



15 November 2002

Ref: 10025

Cabra Holdings Limited
C/- Hutchinson Consultants Limited
PO Box 150
Orewa

Dear Sirs

Re: **Geotechnical Completion Report, The Grange Residential Subdivision Stage 8, (Lots 250 to 259), Orewa**

We enclose herewith our Suitability Statement, field density and classification test results together with the Hutchinson Consultants Limited original contour, as-built contour, cut to fill depth contour, stormwater, sanitary sewer, retaining wall, water reticulation and consent notice as-built plans, numbered A3-8483/AB1 to A3-8483/AB10 dated June 2002 all relating to Stage 8 of the Grange residential subdivision.

This report, which covers lots 250 to 259 relates to the period May 2002 and is to be read in conjunction with our Geotechnical Completion Report reference No 7237/ 8299 dated 26 March 2001 relating to the Grange subdivision as a whole. The appended fill as-built plan indicates that filling here reached a maximum depth of 2.5 metres. During the placement of filling, the compaction control criteria of minimum allowable shear strength and maximum allowable air voids were used for quality assurance.

Specification details were as follows:

Minimum Shear Strength and Maximum Air Voids Method

- (a) Air Voids Percentage
(As defined in NZS 4402:1986)
- General Fill
- | | |
|-------------------------|-----|
| Average value less than | 10% |
| Maximum single value | 12% |
- (b) Undrained Shear Strength
(Measured by Pilcon shear vane - calibrated using BS1377 method)
- General fill
- | | |
|-----------------------------|---------|
| Average value not less than | 140 kPa |
|-----------------------------|---------|

Minimum single value 110 kPa

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

Control criteria for the hardfill placement during the construction of the Keystone retaining walls included a combination of observation and Impact Hammer testing.

Following earthworks operations, we revisited the site and drilled additional hand auger boreholes on all lots to check topsoil depths, which ranged from 0.1 to 0.2 metres. Further, eight boreholes were drilled on lots 252 to 259 for the determination of an appropriate geotechnical ultimate bearing capacities, while two additional boreholes were drilled on lots 250 and 251 to obtain samples for soil classification testing.

The appended as-built plan shows the location of two cantilever pole walls in the vicinity of lots 250 and 251. These walls reach a maximum height of approximately 3.3 metres and were not designed by this Consultancy. Details of resulting building and earthworks restrictions in the vicinity of these walls are presented in the following Suitability Statement.

Statement Of Professional Opinion As To The Suitability Of Land For Building Development

I, R.W. Melville-Smith, of FOUNDATION ENGINEERING, P.O. Box 74-549, Market Road, hereby confirm that:

1. I am a Registered Engineer experienced in the field of geotechnical engineering and was retained by the Owner/Developer as the Geotechnical Engineer on Stage 8 of the Grange subdivision.
2. The extent of preliminary investigations carried out to date are described in Geotechnical Investigation Report number 7237, dated 3 September 1996, and the conclusions and recommendations of that document have been re-evaluated in the preparation of this report. The results of all tests carried out are appended.
3. In my professional opinion, not to be construed as a guarantee, I consider that:
 - (a) The earth fills shown on the appended fill as-built plan have been placed in compliance with NZS 4431:1989 the Standards for Engineering Design and Construction and the provisions of the District Plan of Rodney District Council.
 - (b) The completed earthworks give due regard to land slope and foundation stability considerations within the residential lots, but as shown on the appended

contour as-built plan (west of land gradient contour 24), part of lot 250 has gradients steeper than 1 in 4 or are adjacent to land having such gradients.

Within this area all foundations should be piled to minimum depth of 2.1 metres with a view to transferring structural loads beyond zones of potential soil creep. In addition, no earthworks involving cuts and fills in excess of 0.6 metres should take place. A geotechnical ultimate bearing capacity of 450 kPa may be assumed for the design of piles in end bearing.

The above recommendations may be modified as a result of specific site investigation and foundation design undertaken by a Registered Engineer experienced in geomechanics.

- (c) The backfilling and compaction of the live stormwater and sanitary sewer trenches has to the best of our knowledge been carried out to the highest attainable standards on all sites.

Nevertheless, no building development should take place within the 45 degree zone of influence of drain inverts unless endorsed by specific site investigations, foundation designs and by construction inspections undertaken by a suitably experienced Registered Engineer to ensure that lateral stability and differential settlement issues are addressed and that building loads are transferred beyond the influence of the pipe and beyond the extent of the trench backfill.

- (d) No building construction and no earthworks should take place within the designated retaining wall areas shown on the appended Hutchinson Consultants Ltd Specific Design plan (ref. 8483/AB10) unless endorsed by specific designs and by construction inspections undertaken by a suitably experienced Registered Engineer experienced in geomechanics to ensure that no additional loads are applied to the walls.
- (e) The assessed expansive site Class for all lots is S (slight) and foundation design may be carried out in accordance with the appropriate provisions of AS 2870:1996.

Alternatively, a specific foundation and structural design may be undertaken by a Registered Engineer. In this case, the minimum recommended foundation depth below cleared ground level following topsoil removal and benching of building platform areas is 450mm.

- (f) Apart from the restrictions and expansive soil requirements associated with 4(b), 4(c), 4(d) and 4(e) above, the filled and undisturbed original ground within residential lot boundaries is generally suitable for the construction of residential buildings in accordance with the relevant portions of NZS 3604:1999 and related documents (ie a geotechnical ultimate bearing capacity of 300 kPa may be assumed).

The professional opinion contained within this report is furnished to the Rodney District Council and Cabra Holdings Limited for their purposes alone on the express condition that it will not be relied upon by any other person. Prospective purchasers should still satisfy themselves as to any specific conditions pertaining to their particular land interest.

This opinion does not remove the necessity for the normal inspection of ground conditions and the design of foundations as would be made under all normal circumstances.

FOUNDATION ENGINEERING CONSULTANTS LTD



R.W. Melville-Smith,
REGISTERED ENGINEER.

PDC:ABG

CLASSIFICATION TEST RESULTS

Test Methods: NZS 4402:1986 Tests 2.1, 2.5 & 2.6



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

B. E. Coker Approved Signatory

JOB NO	10025
PROJECT	Lot 250 to 259 Ambassador Glade Orewa
CLIENT	Cabra Holdings Limited

Lot No	250	251
Sample No	S1	S1
Depth	0.4-0.65m	0.4-0.65m
Water Content %	27.1	28.3

Samples prepared from 'As Received' Natural Water Content

Soil fraction used	Whole soil	Whole soil
Cone Penetration Limit	50	55
Linear Shrinkage %	9	10



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TESTED AT	Newmarket
DATE	1.8.02
CHECKED	