

12 July 2016

Danne Mora Holdings Limited
c/o Evolve Land Limited

Via email: greg@evolveland.nz

Attention: Greg Dewe

Dear Greg

**Geotechnical Completion Report – Halswell Commons Stage 1 Development
(Lots 1 to 13, 15, 900, 1000 and 1001)**

This geotechnical completion report is submitted in accordance with Section 12.4.1 of the Christchurch City Council Infrastructure Design Standard.

Introduction

Danne Mora Holdings Limited is in the process of developing the Halswell Commons residential development in Halswell in southwest Christchurch, with Stage 1 of the development nearing completion. During the geotechnical investigation parts of Stage 1 were identified as being susceptible, to a limited degree, to the effects of seismically induced liquefaction.

The liquefaction risk at the site was assessed as being within acceptable levels that a Technical Category 2 (TC2) equivalent classification of the site was applicable. As such no site specific liquefaction mitigation measures were required for the site development.

The conditions of Aurecon's engagement are as per our agreement relating to geotechnical investigations to support subdivision consent, and are set out in our letter of engagement dated 15 June 2015.

Geotechnical Investigations

Aurecon has undertaken a multi-staged geotechnical site investigation across the wider 70ha Halswell Commons site between 2014 and 2015 along with a review of previous geotechnical assessments carried out in 2013. The types and density of investigations meet the intent of the MBIE Guidelines.

This investigation is described in the Aurecon Report *Meadowlands Development, Geotechnical Subdivision Report, Rev1* dated 24 November 2015 prepared for Danne Mora Holdings Limited (Aurecon, 2015).

Liquefaction Hazard Assessment

The report was issued following the publication of the Ministry of Business Innovation & Employment (MBIE), guidelines in December 2012, which define the Technical Category zoning and the liquefaction induced deformation limits for each Technical Category. The categories and corresponding criteria are summarised as follows:

- **Technical Category 1 (TC1)** – Future land damage from liquefaction is unlikely, and ground settlements are expected to be within normally accepted tolerances.
- **Technical Category 2 (TC2)** – Minor to moderate land damage from liquefaction is possible in future large earthquakes.
- **Technical Category 3 (TC3)** – Moderate to significant land damage from liquefaction is possible in future large earthquakes.

For the Canterbury region, the MBIE has released a new classification system for residential land on the flat in regard to liquefaction susceptibility. These are summarised below:

Table 1: Liquefaction Deformation Limits and House Foundation Implications

Technical Category	Index Liquefaction Deformation Limits				Likely Implication for House Foundations (subject to individual assessment)
	Vertical SLS	ULS	Lateral Spread SLS	ULS	
TC1	15mm	25mm	Nil	Nil	Standard NZS3604 type foundations with tied slabs are acceptable subject to shallow geotechnical investigation.
TC2	50mm	100mm	50mm	100mm	MBIE enhanced foundation solutions.
TC3	>50mm	>100mm	>50mm	>100mm	Site specific foundation solution.

A liquefaction hazard assessment was carried out as part of the site assessments has been carried out for the entire 70ha development as outlines in the geotechnical subdivision report (Aurecon, 2015).

The liquefaction analysis for Stage 1 was based on the boreholes and CPT testing carried out as part of the geotechnical investigations for the larger subdivision and observation of actual site performance during the recent major earthquake events. The geotechnical investigation information used to assess Stage 1 is part of a larger group of geotechnical information and only the tests that are relevant for this stage have been assessed. Consideration was given to information and data from outside the stage boundary when assessing geotechnical hazards and issues.

Technical Category Classification

We have assessed the liquefaction hazard at the site. Based upon this assessment and observed site performance we believe:

- **Lots 1 to 13 and 15 fulfil the requirements of TC2 Classification.**
- **Lots 900, 1001 and 1001 are electrical kiosk, roading and balance lot areas; therefore no Technical Category Classification is applicable for these lots.**

A TC2 Classification effectively means that the MBIE believe that '*Minor to moderate land damage from liquefaction is possible in future significant earthquakes*'. House foundations and site specific geotechnical investigations are required in accordance with the MBIE (2012) guideline documents '*Repairing and rebuilding houses affected by the Canterbury earthquakes*' released in December 2012. This report is not intended to be used as a lot specific geotechnical report to support building consent application.

