Ouruhia Hall

BU 0391-03 EQ2

Detailed Engineering Evaluation

Quantitative Report

Version FINAL

225 Guthries Road, Belfast

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

Ouruhia Hall
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225 Guthries Road, Belfast

Christchurch City Council

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Date
06/02/13

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Detailed Engineering Evaluation

Quantitative Report - SUMMARY

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225 Guthries Road, Belfast

Background

The single storey building at 225 Guthries Road, Belfast, Christchurch has been assessed for its safety during an earthquake. We have assessed the structure of the building to determine the current level of safety it affords during an earthquake, and have compared that level to the legal requirements.

This is a summary of the Quantitative 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 19th July 2011, visual inspections on 18th January 2012 and Qualitative report version draft issued on 9th March 2012.

Building Description

The Ouruhia Hall at 225 Guthries Road, Belfast was constructed in 1963, with an extension and alterations added to the northern side of the building in 1969 and modification on the southern side of the building in 2010; based on the drawings provided by Christchurch City Council. The site is bordered by Guthrie's Road to the south and Ouruhia reserve to the north. Residential properties are located to the west and east of the building, the nearest being approximately 80 m distance away. A stream is located approximately 60 m to the north of the building.

The site slopes from Guthrie's Road to the northern side of the building after which it is predominantly flat.

General construction of the Hall consists of glulam timber portal frames across the building and lightweight timber framing forming both internal and external walls. Internal wall linings comprise timber panelling to the main areas of the hall, plasterboard and timber panel linings to the toilet and storage areas on the southern side of the building. Exterior cladding is provided by stucco plaster. The roof structure consists of lightweight cladding on timber purlins. The extension is constructed from glulam timber beams fixed to the portal frames and supported at the outer ends by timber columns. Internal and external claddings match the main structure.

The substructure to the hall and extension consist of suspended timber flooring on timber bearers supported by concrete piles internally and a concrete dwarf wall to the external perimeter.

Key Damage Observed

Key damage observed includes:

- Minor settlement along the northern side of the building.
- Cracking and spalling of the exterior plaster cladding system.
- Cracking along concrete walls in south-east corner of building.

Building Capacity Assessment

GHD finds that the Ouruhia Hall achieves overall 37% New Building Standard (NBS) and is therefore considered an “Earthquake Risk”.

Recommendations

It is recommended that:

- A strengthening scheme is developed to increase the seismic capacity of the building to at least 67% NBS.
- The current placard status of the building of green to remain.

1. Background

GHD has been engaged by the Christchurch City Council (CCC) to undertake a detailed engineering evaluation of Ouruhia Hall; a single storey function centre.

This is a Quantitative Assessment Report of the building structure. Quantitative Assessment involves a full seismic review of the existing structure, which is discussed in this report. The structural investigation has been carried out in accordance with the requirements of the relevant New Zealand Standards and the New Zealand Society for Earthquake Engineering (NZSEE) Guidelines for the ‘Assessment and Improvement of the Structural Performance of Buildings in Earthquakes’.

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 28th March 2011 to take control of the recovery of Christchurch using powers established by the Canterbury Earthquake Recovery Act enacted on 18th 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.

CERA now requires 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). The Detailed Engineering Evaluation Procedure document (draft) issued by the Structural Advisory Group on 19th July 2011 has been adopted by CERA for evaluations 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.

Factors determining the extent of evaluation and strengthening level required 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 2004 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. (Refer to Section 3.0 for definition of NBS).

2.2.1 Section 121 – Dangerous Buildings

The definition of a 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 1st 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 19th 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)

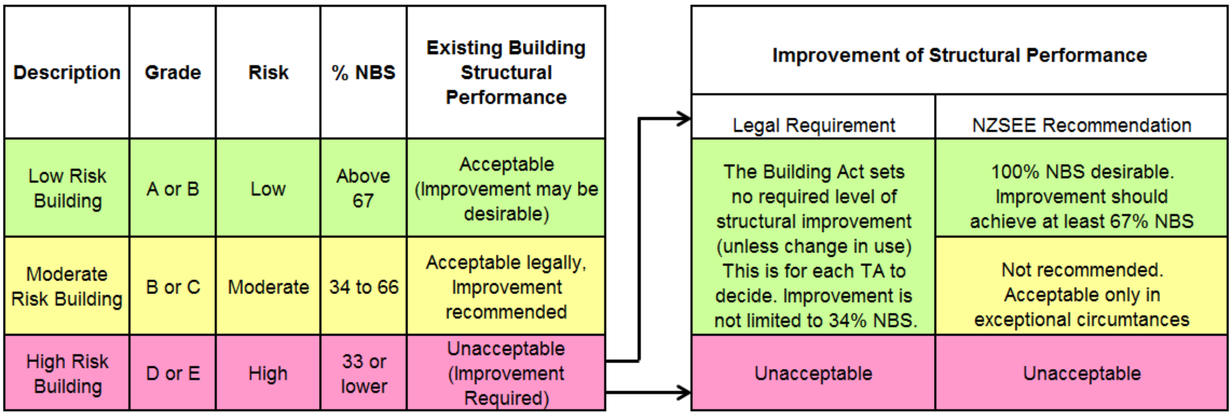
The increase in the above factors has resulted in a reduction in the level of compliance of an existing building relative to a new building despite the capacity of the existing building not changing.

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 building's capacity based on a comparison of loading codes from when the building was designed to that currently used. 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.

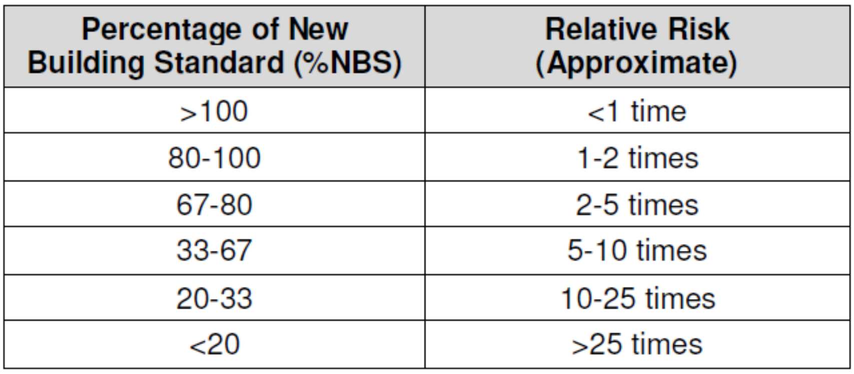


Description	Grade	Risk	% NBS	Existing Building Structural Performance
Low Risk Building	A or B	Low	Above 67	Acceptable (Improvement may be desirable)
Moderate Risk Building	B or C	Moderate	34 to 66	Acceptable legally, Improvement recommended
High Risk Building	D or E	High	33 or lower	Unacceptable (Improvement Required)

Improvement of Structural Performance	
Legal Requirement	NZSEE Recommendation
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
	Not recommended. Acceptable only in exceptional circumtances
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

Ouruhia Hall is located at 225 Guthries Road, Belfast, Christchurch. The original building was constructed in 1963, with an extension added to the northern side of the building in 1969 and modification on the southern side of the building in 2010. This is based on the drawings provided by Christchurch City Council.

Summary of Building key structural features:

- There are three parts of the building. These are:
  1. Main building - approximately 18 m in length, 9 m wide, and 4.50 m in height.
  2. Hall extension – approximately 16 m in length, 5 m wide and 2.30 m in height.
  3. Toilet and Store – approximately 14 m in length, 2.5 m wide and 2.30 m in height.
- General construction of the Hall is glulam timber portal frames across the building and lightweight timber framing forming both internal and external walls.
- Internal wall linings consist of timber panelling to the main areas of the hall with plasterboard and timber panel linings to the toilet and storage areas on the southern side of the building.
- Exterior cladding is provided by a stucco plaster system. The roof structure consists of lightweight cladding on timber purlins.
- The extension is constructed from glulam timber beams fixed to the existing portal frames and supported at the outer end by timber columns. Internal and external claddings match the existing structure.
- Masonry concrete walls form an external storage area on the south-eastern corner of the building.
- The ground floor is made up of timber boarding on timber joist.
- The substructure to the hall and extension consist of suspended timber flooring on timber bearers supported by concrete piles internally and a concrete dwarf wall to the external perimeter.

Key structural details of the building are shown in Figure 2 to 4.

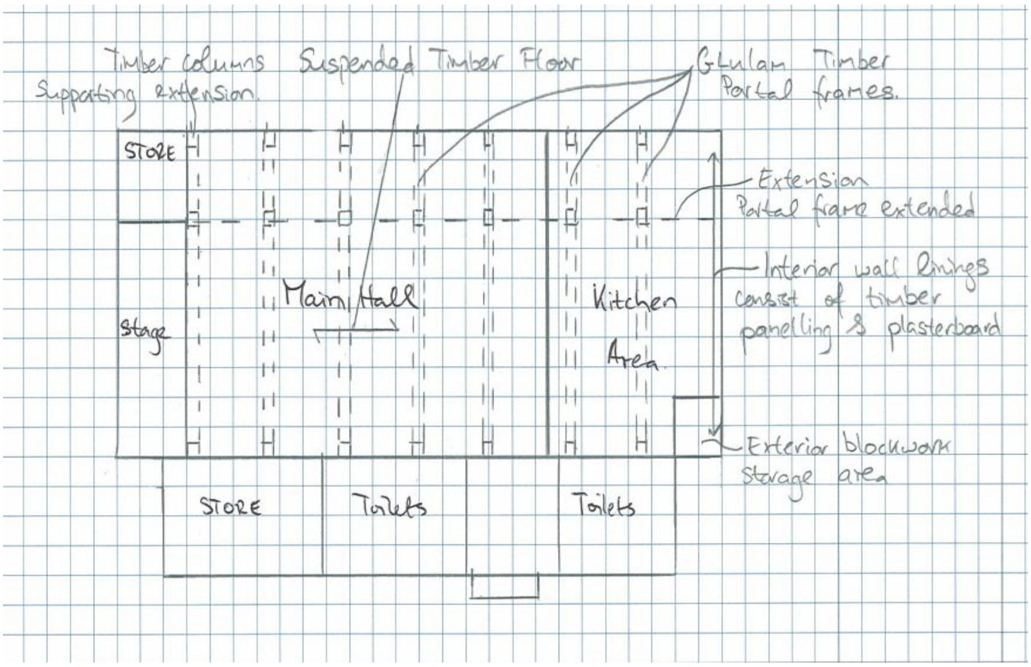


Figure 2 Plan Sketch Showing Key Structural Elements

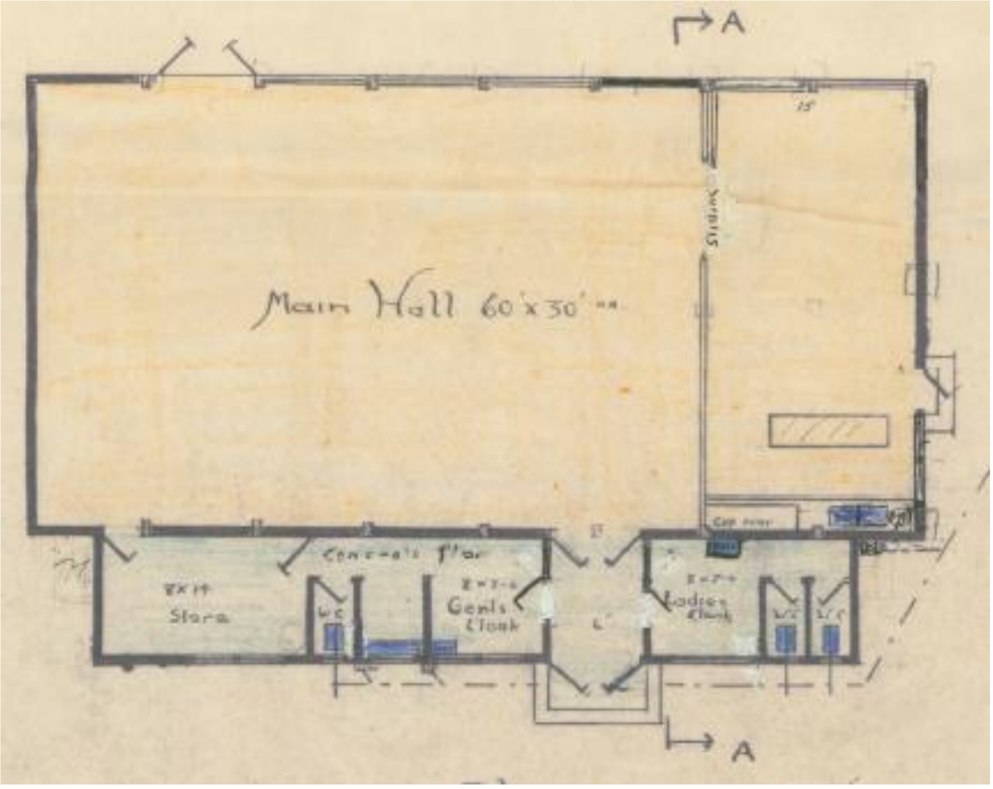


Figure 3 Plan Sketch Showing Main and Toilet Area as per Original Drawings (1963)

