
KATIKATI - MARSHALL ROAD (SHEET 2 OF 2)
OCCUPATION STATUS

N

Appendix 5: Industrial Zoned Land -Te Puke West (Te Puke Quarry Road)



<u>Appendix 6:</u> Industrial Zoned Land -Te Puke Central



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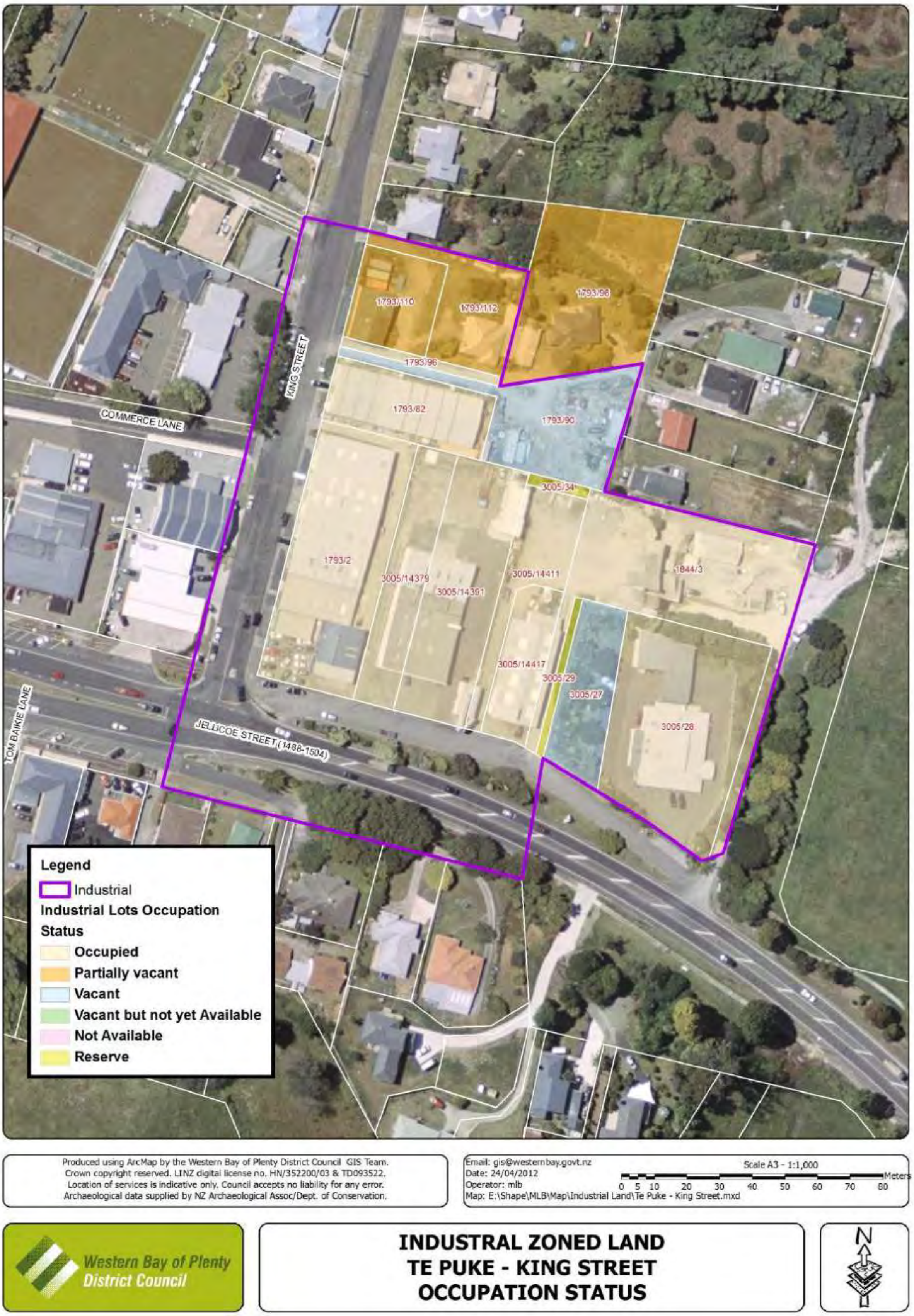
Western Bay of Plenty District Council

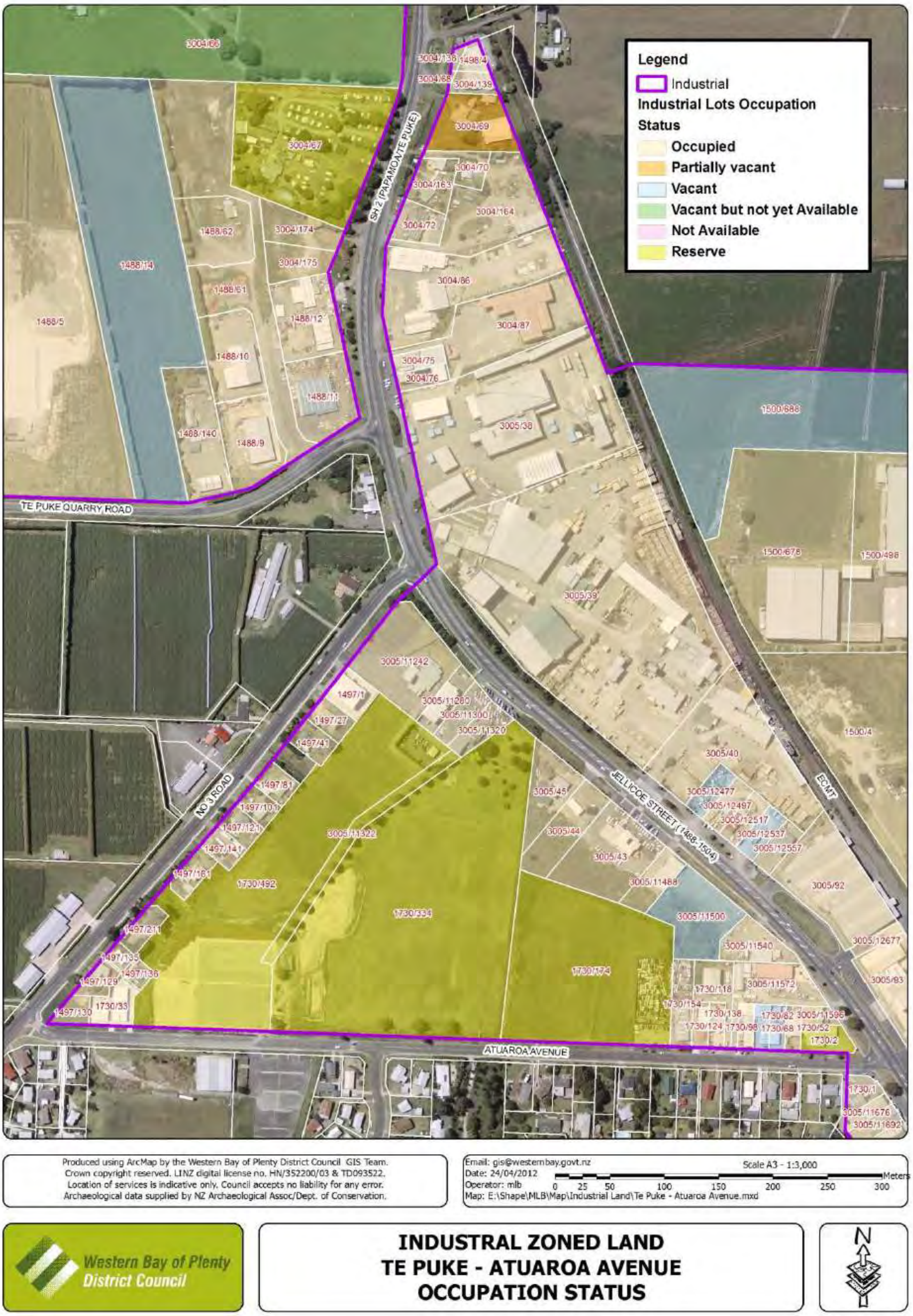
INDUSTRAL ZONED LAND
TE PUKE - CENTRAL
OCCUPATION STATUS

N

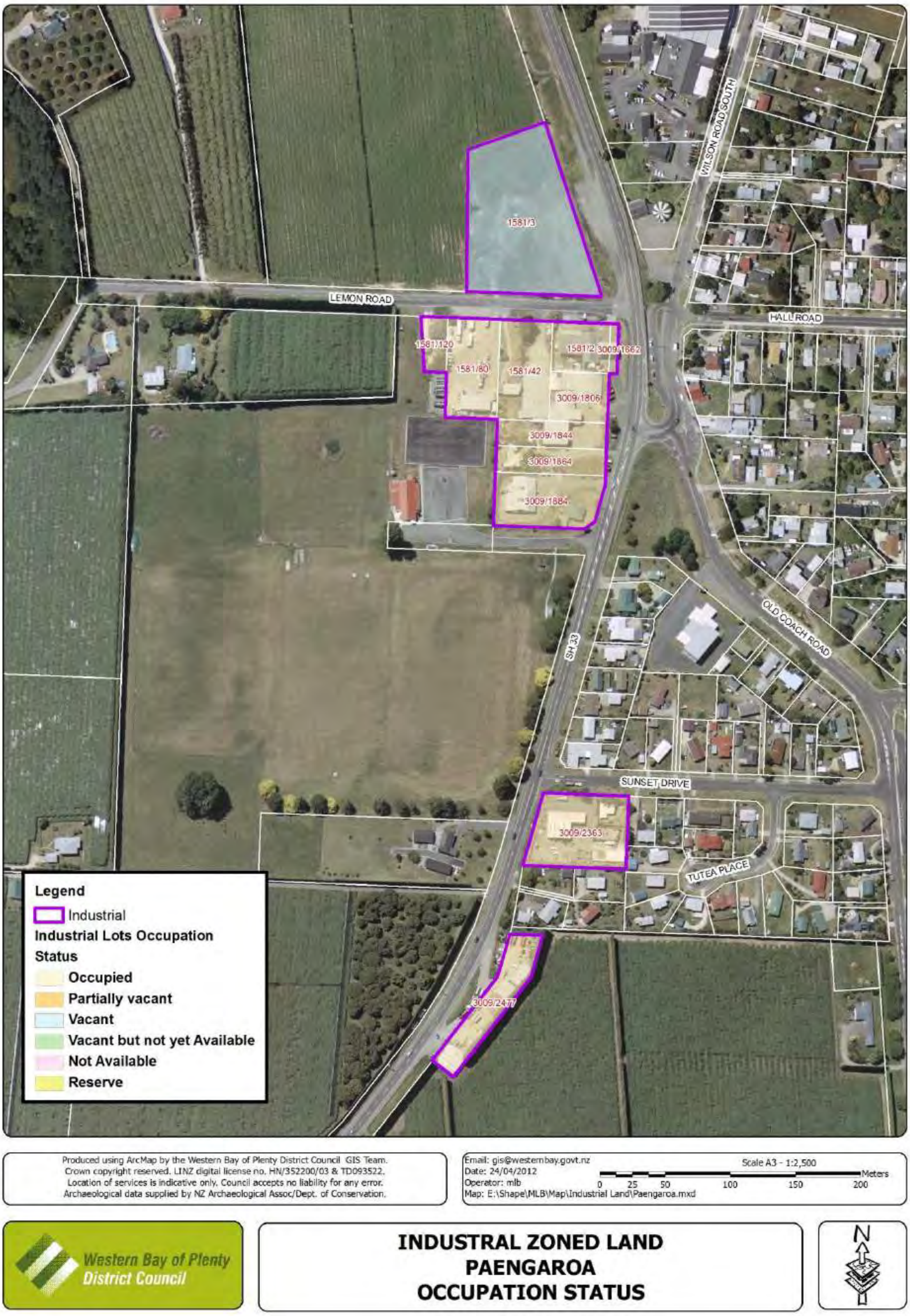
__Appendix 7:__ Industrial Zoned Land -Te Puke (King Street)



<u>Appendix 8:</u> Industrial Zoned Land -Te Puke (Atuaroa Avenue)



Appendix 9: Industrial Zoned Land – Paengaroa



Appendix 10: Industrial Zoned Land – Maketu

Produced using ArcMap by the Western Bay of Plenty District Council GIS Team.

Location of services is indicative only. Council accepts no liability for any error.
Archaeological data supplied by NZ Archaeological Assoc/Dept. of Conservation.

