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Cracroft Hill Reserve Toilets
PRK_1080_BLDG_001
Detailed Engineering Evaluation
Qualitative Report
Version Final

176 Hackthorne Road, Cashmere

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

Cracroft Hill Reserve Toilets
PRK_1080_BLDG_001

Detailed Engineering Evaluation
Qualitative Report
Version Final

176 Hackthorne Road, Cashmere

Christchurch City Council

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Reviewed By
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Date
23 May 2013

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Cracroft Hill Reserve Toilet Block

PRK_1080_BLDG_001

Detailed Engineering Evaluation

Qualitative Report - SUMMARY

Version Final

176 Hackthorne Road, Cashmere

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 and visual inspections on 16 July 2012. No drawings were available.

Key Damage Observed

Key damage observed includes:-

- Minor cracking in mortar of external stone and mortar cladding in two locations.

Critical Structural Weaknesses

No critical structural weaknesses have been identified and the site has no liquefaction risks.

Indicative Building Strength (from IEP and CSW assessment)

Based on the information available, and using the NZSEE Initial Evaluation Procedure, the building's original capacity has been assessed to be in the order of 86% NBS and post-earthquake capacity also in the order of 86% NBS. The building's post-earthquake capacity excluding critical structural weaknesses is in the order of 86% NBS.

The building has been assessed to have a seismic capacity in the order of 86% NBS and is therefore not considered to be potentially Earthquake Prone or an Earthquake Risk.

Recommendations

The recent seismic activity in Christchurch has caused only minor visible damage to the building. Because the building has achieved above 67% NBS following a qualitative Detailed Engineering Evaluation of the building, no further assessment is required.

The building can remain occupied as it has not been assessed as Earthquake Prone.

1. Background

GHD has been engaged by the Christchurch City Council (CCC) to undertake a detailed engineering evaluation of the Cracroft Hill Reserve toilet block.

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 block is located at 176 Hackthorne Road, Cracroft Hill Reserve in Cashmere. The original construction date of the structure is unknown but based on site observation is estimated to be the mid to late 2000's. The toilet block is not connected to any other structure in the reserve. The park site is bordered by residential properties on all sides. The closest structure to the toilet block is a residential property to the east away on the other side of Hackthorne Road, approximately 20m.