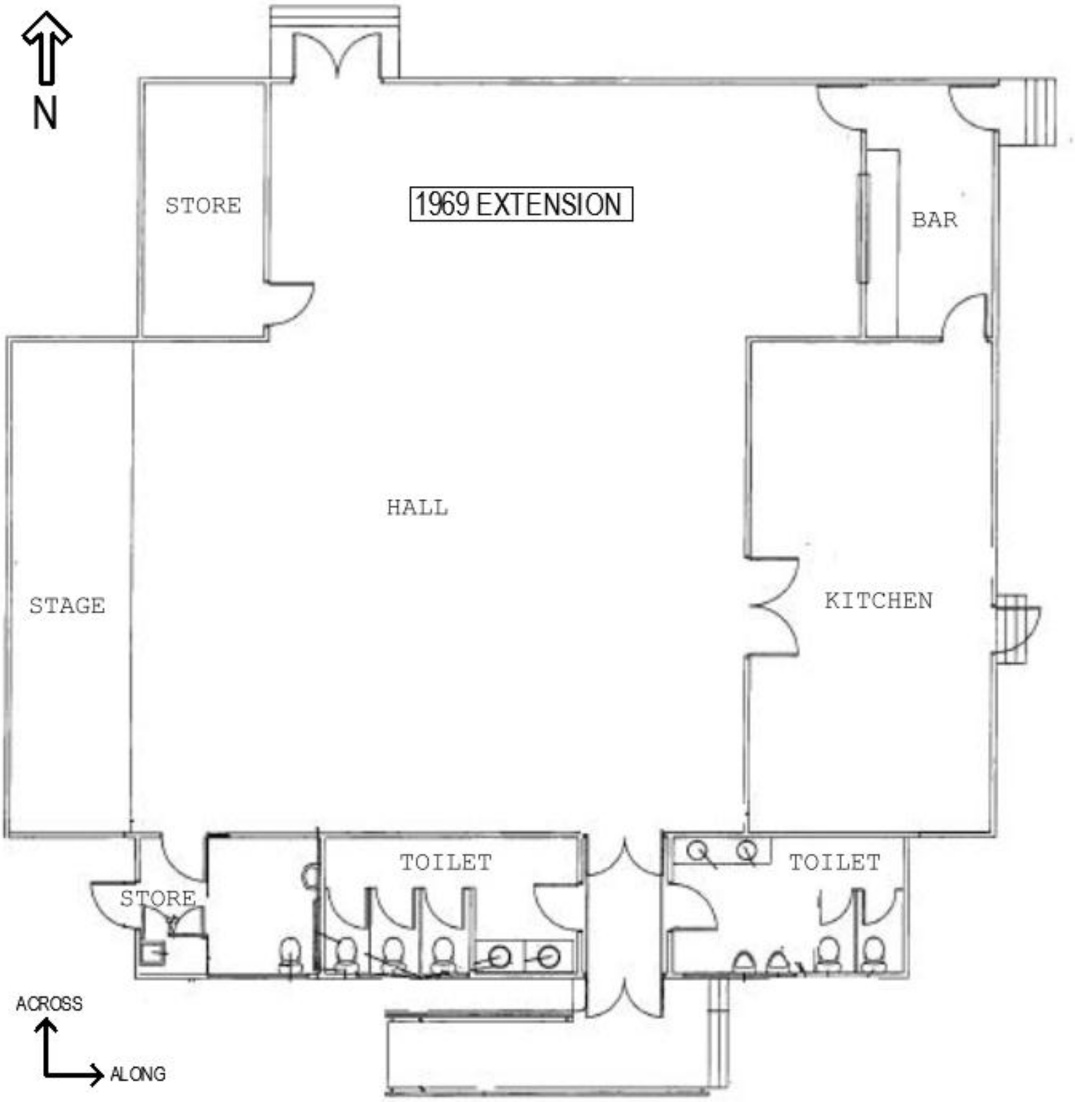


Figure 4 Plan Sketch Showing Main Hall, Hall Extension and Toilet as per 2010 Alterations

4.2 Gravity Load Resisting System

The gravity loads in the structure are resisted by glulam timber portal frames supporting the main hall and kitchen. The 1969 extension roof is supported by timber lean-to framing. Timber framed walls support the remaining areas of the building. The roof consists of corrugated metal cladding on timber purlins connected to the portals and lean-to framing. These members in turn transfer the gravity load down the timber posts to the concrete foundations. The remaining areas of the structure are supported by the load bearing timber framed walls which transfer the load from the lightweight roof, via timber purlins, into the foundations below.

4.3 Lateral Load Resisting System

Lateral loads in the across direction are resisted by the glulam portal frames, internal timber panelled walls between the main hall and kitchen and the gable walls at the eastern and western ends of the building. The timber purlins, and timber ceiling panelling, transfer the lateral roof load to the portal frames and other cross walls and it is then transferred down to the concrete foundations.

Lateral loads in the along direction of the building are resisted by timber panelled walls on the northern and southern sides of the main hall area. In addition timber panelled and plasterboard lined walls resist lateral loads to the toilet and storage areas at the southern side of the building. These walls transfer the loads to the perimeter strip foundations. No bracing elements were evident at the northern wall of the 1969 extension.

5. Assessment

5.1 Site Inspection

A visual inspection of the building was undertaken on 18th January 2012. Both the interior and exterior of the building were inspected. The building was observed to have a green placard in place. The main structural components of the building were in general able to be viewed due to the exposed nature of the structure. Inspection of the subfloor to the extension was carried out from a manhole location. Access to the subfloor of the original structure was not available and therefore this area has not been inspected.

The visual inspection consisted of observing the building to determine the structural systems and likely behaviour of the building during an earthquake. The site was assessed for damage, including observing the ground conditions, checking for damage in areas where damage would be expected for the structure type observed and noting any general damage observed throughout the building in both structural and non-structural elements.

5.2 Investigation & Opening Up Work

Further inspections were carried out on the 29th August 2012 to confirm the beam connection between the timber portals (Photograph 11). Furthermore, the inspections undertook the verification of the roof and wall member dimensions of the toilet/store rooms. Also, the steel reinforcing and the connection to the building of the masonry outhouse were identified.

5.3 Available Drawings

Copies of the following construction drawings were provided by CCC:

Item	Title	Sheet No.	Date
1	Plan and Elevations		30/05/63
2	Section and Details		30/05/63
3	Location Plan		30/05/63
4	Back Elevation		1969
5	North Elevation		1969
6	South Elevation		1969
7	Section A-A		1969
8	Plan View		1969
9	Plan, Elevation and Details		18/03/69
10	Site Plan	1/8	11/05/2010
11	Existing Plan and Demolition Plan	2/8	11/05/2010

12	New Floor Plan	3/8	11/05/2010
13	Proposed Womens WC / Proposed Accessible WC & Cleaners Cupboards	4/8	11/05/2010
14	Proposed Mens WC	5/8	11/05/2010
15	Elevations	6/8	11/05/2010
16	Elevations	7/8	11/05/2010
17	Elevations and Sections	8/8	11/05/2010

Table 2 Available drawings provided by CCC

The drawings have been used to confirm the structural systems, investigate potential critical structural weaknesses (CSW) and identify details which require particular attention.

Drawings are provided in Appendix C of this report.

5.4 Analysis and Modelling Methodology

The seismic assessment procedure determines the capacity of the structure to withstand seismic loading (as defined in the current New Zealand Standard 1170.5:2004) through structural analysis. The seismic capacity of the structure is measured as a proportion of New Building Standard (% NBS), the standard to which a new building must perform in terms of current design codes and standard. The weakest structural element of the structure is the element which governs the seismic capacity of the overall structure.

The methodology and approach adopted for the analysis and assessment is presented in the following sections.

5.4.1 Seismic Design

The Ouruhia Hall was checked to the seismic design standards in accordance with the AS/NZ 1170.5:2004, NZBC Clause B1 Structure and New Zealand Society of Earthquake Engineering “Guidelines for Assessment and Improvement of the Structural Performance of Buildings in Earthquakes”.

The seismic assessment was undertaken using the equivalent static method as described in Clause 6.2 of the NZS 1170.5.

5.4.2 Building Modelling and Loading Conditions (For Portal Frames, Columns and Beams at Hall Extension)

Two-dimensional frame modelling for the portal frames within the main hall and the beams & columns located at the extension of the Ouhuria Hall was performed to realistically simulate the effects of the applied loads on the structure under different loading conditions such as normal operation, earthquake and combinations thereof.

Each section, member and node of the model was defined using the physical dimensions, material properties and connection details from the available drawings described in Section 5.3. The structural software ETABS v.9.7.2 was used for the general modelling and analysis of the structure. The foundations were assumed to be pinned in the 2D model.

The loading conditions and load combinations used in the analysis of the structure were in accordance with AS/NZS 1170:2002.

Figure 5 shows overall view of the model.

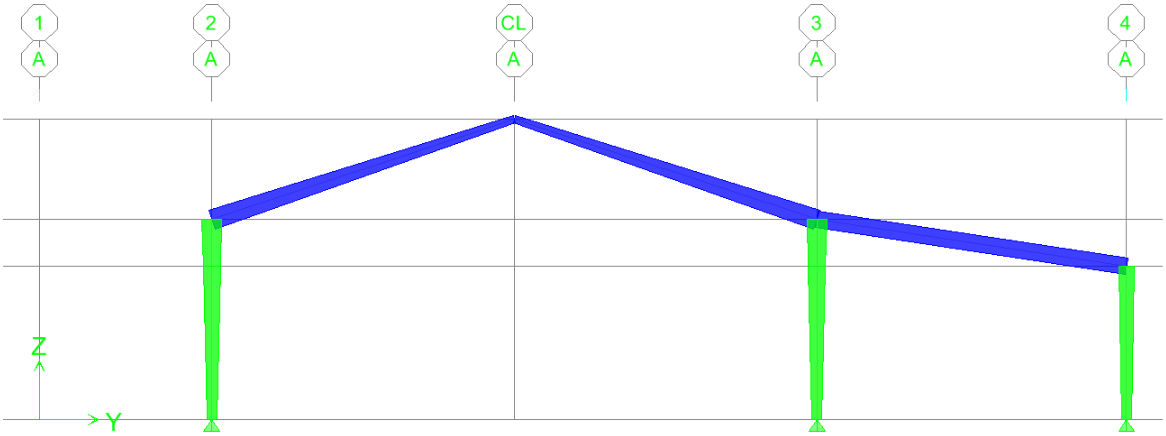


Figure 5 2D Model of the Portal Frames, Beams and Columns of the Extension of Ouhuria Hall Developed in Etabs

5.4.3 Determination of % NBS

Upon determination of the critical loading conditions, each of the structural members that make up the Ouhuria Hall was checked to determine % NBS of the members indicated in the available drawings. Members demand and capacity ratio was computed and % NBS was calculated accordingly.

5.4.4 Timber Walls and Subfloor Bracing Capacity

The Total Bracing Demand, in Bracing Unit (BU), is determined for each direction (along and across) for seismic load combinations. The Total Bracing Demand was compared to the Total Bracing Capacity of the structure and %NBS was calculated accordingly.

Bracing demand and capacity ratio was also computed for each bracing line element.

The effect of the timber portal frame in the timber wall was considered in the calculation of the total bracing capacity.

6. Damage Assessment

6.1 Surrounding Buildings

There are no buildings located immediately adjacent to Ouruhia Hall, the nearest residential building is located approximately 80 m to the north-east. Based on visual inspections from property boundaries there was no damage evident to these buildings

6.2 Residual Displacements and General Observations

Discussions with the hall manager indicate that some minor settlement may have occurred along the northern side of the extension, the indoor bowls club had noted that bowling balls do not roll straight. There was no evidence on site to indicate that settlement has occurred, however given that liquefaction was observed on the northern side of the building (Photograph 10, Appendix B) minor settlement may have occurred that is not readily visible.

Cracking and spalling of the exterior stucco plaster system was noted in several locations around the building. Some of these are new cracks, whilst the remainder are existing cracks that may have opened up slightly during the recent seismic activity. This is evident in Photos 8 and 9 in Appendix B.

Cracking along mortar lines was noted to the concrete walls to the storage area in the south-eastern corner of the building. These appear to be existing cracks that may have opened up slightly during the recent seismic activity. This is evident in Photograph 7 in Appendix B.

No cracking to the perimeter strip footing was noted. Piles and sub-floor framing to the extension appear sound when viewed. Access to the sub-floor area of the original structure was not available

No damage was evident to the portal frames and beams and columns supporting the extension structure.

No damage was evident to the internal timber panelled bracing walls.

6.3 Ground Damage

Approximately 1 m^3 of liquefaction was noted in the reserve area to the north of the building. This can be seen in Photograph 10 in Appendix B. Discussions with the hall manager indicate that this occurred as a result of the 23rd December 2011 aftershock.

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7. Analysis

7.1 Seismic Parameters

Seismic loads were applied based on criteria specified by the New Zealand Code (NZS 1170.5:2004) and New Zealand Society of Earthquake Engineering (NZSEE).

