Allandale Domain Toilets
PRK 3565 BLDG 006

Detailed Engineering Evaluation
Qualitative Report
Version FINAL V.1

133 Governors Bay Teddington Road, Governors Bay

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

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Detailed Engineering Evaluation
Qualitative Report
Version FINAL V.1

133 Governers Bay Teddington Road
Governors Bay

Christchurch City Council

Prepared By
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Reviewed By
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Date
17th May 2013

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Detailed Engineering Evaluation

Qualitative Report - SUMMARY

Version FINAL V.1

133 Governers Bay Teddington Road

Background

This is a summary of the Qualitative report for the building structure, and is based in part on the Detailed Engineering Evaluation Procedure document (draft) issued by the Structural Advisory Group on 19 July 2011, visual inspections on 28th of June 2012 and available construction drawings.

Building Description

The toilet is located in Allandale Domain on 133 Governors Bay Teddington Road. The toilet sits on level ground, approximately 70m from the nearest structure and 40m from the sea. No damage to surrounding buildings or land was noted. The toilet was built in 2010 and is for public use, no alterations have been made to the building since its original construction. The toilet is a single story structure and has a timber framed roof clad with corrugated iron. There is a partition wall splitting the toilet into two sections, a large cubicle and a smaller services duct. Both the perimeter and partition walls are timber framed. Internally, the walls surrounding the cubicle are clad with villa board lining while the walls surrounding the services duct are bare. Externally, the perimeter walls are cladded with timber weatherboards and stone veneer on their top and bottom half's respectively.

Key Damage Observed

No damage was observed to the structure.

Critical Structural Weaknesses

No critical structural weaknesses have been identified in the structure.

Indicative Building Strength (from IEP and CSW assessment)

Based on the information available, and using the NZSEE Initial Evaluation Procedure, the original capacity of the building has been assessed to be in the order of 73% NBS and post-earthquake capacity also in the order of 73% NBS.

This building was constructed post 2004 and would have been built to the current building standards. A rating of 100% NBS would be expected for a building of this date; however, Christchurch's hazard factor has increased from 0.22 to 0.3 resulting in the maximum baseline NBS being 73%.

The building has been assessed to have a seismic capacity in the order of 73% NBS and is therefore neither Earthquake Risk nor Earthquake Prone.

Recommendations

Because the building has not been assessed as being Earthquake Prone it is recommended the toilet remain open.

CCC are not required to undertake a detailed seismic assessment.

1. Background

GHD has been engaged by the Christchurch City Council (CCC) to undertake a detailed engineering evaluation of the Toilet on Allandale Domain.

This report is a Qualitative Assessment of the building structure, and is based in part on the Detailed Engineering Evaluation Procedure document (draft) issued by the Structural Advisory Group on 19 July 2011.

A qualitative assessment involves inspections of the building and a desktop review of existing structural and geotechnical information, including existing drawings and calculations, if available.

The purpose of the assessment is to determine the likely building performance and damage patterns, to identify any potential critical structural weaknesses or collapse hazards, and to make an initial assessment of the likely building strength in terms of percentage of new building standard (%NBS).

At the time of this report, no intrusive site investigation, detailed analysis, or modelling of the building structure had been carried out. Construction drawings were made available, and these have been considered in our evaluation of the building. The building description below is based on a review of the drawings and our visual inspections.

2. Compliance

This section contains a brief summary of the requirements of the various statutes and authorities that control activities in relation to buildings in Christchurch at present.

2.1 Canterbury Earthquake Recovery Authority (CERA)

CERA was established on 28 March 2011 to take control of the recovery of Christchurch using powers established by the Canterbury Earthquake Recovery Act enacted on 18 April 2011. This act gives the Chief Executive Officer of CERA wide powers in relation to building safety, demolition and repair. Two relevant sections are:

Section 38 – Works

This section outlines a process in which the chief executive can give notice that a building is to be demolished and if the owner does not carry out the demolition, the chief executive can commission the demolition and recover the costs from the owner or by placing a charge on the owners' land.

Section 51 – Requiring Structural Survey

This section enables the chief executive to require a building owner, insurer or mortgagee carry out a full structural survey before the building is re-occupied.

We understand that CERA will require a detailed engineering evaluation to be carried out for all buildings (other than those exempt from the Earthquake Prone Building definition in the Building Act). It is anticipated that CERA will adopt the Detailed Engineering Evaluation Procedure document (draft) issued by the Structural Advisory Group on 19 July 2011. This document sets out a methodology for both qualitative and quantitative assessments.

The qualitative assessment is a desk-top and site inspection assessment. It is based on a thorough visual inspection of the building coupled with a review of available documentation such as drawings and specifications. The quantitative assessment involves analytical calculation of the buildings strength and may require non-destructive or destructive material testing, geotechnical testing and intrusive investigation.

It is anticipated that factors determining the extent of evaluation and strengthening level required will include:

- The importance level and occupancy of the building
- The placard status and amount of damage
- The age and structural type of the building
- Consideration of any critical structural weaknesses
- The extent of any earthquake damage

2.2 Building Act

Several sections of the Building Act are relevant when considering structural requirements:

Section 112 – Alterations

This section requires that an existing building complies with the relevant sections of the Building Code to at least the extent that it did prior to any alteration. This effectively means that a building cannot be weakened as a result of an alteration (including partial demolition).