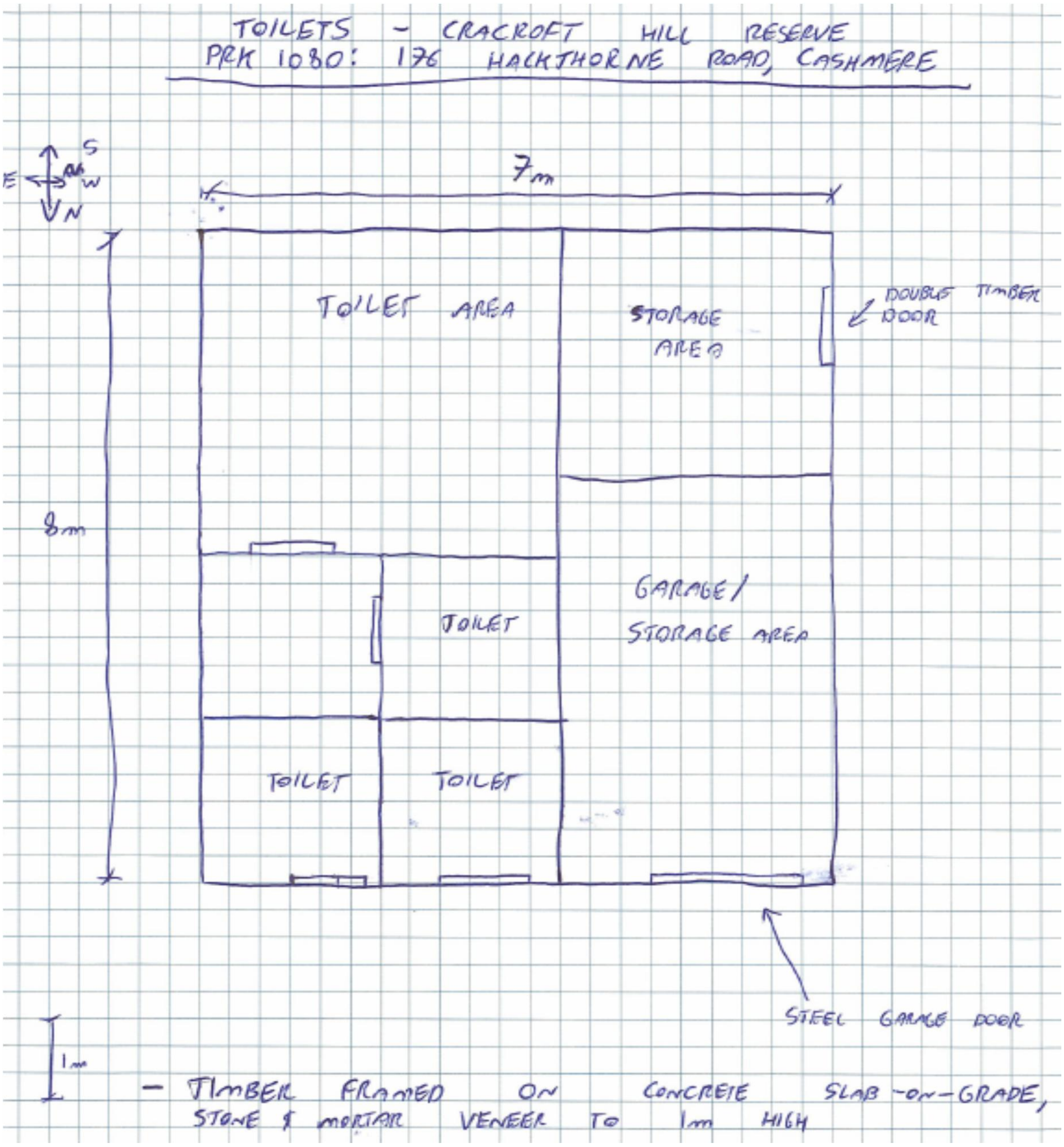

Figure 2 Sketch Showing Key Structural Elements

The building is light timber framed structure. The external walls have stone and mortar veneer up to 1m high and timber panels above. The internal walls are lined with compressed sheets, tiles, and plaster board. The single storey construction has a concrete slab on grade floor.

It was possible to inspect the roof structure directly due to the lack of ceiling panels. The lightweight corrugated steel roof is supported by timber purlins and beams. The timber beams are supported by the timber frame walls. The roof has eight skylights using patched of clear corrugated roof material.

The dimensions of the toilet block are approximately 7m long by 8m wide and 3.2m in height. There are concrete paths on the north and east sides of the building.

The structure appears to have been built in the last eight years. The toilets on the eastern side of the structure are lined with plaster and tiles over compressed sheets. The rear storage area has plaster board wall linings.

4.2 Gravity Load Resisting System

The gravity loads in the structure are resisted by timber beams along the structure. The lightweight steel type roof is supported by timber purlins on timber beams. The timber beams are supported by the timber frame external and internal walls. The roof loads are transferred from the purlins to the roof beams and into the timber frame walls. Then from the timber frame walls the loads travel into the slab on grade pad footings and from there into the ground.

4.3 Lateral Load Resisting System

Lateral loads acting on the structure are resisted by timber frame walls both along and across the dimensions of the building. The internal timber frame walls offers additional lateral resistance both along and across the structure.

5. Assessment

An inspection of the building was undertaken on the 16 July 2012. Both the interior and exterior of the building were inspected. The wall bracing of the building was not able to be viewed due to the lined nature of the building. The roof beams and structure of the roof were inspected due to the exposed building system.

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 solely from visual observation of the building due to the lack of available drawings.

6. Damage Assessment

6.1 Surrounding Buildings

The Cracroft toilets are located in Cracroft Hill Reserve in an area that is largely commercial. There are residential properties on all sides. The nearest building is a residential property located approximately 20m to the east of the toilet block. Based on visual inspections from property boundaries there was no damage evident to these buildings.