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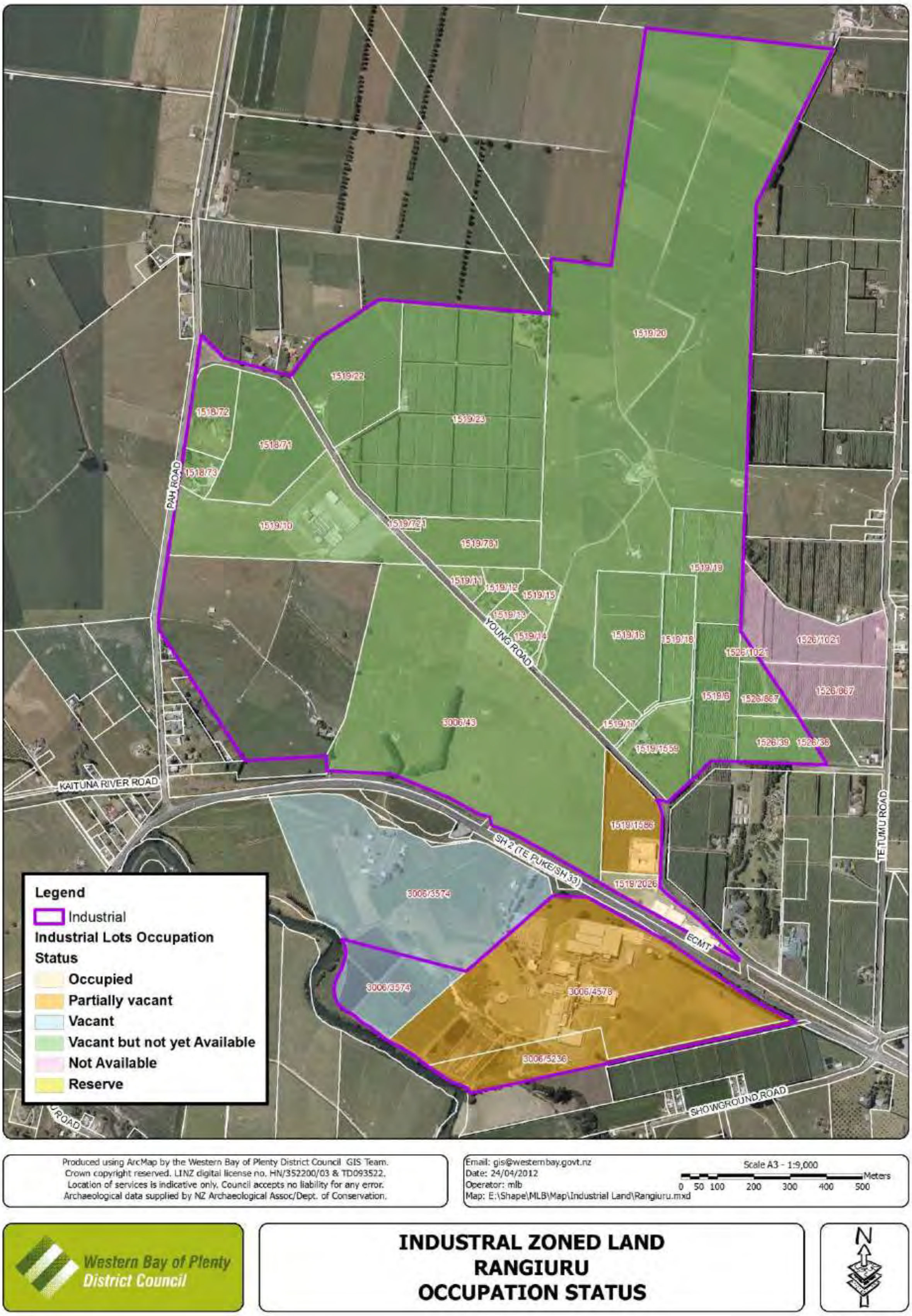
Western Bay of Plenty District Council

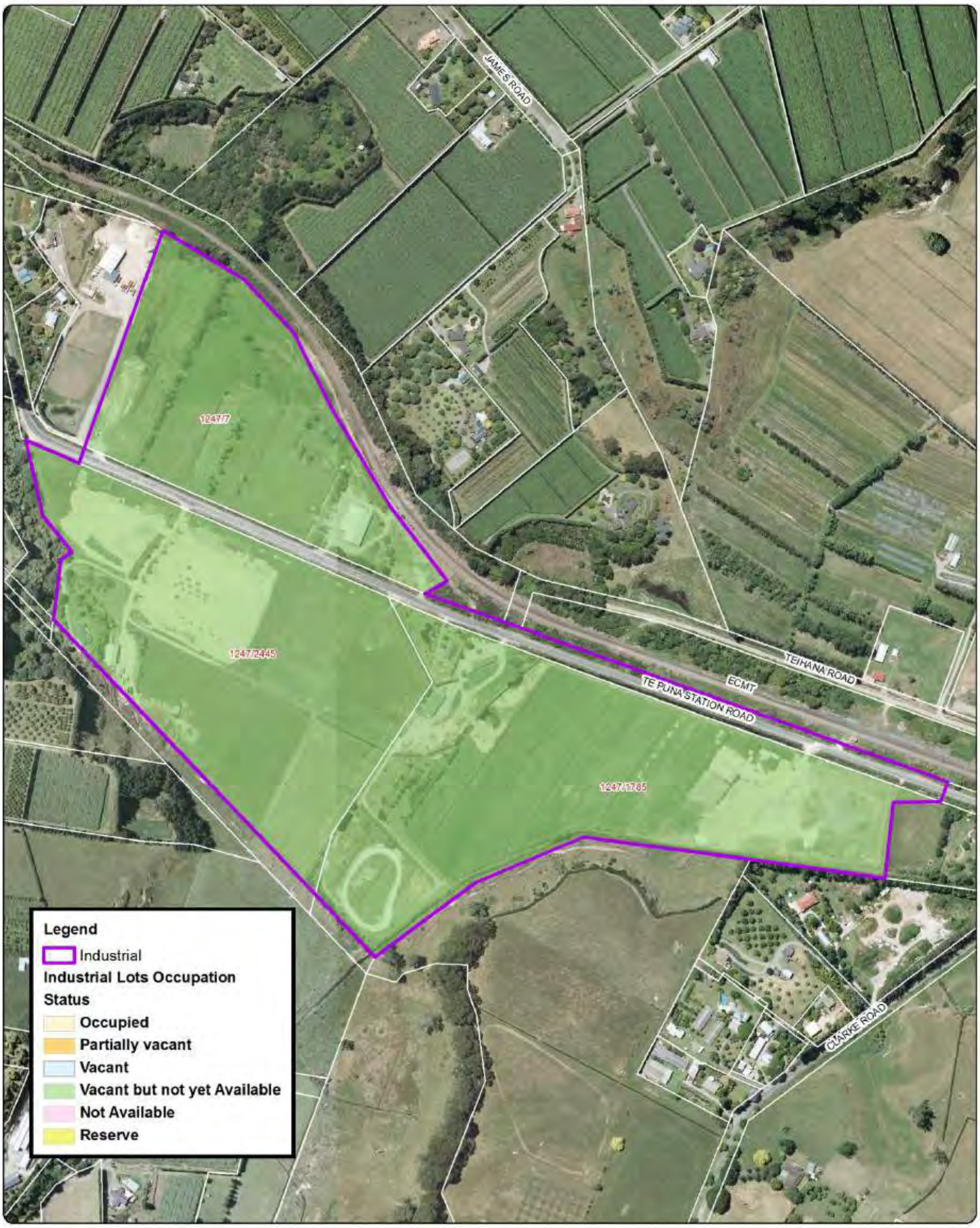
INDUSTRAL ZONED LAND
MAKETU
OCCUPATION STATUS

N

<u>Appendix 11:</u> Industrial Zoned Land – Rangiuru



Appendix 12: *Not Available Industrial Zoned Land – Te Puna Business Zone*



Email: gis@westernbay.govt.nz
Date: 24/04/2012
Operator: mlb
Map: E:\Shape\MLB\Map\Industrial Land\Te Puna.mxd

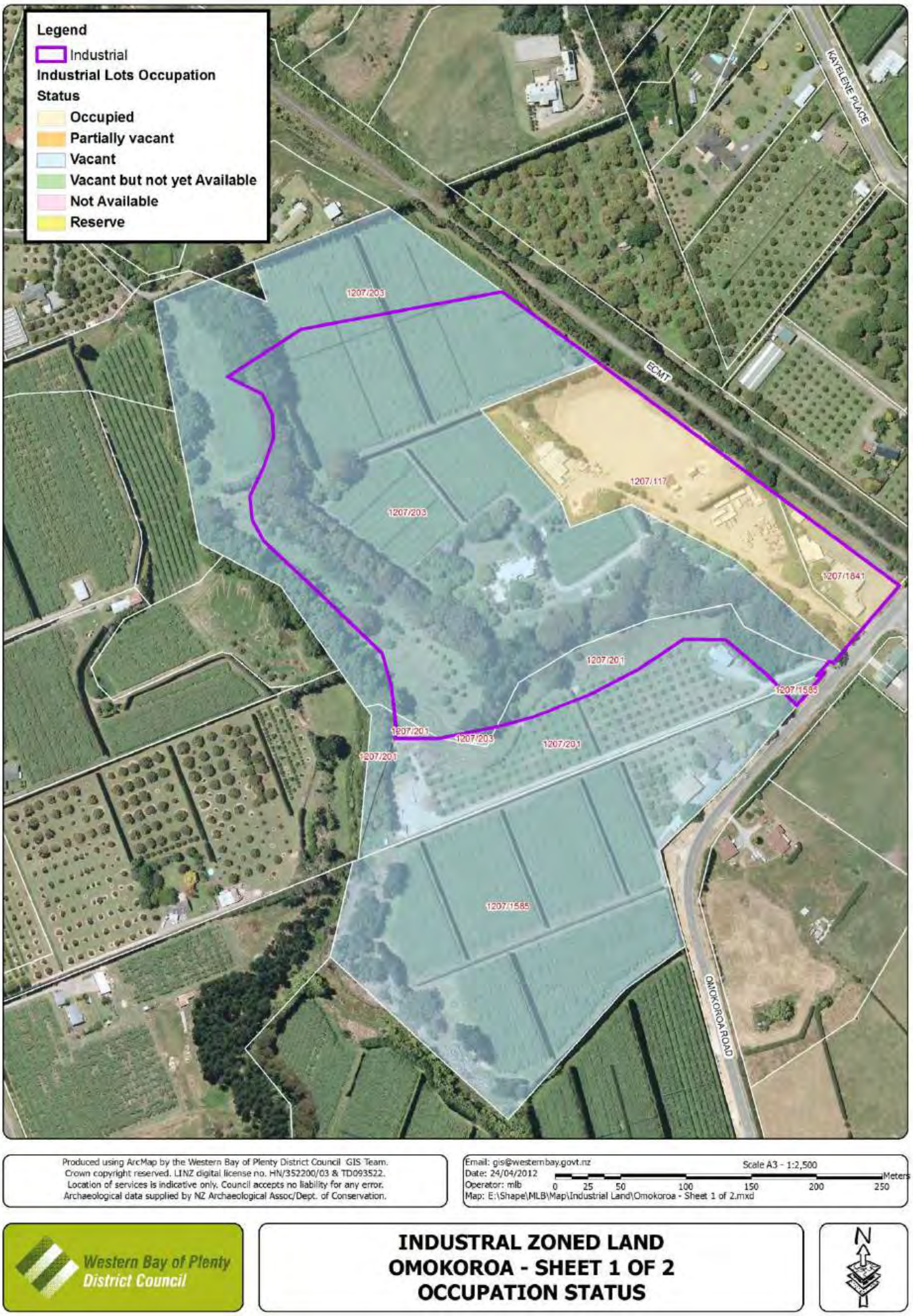
Scale A3 - 1:4,000
0 50 100 200 300 400 Meters

Western Bay of Plenty District Council

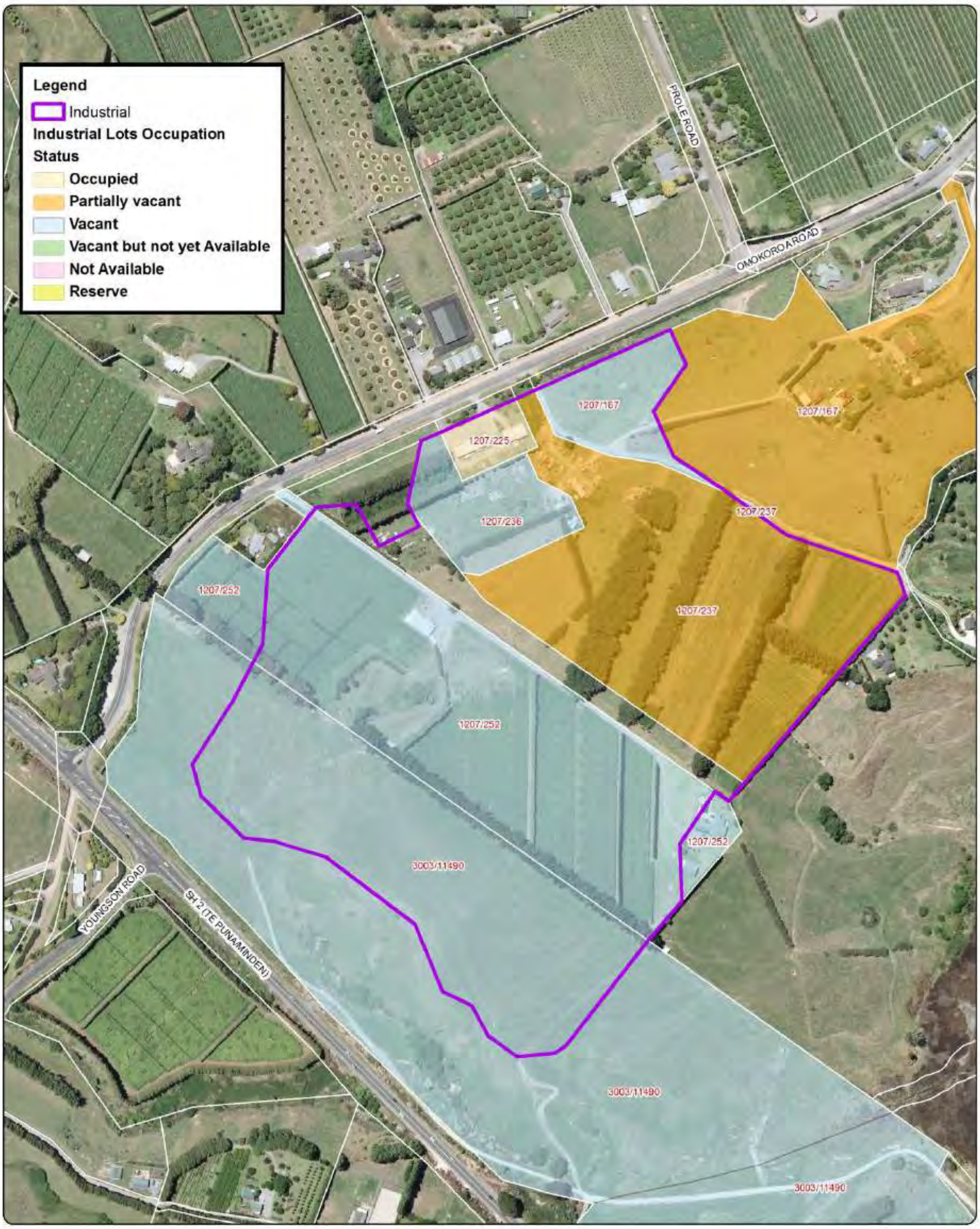
INDUSTRAL ZONED LAND
TE PUNA
OCCUPATION STATUS

N

Appendix 13: Industrial Zoned Land - Omokoroa (1 of 2)



<u>Appendix 14:</u> Industrial Zoned Land - Omokoroa (2 of 2)



Produced using ArcMap by the Western Bay of Plenty District Council GIS Team.
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Location of services is indicative only. Council accepts no liability for any error.
Archaeological data supplied by NZ Archaeological Assoc/Dept. of Conservation.