Section 115 – Change of Use

This section requires that the territorial authority (in this case Christchurch City Council (CCC)) be satisfied that the building with a new use complies with the relevant sections of the Building Code 'as near as is reasonably practicable'. Regarding seismic capacity 'as near as reasonably practicable' has previously been interpreted by CCC as achieving a minimum of 67% NBS however where practical achieving 100% NBS is desirable. The New Zealand Society for Earthquake Engineering (NZSEE) recommend a minimum of 67% NBS.

2.2.1 Section 121 – Dangerous Buildings

The definition of dangerous building in the Act was extended by the Canterbury Earthquake (Building Act) Order 2010, and it now defines a building as dangerous if:

- In the ordinary course of events (excluding the occurrence of an earthquake), the building is likely to cause injury or death or damage to other property; or
- In the event of fire, injury or death to any persons in the building or on other property is likely because of fire hazard or the occupancy of the building; or
- There is a risk that the building could collapse or otherwise cause injury or death as a result of earthquake shaking that is less than a 'moderate earthquake' (refer to Section 122 below); or
- There is a risk that that other property could collapse or otherwise cause injury or death; or
- A territorial authority has not been able to undertake an inspection to determine whether the building is dangerous.

Section 122 – Earthquake Prone Buildings

This section defines a building as earthquake prone if its ultimate capacity would be exceeded in a 'moderate earthquake' and it would be likely to collapse causing injury or death, or damage to other property. A moderate earthquake is defined by the building regulations as one that would generate ground shaking 33% of the shaking used to design an equivalent new building.

Section 124 – Powers of Territorial Authorities

This section gives the territorial authority the power to require strengthening work within specified timeframes or to close and prevent occupancy to any building defined as dangerous or earthquake prone.

Section 131 – Earthquake Prone Building Policy

This section requires the territorial authority to adopt a specific policy for earthquake prone, dangerous and insanitary buildings.

2.3 Christchurch City Council Policy

Christchurch City Council adopted their Earthquake Prone, Dangerous and Insanitary Building Policy in 2006. This policy was amended immediately following the Darfield Earthquake of the 4th September 2010.

The 2010 amendment includes the following:

- A process for identifying, categorising and prioritising Earthquake Prone Buildings, commencing on 1 July 2012;
- A strengthening target level of 67% of a new building for buildings that are Earthquake Prone;
- A timeframe of 15-30 years for Earthquake Prone Buildings to be strengthened; and,
- Repair works for buildings damaged by earthquakes will be required to comply with the above.

The council has stated their willingness to consider retrofit proposals on a case by case basis, considering the economic impact of such a retrofit.

We anticipate that any building with a capacity of less than 33% NBS (including consideration of critical structural weaknesses) will need to be strengthened to a target of 67% NBS of new building standard as recommended by the Policy.

If strengthening works are undertaken, a building consent will be required. A requirement of the consent will require upgrade of the building to comply 'as near as is reasonably practicable' with:

- The accessibility requirements of the Building Code.
- The fire requirements of the Building Code. This is likely to require a fire report to be submitted with the building consent application.

2.4 Building Code

The building code outlines performance standards for buildings and the Building Act requires that all new buildings comply with this code. Compliance Documents published by The Department of Building and Housing can be used to demonstrate compliance with the Building Code.

After the February Earthquake, on 19 May 2011, Compliance Document B1: Structure was amended to include increased seismic design requirements for Canterbury as follows:

- Hazard Factor increased from 0.22 to 0.3 (36% increase in the basic seismic design load)
- Serviceability Return Period Factor increased from 0.25 to 0.33 (80% increase in the serviceability design loads when combined with the Hazard Factor increase)

The increase in the above factors has resulted in a reduction in the level of compliance of an existing building relative to a new building despite the capacity of the existing building not changing.

3. Earthquake Resistance Standards

For this assessment, the building's earthquake resistance is compared with the current New Zealand Building Code requirements for a new building constructed on the site. This is expressed as a percentage of new building standard (%NBS). The new building standard load requirements have been determined in accordance with the current earthquake loading standard (NZS 1170.5:2004 Structural design actions - Earthquake actions - New Zealand).

The likely capacity of this building has been derived in accordance with the New Zealand Society for Earthquake Engineering (NZSEE) guidelines 'Assessment and Improvement of the Structural Performance of Buildings in Earthquakes' (AISPBE), 2006. These guidelines provide an Initial Evaluation Procedure that assesses a buildings capacity based on a comparison of loading codes from when the building was designed and currently. It is a quick high-level procedure that can be used when undertaking a Qualitative analysis of a building. The guidelines also provide guidance on calculating a modified Ultimate Limit State capacity of the building which is much more accurate and can be used when undertaking a Quantitative analysis.

The New Zealand Society for Earthquake Engineering has proposed a way for classifying earthquake risk for existing buildings in terms of %NBS and this is shown in Figure 1 below.

Description	Grade	Risk	%NBS	Existing Building Structural Performance	Improvement of Structural Performance	
					Legal Requirement	NZSEE Recommendation
Low Risk Building	A or B	Low	Above 67	Acceptable (improvement may be desirable)	The Building Act sets no required level of structural improvement (unless change in use) This is for each TA to decide. Improvement is not limited to 34%NBS.	100%NBS desirable. Improvement should achieve at least 67%NBS
Moderate Risk Building	B or C	Moderate	34 to 66	Acceptable legally. Improvement recommended		Not recommended. Acceptable only in exceptional circumstances
High Risk Building	D or E	High	33 or lower	Unacceptable (Improvement	Unacceptable	Unacceptable

Figure 1 NZSEE Risk Classifications Extracted from table 2.2 of the NZSEE 2006 AISPBE

Table 1 compares the percentage NBS to the relative risk of the building failing in a seismic event with a 10% risk of exceedance in 50 years (i.e. 0.2% in the next year). It is noted that the current seismic risk in Christchurch results in a 6% risk of exceedance in the next year.