6.2 Residual Displacements and General Observations

No residual displacements of the structure were noticed during the inspection of the building.

The only visible damage to the structure was minor cracking in the stone and mortar veneer. The cracking in the mortar was located on the northern wall. See photographs 5 and 6 in Appendix A.

No damage was evident to the timber beam roof structure.

No cracks or damage was noted in the concrete slab on grade.

6.3 Ground Damage

There was no visible 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

The timber roof beams were visible. The roof bracing appears to be sufficient for the lightweight roof structure. See photographs 6, 7, and 8.

7.4 Staircases

The building does not contain a staircase.

7.5 Pounding effect

The building is not located near other structures so there is no potential pounding risk.

7.6 Liquefaction

No risk of liquefaction on site.

8. Geotechnical Consideration

8.1 Site Description

The site is situated in the suburb of Cashmere, south of Christchurch City centre. The site is moderately sloping at approximately 200m above mean sea level. It is approximately 1.3km southwest of Heathcote River, 4.5km north of the Littleton Harbour, and 6.5km west of the coast (Pegasus Bay).

8.2 Published Information on Ground Conditions

8.2.1 Published Geology

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

- Springston Formation, dominantly loess and loess colluvium and mixed loess-volcanic derived colluvium overlying volcanic rock, Holocene in age.

Shallow ground water table is considered unlikely.

8.2.2 Environment Canterbury Logs

Information from Environment Canterbury (ECan) indicates that there are no boreholes carried out within 200m of the site.

8.2.3 EQC Geotechnical Investigations

The Earthquake Commission has not undertaken geotechnical testing within 200m of the site.

8.2.4 CERA Land Zoning

Canterbury Earthquake Recovery Authority (CERA) has classified 176 Hackthorne Road, Cashmere as “Green Zone, N/A – Port Hills and Banks Peninsula” category. Land in this zone is generally considered suitable for residential construction, though some areas may require stronger foundations or design where rebuilding or repairs are needed. “Not Applicable” technical category is the classification given for those properties within Port Hills and Bank Peninsula and non-residential properties in a rural area or beyond the extent of land damage mapping. Following these guidelines, normal consenting procedures apply to this site.

8.2.5 Post-Earthquake Aerial Photography

Aerial photography taken following the 22 February 2011 earthquake shows negligible signs of liquefaction close to the site, as shown in Figure 3.

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

Figure 3 Post February 2011 Earthquake Aerial Photography[2]

8.2.6 Summary of Ground Conditions

From the information presented above, the ground conditions underlying the site are anticipated to comprise multiple strata of loess and loess colluvium and mixed loess-volcanic derived colluvium overlying volcanic rock.

8.3 Seismicity

8.3.1 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 below.

Table 2 Summary of Known Active Faults[3,4]

Known Active Fault	Distance from Site	Direction from Site	Max Likely Magnitude	Avg Recurrence Interval
Alpine Fault	130 km	NW	~8.3	~300 years
Greendale (2010) Fault	24 km	W	7.1	~15,000 years
Hope Fault	115 km	NW	7.2~7.5	120~200 years

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

[3] 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, June 2002, pp. 1878-1903.

[4] GNS Active Faults Database, http://maps.gns.cri.nz/website/af/viewer

Kelly Fault	115 km	NW	7.2	150 years
Porter Pass Fault	68 km	NW	7.0	1100 years

The recent earthquakes since 4 September 2010 have identified the presence of a previously unmapped active fault system underneath the Canterbury Plains, including Christchurch City, 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.

8.3.2 Ground Shaking Hazard

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.

The recent 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.

8.4 Slope Failure and/or Rockfall Potential

The area to the northeast of the site is moderately sloping uphill. Further site investigation should be carried out to determine the site-specific slope instability potential. However, given the site's distance to the sloping terrain, global slope instability is considered low.

8.5 Liquefaction Potential

Liquefaction potential of the site is considered unlikely due to the following reasons:

- Negligible signs of liquefaction close to the site (evidence from the post-earthquake aerial photograph);
- Anticipated presence of multiple stiff to hard strata particularly of loess and loess colluvium and mixed loess-volcanic derived colluvium overlying volcanic rock beneath the site; and,
- Shallow ground water table is not considered likely.