Email: gis@westernbay.govt.nz
Date: 24/04/2012
Operator: mlb
Map: E:\Shape\MLB\Map\Industrial Land\Omokoroa - Sheet 2 of 2.mxd

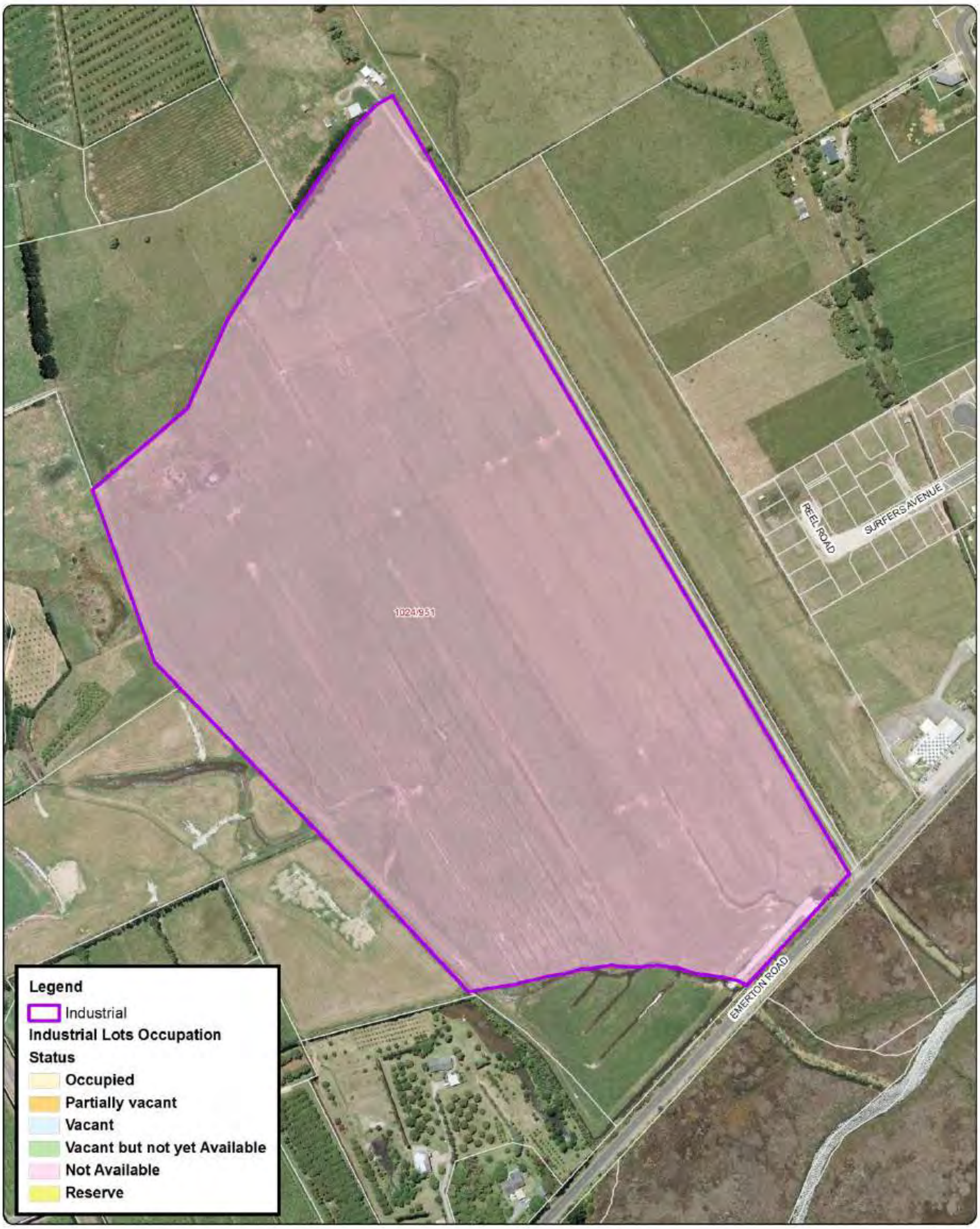
Scale A3 - 1:3,000
0 25 50 100 150 200 250 Meters

Western Bay of Plenty District Council

INDUSTRAL ZONED LAND
OMOKOROA - SHEET 2 OF 2
OCCUPATION STATUS

N

<u>Appendix 15:</u> Industrial Zoned Land –Waihi Beach



Produced using ArcMap by the Western Bay of Plenty District Council GIS Team.
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Location of services is indicative only. Council accepts no liability for any error.
Archaeological data supplied by NZ Archaeological Assoc/Dept. of Conservation.

Email: gis@westernbay.govt.nz
Date: 24/04/2012
Operator: mlb
Map: E:\Shape\MLB\Map\Industrial Land\Waihi Beach.mxd

Scale A3 - 1:3,000
0 25 50 100 150 200 250 Meters

Western Bay of Plenty District Council

INDUSTRAL ZONED LAND
WAIHI BEACH
OCCUPATION STATUS

N

Tom Watts

From:	Customer Works Eastern <CustomerWorksEastern@powerco.co.nz>
Sent:	Wednesday, 10 July 2019 8:46 AM
To:	Tom Watts
Subject:	RE: 66 Washer Road, Te Puke - Consultation

Hi Tom

In order to bring the project forward Powerco would need the Developers to keep us involved in the process of change of re-zoning and likely hood of the development proceeding. Being advised early in order to pull the project forward is key.

Currently the Washer Road Feeder could not support additional Industrial/Commercial load in any great capacity. Specific loadings would need to be known for the site before we could confirm available capacity from the current network.

Regards

Customer Works Team
POWERCO
Web www.powerco.co.nz

From: Tom Watts <tom@mpad.co.nz>
Sent: Monday, 8 July 2019 4:05 PM
To: Customer Works Eastern <CustomerWorksEastern@powerco.co.nz>
Subject: RE: 66 Washer Road, Te Puke - Consultation

Thankyou,

Appreciate the feedback.

Couple of follow up questions, you mention that the 'Te Puke Bus Security Upgrade Project' would need to be brought forward to facilitate the development.

What is the process in bringing this works forward?

Also in the interim could the Washer Road feeder support some small industrial storage sheds/units as part of a first stage of development prior to the upgrade?

Regards

Tom Watts
Planner / Designer Int.NZPI
021 442 521
3 Harington Street, Tauranga 3110
tom@mpad.co.nz
www.mpad.co.nz

From: Customer Works Eastern <CustomerWorksEastern@powerco.co.nz>
Sent: Monday, 8 July 2019 3:53 PM
To: Tom Watts <tom@mpad.co.nz>
Subject: RE: 66 Washer Road, Te Puke - Consultation

Hi Tom

The existing feeder that supplies this part of Washer Rd is close to its capacity and will not be able to support a large load increase such as this development.

This feeder is supplied from Te Puke substation, load growth can be accommodated by the substation itself. In order to support a large-scale industrial development at the site, the Te Puke Bus Security upgrade project would need to be brought forward. You can refer to 2019 Asset Management Plan for details of the project.
www.powerco.co.nz/media/2081/powerco-2019-amp-summary_31may.pdf

Once the Te Puke Bus Security project is completed, 11kV feeder strengthening is required to enable supply to the first stage of the industrial development. It is also likely that when the proposed Washer Rd site exceeds capacity requirements switching the supply source from Te Puke substation to Atuaroa substation will be required. Dependant on loading requirements the development may require its own dedicated feeder from Atuaroa substation.

We trust this helps with the planning for this new development.

Regards

Customer Works Team
POWERCO
Web www.powerco.co.nz

From: Tom Watts <tom@mpad.co.nz>
Sent: Thursday, 4 July 2019 2:42 PM
To: Customer Works Eastern <CustomerWorksEastern@powerco.co.nz>
Subject: 66 Washer Road, Te Puke - Consultation

To Whom it May Concern.

Currently I am assisting in obtaining consent for a private plan change to rezone land from rural to industrial at 66 Washer Road, Te Puke (Site Plan Attached). The pink area shows the land subject to the re-zoning.

The end uses for the site are anticipated to be large scale industrial bulk storage sheds, as well as smaller units that will cater for industrial businesses.

In the first instance, it would be good to understand power supply in Washer Road in relation to the proposed use.

If you could provide some preliminary feedback on this that would be greatly appreciated.

Kind Regards

Tom Watts

Planner / Urban Designer Int.NZPI
021 442 521
3 Harington Street, Tauranga 3110
tom@mpad.co.nz
www.mpad.co.nz

****
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****

Tom Watts

From: McDougall, Dave <dave.mcdougall@westlinkbop.co.nz>
Sent: Tuesday, 23 April 2019 2:13 PM
To: Richard Coles
Cc: NZ - WSP Opus - Westlink BOP Service Requests
Subject: CCR 274987: Station Road and Cameron Road Te Puke

Richard - Further to your query regarding the capacity of bridges on Station and Cameron Roads:

The bridges on Station Road, Cameron Road and Jocelyn St are currently unrestricted for Class 1 loads (up to 50 tonnes) provided the correct documentation has been received for each truck proposed (e.g. HPMV).

In addition several overweight permits have been issues by WBoPDC recently including 79, 85 tonne and higher under special conditions, special configurations, and operating processes and additional fees.

I trust this answers your query. Please advise if you have any further information requests.

David McDougall
Westlink

-LAEmHhHzdJzBITWfa4Hgs7pbKl

Site Photos

Looking south across the subject land

Looking south across the subject land

Looking south down Washer Road – EastPack on right

Looking eastward – along existing private vehicle access at northern boundary of subject land

9 May 2019

Tom Watts
3 Harington Street
Tauranga 3110

Sent via email attachment

Dear Sir/Madam

Site Contamination Enquiry : 66 Washer Road (Part Lot 1 DP 25471)

In response to your enquiry regarding the above site/s, we advise that we were unable to locate any information on our register regarding Hazardous Activities and Industries List (HAIL) activity or contamination.

A HAIL activity is a past or present activity occurring on site that has the potential to cause contamination (e.g. service station, timber treatment site, horticultural site, automotive dismantlers etc). The list of HAIL activities was compiled by the Ministry for the Environment (MfE). Please view their web site for further information.

The Bay of Plenty Regional Council has not yet assessed every site in the region where a hazardous activity is, or has taken place. Therefore there is a possibility that a HAIL activity may have occurred or is occurring on the site.

If you are concerned that a HAIL activity may have taken place, the cautious way to proceed would be to undertake an independent audit of the site.

We recommend you also contact **Western Bay of Plenty Council**, which may hold additional information about this site that we are unaware of.

If you wish to discuss the matter further, please contact email LandUseCommunication@boprc.govt.nz.

Yours faithfully

Emma Joss
Senior Regulatory Project Officer

for General Manager Regulatory Services

Tom Watts

From: Phillip Martelli <Phillip.Martelli@westernbay.govt.nz>
Sent: Tuesday, 9 July 2019 10:10 AM
To: Tom Watts; Richard Coles
Subject: FW: 66 Washer Road, Te Puke

Hi Gents
Comments from our Transportation People that will need to be addressed.

Phillip

From: Stuart Harvey <Stuart.Harvey@westernbay.govt.nz>
Sent: Tuesday, 9 July 2019 10:05 AM
To: Phillip Martelli <Phillip.Martelli@westernbay.govt.nz>
Subject: RE: 66 Washer Road, Te Puke

Phil,

Points we discussed about potential transport effects of land change to industrial:

The bridge load capacity is suitable for larger trucks, but a single lane creates an issue for increased traffic volumes and could create back up towards the Cameron Rd/Station Rd junction.
Certainly increased risk to pedestrians who are using now more frequently to access Pack House late night and early morning.

Road widening of Washer Road would be appropriate - approximately 1m to meet Council standards as industrial area assumes much higher % HGV. Plus, may require rehab as Washer Road is poor quality road formation in general.

Street Lighting could be appropriate for bridge area but also, Washer Road in general and has been raised by East Pack already. Currently in discussion with them about this.

Intersection by Cameron Rd and Te Puke Highway is biggest issue. Uncertain of bridge loading capacity. Upgrade of this intersection to a roundabout would be recommended due to already high volume of traffic waiting to turn right onto TPH. More HGVs would almost certainly lead to fatality. Several near misses recorded in last 12 months. Assessment could be made of forcing all traffic to turn left off bridge and going up to Boucher Ave roundabout to U-turn. However, this may create other issues.