The seismic assessment parameters are as tabulated below:

Site Classification	D
Importance Level	2
Hazard factor, (Z) (Table 3.3, NZS 1170.5:2004	0.30 (Christchurch)
And NZBC Clause B1 Structure)	
Annual Probability of Exceedance (Table 3.3, NZS 1170.0:2002)	1/500 (ULS)
Annual Probability of Exceedance (Table 3.3, NZS 1170.0:2002)	1/25 (SLS)
Return Period Factor (R_u), (Table 3.5, NZS 1170.5:2004)	1.0 (ULS)
Return Period Factor (R_s), (Table 3.5, NZS 1170.5:2004)	0.33 (SLS)
(NZBC B1 Clause 2.2.14c)	
Ductility Factor (μ), (Section 4.3.1.1, NZS 1170.5:2004)	3.0 (Portal and Timber Frames)
Performance Factor (S_p), (Section 4.4.2, NZS 1170.5:2004)	0.70 (Portal and Timber Frames)
Liquefaction Potential	minor

7.2 Bracing Unit Capacity

7.2.1 Timber Framed Wall

The bracing unit used for the calculations is based on NZS 3604:1981, Section 6.9.6, Table 20:

Timber Wall:	42 BU

7.2.2 Subfloor

The bracing unit used for the calculations are based on NZS 3604:2011

Subfloor ID	Min. No. or Required Length	Bracing Capacity Seismic (BU's)
Rcw1	1.50 m	0
Rcw2	1.50 m	42
Rcw3	1.50 m	100

Rcw4	1.50 m	200
Rcw5	1.50 m	300
Anchor Pile	1 pc	120

Table 3 Bracing Unit Capacity of Timber Subfloor

Where:

Rcw1 = Ratio of wall length to average wall height is less than 0.75

Rcw2 = Ratio of wall length to average wall height is more than 0.75 but less than 1.50

Rcw3 = Ratio of wall length to average wall height is more than 1.50 but less than 3.0

Rcw4 = Ratio of wall length to average wall height is more than 3.0 but less than 4.50

Rcw5 = Ratio of wall length to average wall height is more than 4.50

8. Geotechnical Investigation

The site is in a semi-rural area north of Christchurch, bordered by Guthries Road to the south and Ouruhia reserve to the north. The site slopes gently from Guthries Road to the northern side of the building after which it is predominantly flat at approximately 6 m above mean sea level.

The site is within a bend of the Kaputone stream, which at its closest point is approximately 60 m north of the building. It is located 60 m south of the Kaputone Creek, 1.2 km west of the Styx River and 5 km west of Pegasus Bay.

8.1 Published Information on Ground Conditions

8.1.1 Published Geology

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

- Grey river alluvium beneath plains or low-level terraces, Holocene in age (Q1a).

8.1.2 Environment Canterbury Logs

Information from Environment Canterbury (ECan) indicates that eight boreholes are located within a 200m radius of the site. Of these boreholes, one (180 m southwest of the site) had a lithographic log which can be summarised as sand and gravel, with some clay lenses. The groundwater was recorded as artesian.

It should be noted that the logs have been written by the well driller and not a geotechnical professional or to a standard. In addition strength data is not recorded.

8.1.3 EQC Geotechnical Investigations

The Earthquake Commission has not undertaken geotechnical testing in this area.

8.1.4 Land Zoning

Canterbury Earthquake Recovery Authority (CERA) has published maps showing the site to be within the Green Zone, indicating repair and rebuild may take place.

The site has been classified as “N/A – Rural & Unmapped” because it is a rural area outside the city.

8.1.5 Land Damage Observations

A small number of “sand boils” on the lawn and in the garden were observed during the site inspection; these are surface evidence of liquefaction. According to the building manager, these sand boils occurred in the 23rd December 2011 aftershock.

There are no obvious signs of liquefaction on the aerial photography taken following the 22nd February 2011 earthquake (Figure 6).

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[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.

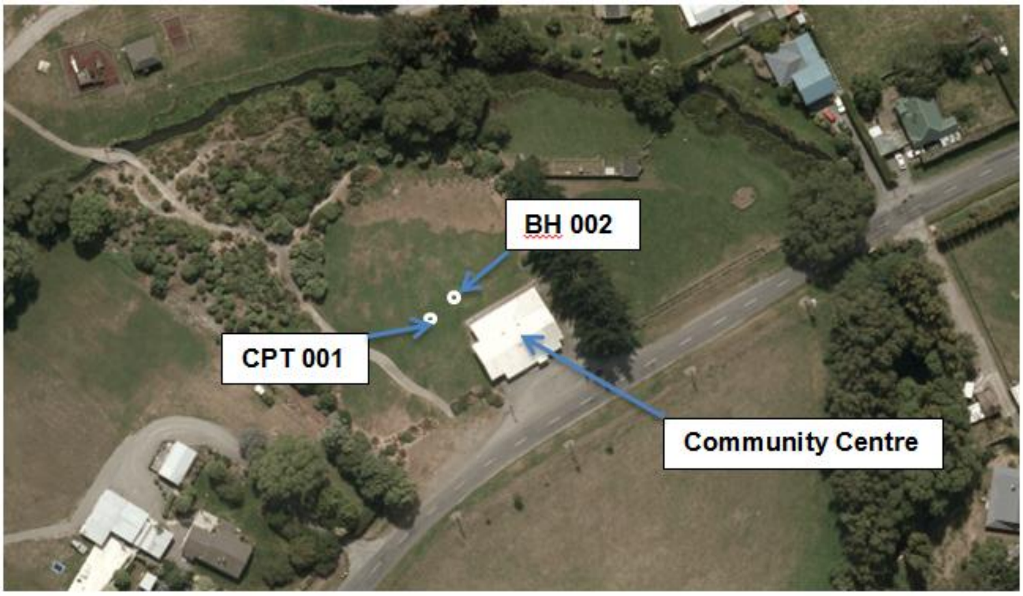

Figure 6 Post February 2011 Earthquake Aerial Photography [2]

8.1.6 Summary of Ground Conditions

Based on the desktop study, the site is anticipated to be underlain by sandy gravel, and sand and clay to a depth of 21 m below ground level (bgl).

8.2 Seismicity

8.2.1 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 4 Summary of Known Active Faults[3,4]

Known Active Fault	Distance from Site (km)	Max Likely Magnitude	Avg Recurrence Interval
Alpine Fault	120	8.3	~300 years
Greendale (2010) Fault	34	7.1	~15,000 years
Hope Fault	100	7.2~7.5	120~200 years
Kelly Fault	105	7.2	~150 years

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[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, pp 1878-1903, June 2002.

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

Known Active Fault	**Distance from Site (km)**	**Max Likely Magnitude**	**Avg Recurrence Interval**
Porters Pass Fault	72	7.0	~1100 years

Recent earthquakes since 22nd February 2011 have identified the presence of a new active fault system / zone underneath Christchurch City and the Port Hills. Research and published information on this system is in development and not generally available and average recurrence intervals are yet to be established.

8.2.2 Ground Shaking Hazard

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 close to the epicentre. This has resulted in widespread liquefaction throughout Christchurch.

New Zealand Standard NZS 1170.5:2004 now 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 4th September 2010.

8.3 Field Investigations

In order to further understand the ground conditions at the site, intrusive testing comprising one cone penetration test with porewater measurement CPTU (CPT 001) investigation and one machine-drilled borehole (BH 002) were conducted.

The locations of the tests are tabulated in Table 5 and are shown on Figure 6; the logs can be found in Appendix A.

Investigation	**Depth (m bgl)**	**Easting (NZMG)**	**Northing (NZMG)**
CPT 001	2.5	2481895	5751725
BH 002	16.0	2481901	5751731

Table 5 Coordinates of Investigation Locations

The CPT investigation was undertaken by McMillan Drilling Service on 04 April 2012 scheduled to a target depth of 20 m below ground level. However, refusal was reached at depth of 2.5 m due to the presence of dense gravels.

Interpretation of output graphs5 from the investigation showing Cone Tip Resistance (qc), Friction Ratio (Fr), Inferred Lithology and Inferred Liquefaction Potential are presented in Table 7.

The machine borehole was undertaken by McMillan Drilling Service on 10th May 2012. This test achieved a depth of 16.0 m.

---

[5] McMillans Drilling CPT data plots, Appendix X.

8.4 Ground Conditions Encountered

The ground conditions as encountered from the borehole investigation indicate the site to be underlain by medium to very dense gravel. The machine-drilled borehole is summarised in Table 6.

Depth (m bgl)	Ground Conditions Encountered	D (m)	SPT N
0.0 – 0.4	Topsoil		
0.4 – 16.0	Sandy, fine to medium GRAVEL; grey. Medium to very dense.	1.0	33
		2.5	29
		4.0	28
		5.5	29
		7.0	50
		8.5	23
		10.0	17
		11.5	16
		13.0	50
		14.5	29

Groundwater was encountered during the investigation at a depth of 1.4 m bgl.

Table 6 Summary of Ground Investigation Results

8.4.1 Summary of CPT-Inferred Lithology

Depth (m)	Lithology [1]	Cone Tip Resistance q_c (MPa)	Friction Ratio Fr (%)
0 – 2.5	Silty SAND to gravelly SAND	10 to 15	1 to 2
> 2.5	GRAVEL – Unable To Penetrate	> 30	~0

Table 7 Summary of CPT-Interred Lithology

8.5 Slope Failure and/or Rockfall Potential

The site is flat lying and slope instability risk is considered negligible. However, any localised retaining structures and/or embankments should be further investigated to determine the site-specific slope instability potential.

8.6 Liquefaction Assessment

The site is considered to have a minor liquefaction potential, based on the following:

- The CPT probe met refusal at 2.5 m depth due to dense gravel. Borehole results encountered medium dense to dense gravel-dominated subsoils;
- Evidence of liquefaction after the December 23rd 2011 aftershock.

8.7 Summary and Recommendations

The ground conditions underlying the site are medium dense to very dense gravels.

The site is considered to have minor to moderate liquefaction susceptibility.

The Site Class of **D** (in accordance with NZS 1170.5:2004) recommended in previous assessments is still considered appropriate for this site.

The ground conditions indicate TC1 type behaviour soils and as such foundation requirements in accordance with DBH Guidelines for TC1 are appropriate.

9. Results

9.1 Summary of Results

The outcome of the demand/capacity assessment is summarised below in Table 8. Note that the values given represent the critical elements in the building, as these effectively define the building's capacity. Other elements within the building will have significantly greater capacity when compared with the governing elements.

Summary of tabulations can be found in Appendix D.

Level	Direction	Elements	% NBS
Ground – Roof Level	Across	Timber Framed Walls	50%
		Timber Framed Subfloors	> 100%
		Timber Rafters	> 100%
		Timber Columns	> 100%
	Along	Timber Framed Walls	37%
		Timber Framed Subfloors	> 100%
		Timber Columns	> 100%

Table 8 Existing Building Element to % NBS

9.1.1 Timber Framed Walls

Total Bracing System

Based on the analysis, the overall bracing system of the structure achieved a score of 37% NBS. This is based on the timber framed walls in the 'along' direction. Overall building capacity of the timber framed walls in the 'across' direction achieved a score of 50% NBS. The wall bracing system falls in the "Earthquake Risk" category.

9.1.2 Timber Framed Subfloors

Calculations showed that the overall bracing capacity of the timber framed subfloor achieved a rating of over 100% NBS.

9.1.3 Timber Rafters

The timber rafters in the 'across' direction were assessed to have an NBS score of >100%.

9.1.4 Timber Columns

The timber columns were assessed to have an NBS score of >100%.

9.1.5 Foundations

Based on the information presented on the Geotechnical investigation report, GHD assess the following for the subject site:

- The ground conditions underlying the site are medium dense to very dense gravels.
- The site is considered to have minor to moderate liquefaction susceptibility.
- The Site Class of **D** (in accordance with NZS 1170.5:2004) recommended in previous assessments is still considered appropriate for this site.
- The ground conditions indicate TC1 type behaviour soils and as such foundation requirements in accordance with DBH Guidelines for TC1 are appropriate.

9.2 Discussion of Results

The results obtained from the analysis are consistent with those expected for a building of this age and construction type founded on Class D soils.

The building was constructed in 1963 and was likely to be designed to the loading standard current at the time, NZS 95. The design loads used in this code are likely to have been less than those required by the current loading standard. In addition, the detailing requirements for ductile seismic behaviour that are present in the current codes are unlikely to have been considered in the design of this building. As a result, it would be expected that the building would not achieve 100% NBS. The increase in the hazard factor for Christchurch to 0.3 further reduces the % NBS score of the structure.

10. Conclusions

10.1 Building Capacity Assessment

The structure has been assessed to have a seismic capacity of 37% NBS and is therefore classified as an “Earthquake Risk”. A building with % NBS score in the range of 34% to 67% NBS is between 5 to 10 times more likely than a similar building constructed to current loading standards to cause loss of life or serious injury during a seismic event.

The critical structural weaknesses for this building are the timber framed walls.

11. Recommendations

Based on the results acquired in the quantitative analysis performed, the following recommendations are made:

- It is recommended that the current placard status of the building of green remains.
- A strengthening scheme is developed to increase the seismic capacity of the building to at least 67% NBS should be prepared.

12. Limitations

12.1 General

This report has been prepared subject to the following limitations:

- No level or verticality surveys have been undertaken.
- No material testing has been undertaken.
- This report is prepared for CCC to assist with assessing the remedial works required for council buildings and facilities. It is not intended for any other party or purpose.

12.2 Scope and Limitations of Geotechnical Investigation

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 by third parties.

Where drill hole or test pit logs, cone tests, laboratory tests, geophysical tests and similar work have been performed and recorded by others under a separate commission, the data is included and used in the form provided by others. The responsibility for the accuracy of such data remains with the issuing authority, not with GHD.

The advice tendered in this report is based on information obtained from the desk study investigation location test points and sample points. It is not warranted in respect to the conditions that may be encountered across the site other than at these locations. It is emphasised that the actual characteristics of the subsurface materials may vary significantly between adjacent test points, sample intervals and at locations other than where observations, explorations and investigations have been made. Subsurface conditions, including groundwater levels and contaminant concentrations can change in a limited time. This should be borne in mind when assessing the data.

It should be noted that because of the inherent uncertainties in subsurface evaluations, changed or unanticipated subsurface conditions may occur that could affect total project cost and/or execution. GHD does not accept responsibility for the consequences of significant variances in the conditions and the requirements for execution of the work.