Percentage of New Building Standard (%NBS)	Relative Risk (Approximate)
>100	<1 time
80-100	1-2 times
67-80	2-5 times
33-67	5-10 times
20-33	10-25 times
<20	>25 times

Table 1 %NBS compared to relative risk of failure

4. Building Description

4.1 General

The toilet is located in Allandale Domain on 133 Governors Bay Teddington Road. The toilet sits on level ground, approximately 70m from the nearest structure and 40m from the sea. No damage to surrounding buildings or land was noted. The toilet was built in 2010 and is for public use. There have been no alterations to the building.

The toilet is a single story structure approximately 3.2m in height and has a plan area of 6.5m^2. The plan dimensions are shown below.

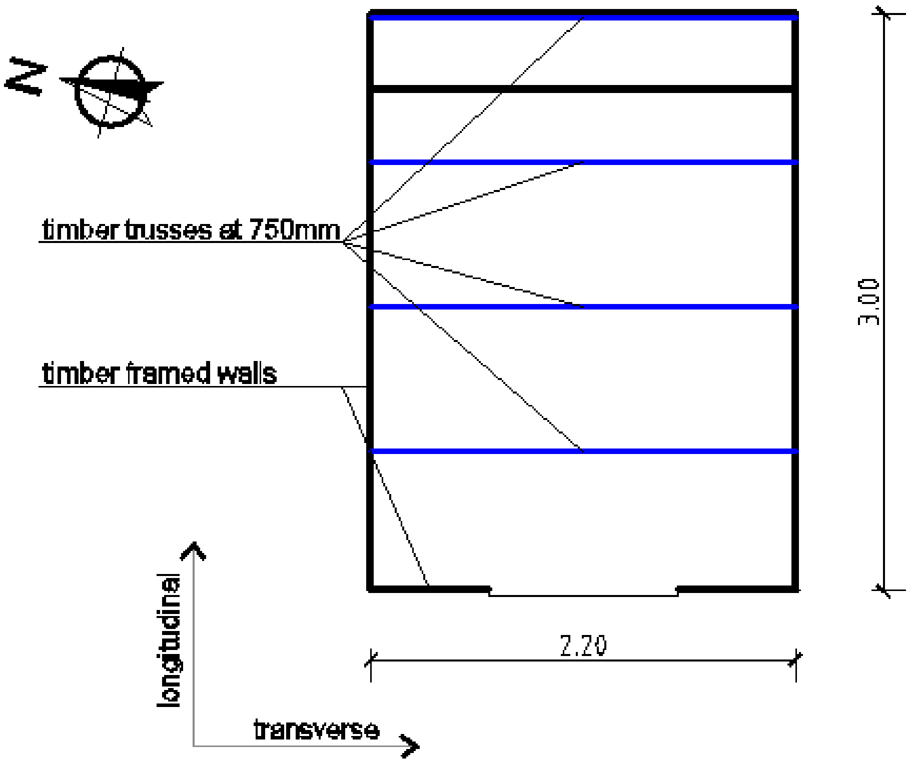


Figure 2 Plan Sketch Showing Key Structural Elements

The roof consists of corrugated iron cladding, 75x50mm purlins spaced at 800mm and timber trusses spaced at approximately 750mm centres.

There is a partition wall splitting the toilet into two sections, a large cubicle and a smaller services duct. Both the perimeter and partition walls are timber framed.

Internally, the walls inside the cubicle are clad with villa board lining while the walls inside the services duct are bare. Externally, the perimeter walls are cladded with timber weatherboards and stone veneer on their top and bottom half's respectively.

The structure sits on a raft foundation.

Construction plans are available and will be attached in the index.

4.2 Gravity Load Resisting System

Gravity roof loads are carried by timber purlins spanning in the longitudinal direction. Gravity loads are then transferred to the timber roof trusses which span the building in the transverse direction. Loads from the trusses are transferred to the timber framed walls to the external perimeter of the reinforced raft foundation and into the ground. Floor gravity loads are transferred through the reinforced concrete raft foundation into the ground.

4.3 Lateral Load Resisting System

In the transverse direction the rigid connection of the purlins, roof trusses and wall top plates provide a rigid frame which transfers lateral roof loads to the walls in the plane of loading. The lateral loads are then resisted by the panel action of the timber framed walls and are passed to the foundation and finally to the ground.

In the longitudinal direction the lateral roof loads are transferred from the purlins, via the roof trusses to the walls in the plane of loading. Panel action is used by these walls to transfer the longitudinal loads into the foundation.

Walls perpendicular to the loading are restrained by the diaphragm action provided by the roof. This action redistributes the lateral loads to the in plane walls.