Encouraging route along Station Road is generally supported, width certainly appropriate but improvement works on this road required. However, effects would also need to be considered at right turn to Jocelyn St, plus pedestrian volumes are high past New world and Commerce Lane.

Noise and Vibration should also be considered as many of these houses nearby may begin to shake with increased heavy trucks passing by.

Kind regards,

Stuart Harvey
Roading Engineer (East)

Tom Watts

To: Carlisle, Ian; Richard Coles
Subject: RE: Meeting at WBOPDC - 66 Washer Road Plan Change

From: Stuart Harvey <Stuart.Harvey@westernbay.govt.nz>
Sent: Wednesday, 11 September 2019 3:17 PM
To: Hyde, Will <Will.Hyde@stantec.com>
Subject: RE: Meeting at WBOPDC - 66 Washer Road Plan Change

Will,

Thanks for the initial design concept. I have reviewed briefly with WestLink and the Transport Manager and the response is generally positive as a roundabout is a sensible option here and the slightly reduced RAB diameter is acceptable, provided it was supported by a comprehensive safety audit. But you certainly don't need to go into expensive, detailed design at this stage.

The key issue you could provide for us now for the plan change would be an analysis/understanding of the traffic threshold at this intersection against Austroads standards. This may also involve some assessment of asset life expectancy against predicted traffic growth (based on predictions of increased industrial businesses on Washer Road and the Town Centre in general). In addition, some intersection modelling using SIDRA or a similar analysis package. That would allow you to recommend an appropriate design of RAB vs. Signals vs. A simpler central lane Seagull island.

Kind regards,

Stuart Harvey
Roading Engineer (East)
Kaipukaha Huarahi (Rawhiti)

From: Hyde, Will <Will.Hyde@stantec.com>
Sent: Thursday, 5 September 2019 3:58 PM
To: Stuart Harvey <Stuart.Harvey@westernbay.govt.nz>
Subject: RE: Meeting at WBOPDC - 66 Washer Road Plan Change

Hi Stuart,

In discussion with our client the attached concept plan has been suggested as a possible solution at the Jellicoe St/Cameron Road intersection. As discussed at our meeting with you, there are some existing issues here already and the proposed plan change would likely add to the existing delays. A roundabout would therefore have wider benefits that just mitigating effects from the plan change.

The plan is very much a concept, and would be subject to further design scrutiny and a safety audit, but I'd like to discuss it with you to see what Council's thoughts would be. The concept is based on the two roundabouts further along Jellicoe at No3 Rd and Quarry Road, so would be consistent with driver expectations of the road corridor. As you described for the two other roundabouts, this one would likely introduce some minor delays on the main alignment but would be a significant benefit to side-road movements in terms of safety and delays.

I'll give you a call tomorrow to discuss further.

Regards,

Will Hyde

Stantec

From: Stuart Harvey <Stuart.Harvey@westernbay.govt.nz>
Sent: Thursday, 18 July 2019 10:58 AM
To: Hyde, Will <Will.Hyde@stantec.com>
Cc: 'Richard Coles' <richard@mpad.co.nz>
Subject: RE: Meeting at WBOPDC - 66 Washer Road Plan Change

Will,

I've done some digging on this area but there's no real design ideas on paper; just plenty of documented opinions about options that Council could consider - See below.

Hi Stuart

The short answer is yes, there is plenty of background and we are very familiar with the complex issues here. Please refer to the email chain below from earlier this year.

The summarised answer to your question about what to do is also in the email chain below but here is the crux:

I've discussed this situation with Justine from a safety perspective. Outside of a temporary solution for the kiwifruit situation, Westlink could undertake a safety study of this intersection and look at the options for a medium term solution e.g.

1. *Permanent left turn in, left turn out only*
2. *Intersection improvement using painted lines/islands or solid islands*
3. *Roundabout*
4. *Traffic Signals*

If you are interested we could discuss this further next time you are in the office and if appropriate provide an offer of service.

Thanks
Kathy

Kind regards,

Stuart Harvey
Roading Engineer (East)
Kaipukaha Huarahi (Rawhiti)

From: Hyde, Will <Will.Hyde@stantec.com>
Sent: Friday, 12 July 2019 2:36 PM
To: Stuart Harvey <Stuart.Harvey@westernbay.govt.nz>
Cc: Richard Coles <richard@mpad.co.nz>
Subject: RE: Meeting at WBOPDC - 66 Washer Road Plan Change

Hi Stuart,

Just thought I'd follow up on the request from the meeting this week - you mentioned that Jellicoe/Cameron is on a list maintained by Westlink of intersections which require attention, along with a suggested solution and (high-level) cost stimate.

If you could chase up and let us know what the current thoughts are for the interseciton it would be a good starting point for resolving the potential plan change effects.

Regards,

Will Hyde
Senior Transport Engineer

Direct: +64 7 929 7633

Stantec New Zealand
Level 1, 117 Willow Street
PO Box 13268
Tauranga 3141

-----Original Message-----
From: Stuart Harvey <Stuart.Harvey@westernbay.govt.nz>
Sent: Wednesday, 10 July 2019 11:46 AM
To: Richard Coles <richard@mpad.co.nz>
Cc: Hyde, Will <Will.Hyde@stantec.com>
Subject: Re: Meeting at WBOPDC - 66 Washer Road Plan Change

All good. Might be a little late as current meeting on site is taking longer than expected.

Regards,

Stuart

> On 10/07/2019, at 11:06 AM, Richard Coles <richard@mpad.co.nz> wrote:
>
> Stuart just confirming 12.30 is fine
>
> Will I will pick you up 12.15
> <meeting.ics>

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Proposed Amendments to the Operative Western Bay of Plenty District Plan

Add the Washer Road Business Park Structure Plan to Appendix 7 of the District Plan.

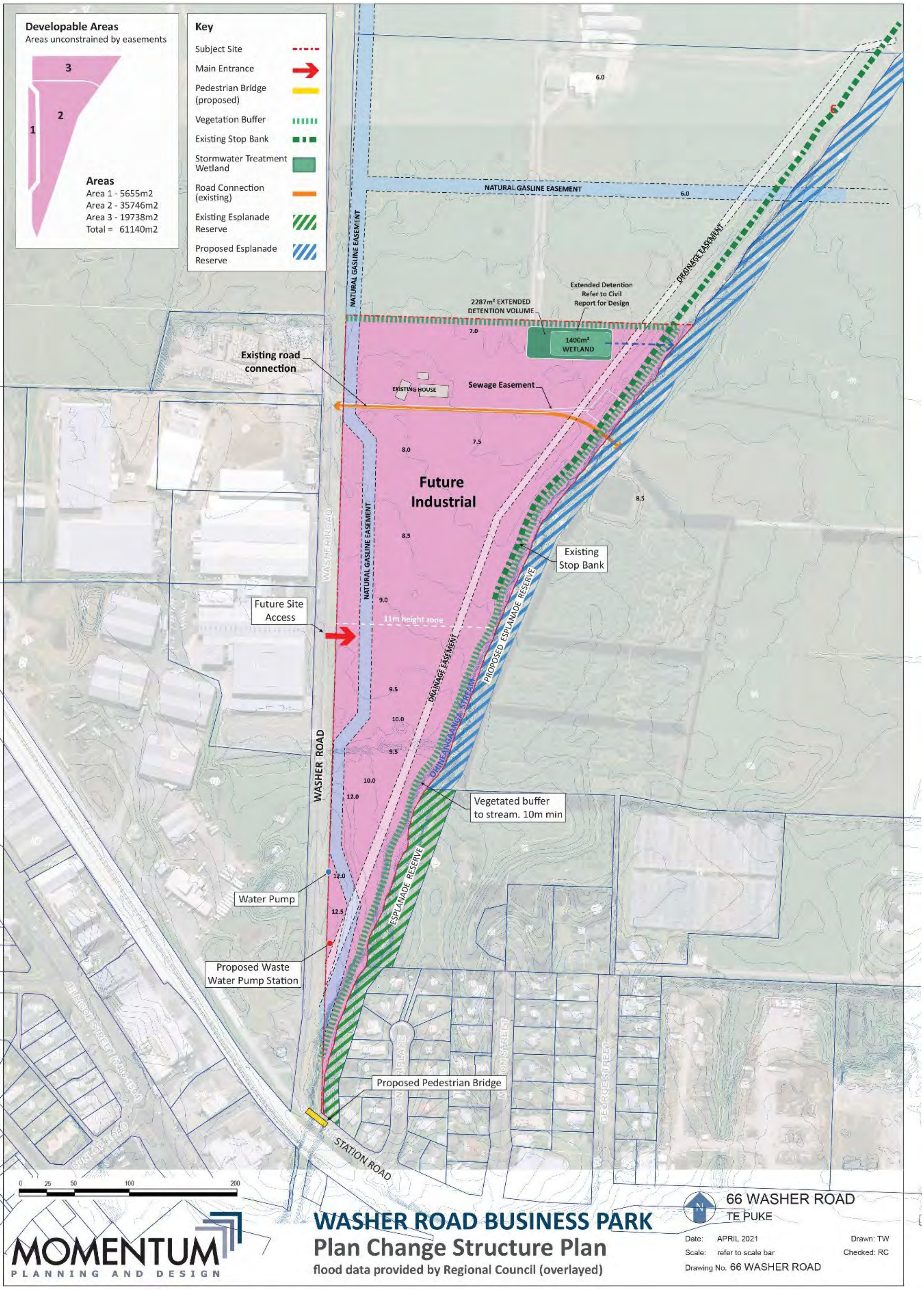


Figure 1: Washer Road Business Park Structure Plan

Washer Road Business Park, Structure Plan - Proposed Staging

The following Staging is proposed for Washer Road Industrial to enable the site to be developed progressively. Earthworks and preloading of the site are required to prepare the land for future industrial use.

Stage 1 Infrastructure Works

- Sewer pump station and rising main
- Stormwater pond (extended detention)
- Water supply
- Landscape buffer adjacent to Stage 1

Stage 1A Infrastructure Works

- Washer Road seal widening
- Form primary road entrance to industrial land
- Pedestrian bridge over Ohineangaanga Stream
- Landscape buffer adjacent to Stage 1A

Stage 2 Infrastructure Works

- Roundabout upgrade at Cameron Road and Jellicoe Street. Refer to preliminary design within Attachment A.

Note: Bulk earthworks will be staged subject to large scale Regional Council earthworks consents

Non-compliance with the proposed staging works above will render development or subdivision within the Washer Road Industrial Structure Plan area a discretionary activity.