The subsurface and surface earthworks, excavations and foundations should be examined by a suitably qualified and experienced Engineer who shall judge whether the revealed conditions accord with both the assumptions in this report and/or the design of the works. If they do not accord, the Engineer shall modify advice in this report and/or design of the works to accord with the circumstances that are revealed.

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 in section 8.

13. References

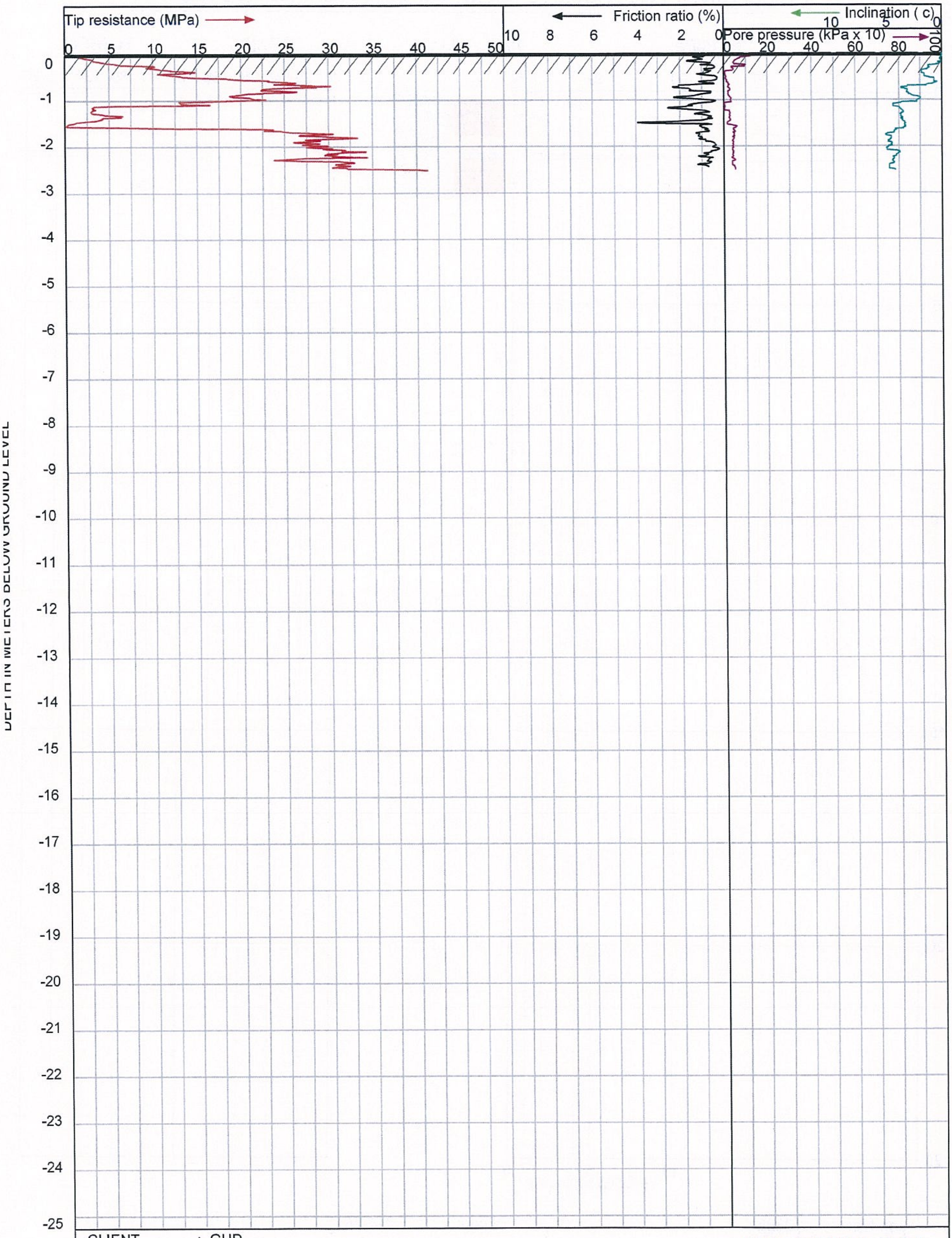
- Drawings for Ouhuria Hall prepared by Cutler Brothers Builders (1963), and Peter Dunbar Architectural Designer (2010)
- Ouhuria Hall, BU 0391-003 EQ2, Detailed Engineering Evaluation, Qualitative Report, Version Draft; 09th March 2012, GHD Pty Ltd. - Christchurch

New Zealand Standard

- NZS 1170.0:2002 Structural Design Actions Part 0: General Principles
- NZS 1170.1:2002 Structural Design Actions Part 1: Permanent, Imposed and Other Actions
- NZS 1170.1: Supplement 1:2002 Structural Design Actions: Permanent, Imposed and Other Actions-Commentary
- NZS 1170.5:2004 Structural Design Actions Part 5: Earthquake Actions – New Zealand and NZBC Clause B1 Structure.
- NZS 3603:1993 Timber Structures Standard
- NZS 3604:2011 Timber Framed Buildings
- Timber Design Guide by Andrew Buchanan, University of Canterbury, 3rd Edition 2007
- Assessment and Improvement of Unreinforced Masonry Buildings for Earthquake Performance.
- New Zealand Society of Earthquake Engineering Guidelines for Assessment and Improvement of the Structural Performance of Buildings in Earthquake

Appendix A

Geotechnical Investigation Results and Analysis



CLIENT	:	GHD
LOCATION	:	Christchurch Various (CCC Properties)
DATE	:	4-4-2012
OPERATOR	:	H. Pardoe
REMARK 1	:	CPTu03
REMARK 2	:	Effective Refusal

JOB # : 10386
TEST #: CPT 001

McMILLAN
DRILLING SERVICES
120 High St Southbridge CANTERBURY NZ
Ph +64 3 324 2571 Fax +64 3 324 2431
www.drilling.co.nz

PIEZOCONE PENETROMETER TEST (CPTU) INTERPRETIVE REPORT

Job No: 10386

CPT No: CPT 001

Project: GHD

Location: Christchurch Various (CCC Properties)

Date: 4-4-2012

Operator: H. Pardoe

Remark: Effective Refusal

McMILLAN
DRILLING SERVICES

BOREHOLE LOG

GHD Limited

PO Box 13468
Christchurch 8141

Site Identification: **BH002**

Sheet 1 of

Project: Geotechnical Investigation Report
Client: Christchurch City Council
Site: Ouruhia Hall
Job No.: 5130596/03

Coordinates: E 2481 901, N 5751 731
Surface RL (m): +6.0m MSL
Commenced: 05-Oct-12
Completed: 10-May-12

Datum: NZTM
Total Depth: 16.0m
Contractor: McMillan
Driller: P. Smith

Equipment: Track Tri-cone Rotary Air Flush
Shear Vane: Geo 308
Bore Diameter (mm): 100

Inclination: -90
Comments: Logged from chip samples

Logged:	DW
Processed:	DW
Checked:	BC

Depth (m)/ [Elev.]	Drilling Method	Core Run / Recovery (%)	Support / Casing (m)	Water	Geological Fm	Classification	Graphic Log	SOIL DESCRIPTION: (Soil Code), Soil Name [minor MAJOR], colour, structure [zoning, defects, cementing], plasticity or grain size, secondary components, structure. (Geological Formation) / ROCK DESCRIPTION: Weathering, colour, fabric, ROCK NAME (Formation Name)	Moisture Condition	Consistency/ Relative Density	Weathering	Estimated Rock Strength EW VW W MS S VS ES	RQD (%)	Defect Spacing (mm) 20 60 200 600 2000	TESTS & SAMPLES / ROCK MASS DEFECTS: Depth, Type, Inclinations, Roughness, Texture, Aperture, Coating
0.0	Wash Boring		HQ	▽	Springston Formation	GW		Sandy medium GRAVEL; grey. Medium dense to dense; subrounded, slightly weathered greywacke gravel; sand, coarse to medium, well graded. (Springston Formation) (Samples recovered as angular chips due to drilling technique. Springston Formation gravels generally rounded.)	M	D					
4.0 [+2.0]	Rotary Coring		HQ		Springston Formation	SP		Gravelly medium SAND; grey. Medium dense; moist; gap graded. Gravel, medium, subrounded, slightly weathered greywacke gravel. (Springston Formation) (Samples recovered as angular chips due to drilling technique. Springston Formation gravels generally rounded.)	M	MD					
6.5 [-0.5]						GW		Sandy medium GRAVEL; grey. Medium dense to dense; moist; subrounded, slightly weathered greywacke gravel; sand, coarse to medium. (Springston Formation) (Samples recovered as angular chips due to drilling technique. Springston Formation gravels generally rounded.)	M	D					

Depth (m)	TESTS & SAMPLES	
1	SPT	4,4, 5,6, 11,11, [33]
2.5	SPT	4,7, 7,7, 7,8, [29]
4	SPT	4,4, 5,5, 8,10, [28]
5.5	SPT	9,7, 8,8, 8,5, [29]
7	SPT	6,13, 18,17, 22,0, [50]
8.5	SPT	4,5, 5,6, 5,7, [23]

BOREHOLE LOG

GHD Limited

PO Box 13468
Christchurch 8141

Site Identification: **BH002**

Sheet 2 of

Project:	Geotechnical Investigation Report	**Coordinates:** E 2481 901, N 5751 731	**Datum:** NZTM
Client:	Christchurch City Council	**Surface RL (m):** +6.0m MSL	**Total Depth:** 16.0m
Site:	Ouruhia Hall	**Commenced:** 05-Oct-12	**Contractor:** McMillan
Job No.:	5130596/03	**Completed:** 10-May-12	**Driller:** P. Smith

Equipment:	Track Tri-cone Rotary Air Flush	**Inclination:** -90		**Logged:**	DW
Shear Vane:	Geo 308	**Comments:** Logged from chip samples		**Processed:**	DW
Bore Diameter (mm):	100			**Checked:**	BC

Depth (m)/ [Elev.]	Drilling Method	Core Run / Recovery (%)	Support / Casing (m)	Water	Geological Fm	Classification	Graphic Log	SOIL DESCRIPTION: (Soil Code), Soil Name [minor MAJOR], colour, structure [zoning, defects, cementing], plasticity or grain size, secondary components, structure. (Geological Formation) / ROCK DESCRIPTION: Weathering, colour, fabric, ROCK NAME (Formation Name)	Moisture Condition	Consistency/ Relative Density	Weathering	Estimated Rock Strength EW VW W MS S VS ES	RQD (%)	Defect Spacing (mm) 20 60 200 600 2000	TESTS & SAMPLES / ROCK MASS DEFECTS: Depth, Type, Inclinations, Roughness, Texture, Aperture, Coating
11 12	Rotary Coring		HQ		Springston Formation	GW		Sandy medium GRAVEL; grey. Medium dense to dense; moist; subrounded, slightly weathered greywacke gravel; sand, coarse to medium. (Springston Formation) (Samples recovered as angular chips due to drilling technique. Springston Formation gravels generally rounded.)	M	D					SPT 3,4, 4,5, 3,5, [17] SPT 3,4, 3,2, 5,6, [16]
13 13.0 [-7.0] 14						SP		Medium SAND; greyish brown. Dense; poorly graded; wet. (Springston Formation)	W	MD					SPT 8,9, 13,15, 16,6, [50]
14.5 [-8.5] 15						SP		Gravelly medium SAND; greyish brown. Medium dense; poorly graded; saturated. Gravel, fine, subrounded, slightly weathered greywacke gravel. (Springston Formation) (Samples recovered as angular chips due to drilling technique. Springston Formation gravels generally rounded.)	S	MD					SPT 4,6, 7,7, 7,8, [29]
16 16.0 [-10.0] 17 18 19 20								Termination Depth = 16m, Target Depth							

Appendix B

Photographs

Photograph 1 **South Elevation**

Photograph 2 **West Elevation**

Photograph 3 **North Elevation**

Photograph 4 **East Elevation**

Photograph 5 **Hall Interior**

Photograph 6 **Hall Extension**

Photograph 7 Cracking along mortar lines

Photograph 8 Cracking in Stucco Plaster

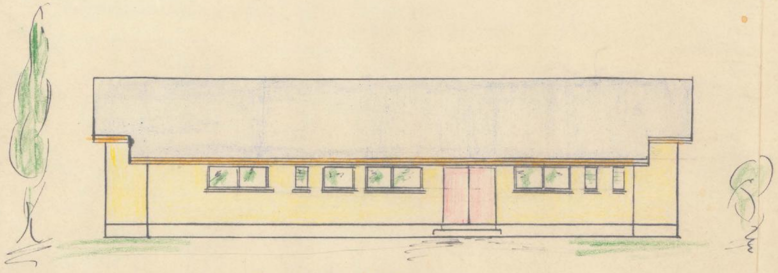
Photograph 9 Existing damage to exterior cladding

Photograph 10 Evidence of Liquefaction in the rear paddock

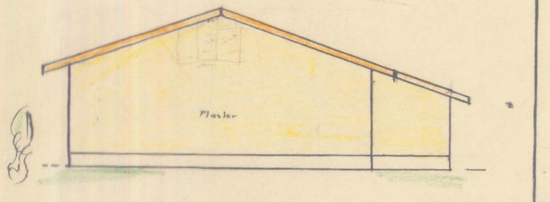
Photograph 11 **Beam Connection between the Timber Portals**