Due to the limited subsoil information, further investigation is recommended to better determine subsoil conditions. From this, a more comprehensive liquefaction assessment could be undertaken.

8.6 Conclusions & 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 appears to be situated on loess and loess colluvium and mixed loess-volcanic derived colluvium overlying volcanic rock. The site is considered unlikely to be susceptible to liquefaction.

A soil class of **C** (in accordance with NZS 1170.5:2004) should be adopted for the site.

Should a more comprehensive liquefaction and/or ground condition assessment be required, it is recommended that intrusive investigation be conducted.

9. Survey

No level or verticality surveys have been undertaken for this building at this stage.

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 3. These capacities are subject to confirmation by a more detailed quantitative analysis.

Item	%NBS
Building excluding CSW's	86

Table 3 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 86% New Building Standard (NBS). Under the New Zealand Society for Earthquake Engineering (NZSEE) guidelines the building is not considered Earthquake Prone or potentially an Earthquake Risk as it achieves greater than 67% NBS. This score has not been adjusted when considering damage to the structure as all damage observed was relatively minor and considered unlikely to adversely affect the load carrying capacity of the structural systems.

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: C, NZS 1170.5:2004, Clause 3.1.3, Gravel
- 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. Although the original building construction date is unknown it was likely designed to the current loading standards. When combined with the increase in the hazard factor for Christchurch to 0.3, it would be expected that the building would achieve close to 100% NBS.

10.5 Occupancy

As the structure achieves only 86% NBS, it does not have any Earthquake concerns in accordance with the NZSEE guidelines. Minor damage to the stone and mortar cladding has been noted and this should be repaired. The building does not pose a risk to users and occupants. The structure can remain occupied as the building has not been classified as Earthquake Prone.

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11. Initial Conclusions

The building has been assessed to have a seismic capacity in the order of 86% NBS and is therefore not a risk in accordance with the NZSEE guidelines. The site where the toilet block is has no evidence of liquefaction. The lack of any significant damage suggests that the toilet block is well constructed. In accordance the fact that the structure is not considered Earthquake Prone, the building may remain occupied.

12. Recommendations

The recent seismic activity in Christchurch has caused only minor visible damage to the building. As the building has not been classified as Earthquake Prone the building can remain occupied. Because the building has achieved 67% NBS or higher, it is not necessary to carry out any further inspections or surveys.

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 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 North elevation.

Photograph 2 View of the toilet block from the south east.

Photograph 3 View of the toilet block from the west.

Photograph 4 Minor cracks in the mortar on the north side of the toilet block.

Photograph 5 Minor cracks in the mortar on the north side of the toilet block.

Photograph 6 Roof structure with purlins and timber beam visible.

Photograph 7 Roof structure with skylight visible.

Photograph 8 Storage area with roof internal lining panels visible.

Photograph 9 The south wall shows the timber panelling above the stone and mortar veneer.

Photograph 10 The concrete slab on grade in the toilet areas has been lined with tiles.

Appendix B
Existing Drawings

No existing drawings were available for the building.

Appendix C

CERA Building Evaluation Form

Detailed Engineering Evaluation Summary Data

V1.11

Location

Building Name:	Cracroft Hill Reserve Toilets	Reviewer:	David Lee
	Unit / No: 176 / Street	CPEng No:	112052
Building Address:	Hackthorne Road	Company:	GHD
Legal Description:	Lot 1 DP 6163	Company project number:	513090257
		Company phone number:	
	Degrees / Min / Sec		
GPS south:	43 / 34 / 51.84	Date of submission:	23/05/2013
GPS east:	172 / 38 / 7.19	Inspection Date:	16/07/2012
		Revision:	Final
Building Unique Identifier (CCC):	PRK_1080_BLDG_001 EQ2	Is there a full report with this summary?	yes

Site

Site slope:	slope < 1in 5	Max retaining height (m):	0
Soil type:	gravel	Soil Profile (if available):	
Site Class (to NZS1170.5):	C		
Proximity to waterway (m, if <100m):		If Ground improvement on site, describe:	
Proximity to clifftop (m, if < 100m):			
Proximity to cliff base (m,if <100m):		Approx site elevation (m):	