5. Assessment

An inspection of the building was undertaken on the 28th of June, 2012. Both the interior and exterior of the building were inspected. The main structural components of the roof of the building were all able to be viewed. The foundations were able to be partially viewed from the exterior; detailing of these was confirmed via construction plans. The inspection consisted of scrutinising the building to determine the structural systems and likely behaviour of the building during an earthquake. The site was assessed for damage, including examination of the ground conditions, checking for damage in areas where damage would be expected for the type of structure and noting general damage observed throughout the building in both structural and non-structural elements.

The %NBS score determined for this building has been based on the IEP procedure described by the NZSEE and based on the information obtained from visual observation of the building and available drawings.

6. Damage Assessment

6.1 Surrounding Buildings

The public toilet sits on level ground approximately 70m from the nearest structure and 40m from the sea. There was no obvious damage to surrounding buildings.

6.2 Residual Displacements and General Observations

No residual displacements or damage to the structure were noticed during our inspection of the building.

6.3 Ground Damage

There was no evidence of ground damage on the property or surrounding neighbours land.

7. Critical Structural Weakness

7.1 Short Columns

No short columns are present in the structure.

7.2 Lift Shaft

The building does not contain a lift shaft.

7.3 Roof

Rigid connections between the roof trusses, wall plates and timber purlins form a rigid braced frame.

7.4 Staircases

The building does not contain a staircase.

7.5 Site Characteristics

Following the geotechnical appraisal it was found that the site has a minor potential for liquefaction. For the purposes of the IEP assessment of the building and the determination of the %NBS score, the effects of soil liquefaction on the performance of the building has been assessed as an insignificant site characteristic in accordance with the NZSEE guidelines.

7.6 Plan Irregularity

There is an imbalance of stiffness when considering lateral loading in the transverse direction. The northern end has two walls spanning the width of the toilet where the southern side has one with an opening. This imbalance of stiffness has the potential to cause torsional effects; however, due to the size and nature of this structure these potential torsional effects have not been considered a critical structural weakness.

7.7 Vertical irregularity

There is no vertical irregularity in this structure.

8. Geotechnical Consideration

8.1 Introduction

This desktop geotechnical study outlines the ground conditions, as indicated from sources quoted within. This is a desktop study report and no site visit has been undertaken by GHD Geotechnical personnel.

This report is specific only to the toilet block at Detailed Engineering Evaluations. It is surrounded by rural and agricultural properties. The property is owned and maintained by the Christchurch City Council.

8.2 Site Description

The site is situated on parkland in the settlement of Allandale, between Govenors Bay and Teddington on Banks Peninsula. It is relatively flat at approximately 3m above mean sea level and isolated on the coast at Governors Bay in Lyttelton Harbour.

8.3 Published Information on Ground Conditions

8.3.1 Published Geology

The geological map of the area[1] indicates that the site is underlain by:

- Holocene fan deposits – grey to brown alluvium, comprising silty sub-angular gravel and sand forming alluvial fans.

The headlands comprise Allandale Rhyolite, a flow banded rhyolite and dacite domes and lava flows with rare breccia, tuff and obsidian.

8.3.2 Environment Canterbury Logs

Information from Environment Canterbury (ECan) indicates that two boreholes are located within a 200m radius of the site (see Table 2). Both of these boreholes have an adequate lithographic log. The site geology described in this log indicates the area is predominantly layers of clay, limestone[2] and volcanic rock to a depth of ~67m bgl.

[1] Forsyth P.J., Barrell D.J.A., & Jongens R. (2008): *Geology of the Christchurch Area*. Institute of Geological and Nuclear Sciences 1:250,000 Geological Map 16. IGNS Limited: Lower Hutt.

[2] The term " limestone" is likely to be incorrect and probably refers instead to weathered rhyolite.

Table 2 ECan Borehole Summary

Bore Name	Log Depth	Groundwater	Distance & Direction from Site	Log Summary
M36/5905	52.7m	-	100m ESE	Clays, volcanic rock and gravels
M36/7082	67m	N/A	120m S	Clays, limestones and volcanics

Recent earthquakes since 4 September 2010 have identified the presence of a previously unmapped active fault system underneath Canterbury Plains and the Port Hills. Research and published information on this system is in development and not generally available. Average recurrence intervals are yet to be estimated.

8.3.3 EQC Geotechnical Investigations

The Earthquake Commission has not undertaken geotechnical testing in the area of the site.

8.3.4 Land Zoning

Canterbury Earthquake Recovery Authority (CERA) has indicated the site is situated within the Green Zone, indicating that repair and rebuild may take place.

The site at 133 Teddington Road Govenors Bay is categorised as Green Zone N/A - Port Hills and Banks Peninsula.

Due to the area's different geology, technical categories have not been allocated to the Port Hills or Banks Peninsula.

8.3.5 Post February Aerial Photography

Aerial photography taken following the 22 February 2011 earthquake shows no signs of liquefaction outside the building footprint, as shown in **Figure 3**.

Figure 3 Post February 2011 Earthquake Aerial Photography [3]

8.3.6 Summary of Ground Conditions

From the information presented above, the ground conditions underlying the site are anticipated to comprise interbedded alluvium with gravel sequences underlain by volcanics. The depth to rock is not known.

8.4 Seismicity

8.4.1 Nearby Faults

There are many faults in the Canterbury region, however only those considered most likely to have an adverse effect on the site are detailed in Table 3.