Appendix C

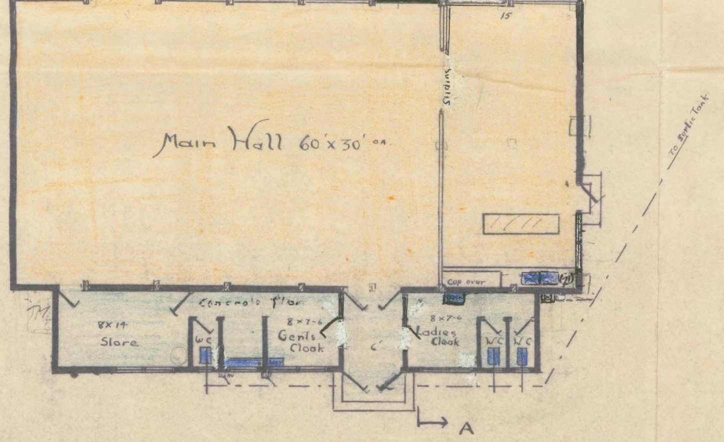
Original Drawings


South Elevation

North Elevation



West Elevation

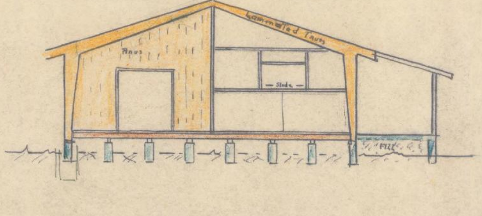


Plan

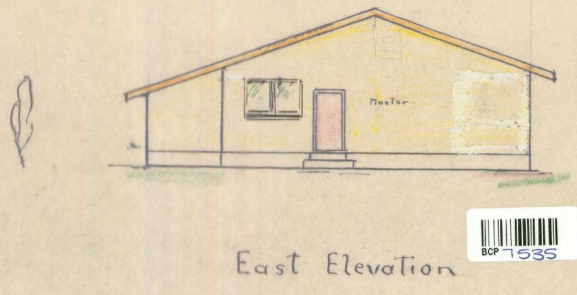
CUTLER BROS
per [illegible]

WAIMAIRI COUNTY COUN
APPROVED, Subject to:-
1. All work to comply with the County Building By-Laws
2. 24 hours' notice to be given to the County Building Inspector prior to pouring any concrete

R [illegible] Building Inspector



Section AA



East Elevation

WAIMAIRI COUNTY COUNCIL
PLUMBING AND DRAINAGE PERMITS MUST BE OBTAINED FROM THE COUNTY HEALTH INSPECTOR.

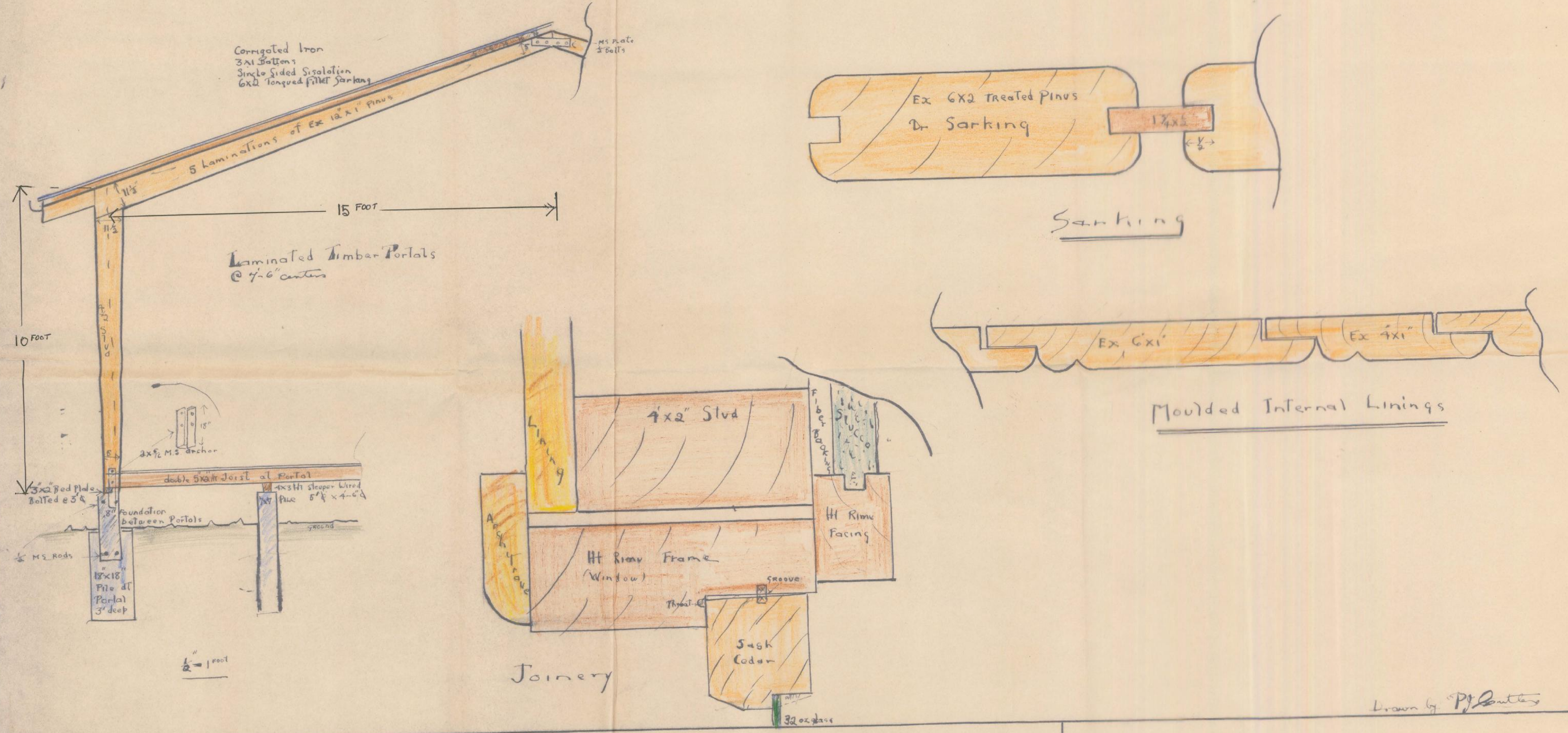
Egress Satisfactory
1 bucket pump required in Hall

Drawn by P L Cutler

NEW HALL at OURUHIA

Scale 1/8 - 1 FT

CUTLER BROS BUILDERS 30/5/63

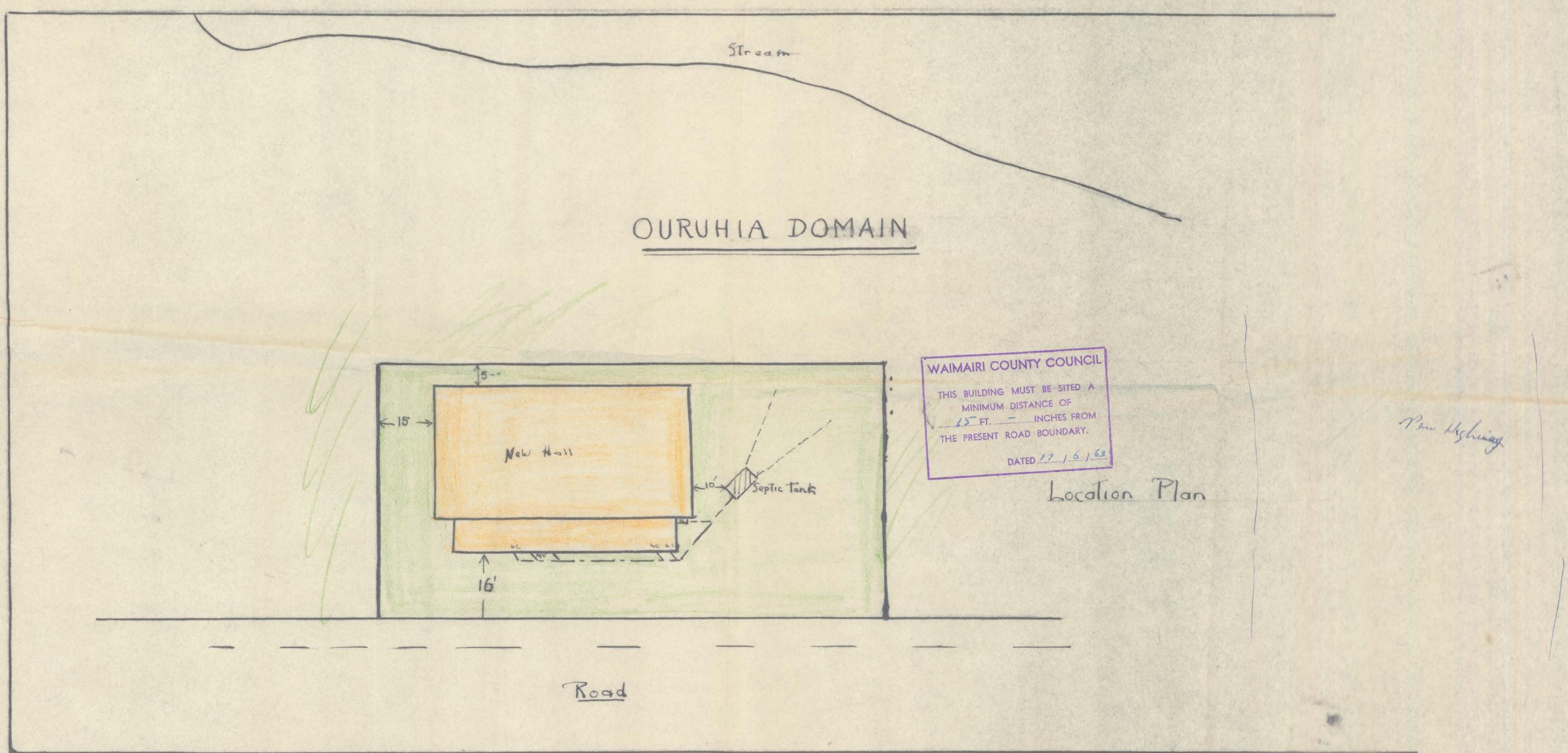


Drawn by PJ Cutler 30/5/63

NEW HALL at OURUHIA

CUTLER BROS BUILDERS

4 Oliver
Cutler Bros
159 Waimairi Road



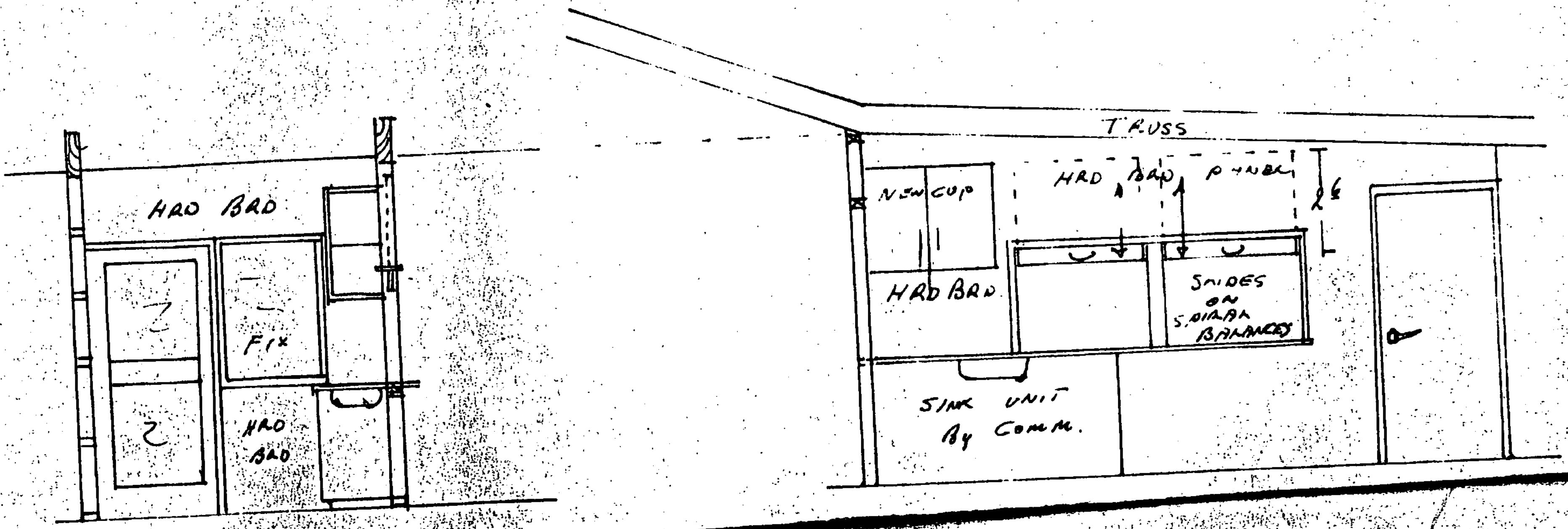
WAIMAIRI COUNTY COUNCIL
THIS BUILDING MUST BE SITED A MINIMUM DISTANCE OF 15 FT. – INCHES FROM THE PRESENT ROAD BOUNDARY.
DATED 17 / 6 / 63