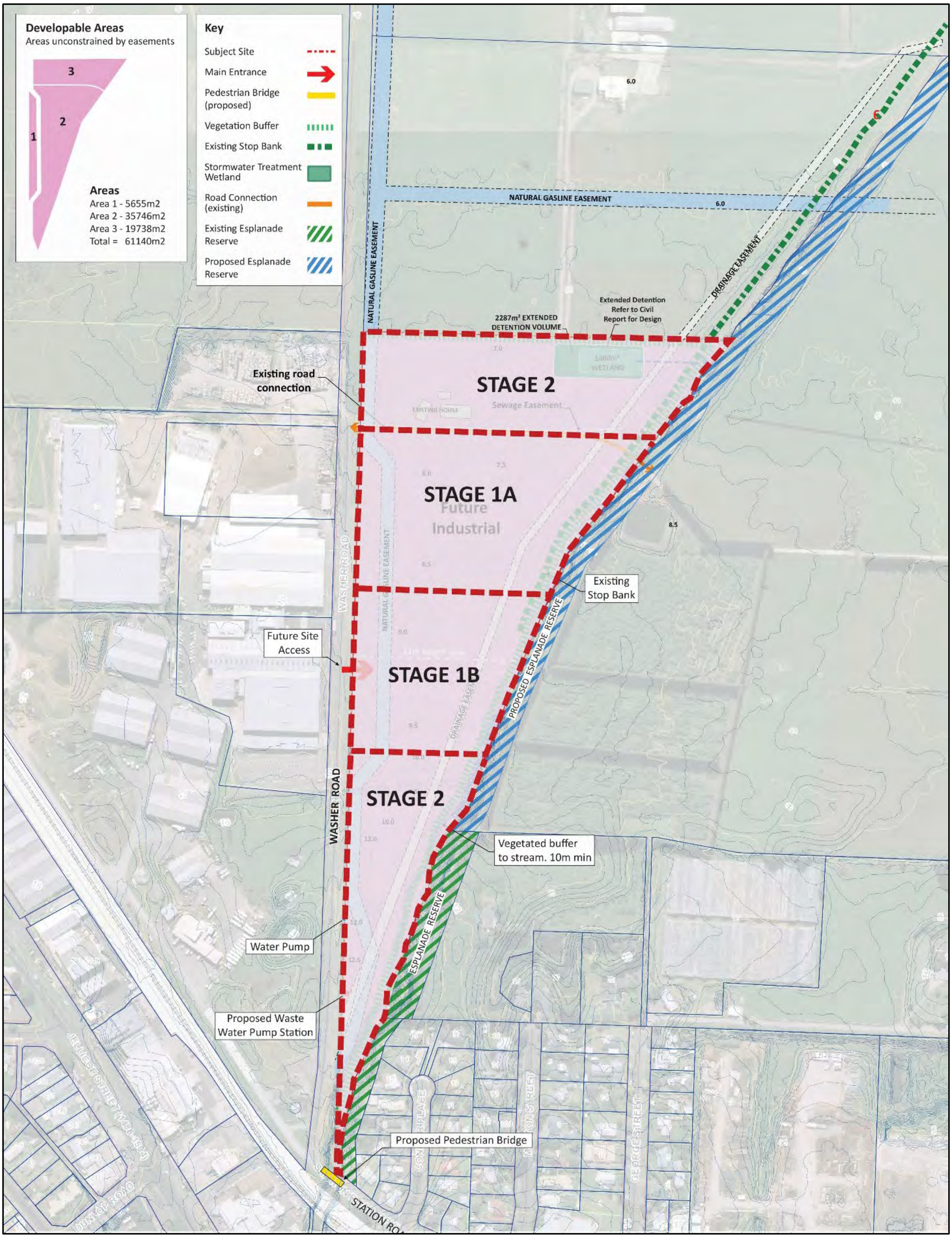


Figure 2: Washer Road Business Park Staging Plan

Assessment of Existing Rule Framework

Assessment of Existing Rule Framework		
Topic	**Existing Rule Framework**	**Proposed Rules**
Subdivision and Development	The existing rule framework and performance standards under Chapter 12 of the District and Infrastructure Development Code are adequate for the proposed plan change area.	Infrastructure works to be implemented in accordance with Washer Road Industrial Area Staging Plan and schedule of works.
Industrial land use activities and performance standards	Permitted Industrial activities provided for under chapter 21 of the District Plan for the Industrial Zone are adequate for the plan change area.	New rules have been prepared
Landscape Buffer Area	Chapter 21 identifies the need for landscape buffer areas where industrial activities are located against ecological feature such as a stream and when located adjacent to rural and residential zones. Buffer areas are proposed and referenced on the structure plans.	Landscape buffer area is to be in accordance with the proposed Structure Plan Map and supporting schedule of works. A detailed landscape plan and planting schedule should be provided for approval at time of Development Works Approval.
Earthworks	Earthworks fall within the jurisdiction of the Regional Council, but there are provisions within the District Plan as well. These are appropriate to control the proposed works. Regional Earthworks consent will be required for raising low lying land above flood levels, as the disturbance area will exceed 1ha and 5000m^3. Refer to flood overlay map and associated earthwork volumes.	

Transportation and Car Parking	The Policy and Rule framework for car parking and transport under Chapter 4 of the District Plan is adequate for the plan change area. Further rules will be added to facilitate mitigation.	Proposed transportation upgrades and mitigation are to be in accordance with the staging and schedule of works outlined under Structure Plan.
Financial Contributions Chapter	In accordance with Chapter 11 of the District Plan, financial contributions payments made by development of the Industrial land will contribute to the proportionate share of infrastructure.	LTP and finco charges to be updated by Council.
Natural Hazards	Chapter 8 of the operative District Plan relates to natural hazards including floodable areas. Rule 8.3.3(c) applies to earthworks or the establishment of buildings in floodable areas. The Services and hazards report by Lysaght Consultants (Appendix 3 to this Plan Change application) identified the plan change area should be raised to RL 10.5m to avoid the 1% AEP. This will be addressed at time of earthworks or subdivision consent.	No new rules are required. The activity is an RDA

Proposed Amendment Rule Framework (amendments and new rules)

Amend **Rule 21.3.5** by making the following amendment to the title of the rule.

Additional Permitted Activities (Te Puna Business park and Washer Road Business Park only)

Amend **Rule 21.4.1(a) Height and Daylighting**, by adding a bullet point maximum height limit as follows.

- Washer Road Business Park – 9-11m as illustrated on the Washer Road Business Park Structure Plan.

Amend **Rule 21.4.1 (c) Visual amenity – Streetscene,** add bullet point

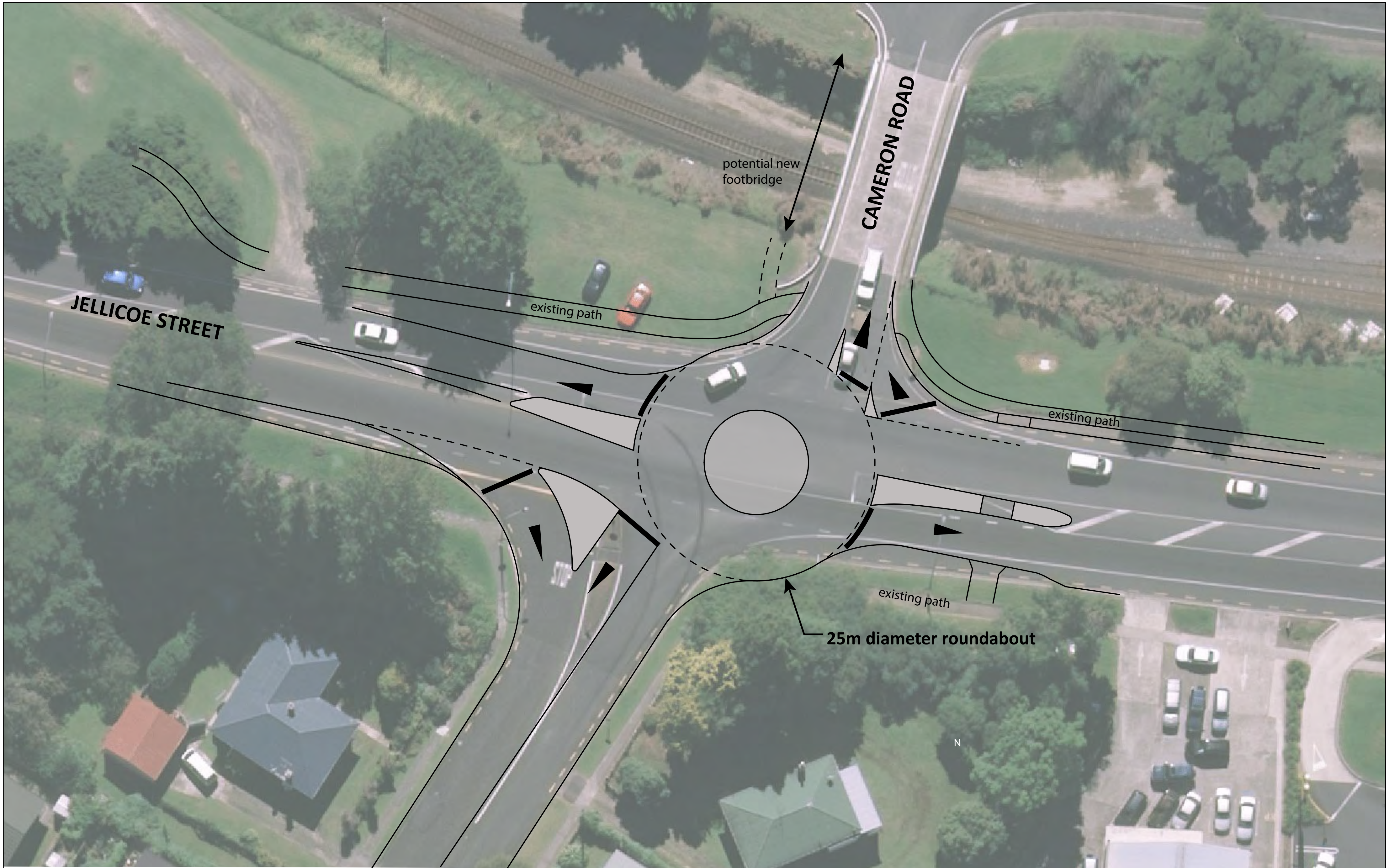
- Washer Road Business Park and having a boundary to Washer Road and any future public road to be vested in Council.

Amend **Rule 21.4.1(d) Visual amenity – reflectivity**, add

- Washer Road - All buildings/structures adjacent to the Ohineangaanga Stream and shall be developed in accordance with Washer Road Industrial Structure Plan included in Appendix 7

Update Appendix 7 of the District Plan by adding the Washer Road Business Park Structure Plan as per Figure 1 above.

Attachment A – Roundabout Upgrade



Jellicoe Street and Cameron Road

Intersection Concept Plan

Jellicoe Street and Cameron Road Intersection

0 5 10 15 20 25

Date: 22 July 2019

Scale: Refer to Scalebar

Drawing No. Jellicoe Street and Cameron Road Intersection.ai

DESIGNED BY STANTEC, DRAUGHTING BY MPAD

Stantec

MOMENTUM PLANNING AND DESIGN

Landscape and Visual Assessment

Washer Road Business Park

David Marshall

April Month 2021

Table of Contents

1.0 Applicant and Property Details

The details of the applicant and the site are as follows:

To:	Western Bay of Plenty District Council
Applicant's Name:	David Marshall
Site Address:	66 Washer Road Te Puke
Legal Description:	PT LOT 1 DP 25471
Site Area:	Total Lot Area (20.7718ha). Subject area = 7.012ha
District Plan Zoning:	Rural zone
Designations / Limitations:	Flood Plan Area; Gas Easement; Drainage Easement; Adjacent to Ohineangaanga Stream being part of the Kaituna Drainage Scheme.

2.0 Introduction

Momentum Planning and Design has been engaged by David Marshall, 'the applicant', to assess the potential landscape and visual effects introduced by the proposed Washer Road Industrial Park Plan Change, and associated effects resulting from the development of this land for industrial use. This report will provide an overview of the existing environment, a description of the landscape change proposed, and identify how such a change will affect the physical landscape, the landscape character and/or the amenity values of the site and surrounding area.

The statutory approval process that is being adopted for this project is a private plan change request to rezone the land from rural to industrial. This landscape and visual assessment will also be relevant for future subdivision consent applications that will follow the plan change process.

The assessment of the potential for landscape and visual effects is therefore based on the subsequent subdivision and development of the land that will be enabled through the approval of the plan change request.

In the context of the above, this report will provide an overview of the existing environment, a description of the change that will be enabled by the proposed plan change and identify how such change will affect the physical landscape, landscape character and/or visual amenity values of the site and the surrounding area.

This report should be read in conjunction with the Momentum Planning and Design Washer Road Industrial Park Structure Plan (Appendix 1).

3.0 Methodology

The landscape and visual assessment provides a framework for assessing and identifying the nature and significance of potential landscape and visual effects.

The landscape and visual assessment includes the identification of potential effects on the receiving environment, taking into consideration the existing and planned character of the surrounding context, both natural and urban.

The assessment of landscape and visual effects are separate, although linked procedures. The existing landscape and its visual context contribute to the existing environment against which any effects can be assessed in a landscape and visual effects assessments. The effects can be defined and differentiated by the following definitions (Quality Planning, 2020).

> ***Physical landscape effects*** *derive from changes in the physical landscape, which may give rise to changes in its character and how this is experienced. This may in turn affect the perceived value ascribed to the landscape.*
>
> ***Visual landscape effects*** *relate to the changes that arise in the composition of available views as a result of changes to the landscape, to people's responses to the changes, and to the overall effects with respect to visual amenity.*[1]

[1] http://www.qualityplanning.org.nz/index.php/planning-tools/land/landscape/landscape-assessment

Landscape and visual effects are assessed by first understanding the existing context, associated viewing audience and permitted baseline. This will establish a baseline which the proposal can be determined against. This assessment also highlights any mitigation techniques that have been incorporated into the proposal.

This assessment has been undertaken taking into consideration Quality Planning Landscape Guidance Note and the NZILA Guidelines for Landscape Assessment, which utilises a 7-point rating scale to assess effects – described in table 1 below.

Table 1: Defined Table of Effects

Table 1 - 7 Point rating scale with associated definitions.

Very High	**Total loss to the characteristics**
Extreme	*Total loss of the existing character, distinctive features or quality of the landscape resulting in a complete change to the landscape outlook*
Very High	*Major change to the existing character, distinctive features or quality of the landscape or a significant reduction in the perceived amenity of the outlook.*
High	*Noticeable change to the existing character or distinctive features of the landscape or reduction in the perceived amenity or the addition of the*
Moderate - Low	*Partial change to the existing character or distinctive features of the landscape and a small reduction in the perceived amenity.*
Low	*A slight loss to the existing character, features or landscape quality*
Very Low	*The proposed development barely discernible with little change to the existing character, features or landscape quality*
Negligible	*The proposed development is barely discernible or there are no changes to the existing character, features or landscape quality.*

In accordance with the Resource Management Act (RMA), a rating scale for the effects on the environment is derived as being more than minor, minor or less than minor. An overall conclusion as to the nature and extent of the effects on the environment will be made based on the assessment completed.

Prior to conducting the assessment, a desktop study was completed which included a review of the relevant information relating to the landscape and visual aspects of the proposal. This information included:

• the Washer Road Business Park Structure Plan.

• Western Bay of Plenty District Plan, including relevant planning maps and the Rural objectives and policies and the Industrial zone objectives and policies.

• Aerial photography.

• Ground contours.

Site visits were also undertaken to further understand both the site and the surrounding context. A site visit took place on 23rd of April 2021 and focused on the potential physical impact the proposal would have on the surrounding context, what changes there would be to the landscape character of the site and surrounding area and the identification of viewing audiences to inform potential for adverse visual effects.

4.0 Existing Environment

4.1 Site Location and Context

The Marshall farm comprises approximately 200ha over 6 combined titles (see Figure 1 below). The farm has been used for predominantly grazing and horticultural uses in the past, including the land subject to this proposal – highlighted in red.

The Marshall farm as shown in Figure 1 below is accessed from Washer Road and Seddon Street. The farm adjoins the zoned urban area of Te Puke and the proposed zone change area is located on the south western corner of the property bound by Washer Road and west and the Ohineangaanga Stream to the East. A stop bank is established along the true left bank of the Ohineangaanga Stream (See Figure 12). Washer road is a sealed road with approximate sealed width of 5.0m.