Building

No. of storeys above ground:	1	single storey = 1	Ground floor elevation (Absolute) (m):	200.00
Ground floor split?	no		Ground floor elevation above ground (m):	0.10
Storeys below ground	0			
Foundation type:	mat slab		if Foundation type is other, describe:	Slab on grade
Building height (m):	3.20		height from ground to level of uppermost seismic mass (for IEP only) (m):	2.4
Floor footprint area (approx):	56			
Age of Building (years):			Date of design:	2004-
Strengthening present?	no		If so, when (year)?	
			And what load level (%g)?	
Use (ground floor):	public		Brief strengthening description:	
Use (upper floors):				
Use notes (if required):				
Importance level (to NZS1170.5):	IL2			

Gravity Structure

Gravity System:	load bearing walls		
Roof:	timber framed	rafter type, purlin type and cladding	Lightweight roof on timber purlins and beams
Floors:	concrete flat slab	slab thickness (mm)	
Beams:	none	overall depth x width (mm x mm)	
Columns:			
Walls:	non-load bearing	0	

Lateral load resisting structure

Lateral system along:	timber moment frame	Note: Define along and across in detailed report!	note typical bay length (m)	0.6
Ductility assumed, μ:	2.00			0.2
Period along:	0.40	0.00	estimate or calculation?	
Total deflection (ULS) (mm):			estimate or calculation?	
maximum interstorey deflection (ULS) (mm):			estimate or calculation?	

Lateral system across:	timber moment frame		note typical bay length (m)	5
Ductility assumed, μ:	2.00			0.2
Period across:	0.40	0.00	estimate or calculation?	
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:			
Wall cladding:	other light	describe	HardiePanel lined toilets and storage areas
Roof Cladding:	Metal	describe	Corrugated steel roofing
Glazing:	steel frames		
Ceilings:	none		
Services(list):			

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	partial	original designer name/date	

Damage

Site:
(refer DEE Table 4-2)

Site performance:	Good	Describe damage:	
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:	green		
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:	minor non-structural	Describe:	repair crack repairs in stone cladding
	Building Consent required:	no	Describe:	
	Interim occupancy recommendations:	full occupancy	Describe:	
Along	Assessed %NBS before:	86%	86% %NBS from IEP below	If IEP not used, please detail assessment methodology:
	Assessed %NBS after:	86%		
Across	Assessed %NBS before:	86%	86% %NBS from IEP below	
	Assessed %NBS after:	86%		

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: 2.4m

Seismic Zone, if designed between 1965 and 1992: B

Design Soil type from NZS1170.5:2004, cl 3.1.3: C shallow soil

not required for this age of building: a) Rigid

	along	across
Period (from above):	0.4	0.4
(%NBS)nom from Fig 3.3:	22.5%	22.5%
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
Final (%NBS)$_{nom}$:	**23%**	**23%**
2.2 Near Fault Scaling Factor — Near Fault scaling factor, from NZS1170.5, cl 3.1.6:		1.00
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 — Assessed ductility (less than max in Table 3.2)	2.00	2.00
Ductility scaling factor: =1 from 1976 onwards; or =k_μ, if pre-1976, fromTable 3.3:	1.00	1.00
Ductiity Scaling Factor, **Factor D:**	1.00	1.00
2.6 Structural Performance Scaling Factor: — Sp:	0.700	0.700
Structural Performance Scaling Factor **Factor E:**	1.428571429	1.428571429
2.7 Baseline %NBS, (NBS%)$_b$ = (%NBS)$_{nom}$ x A x B x C x D x E — **%NBS$_b$:**	**86%**	**86%**

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
3.5. Site Characteristics	insignificant	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

		Along	Across
3.6. Other factors, Factor F	For ≤ 3 storeys, max value =2.5, otherwise max value =1.5, no minimum	1.0	1.0
	Rationale for choice of F factor, if not 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 Baseline %NBS:	86%	86%
4.4 Percentage New Building Standard (%NBS), (before)			86%

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