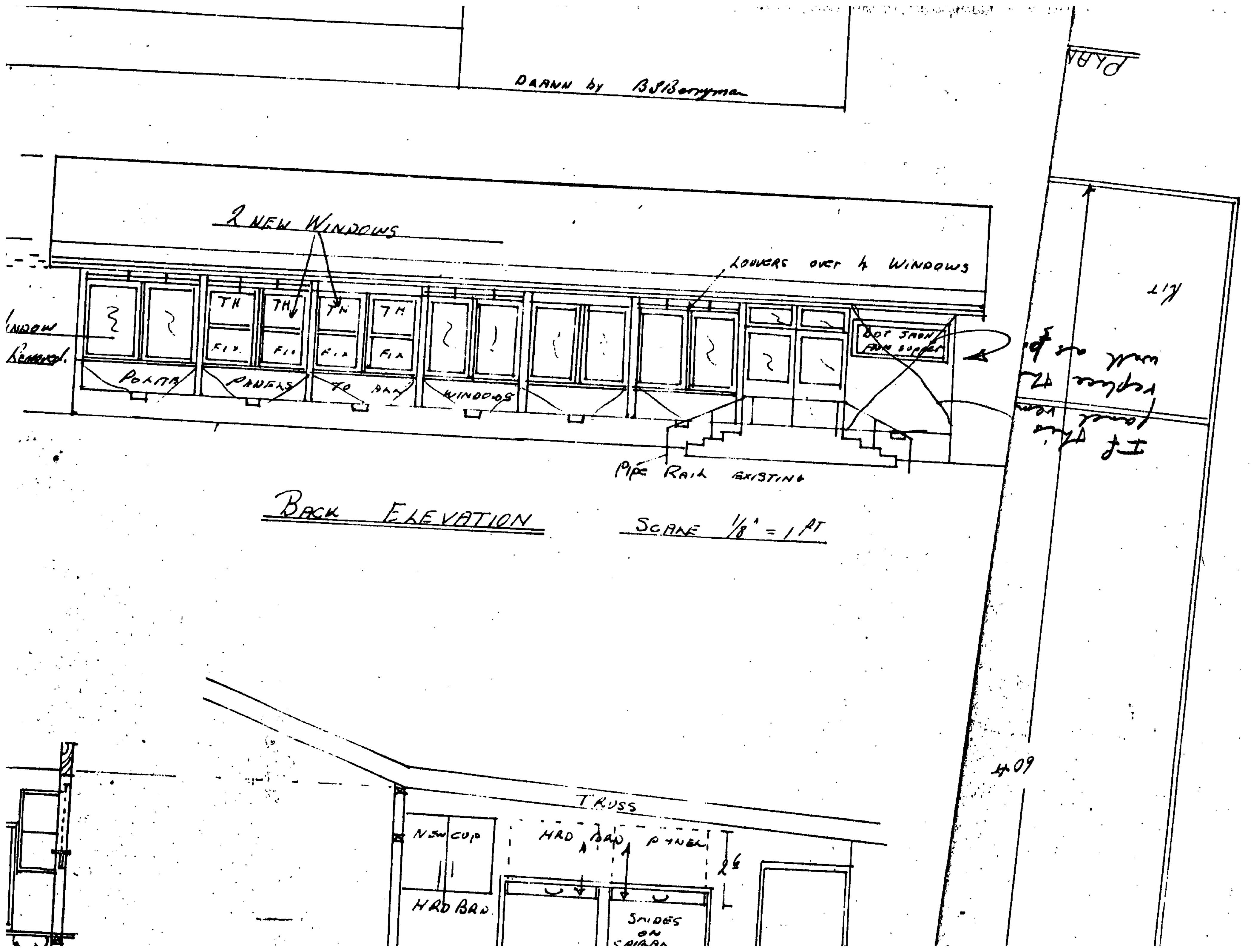
NEW HALL at OURUHIA

Drawn by P J Cutler
CUTLER BROS BUILDERS
30/5/63

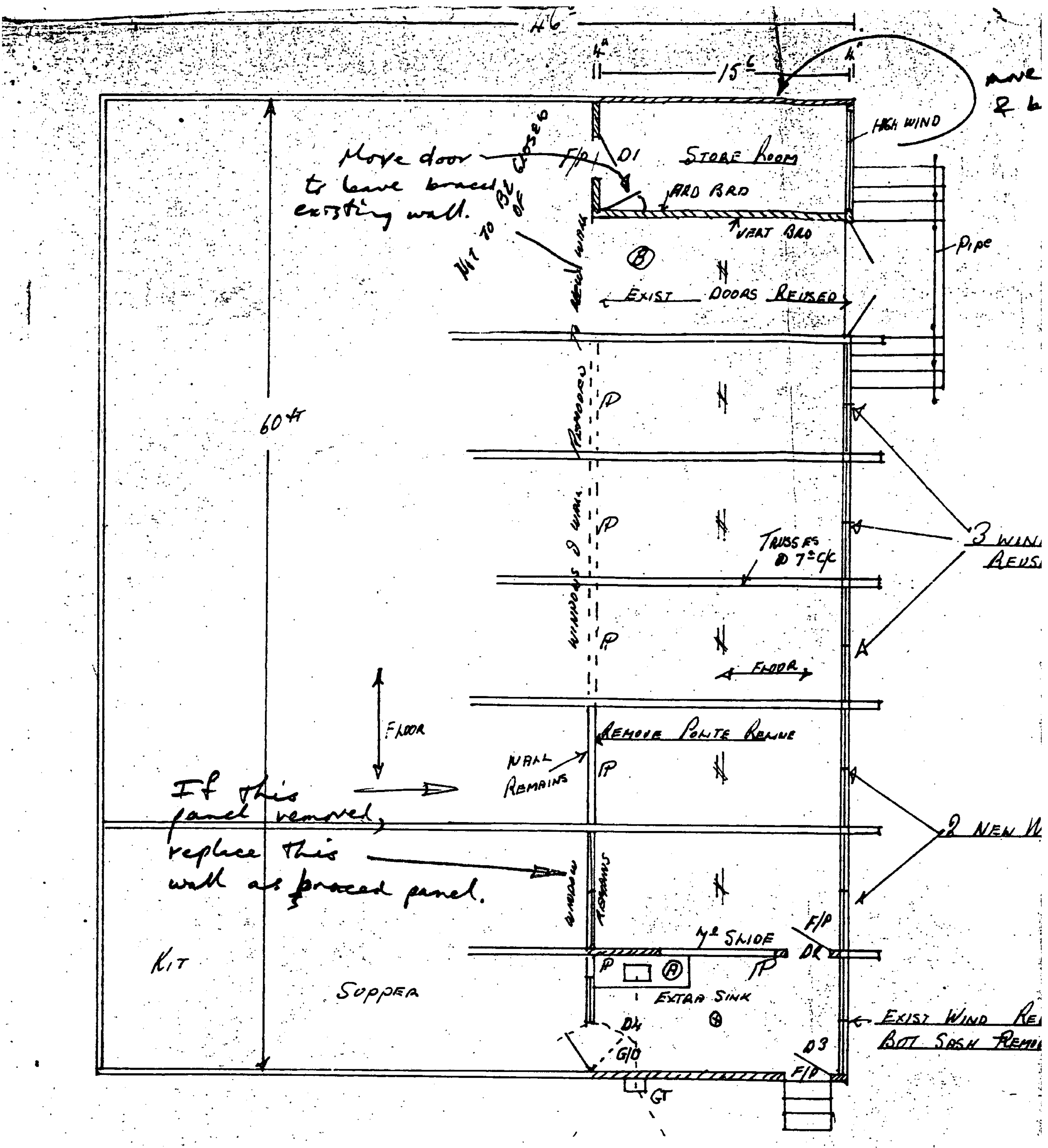
BACK ELEVATION

SCALE 1/8" = 1'