[3] Aerial Photography Supplied by Koordinates sourced from http://koordinates.com/layer/3185-christchurch-post-earthquake-aerial-photos-24-feb-2011/

Table 3 Summary of Known Active Faults[4,5]

Known Active Fault	Distance from Site	Direction from Site	Max Likely Magnitude	Avg Recurrence Interval
Alpine Fault	140 km	NW	~8.3	~300 years
Greendale (2010) Fault	24 km	W	7.1	~15,000 years
Hope Fault	120 km	N	7.2~7.5	120~200 years
Kelly Fault	120 km	NW	7.2	~150 years
Porters Pass Fault	70 km	NW	7.0	~1100 years

Recent earthquakes since 4 September 2010 have identified the presence of a previously unmapped active fault system underneath Canterbury Plains and the Port Hills. Research and published information on this system is in development and not generally available. Average recurrence intervals are yet to be estimated.

8.4.2 Ground Shaking Hazard

This seismic activity has produced earthquakes of Magnitude-6.3 with peak ground accelerations (PGA) up to twice the acceleration due to gravity (2g) in some parts of the city. This has resulted in widespread liquefaction throughout Christchurch.

New Zealand Standard NZS 1170.5:2004 quantifies the Seismic Hazard factor for Christchurch as 0.30, being in a moderate to high earthquake zone. This value has been provisionally upgraded recently (from 0.22) to reflect the seismicity hazard observed in the earthquakes since 4 September 2010.

8.5 Slope Failure and/or Rockfall Potential

The subject site is located on flat to gently sloping land with no significant rock bluffs close to the site, global slope instability and rockfall potential is considered negligible. However, any localised retaining structures or embankments should be further investigated to determine the site-specific slope instability potential.

8.6 Liquefaction Potential

The liquefaction hazard potential for the subject site is considered low. This is based on

- The anticipated presence of alluvial soils it is considered possible that liquefaction could occur where sands are present.
- Lack of evidence of liquefaction during recent seismic events.

To better determine subsoil conditions and quantify the liquefaction potential, further investigation would be required.

[4] Stirling, M.W, McVerry, G.H, and Berryman K.R. (2002) A New Seismic Hazard Model for New Zealand, Bulletin of the Seismological Society of America, Vol. 92 No. 5, pp 1878-1903, June 2002.

[5] GNS Active Faults Database

8.7 Conclusions and Recommendations

This assessment is based on a review of the geology and existing ground investigation information, and observations from the Christchurch earthquakes since 4 September 2010.

The site is anticipated to be situated on sands and silts overlying volcanic bedrock at shallow depth. Associated with this the site also has a low liquefaction potential.

A soil class of **D** (in accordance with NZS 1170.5:2004) should be adopted for the site. However, should intrusive testing encounter bedrock, this may be subject to reassessment.

If a more detailed assessment is required, the investigation should comprise deep intrusive testing. Details can be provided upon approval of the quantitative assessment phase.

9. Survey

No level or verticality surveys have been undertaken for this building at this stage as indicated by Christchurch City Council guidelines.

10. Initial Capacity Assessment

10.1 % NBS Assessment

The building has had its capacity assessed using the Initial Evaluation Procedure based on the information available. The buildings capacity excluding critical structural weaknesses and the capacity of any identified weaknesses are expressed as a percentage of new building standard (%NBS) and are in the order of that shown below in Table 4. These capacities are subject to confirmation by a more detailed quantitative analysis.

Item	%NBS
Building excluding CSW's	73
Building including CSW's	73

Table 4 Indicative Building and Critical Structural Weaknesses Capacities based on the NZSEE Initial Evaluation Procedure

Following an IEP assessment, the building has been assessed as achieving 73% New Building Standard (NBS). Under the New Zealand Society for Earthquake Engineering (NZSEE) guidelines the building is considered neither Earthquake Risk nor Earthquake Prone as it achieves greater than 67% NBS.

This building was constructed post 2004 and would have been built to the current building standards. We would expect to be 100% NBS; however, Christchurch's hazard factor has increased from 0.22 to 0.3 resulting in the maximum baseline NBS being 73%.

10.2 Seismic Parameters

The seismic design parameters based on current design requirements from NZS 1170:2002 and the NZBC clause B1 for this building are:

- Site soil class: D, NZS 1170.5:2004, Clause 3.1.3, Soft Soil
- Site hazard factor, Z = 0.3, NZBC, Clause B1 Structure, Amendment 11 effective from 1 August 2011
- Return period factor R_u = 1.0 , NZS 1170.5:2004, Table 3.5, Importance level 2 structure with a 50 year design life.

An increased Z factor of 0.3 for Christchurch has been used in line with requirements from the Department of Building and Housing resulting in a reduced % NBS score.

10.3 Expected Structural Ductility Factor

A structural ductility factor of 2.0 has been assumed based on the structural system observed and the date of construction.

10.4 Discussion of Results

The results obtained from the initial IEP assessment are consistent with those expected for a building of this age and construction type. Due to increase in hazard factor the design loads used would have been less than those required by the current loading standard. Therefore it would be expected that the building would not achieve 100% NBS. Due to the lack of any Critical Structural Weaknesses and the abundance of bracing it is reasonable to expect the building to be classified as neither Earthquake Prone nor Earthquake Risk.

10.5 Occupancy

The building does not pose an immediate risk to users and occupants and no critical structural weaknesses have been identified. The building has not been assessed as being Earthquake Prone. As a result, the toilet can remain open.

11. Initial Conclusions

The building has been assessed to have a seismic capacity in the order of 73% NBS and is therefore not potentially Earthquake Prone nor Earthquake Risk.