References

Aurecon, 2015. *Meadowlands Development, Geotechnical Subdivision Report, Danne Mora Holdings Limited, Revision 1* - dated 24 November 2015. Aurecon New Zealand Limited, Christchurch, New Zealand.

MBIE, 2012. *Repairing and rebuilding houses affected by the Canterbury earthquakes*. Ministry of Business, Innovation and Employment, Wellington, New Zealand.

Limitations

We have prepared this report in accordance with the brief as provided. The contents of the report are for the sole use of the Client and no responsibility or liability will be accepted to any third party. Data or opinions contained within the report may not be used in other contexts or for any other purposes without our prior review and agreement.

The recommendations in this report are based on data collected at specific locations and by using suitable investigation techniques. Only a finite amount of information has been collected to meet the specific financial and technical requirements of the Client's brief and this report does not purport to completely describe all the site characteristics and properties. The nature and continuity of the ground between test locations has been inferred using experience and judgement and it must be appreciated that actual conditions could vary from the assumed model.

Subsurface conditions relevant to construction works should be assessed by contractors who can make their own interpretation of the factual data provided. They should perform any additional tests as necessary for their own purposes.

Subsurface conditions, such as groundwater levels, can change over time. This should be borne in mind, particularly if the report is used after a protracted delay.

This report is not to be reproduced either wholly or in part without our prior written permission.

This conclusions in this report draws on investigations, analysis and conclusions from various investigations stages and numerous reports. For specific details please refer to the above mentioned references or contact the writers.

If you have any queries regarding the content of this letter, please do not hesitate to contact the undersigned.