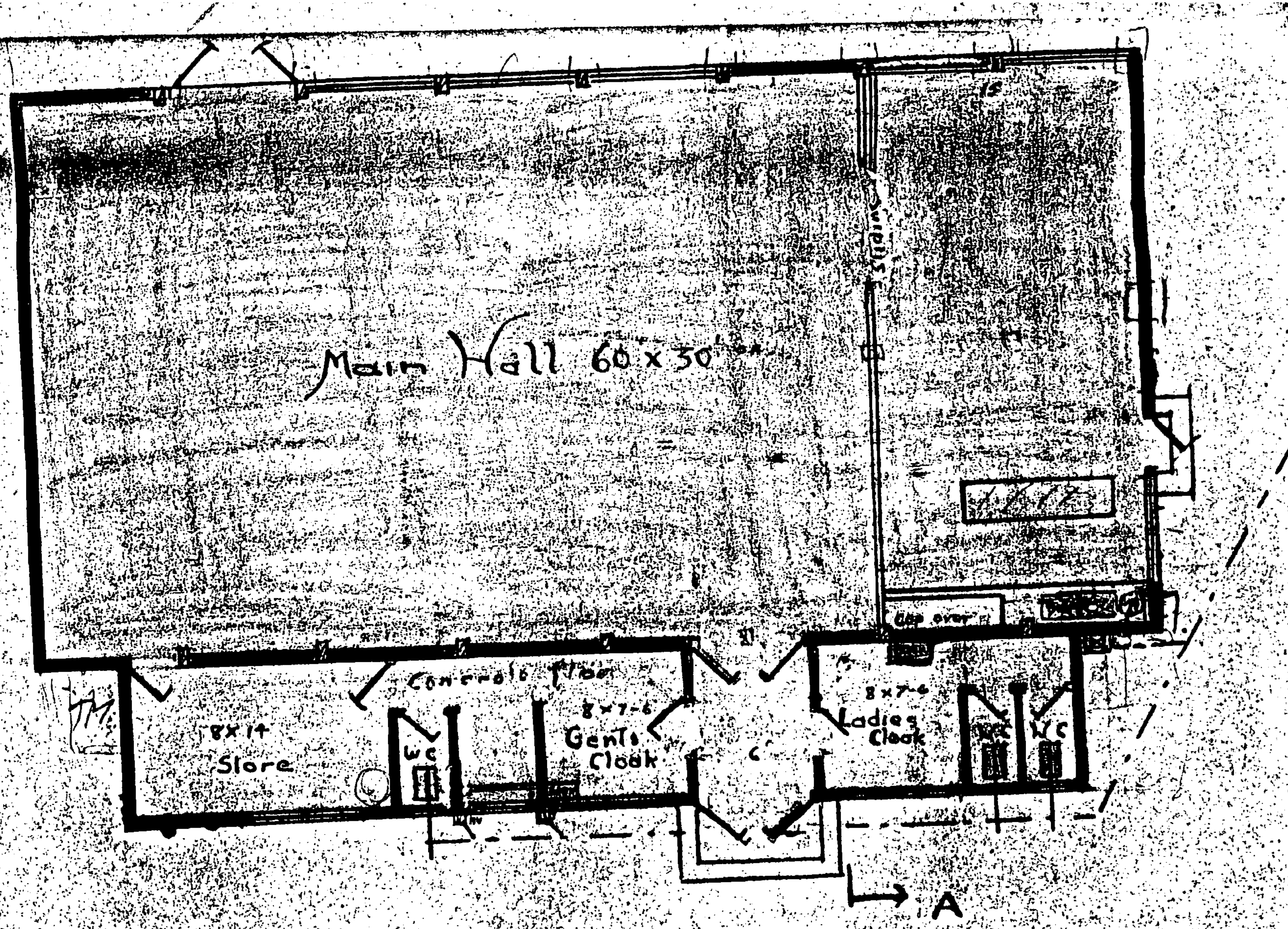




BACK ELEVATION SCALE 1/8" = 1 FT



PLAN VIEW   SCALE 1/8" = 1 ft   ~~DRAINAGE~~ TO EXISTING CEP

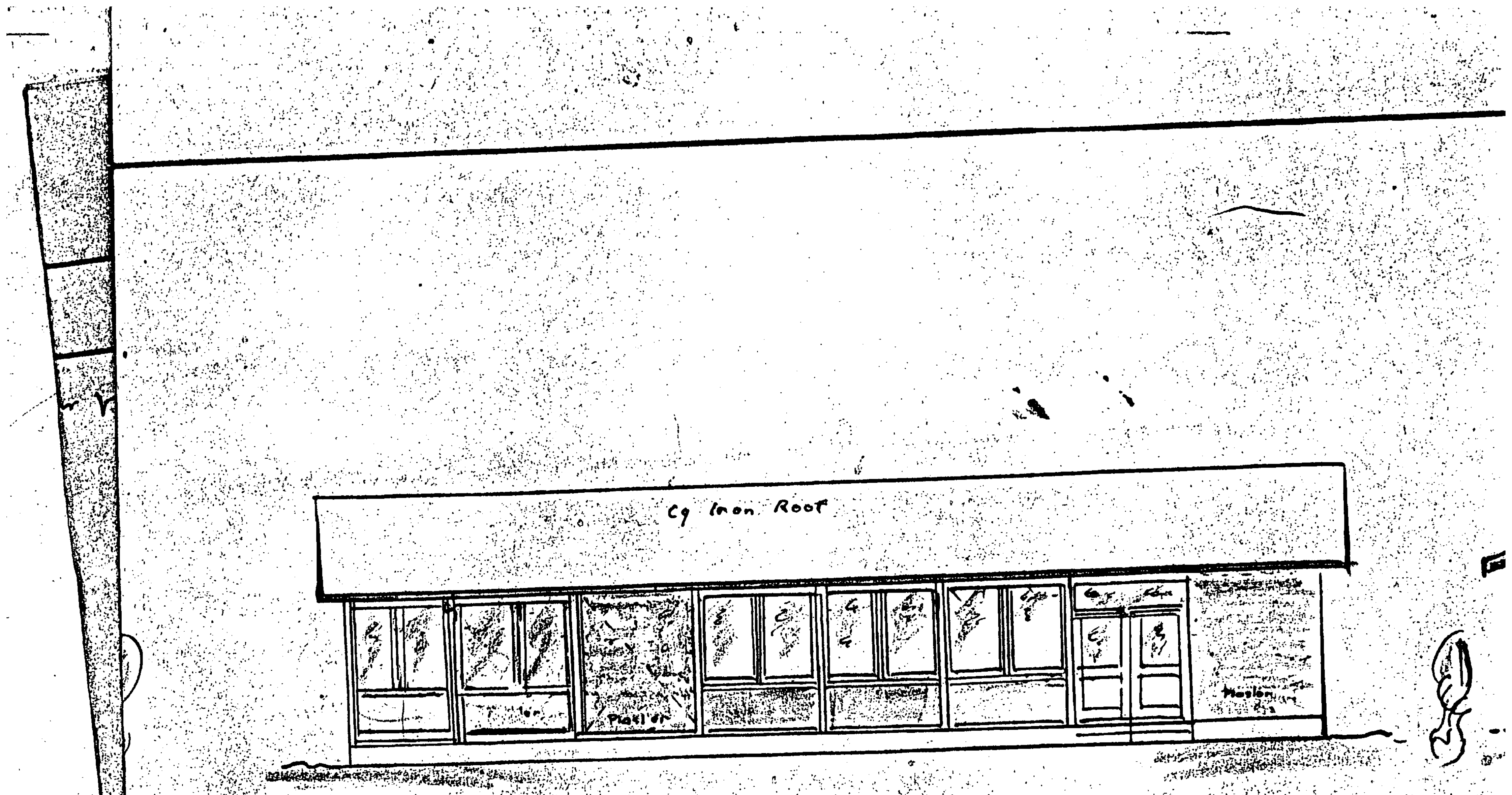


Plan

Egress satisfactory
1 Illuminated [illegible] required

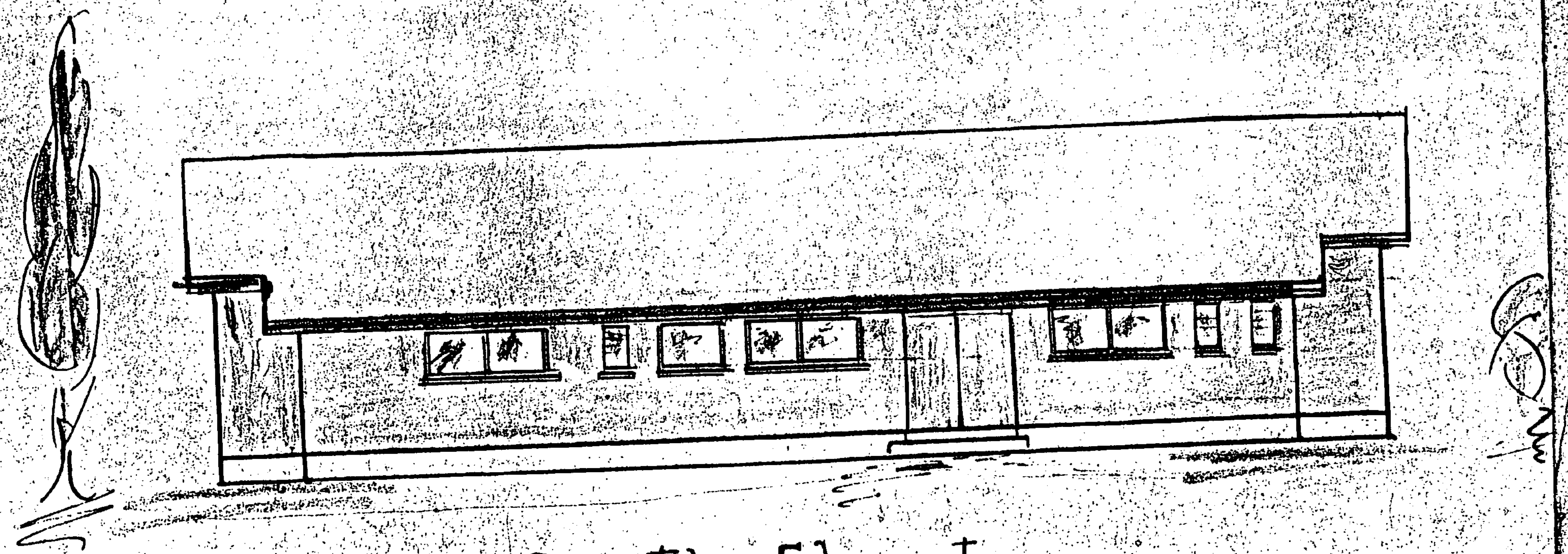
WAIMAIRI COUNTY COUNCIL
PLUMBING AND DRAINAGE PERMITS
MUST BE OBTAINED FROM THE
COUNTY HEALTH INSPECTOR

NEW HALL at OURUHIA



North Elevation

CUTLER BROS



South Elevation

WAIMAIRI COUNTY COUN

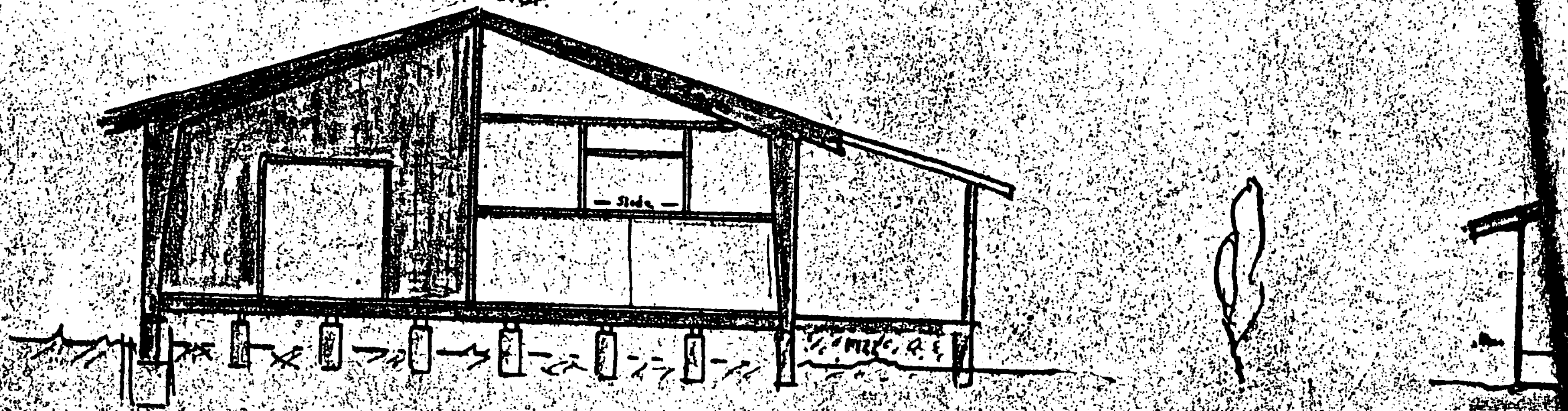
APPROVED, Subject to:-

1. All work to comply with the County Building By-Laws

2. 24 hours' notice to be given to the County Building Inspector prior to pouring any concrete

R. S... Building Inspector.

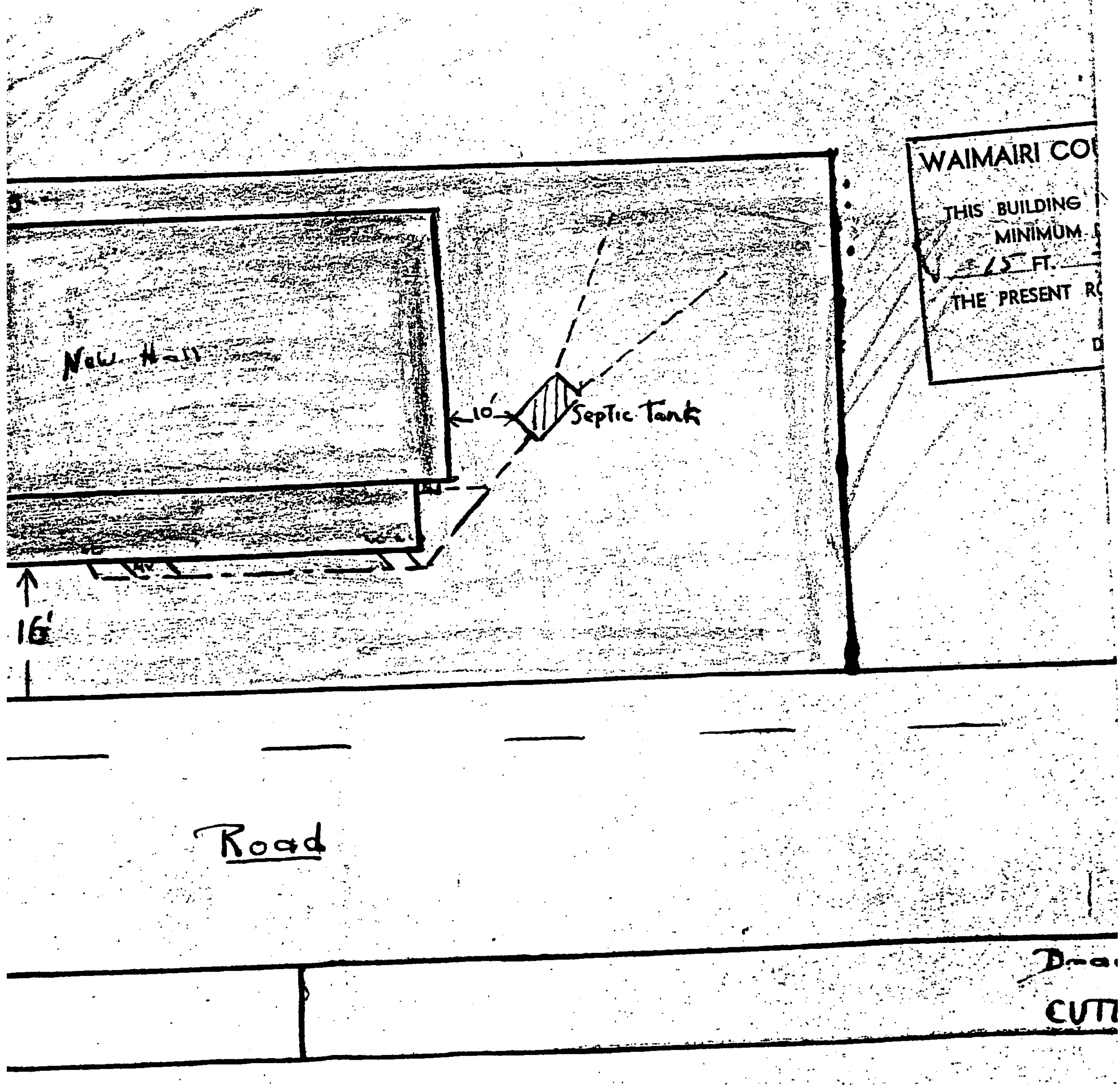
To Septic Tank



Section AA

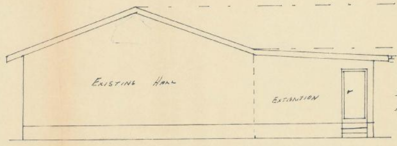
all

OURUHIA DOMAIN

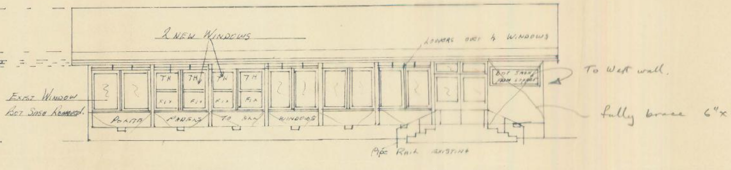


PROPOSED EXTENTIONS TO OURUHIA HALL
OURUHIA DOMAIN

DRAWN by B.S. Berryman



END ELEVATION



BACK ELEVATION SCALE 1/8" = 1 ft

LEGEND

▨▨▨	NEW WALL
#	FLUO LIGHTS NEW
F/P	FLUSH PANEL NEW
G/D	GLASS DOOR NEW
H/P or HP	HEAT POINT NEW
Ⓐ	SINK BY COMMITTEE
Ⓑ	STEPS REMOVED by "
↔	DIRECTION OF FLOORING

WAIMAIRI COUNTY COUNCIL
APPROVED, Subject to:-
All work to comply with the County Building By-Laws
24 hours' notice to be given to the County Building Inspector prior to pouring any concrete
R. J. Harris Building Inspector.

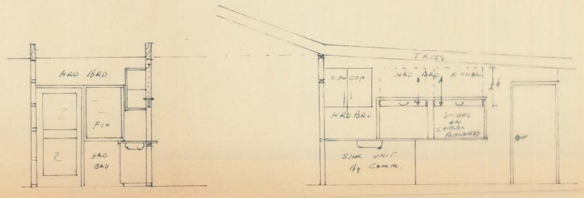
TO ALL ARCHITECTS, BUILDERS AND APPLICANTS FOR BUILDING PERMITS

The Drainage and Plumbing Regulations, 1959, do not permit building over any drainage or sewerage system or constructing drains under buildings without special permission.

As the consequences of contravening these Regulations are usually most expensive all persons contemplating building any structures or any additions should, before commencing, discuss their proposals with the Christchurch Drainage Board to ensure that this trouble does not occur.