12. Recommendations

The recent seismic activity in Christchurch has caused no damage to the building. As the building suffered no apparent damage the load resisting capacity of the existing structural systems should be unaffected. Because the building and has achieved greater than %67 NBS following an initial IEP assessment, no further assessment is required.

13. Limitations

13.1 General

This report has been prepared subject to the following limitations:

- No intrusive structural investigations have been undertaken.
- No intrusive geotechnical investigations have been undertaken.
- No visual inspections of the sub-floor space undertaken.
- No level or verticality surveys have been undertaken.
- No material testing has been undertaken.
- No calculations, other than those included as part of the IEP in the CERA Building Evaluation Report, have been undertaken. No modelling of the building for structural analysis purposes has been performed.

It is noted that this report has been prepared at the request of Christchurch City Council and is intended to be used for their purposes only. GHD accepts no responsibility for any other party or person who relies on the information contained in this reportrite a specific limitations section.

13.2 Geotechnical Limitations

This report presents the results of a geotechnical appraisal prepared for the purpose of this commission, and for prepared solely for the use of Christchurch City Council and their advisors. The data and advice provided herein relate only to the project and structures described herein and must be reviewed by a competent geotechnical engineer before being used for any other purpose. GHD Limited (GHD) accepts no responsibility for other use of the data.

The advice tendered in this report is based on a visual geotechnical appraisal. No subsurface investigations have been conducted. An assessment of the topographical land features have been made based on this information. It is emphasised that Geotechnical conditions may vary substantially across the site from where observations have been made. Subsurface conditions, including groundwater levels can change in a limited distance or time. In evaluation of this report cognisance should be taken of the limitations of this type of investigation.

An understanding of the geotechnical site conditions depends on the integration of many pieces of information, some regional, some site specific, some structure specific and some experienced based. Hence this report should not be altered, amended or abbreviated, issued in part and issued incomplete in any way without prior checking and approval by GHD. GHD accepts no responsibility for any circumstances, which arise from the issue of the report, which have been modified in any way as outlined above.

Appendix A

Photographs

Photograph 1 Northern elevation.

Photograph 2 Southern elevation.

Photograph 3 Western elevation.

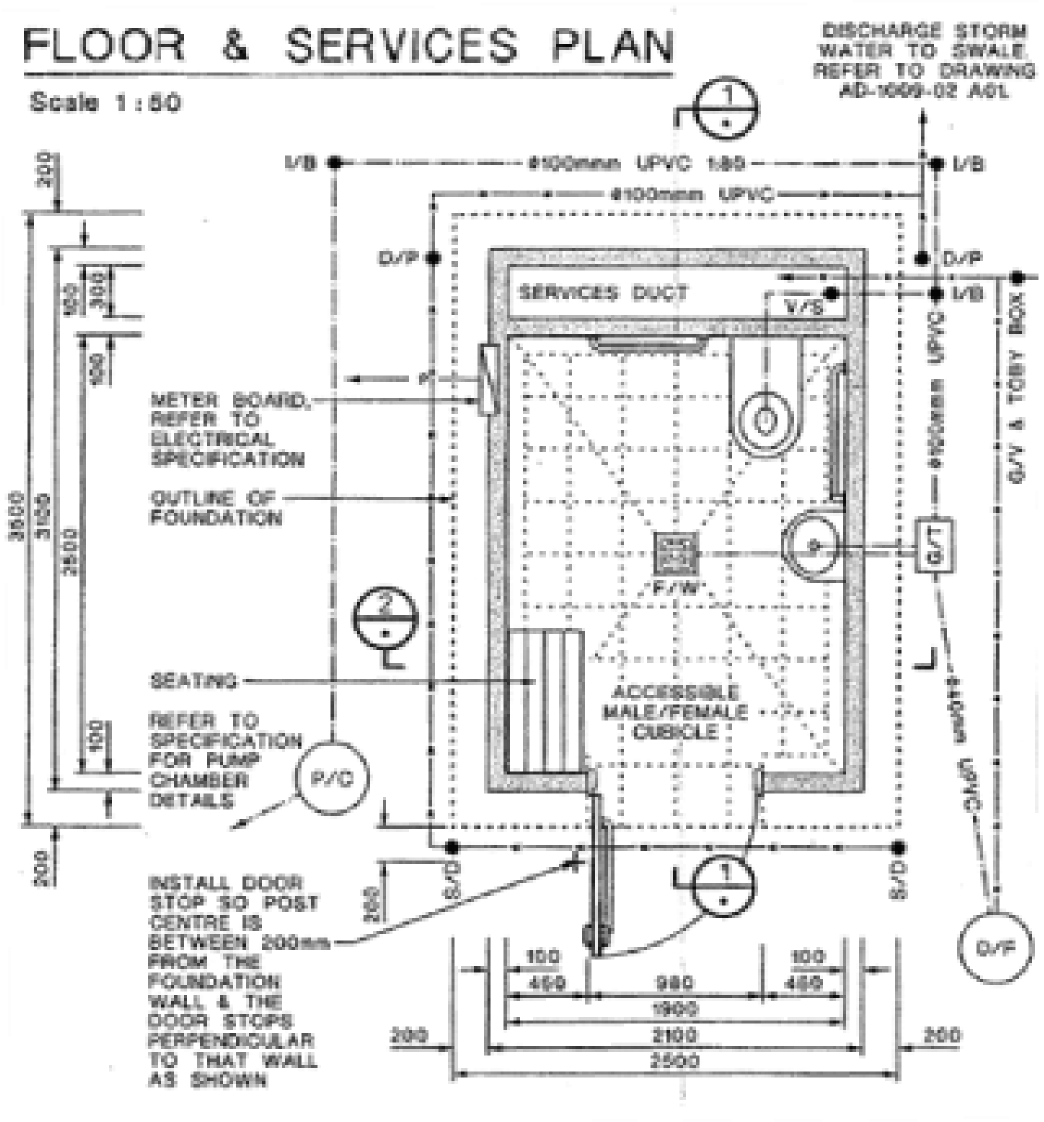
Photograph 4 Eastern and northern elevations.

