

Christchurch City Council
PO Box 73012
Christchurch 8154
New Zealand

30 May 2017

Attention: Ivan Thomson

Dear Ivan

Cranford Basin Rezoning - Additional Geotechnical Review

Beca Ltd (Beca) has been commissioned by Christchurch City Council (CCC) to provide technical advice on the suitability of rezoning approximately 50ha of land in parts of the Cranford Basin. This land, which is outside the “urban limits”, is being considered for residential zoning.

The Beca report, *Cranford Basin Rezoning - Review of Geotechnical, Hydrogeology and Stormwater Evidence*, of 8 September 2016 summarised a review of the technical evidence presented at a hearing to the proposed District Plan in December 2015. The subsequent Beca reports, *Spring identification and groundwater management for potential rezoning at the Grassmere Block*, of 22 December 2016, and *Cranford Basin Rezoning – Preliminary Geotechnical Assessment*, of 22 December 2016 addressed CCC staff comments for the Grassmere Block.

Further to these previous studies CCC have requested that Beca review aspects of the Draft Cranford Regeneration Plan (DCRP) of 30 March 2017. The scope of this current study comprises an assessment of:-

- Whether the Crozier and Case blocks [Area 5 in the DCRP] meet the recommendations of MBIE (2012) having regard to the *Geotechnical Report for Proposed Plan Change, 340 Cranford St and 60 Croziers Rd, St Albans, Christchurch, 30 June 2015, Elliot Sinclair* and the geotechnical investigation data previously considered.
- Any increased risks that would be associated with medium density housing (30 hh/ha) [Areas 1 and 2 in the DCRP] and whether there are additional risks or costs associated with land remediation for medium density housing compared to lower density options.
- Any increased risks that would be associated with medium density housing (30 hh/ha) [Areas 1 and 2 in the DCRP] and whether there are additional risks or costs associated with groundwater management for medium density housing compared to lower density options.

Sufficiency of Geotechnical Data for the Crozier and Case blocks [Area 5 in the DCRP]

Section 3.2 of the Beca September 2016 report refers to the MBIE criteria for depth (15m) and density (0.5/ha for highly variable ground conditions and a minimum of 5 for sites > 1 ha) of exploratory holes at Plan Change.

Within the data referred to above there are four exploratory holes [in Area 5 of the DCRP], as follows:-

- CPT 6 to 7.2m depth by ProDrill (2013)
- BH001 to 10m depth for Elliot Sinclair (2015)
- CPTu 02 to 10m depth for Elliot Sinclair (2015)
- CPTu 01 to 15m depth for Elliot Sinclair (2015)

Additionally the Elliot Sinclair report of 30 June 2015 refers to CPTs 7 and 8 which we understand were included in a Connell Wagner Limited report, *Site Appraisal - Geotechnical Report Cranford Street, Christchurch*, of 18 February 2007. These CPTs extended to between ~ 5m and 7m depth. Elliot Sinclair state that they were unable to obtain the raw CPT data for these tests and as such they have not been included in the liquefaction assessment.

As the 2007 data has not been analysed (and may well no longer be valid as there is evidence of liquefaction and subsequent re-consolidation having occurred during the Canterbury Earthquake Sequence which would have altered the characteristics of the soils) the total number of exploratory holes that can be considered is four. This is less than the minimum of five given by MBIE.

There also remains a question of whether all the exploratory holes undertaken to date are “*deep*” (i.e. can the soils between 10m and 15m depth be adequately characterised by one 15m deep CPT) and if so, are the soils of an “*acceptable quality from lesser depths*” (i.e. below 10m). The ‘acceptable quality’ reference in the MBIE guidance gives “*for example, in areas known to be underlain by competent gravels and deep groundwater profiles, or in hillside areas*”. The soils between 10m and 15m depth in Area 5 of the DCRP do not fall into these categories. Additionally there is evidence that indicates variability in the stratigraphy, with low competency, compressible horizons between these depths.

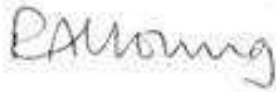
Medium density housing (30 hh/ha) [Areas 1 and 2 in the DCRP]

The geotechnical hazards associated with medium density housing (30 hh/ha) compared to a lower density of housing are expected to be broadly similar if subdivision-wide ground remediation (as recommended by the MBIE guidance) is adopted. The geotechnical risks would be slightly higher on the basis that a greater number of houses would be affected, however the costs per house associated with land remediation for the higher density of housing might be expected to be lower.

We concur with Ian Wright’s comments (email from Wright to Thompson / Stevenson on Fri 19/05/2017 12:08 p.m.) that the land naturally lends itself to an area wide (geotechnical) mitigation where economies of scale would be important. Also, from a purely geotechnical perspective, there are constraints in understanding specific risks, as the land remediation will be determined by the developer and as such there are a number of techniques that could be used.

In terms of groundwater risks to the medium density housing (30hh/ha), there are no additional groundwater management issues beyond those that have already been identified. The medium density zone is more elevated with one spring fed feature located within it so is at less risk than other zones proposed by the DCRP. The medium density housing zone will require land drainage measures that address the proposed increased number of dwellings and the groundwater management outcomes sought by the DCRP.

Yours sincerely



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on behalf of

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Yours sincerely



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