The farm is identified in the District Plan as being floodable. Flood modelling has been completed by the Regional Council who have mapped the extent of the 100-year flood plain. Part of the proposed Industrial zoned land will be filled to avoid the flood hazard. The contour of the land proposed for industrial use has a contour range of approximately RL 7.0m Moturiki to the northern and RL 12.5m Moturiki to the south.

The geology of the site has been assessed by CMW Geoscience. The site is underlain by Late Pleistocene to Holocene aged alluvial river deposits, with Upper Matua Subgroup deposits at depth. Some filling to the south of the site to a depth of approximately 1.0m was detected by CMW during their investigations.

"Holocene aged alluvium comprising interbedded sandy silts, clayey silts and organic soils inferred to be very soft to stiff were presence in all CPT tests to depths of up to approximately 10 metres below existing ground. A distinct bed of sandy dominant soils inferred to be pumiceous sands was observed within the alluvium between 5.0 and 8.0m below existing ground, at up to 5m thick." (CMW, Geotechnical Assessment Page 4).

Groundwater was present at depths ranging from 2.1m to 5.2m below ground level.

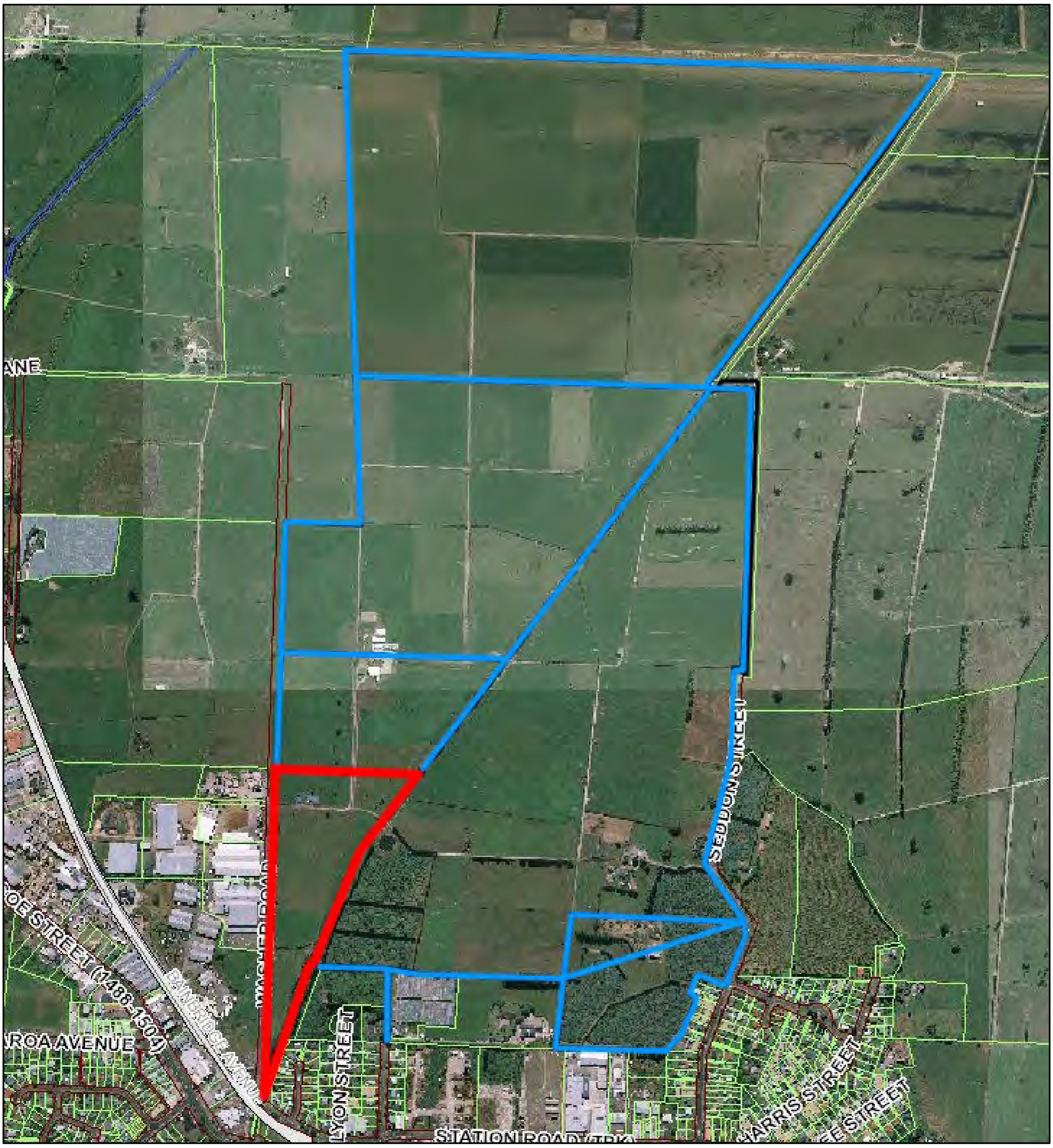


Figure 1. Map showing title comprising David Marshall's Farm (blue). The area subject of this re-zoning is highlighted with a red boundary.

5.0 Statutory Context

5.1 Resource Management Act

Part 2 of the Resource Management Act (RMA) sets its purpose and principles. Part 2, Section 5 states that the purpose of the RMA is to promote the sustainable management of natural and physical resources. Section 6 sets out the matters of national importance that must be recognised and provided for in achieving the purpose of the RMA.

The protection of outstanding natural features and landscapes from inappropriate subdivision, use and development is also identified as a matter of national importance in section 6(b). There are no such features and landscapes identified near or within the site.

Section 7 contains other matters that must be given particular regard to, and section 8 states that the principles of the Treaty of Waitangi must be considered in achieving the purpose of the RMA.

Regarding section 8, consultation with local Iwi has been undertaken as part of the plan change application process. As part of any future development proposal, archaeology will be considered to ensure appropriate measures are in place to deal with any potential findings. This will include appointment of an archaeological authority.

5.2 Western Bay of Plenty District Plan

The site is located within the Rural Zone and is low lying farmland adjacent to the Ohineangaanga Stream. The District Plan does not identify this area as having any special landscape features. However, it does aim to protect the stream and river corridors from inappropriate development and seeks to improve public access to these areas. Below is an assessment of both the District Plan objectives and policies that are relevant to the Plan Change application and consideration of landscape and visual effects.

The District Plan identifies the following significant issues with respect to the landscape values of the district.

> *1. The District has a number of outstanding natural features and landscapes, the visual quality of which can be adversely affected by inappropriate subdivision, use and development.*
>
> *2. Important viewshafts from public locations such as State Highways, other strategic roads and public lookouts can be compromised by inappropriate land use and development activities.*

There are no outstanding natural features and landscape (ONFL) overlays applying to the application site (See Appendix 2, WBOPDP).

A review of the planning maps identifies there are no important view shafts that affect the site. The site is separated from Jellicoe Street, the main street in Te Puke, by the East Coast Main Truck Railway line, the Industrial zone and a local road – Station Road. It does form part of a distant view from View 7 – Appendix 2 WBOP District Plan, but as the separation is several kilometres and the site is relatively small there will be no noticeable change to the rural and coastal vista when viewed from the site.

The District Plan in Appendix 4 does identify a schedule of proposed esplanade and strips and this includes both banks of the Ohineangaanga Stream between State Highway 2 (now divested to WBOPDC) right through to the banks of the Kaituna River. However, neither the planning maps nor Appendix 4A list these proposed esplanade reserves for the Ohineangaanga. The proposed Plan Change and structure plan includes a riparian buffer area along the left bank of the Ohineangaanga Stream, so is consistent with the overall intent of the District Plan.

Chapter 6 - Landscape Objectives and Policies

Objective/Policy	Comment
Objective 6.2.1 The unique visual quality and character of the District's outstanding natural features, landscapes and viewshafts are protected from inappropriate subdivision, use and development	There are no ONFL or important landscape features affected by this proposal. Similarly, there are no important view shafts affected.
Policy 6.2.2.1. Within areas identified as being outstanding natural features and landscapes, landscape character should be protected and enhanced by managing the adverse effects of inappropriate land use and development activities.	This is not relevant to the site as there are no ONFL landscape areas affecting the site. The District Plan does identify landscape and visual effects.
Policy 6.2.2.1. 2. Identified outstanding viewshafts throughout the District should be maintained through the avoidance of inappropriate development	This is not relevant to the site as there are no important viewshafts likely to be adversely affected as a result of the land use change.

5.3 Regional Policy Statement

The RPS provides a regional guidance document that district and regional plans must be consistent with. The relevant landscape objective of the BOP RPS is identified below.

> *Objective 18: The protection of historic heritage and outstanding natural features and landscapes from inappropriate subdivision, use and development.*

Although the site and nearby surrounds do not encompass any outstanding natural features or landscapes, the adjacent Ohineangaanga Stream is an important ecological feature. The proposed structure plan ensures any future industrial development is set back from this stream boundary, while also providing for a 10m wide landscape buffer area to enhance the existing riparian margin.

5.4 Response to Statutory Context

As discussed under section 5.1 - 5.3 above, statutory matters relevant to the site's natural character, landscape and future industrial use have been considered. Effects will be appropriately managed in accordance with the environmental outcomes sought by the RMA, and objectives and policies of the RPS and District Plan.

5.5 Visual Catchment and Viewing Audiences

Based upon the site visits undertaken and an analysis of the project area in relation to the surrounding topography and land use it is considered that the primary public and private viewing audiences comprise:

Public viewing audiences:

- Views when driving north and south along Washer Road.
- Minor views when driving along Bainbridge Ave.

Private viewing audiences:

- Industrial land uses to the west
- Commercial and industrial land uses to the south west, on the north and south side of Bainbridge Ave.
- Private residences to the south east along Conifer Place and Maylon Street.

Table 2 Assessment Viewpoints

View Point No	Location	Direction of View	Distance to Site	Degree of visibility	Reason for Selection
1	The northern end of Washer Road	looking south southeast across the site	10m	Unobstructed	Rural landscape character
2	Washer road midway	looking north east through to south east across the site	10m	Unobstructed	Aspect of key visual change likely as a result of future industrial use
3	Washer Road 150m north	looking across the site in a northern direction	10m	Unobstructed	Aspect of key visual change likely as a result of future industrial use
4	Bainbridge Avenue	Looking north north east across the site from Bainbridge Avenue	200m	Unobstructed distant view	View from adjacent industrial street. Change in visual character.
5	Conifer Place cul de sac	Looking north from the cul des sac towards the site	80m	Partial from private properties	Adjacent residential street
6	Maylon Street	Looking north north west from the cul des sac towards the site	240m	Fully obstructed	Nearby residential street

Each of these identified viewpoints is considered under the viewpoint analysis within section 6, and supporting viewpoint photos within Appendix 3.

6.0 Proposal

The applicant, David Marshall, seeks a plan change to rezone approximately 7.012ha of land at 66 Washer Road, Te Puke from Rural to Industrial to establish the Washer Road Business Park (See plan change Structure plan in appendix 1). The new zoning enables Industrial activities including buildings and yards.

This comprises the southern portion of the Marshall farm, a wedge shape piece of pastural land, which is bordered by Washer Road and the East Pack industrial buildings to the east, and Ohineangaanga Stream along the western boundary. To the north is more pastural land owned by the applicant. To the south-east is existing residential properties, separated from the site by the Ohineangaanga Stream and a proposed 10m minimum vegetation buffer, which will be implemented for the length of the eastern boundary as part of the plan change.

Figure 2. Map showing the southern portion of Marshall farm subject to plan change.

The site has several no-build areas due to the setback from the stream, the existing esplanade reserve, drainage reserves and also the First Gas easement across the site. This limits the developable area and where building may be located.

The wedge-shaped area to the south of the site is heavily affected by the constraints and it is unlikely that there will be any significant industrial buildings in this area. As a consequence, the industrial built form is anticipated to be towards the north of the site reducing potential visual effects to the small residential neighbourhood east of the site (Conifer Place).

The proposed zone and structure plan has height overlays restricting building height to 9m to the southern portion of the site and 11m to the northern part of the site. This will also help to minimise the visual effects of future industrial development.

7.0 Landscape Effects

7.1 Existing Landscape

The landscape character of the site is typical of flat pastoral grazing land in New Zealand. The productive areas are predominantly clear of any structures or trees, with the exception of farm drains across the site and associated vegetation growing in the drains. Large trees are located towards the boundaries along the road edge and riparian margin to stream. A farmhouse and ancillary buildings are located at the northern end of the site as illustrated in Figure 2.

The site is located adjacent to the northern urban boundary of Te Puke located between established residential and industrial areas.

Opposite the site on the western side of Washer Road is the Eastpack kiwifruit post-harvest processing facility. This includes large storage buildings, kiwifruit packhouse, office and car parking.

East of the Ohineangaanga Stream is Conifer Place a short no exit residential street. This is fully developed and has dwellings predominantly of weather board cladding typical of the 1960's and 1970's. The stream corridor separates the site from Conifer Place creating a visual separation resulting from the existing landscape trees and also shelter belt hedging.

7.2 Change in Landscape Effects

7.2.1 Physical Landscape Effects

It is relevant to assess and comment on the change in landform and vegetation, and ultimately landscape character change as a result of the zone change and likely future development.

With the exception of the riparian margin, shelter belt trees and future landscape buffer, the site will be cleared of any vegetation, filled and recontoured to accommodate the landform specified in the civil engineering documentation prepared by Lysaght Consultants. This will ensure the land is no longer subject to flooding and is suitably prepared to support future industrial buildings.