Photograph 5 Roof Trusses.

Photograph 6 Interior flooring.

Appendix B

Existing Drawings


FLOOR & SERVICES PLAN
Scale 1:50
DISCHARGE STORM WATER TO SWALE. REFER TO DRAWING AD-1009-02 A01
SERVICES DUCT
V/S
METER BOARD, REFER TO ELECTRICAL SPECIFICATION
OUTLINE OF FOUNDATION
F/W
SEATING
ACCESSIBLE MALE/FEMALE CUBICLE
REFER TO SPECIFICATION FOR PUMP CHAMBER DETAILS
P/C
INSTALL DOOR STOP SO POST CENTRE IS BETWEEN 200mm FROM THE FOUNDATION WALL & THE DOOR STOPS PERPENDICULAR TO THAT WALL AS SHOWN
G/T
G/V & TOBY BOX
D/P
I/B
S/D

Appendix C

CERA Building Evaluation Form

Detailed Engineering Evaluation Summary Data V1.11

Location

Building Name:	Allendale Domain Toilets	Reviewer:	Stephen Lee
	Unit / No: / Street	CPEng No:	1006840
Building Address:	133 Governers Bay Teddington Road	Company:	GHD
Legal Description:	Lot 1 DP 41288 2.1921	Company project number:	51/30902/32
		Company phone number:	04 472 0799
	Degrees / Min / Sec		
GPS south:	43 / 38 / 30.00	Date of submission:	17-05-13
GPS east:	172 / 39 / 4.00	Inspection Date:	28-06-12
		Revision:	FINAL
Building Unique Identifier (CCC):	PRK 3565 BLDG 006	Is there a full report with this summary?	yes

Site

Site slope:	flat	Max retaining height (m):	
Soil type:	mixed	Soil Profile (if available):	Interbedded Aluvium with gravel sequences, underlain by volcanics
Site Class (to NZS1170.5):	D		
Proximity to waterway (m, if <100m):	50	If Ground improvement on site, describe:	
Proximity to clifftop (m, if < 100m):			
Proximity to cliff base (m,if <100m):		Approx site elevation (m):	3.00

Building

No. of storeys above ground:	1 (single storey = 1)	Ground floor elevation (Absolute) (m):	0.13
Ground floor split?	no	Ground floor elevation above ground (m):	0.13
Storeys below ground			
Foundation type:	strip footings	if Foundation type is other, describe:	
Building height (m):	3.24	height from ground to level of uppermost seismic mass (for IEP only) (m):	3.374
Floor footprint area (approx):	7		
Age of Building (years):	2	Date of design:	2004-
Strengthening present?	no	If so, when (year)?	
		And what load level (%g)?	
Use (ground floor):	other (specify)	Brief strengthening description:	
Use (upper floors):			
Use notes (if required):	Public Toilet		
Importance level (to NZS1170.5):	IL2		

Gravity Structure

Gravity System:	load bearing walls		
Roof:	timber truss	truss depth, purlin type and cladding	0.5m Deep, Timber Purlins, Corregated Iron Cladding
Floors:	concrete flat slab	slab thickness (mm)	
Beams:	none	overall depth x width (mm x mm)	
Columns:			
Walls:			

Lateral load resisting structure

Note: Define along and across in detailed report!

Lateral system along:	lightweight timber framed walls			
Ductility assumed, μ:	2.00		note typical wall length (m)	
Period along:	0.40	0.00	estimate or calculation?	estimated
Total deflection (ULS) (mm):			estimate or calculation?	
maximum interstorey deflection (ULS) (mm):			estimate or calculation?	
Lateral system across:	lightweight timber framed walls			
Ductility assumed, μ:	2.00		note typical wall length (m)	
Period across:	0.40	0.00	estimate or calculation?	estimated
Total deflection (ULS) (mm):			estimate or calculation?	
maximum interstorey deflection (ULS) (mm):			estimate or calculation?	