Yours sincerely

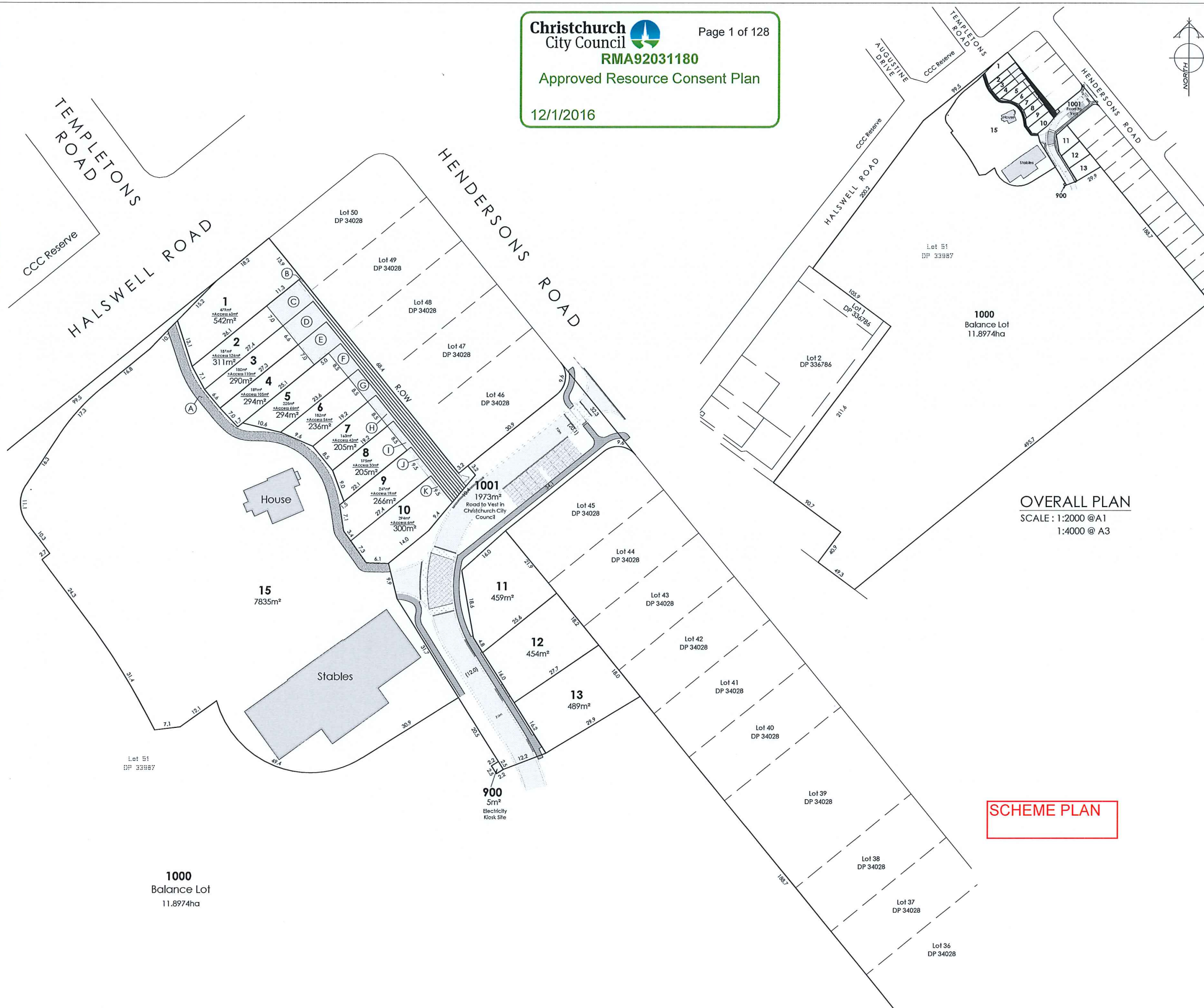


Dr Jan Kupec

PhD MSc candIng MIPENZ CPEng IntPE MRSNZ | NZGS IGS ISSMGE NZSEE

Chartered Professional Geotechnical Engineer – Technical Director

Inc: Halswell Commons Stage 1 Site Layout Plan



AMENDMENTS:		
AMENDMENT	DATE	DESCRIPTION
R1	7-8-15	BOUNDARIES UPDATED
R2	17-8-15	SUBDIVISION REDESIGN
R3	09-9-15	BOUNDARIES UPDATED
R4	11-9-15	LOT 900 ADDED
R5	24-9-15	LOTS 2, 3 & 4 AMENDED
R6	07-10-15	LOTS 1-7, 10, 11 & 13 AMENDED
R7	16-10-15	LOTS 1, 10, 15, 16, 900 & 1000 AMENDED
R8	20-11-15	LOTS 1-10, 15-16 AMENDED
R9	24-11-15	LOTS 9, 10, 15-16 & 1000 & 1001 AMENDED, ESMT ADDED
R10	01-12-15	ROAD LAYOUT SHEET ADDED

- NOTES:
- 1) Areas and dimensions are approximate & subject to final survey and deposit of plans.
 - 2) Service easements to be created as required.
 - 3) This plan has been prepared for subdivision consent purposes only. No liability is accepted if the plan is used for any other purpose.
 - 4) Any measurements taken from information which is not dimensioned on the electronic copy are at the risk of the recipient.
 - 5) This plan is subject to the granting of subdivision and/or resource consents and should be treated as a proposal until such time as the necessary consents have been granted by the relevant authorities.
 - 6) This plan has been prepared for the use of Danne Mora Holdings Limited only and no liability is accepted in relation to any other parties.

OVERALL PLAN
SCALE: 1:2000 @A1
1:4000 @A3

Proposed Memorandum of Easements

Nature	Servient Tenement		Dominant Tenement
	Lot No	Shown	
Right of way in foot	15	A	Lots 1-10
Right of way, rights to drain water & sewage & rights to convey gas, water, electricity, telecommunications & computer media	1	B	Lots 2-10
	2	C	Lots 1, 3-10
	3	D	Lots 1, 2, 4-10
	4	E	Lots 1-3, 5-10
	5	F	Lots 1-4, 6-10
	6	G	Lots 1-5, 7-10
	7	H	Lots 1-6, 8-10
	8	I	Lots 1-7, 9 & 10
	9	J	Lots 1-8 & 10
	10	K	Lots 1-9

TOTAL AREA: 13.3132ha (C.F.R. 13.3140ha)
COMPRISED IN: C.F.R. 138/1447



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JOB TITLE:
Meadowlands Heritage Park Application Plan

SHEET TITLE:
Proposed Subdivision of Lot 51 DP 33987

DRAWING STATUS:
For Subdivision Consent

SCALE: 1:500@A1 DATE: December 2015
1:1000@A3

CAD FILE: J:\18431\SUBCON\Stage 2\Heritage Subcon_R10.dwg REVISION:

DRAWING No: SHEET No:
E.18431 1 OF 2 R10