To establish the proposed landform material will need to be imported and placed to raise the ground contour in some areas in accordance with the flood overlay map in appendix 2b and the Lysaght Services Report.

The landform will remain flat, albeit at a higher level. Ultimately there will be a moderate change to the landscape, in order to clear the land and prepare it for industrial development.

Using the NZILA 7 point rating scale system, the change in landscape effects from the rural character to an industrial land use, would be considered **moderate to high** following future development enabled by the Plan Change.

7.2.2 Visual Landscape Effects

Visual Landscape effects relate to the change in landscape character resulting from the proposal on the application site.

The key viewpoints are identified in Table 2 and Figure 3 below. This includes views looking north and south along Washer Road. Views looking east from the adjacent industrial land uses, views from the commercial and industrial land uses to the south, and views from the residential properties to the southeast.

The effects on views from the rural land to the east and north are not considered as part of this assessment as this land forms part of the applicants farm.

The degree of change to view shafts depends on the existing and proposed boundary treatments within the site. Ultimately, industrial buildings will be established to a height of between 9 and 11m within the developable area illustrated on the structure plan map and supporting height overlay map.

The most sensitive visual catchment is the residential properties to the south and south-east along Conifer Place and Maylon Street. Industrial buildings in close proximity to this area will be restricted to 9m.

Views from these properties into the industrial land is screened by the existing trees along the edge of the Ohineangaanga Stream, which are up to 10m in height. This tree lined edge will be bolstered by the 10m landscape buffer along the eastern boundary, as shown on the Structure Plan Map.

The combination of the existing trees and proposed landscape strip will ensure that the industrial uses will remain suitably screened from the residential properties. This is illustrated in cross section AA in Appendix 4.

The less sensitive viewing audience is the industrial uses on the western side of Washer Road and those to the south west adjacent to Bainbridge Ave. These properties will experience the most notable change to their aspect east and north as there is limited screening to the properties' western boundary. However, given these properties are in industrial uses, the visual effects of the proposal are consistent with these existing land uses and therefore complimentary.

The effects on each identified view shaft are assessed in detail within section 6 below and rated using the NZILA 7 point rating scale system.

8.0 Viewpoint Analysis

The context plan in figure 3 below, illustrates the viewpoints subject of this assessment. This viewpoint analysis should be read in conjunction with the viewpoint photos within Appendix 3 and shown in Figure 3 below.

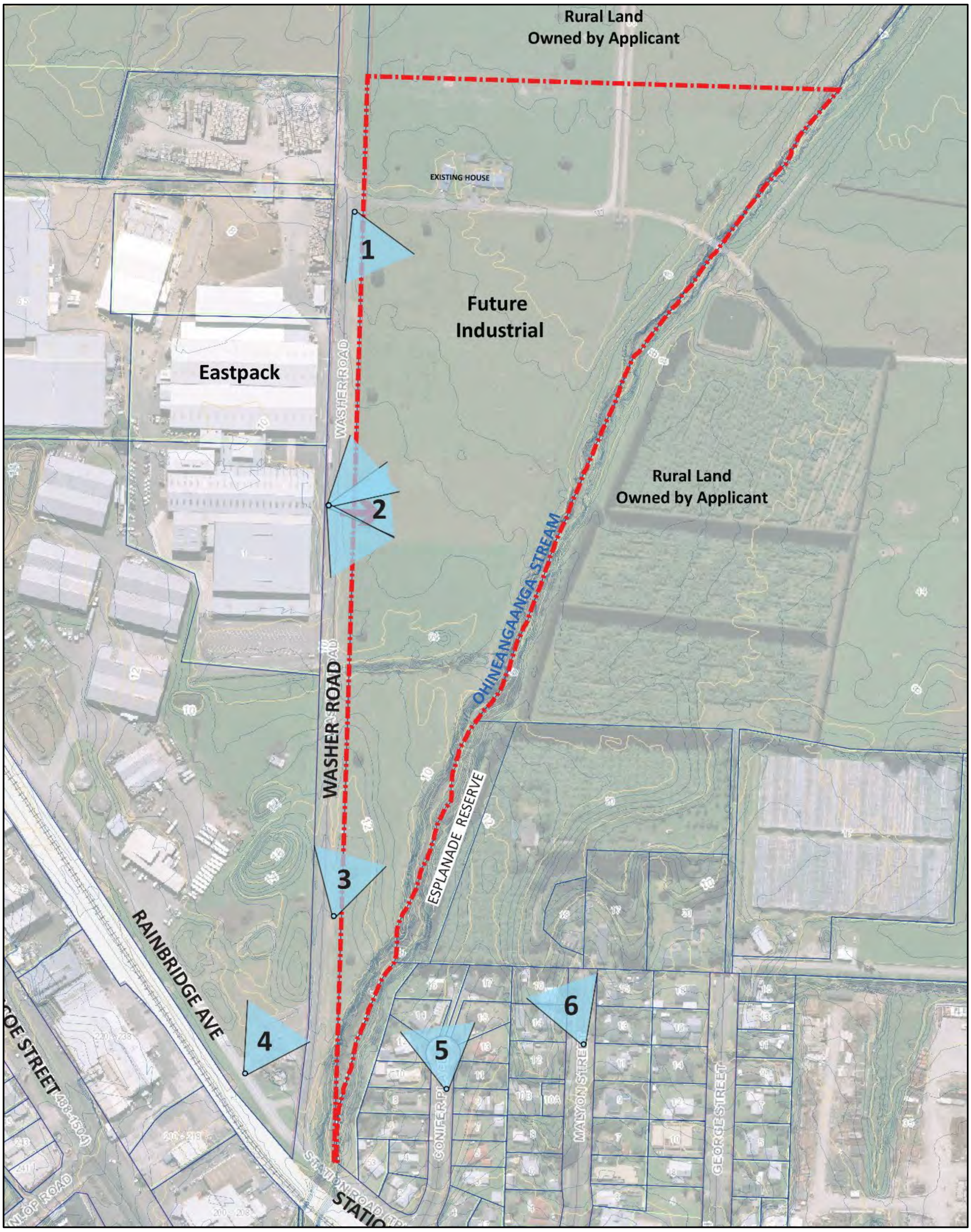


Figure 3 - Landscape Assessment - Viewpoint Location Map

Viewpoint 1

Looking south across the site from northern end of Washer Road, which is an unobstructed view of the site also showing the adjacent industrial zone.

This viewpoint is representative of the rural character of the site and adjacent industrial land to the west of the site looking south along Washer Road. As shown in Viewpoint 1 in Figure 3, the view is defined by flat grazing land with shelter belt trees in the distance, which run along the edge of the Ohineangaanga Stream.   The existing industrial buildings on the Eastpack site, create a visual contrast to the open pasture of the application site.

Viewpoint 2

Looking east, north-east and south-east across the site, from the Washer Road berm outside EastPack, which is an unobstructed view of the site.

This viewpoint is representative of the aspect experienced from Eastpack Industrial area and their workers. Similarly, this viewpoint is defined by flat grazing rural land with shelter belt trees in the distance, which run along the edge of the Ohineangaanga Stream and function as a wind break for the kiwifruit orchard on the opposite side of the Ohineangaanga Stream.

Viewpoint 3

Looking north across site from the southern end of Washer Road, which is an unobstructed view of the site.

This viewpoint is representative of the southern extent of Washer Road and is a representative view that vehicles experience while travelling north. This viewpoint is defined by flat rural grazing land, shelter belt trees along the edge of the Ohineangaanga Stream and farmhouse and buildings in the distance towards the northern boundary of the application site. The Eastpack site is a prominent industrial site and contrasts with the open grazing paddocks of the application site. Trees set back 10m to 15m into the site provide a linear and regular landscape feature to the site, which contribute to the Landscape amenity values of Washer Road.

Viewpoint 4

Looking north east towards site from Bainbridge Ave industrial area, provides an unobstructed but distant view of the site.

This viewpoint is representative of what can be seen from not only Bainbridge Ave, but also the industrial and commercial properties located adjacent on the western side of the railway line.

Viewpoint 5

Looking north towards site from Conifer Place, the site is partially screened by mature trees that run along the edge of the Ohineangaanga Stream. As there is separation provided by an esplanade reserve, the stream and a future esplanade reserve on the true west bank of the stream there is a fair separation between residential activities and future industrial site.

This viewpoint is generally representative of the residential properties along the eastern side of Conifer Place and at the cul de sac head.

Viewpoint 6

Looking north towards site from Maylon Place, view of site is screened by mature trees that run along the edge of the Ohineangaanga Stream and the southern boundary of the adjacent kiwifruit orchard. There are also large specimen trees located in the residential properties in the street that obstruct views north and north west towards the site. There is no clear view of the site from this no exit street and the dwellings on Conifer Place further obstruct the view to the site.

This viewpoint is representative of the residential properties within this cul-de-sac.

8.1 Summary of Visual Effects

A summary of visual effects anticipated under each option is provided below:

Table 3: Assessment of Effects Viewpoints

VP No	Location	Rating (negligible; very low; low; moderate; high; very high; extreme)
1	Washer Rd	High
2	Washer Rd	High
3	Washer Rd	High
4	Bainbridge Ave	Low-moderate
5	Conifer Place	Low
6	Maylon Street	negligible

Using the NZILA best practice rating scale, the visual assessment concludes that in the context of the industrial land to the west (Eastpack) the change in visual effects is **high** due to the lack of vegetation or contour change on the site. The visual effects are considered to be low-moderate on the distant industrial uses to the south-west.

Visual effects on the residential properties to the south/ south-east in Conifer Place and Maylon Street are determined to be low to negligible, taking into consideration the existing shelter belt planting along the Ohineangaanga Stream, which will visually screen the proposed industrial buildings. This screening will be bolstered by the existing esplanade reserve and proposed 10m landscape buffer.

9.0 Conclusions

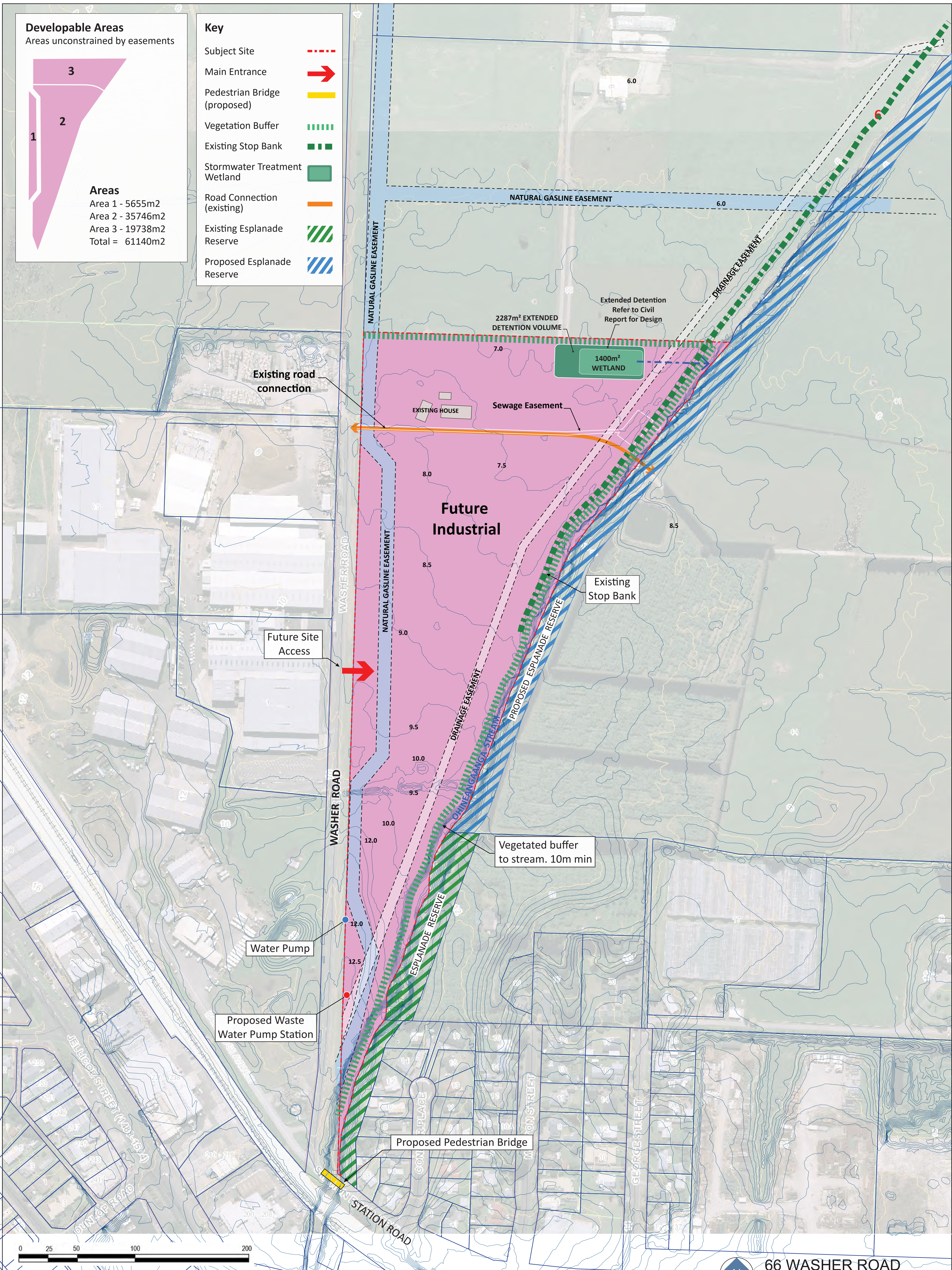
In conclusion, the landscape and visual effects resulting from the proposed industrial development are rated between negligible and high. Importantly, the most sensitive residential neighbours will experience negligible to low visual effects as a result of the separation and existing mature trees and proposed mitigation landscaping along the Ohineangaanga Stream, which screen views north and north west.