Separations:

north (mm):		leave blank if not relevant
east (mm):		
south (mm):		
west (mm):		

Non-structural elements

Stairs:			None
Wall cladding:	other heavy	describe	Exterior cladding consist of timber panels and stone
Roof Cladding:	Metal	describe	Corregated Iron
Glazing:			None
Ceilings:			None
Services(list):	Sewage, Water		

Available documentation

Architectural	none	original designer name/date	
Structural	none	original designer name/date	
Mechanical	none	original designer name/date	
Electrical	none	original designer name/date	
Geotech report	full	original designer name/date	

Damage

Site: (refer DEE Table 4-2)

Site performance:	Good	Describe damage:	None
Settlement:	none observed	notes (if applicable):	
Differential settlement:	none observed	notes (if applicable):	
Liquefaction:	none apparent	notes (if applicable):	
Lateral Spread:	none apparent	notes (if applicable):	
Differential lateral spread:	none apparent	notes (if applicable):	
Ground cracks:	none apparent	notes (if applicable):	
Damage to area:	none apparent	notes (if applicable):	

Building:

	Current Placard Status:			
Along	Damage ratio:	0%	Describe how damage ratio arrived at:	
	Describe (summary):			
Across	Damage ratio:	0%		
	Describe (summary):			
Diaphragms	Damage?:	no	Describe:	
CSWs:	Damage?:	no	Describe:	
Pounding:	Damage?:	no	Describe:	
Non-structural:	Damage?:	no	Describe:	

$$Damage\_Ratio = \frac{(\%NBS\,(before) - \%NBS\,(after))}{\%NBS\,(before)}$$

Recommendations

	Level of repair/strengthening required:	none	Describe:	
	Building Consent required:	no	Describe:	
	Interim occupancy recommendations:	full occupancy	Describe:	
Along	Assessed %NBS before e'quakes:	72%	73% %NBS from IEP below	If IEP not used, please detail assessment methodology:
	Assessed %NBS after e'quakes:	72%		
Across	Assessed %NBS before e'quakes:	72%	73% %NBS from IEP below	
	Assessed %NBS after e'quakes:	72%		

IEP **Use of this method is not mandatory - more detailed analysis may give a different answer, which would take precedence. Do not fill in fields if not using IEP.**

Period of design of building (from above): 2004-

h_n from above: 3.374m

Seismic Zone, if designed between 1965 and 1992: B

Design Soil type from NZS1170.5:2004, cl 3.1.3: D soft soil
not required for this age of building

	along	across
Period (from above):	0.4	0.4
(%NBS)nom from Fig 3.3:	19.3%	19.3%

Note:1 for specifically design public buildings, to the code of the day: pre-1965 = 1.25; 1965-1976, Zone A =1.33; 1965-1976, Zone B = 1.2; all else 1.0: 1.00
Note 2: for RC buildings designed between 1976-1984, use 1.2: 1.0
Note 3: for buildngs designed prior to 1935 use 0.8, except in Wellington (1.0): 1.0

	along	across
Final $(\%NBS)_{nom}$:	**19%**	**19%**

2.2 Near Fault Scaling Factor

Near Fault scaling factor, from NZS1170.5, cl 3.1.6: 1.00

	along	across
Near Fault scaling factor (1/N(T,D), **Factor A**:	1	1

2.3 Hazard Scaling Factor

Hazard factor Z for site from AS1170.5, Table 3.3: 0.30
Z_{1992}, from NZS4203:1992: 0.8
Hazard scaling factor, **Factor B:** 2.666666667

2.4 Return Period Scaling Factor

Building Importance level (from above): 2
Return Period Scaling factor from Table 3.1, **Factor C**: 1.00

2.5 Ductility Scaling Factor

	along	across
Assessed ductility (less than max in Table 3.2)	2.00	1.00
Ductility scaling factor: =1 from 1976 onwards; or =kμ, if pre-1976, fromTable 3.3:	1.57	1.57
Ductiity Scaling Factor, **Factor D**:	1.00	1.00

2.6 Structural Performance Scaling Factor:

	along	across
Sp:	0.700	0.700
Structural Performance Scaling Factor **Factor E**:	1.428571429	1.428571429

2.7 Baseline %NBS, $(NBS\%)_b = (\%NBS)_{nom} \times A \times B \times C \times D \times E$

	along	across
$\%NBS_b$:	**73%**	**73%**

Global Critical Structural Weaknesses: (refer to NZSEE IEP Table 3.4)

3.1. Plan Irregularity, factor A:	insignificant	1
3.2. Vertical irregularity, Factor B:	insignificant	1
3.3. Short columns, Factor C:	insignificant	1

3.4. Pounding potential

Pounding effect D1, from Table to right: 1.0
Height Difference effect D2, from Table to right: 1.0
Therefore, Factor D: 1

Table for selection of D1	Severe	Significant	Insignificant/none
Separation	0<sep<.005H	.005<sep<.01H	Sep>.01H
Alignment of floors within 20% of H	**0.7**	**0.8**	**1**
Alignment of floors not within 20% of H	**0.4**	**0.7**	**0.8**

Table for Selection of D2	Severe	Significant	Insignificant/none
Separation	0<sep<.005H	.005<sep<.01H	Sep>.01H
Height difference > 4 storeys	0.4	0.7	1
Height difference 2 to 4 storeys	0.7	0.9	1
Height difference < 2 storeys	1	1	1

3.5. Site Characteristics	insignificant	1

3.6. Other factors, Factor F

	Along	Across
For ≤ 3 storeys, max value =2.5, otherwise max valule =1.5, no minimum	1.0	1.0
Rationale for choice of F factor, if not 1	1	1

Detail Critical Structural Weaknesses: (refer to DEE Procedure section 6)
List any: Refer also section 6.3.1 of DEE for discussion of F factor modification for other critical structural weaknesses

	along	across
3.7. Overall Performance Achievement ratio (PAR)	**1.00**	**1.00**
4.3 PAR x (%NBS)b: PAR x Baselline %NBS:	**73%**	**73%**
4.4 Percentage New Building Standard (%NBS), (before)		**73%**

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