The proposed industrial development will complement the industrial zone to the west and south-west. Although the visual changes have been determined as 'high' for these properties, it is considered acceptable based on the consistency in industrial land use.

A 10m wide landscaping buffer is proposed along the edge of the Ohineangaanga Stream, to separate industrial activities from the riparian margin and enhance the landscaping and ecological values along the Ohineangaanga Stream.

Based on the above assessment, landscape and visual effects are considered be more than minor on the adjacent industrial areas (view shafts 1-4) and less than minor on the residential properties to the south and south-east (view shafts 5-6), taking into consideration the landscape buffer proposed.

Appendix 1 – Proposed Structure Plan



MOMENTUM PLANNING AND DESIGN

WASHER ROAD BUSINESS PARK

Plan Change Structure Plan

flood data provided by Regional Council (overlayed)

66 WASHER ROAD
TE PUKE

Date: APRIL 2021 | Drawn: TW
Scale: refer to scale bar | Checked: RC
Drawing No. 66 WASHER ROAD

Appendix 2 – View Point Location Map

Viewing Audience

1. The northern end of Washer Road. Looking South south east across the site

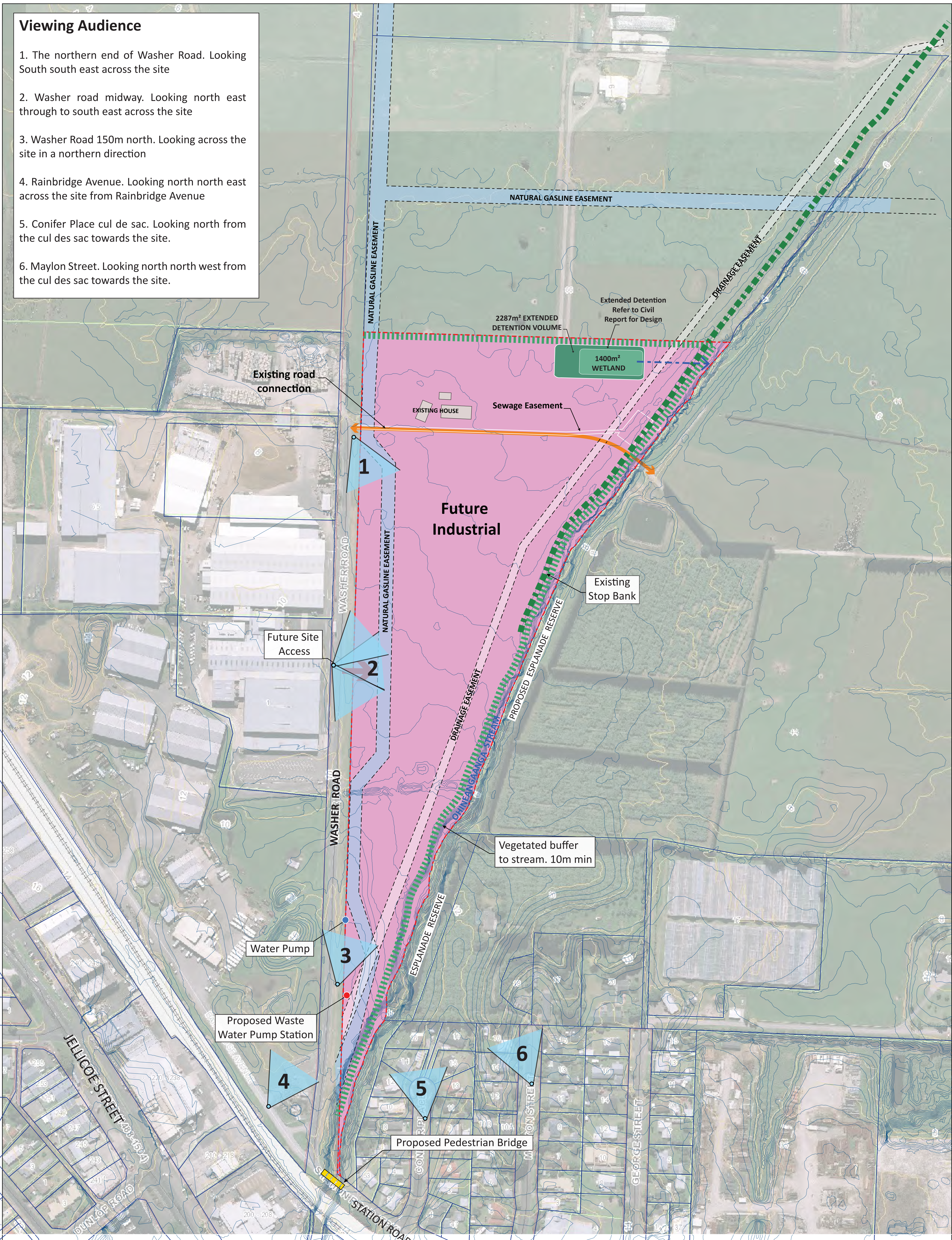
2. Washer road midway. Looking north east through to south east across the site

3. Washer Road 150m north. Looking across the site in a northern direction

4. Rainbridge Avenue. Looking north north east across the site from Rainbridge Avenue

5. Conifer Place cul de sac. Looking north from the cul des sac towards the site.

6. Maylon Street. Looking north north west from the cul des sac towards the site.



WASHER ROAD BUSINESS PARK

VIEW POINT LOCATION MAP

Defined for supporting Landscape and Visual Assessment

MOMENTUM PLANNING AND DESIGN

66 WASHER ROAD
TE PUKE

Date: APRIL 2021
Scale: refer to scale bar
Drawing No. 66 WASHER ROAD
Drawn: TW
Checked: RC

Appendix 3 – Viewpoint Photos

Client David Marshall	**Project** 66 Washer Road, Te Puke	**Appendix 4** View Point 1, Washer Road looking South	**Issue Date:** 23/04/2021

MOMENTUM PLANNING AND DESIGN

Client	Project	Appendix 4	Issue
David Marshall	66 Washer Road, Te Puke	View Point 2 - Washer Road looking east	Date: 23/04/2021

MOMENTUM PLANNING AND DESIGN

Client	Project	Appendix 4	Issue
David Marshall	66 Washer Road, Te Puke	View Point 3 - Washer Road looking north	Date: 23/04/2021

MOMENTUM
PLANNING AND DESIGN

Client	Project	Appendix 4	Issue
David Marshall	66 Washer Road, Te Puke	View Point 4 - Bainbridge Ave looking north-east	Date: 23/04/2021

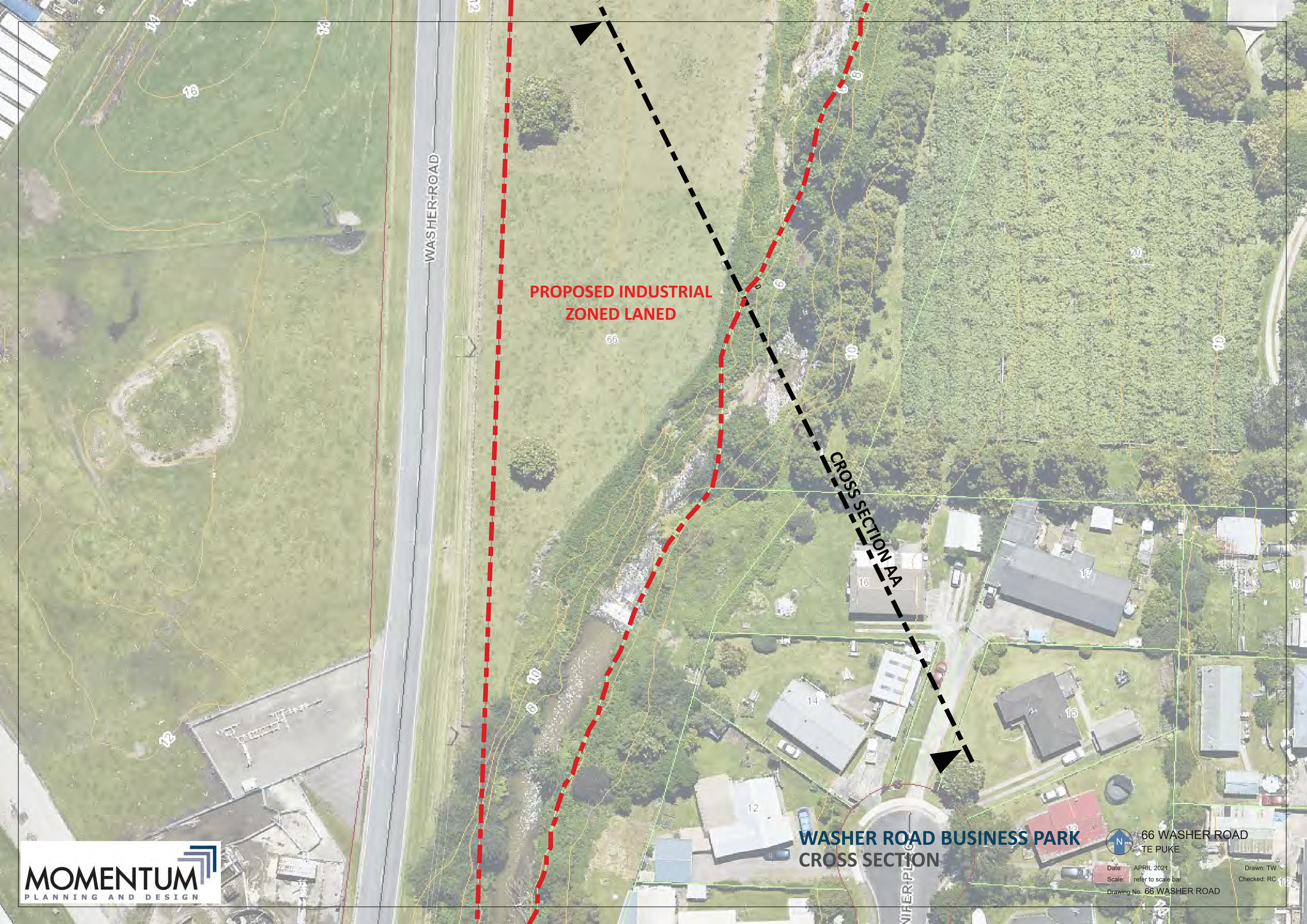
MOMENTUM
PLANNING AND DESIGN

Client	Project	Appendix 4	Issue
David Marshall	66 Washer Road, Te Puke	View Point 5 - Conifer Place looking north	Date: 23/04/2021

MOMENTUM PLANNING AND DESIGN

Client	Project	Appendix 4	Issue
David Marshall	66 Washer Road, Te Puke	View Point 6 - Maylon Street looking north	Date: 23/04/2021

Appendix 4 – Cross Section AA



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PLANNING AND DESIGN
WASHER ROAD BUSINESS PARK
CROSS SECTION
66 WASHER ROAD
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Date: APRIL 2021
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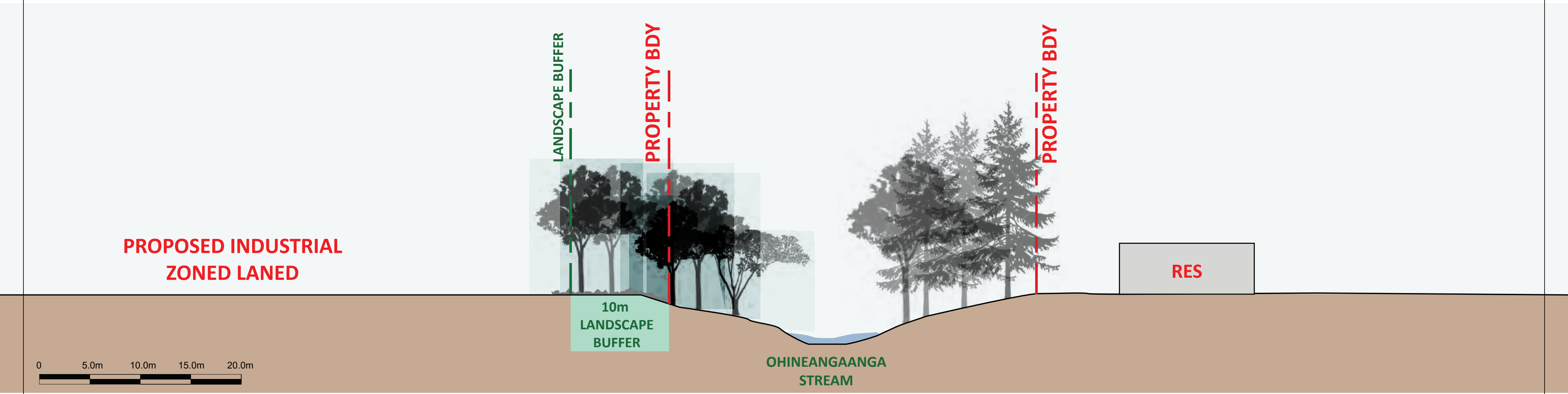

CROSS SECTION AA:

THROUGH SITE, OHINEANGAANGA STREAM & ADJACENT RES PROPERTIES

BASED OFF WBOPDC MAPI DATA

MOMENTUM
PLANNING AND DESIGN

WASHER ROAD BUSINESS PARK
CROSS SECTION

N

66 WASHER ROAD
TE PUKE

Date: APRIL 2021
Scale: refer to scale bar
Drawing No. 66 WASHER ROAD
Drawn: TW
Checked: RC