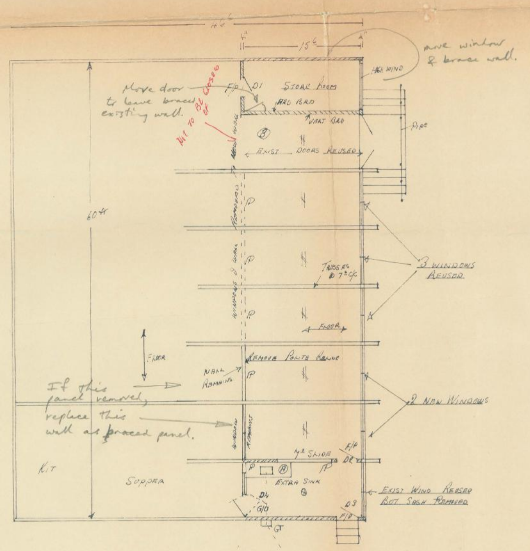
Such action taken prior to building could save unnecessary expense.

Stormwater to discharge to approved boulder hole(s).
G. Nicholson
Health Inspector
WCC
21/3/69.

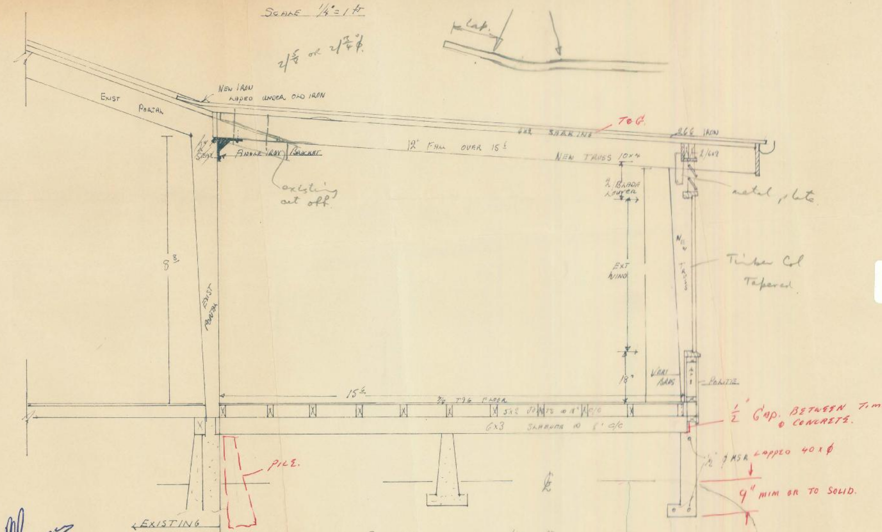


SWING DOOR WALL — SUPPER ROOM — SLIDE WALL

SCALE 1/4" = 1 ft



PLAN VIEW SCALE 1/4" = 1 ft ~~DRAINAGE~~ TO EXISTING CEPTIC TANK. B.S. Berryman



SECTION SCALE 1/2" = 1 ft

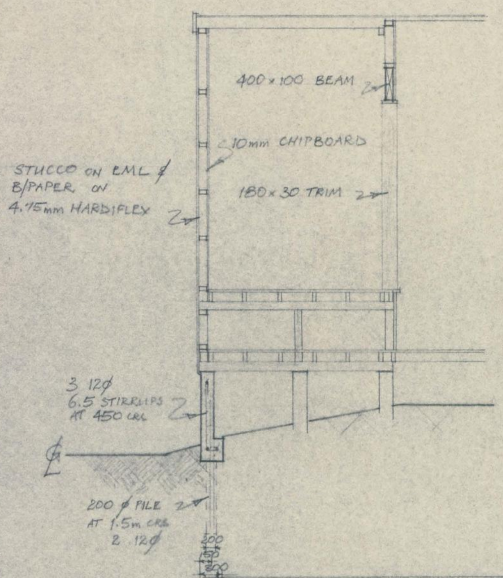
Dated
18/3/69
LR

2250
960
3210 ÷ 10.76.

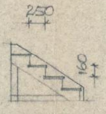
298.3 m2
+ 21
319.3

BUILDER
PLEASE ENSURE THE
DRAINLAYER
SEES THE ABOVE
REQUIREMENTS

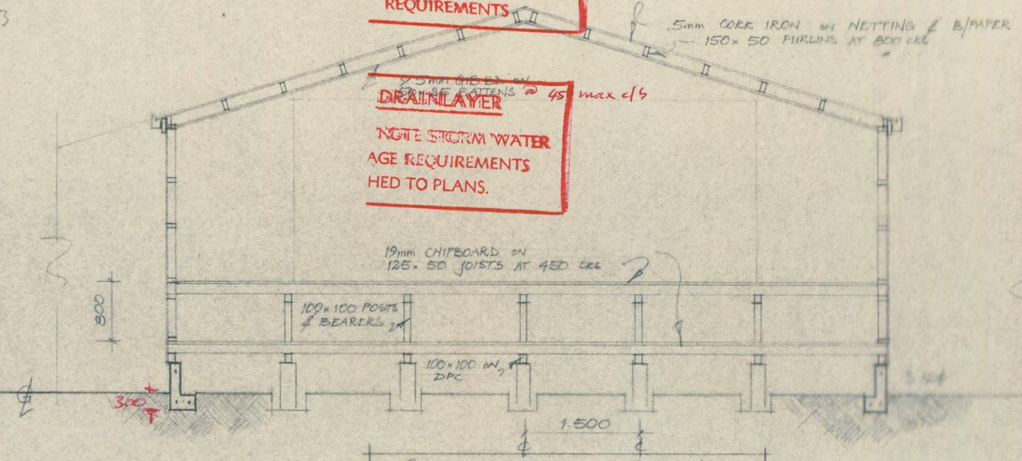
DRAINLAYER
NOTE STORM WATER
AGE REQUIREMENTS
HED TO PLANS.



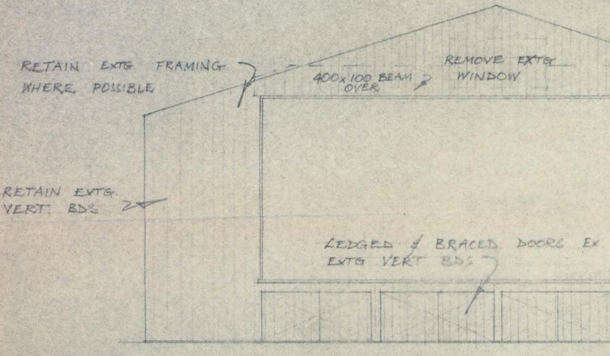
SECTION B-B



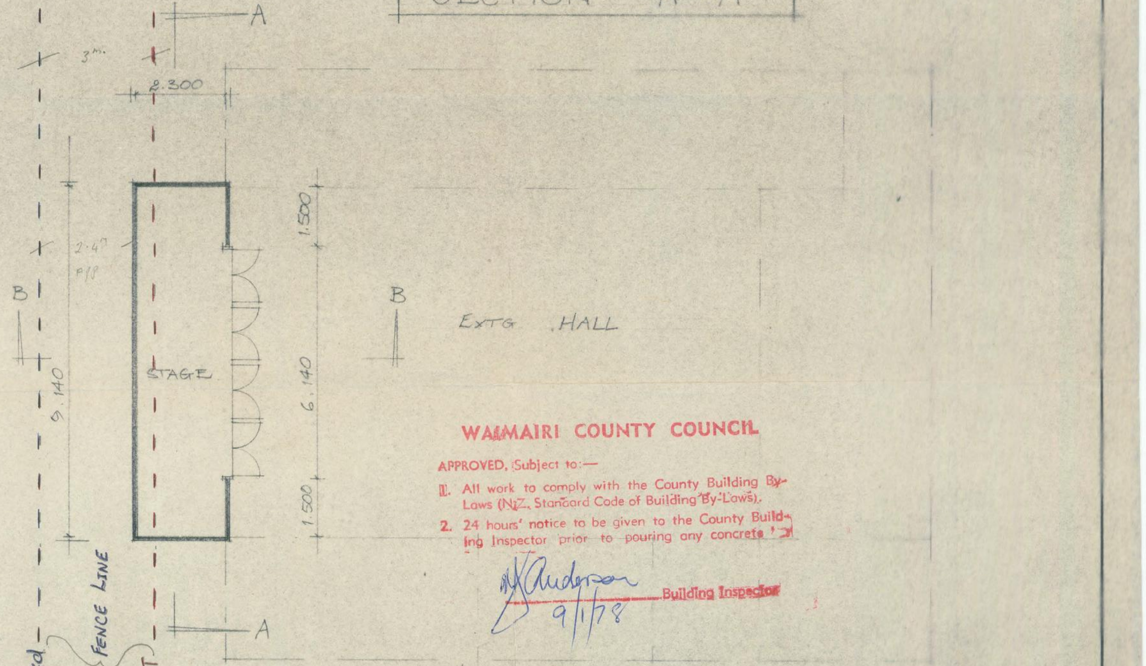
MOVEABLE STEPS



SECTION A-A



INTERIOR ELEVATION



PLAN

WAIMAIRI COUNTY COUNCIL

APPROVED, Subject to:—

1. All work to comply with the County Building By-Laws (N.Z. Standard Code of Building By-Laws).
2. 24 hours' notice to be given to the County Building Inspector prior to pouring any concrete.

N.J. Anderson Building Inspector
9/1/78

(Mr Sly)

STAGE EXTENSION TO OURUHIA HALL, BELFAST.

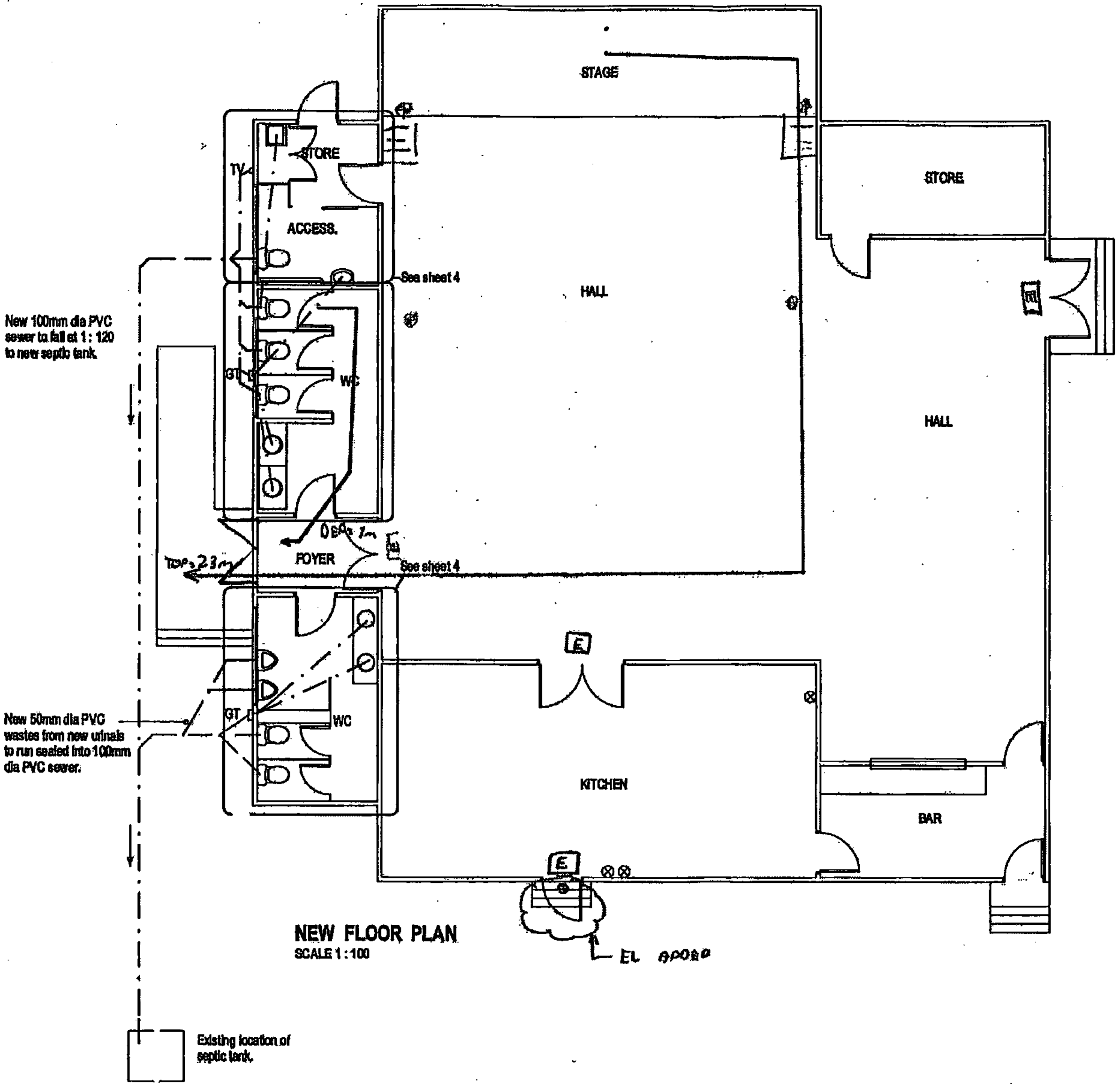
22.42 m²

DRAWN	CHECKED	SCALES	SERIES OF	SHEET
TRACED	DATE 8.11.77	1:50	REF	

LEGEND

⊕ EMERGENCY LIGHT - REFER TO FIRE REPORT APPENDIX.

E EXIT SIGN - REFER TO FIRE REPORT APPENDIX.



New 100mm dia PVC sewer to fall at 1 : 120 to new septic tank.

New 50mm dia PVC wastes from new urinals to run sealed into 100mm dia PVC sewer.

Existing location of septic tank.

NEW FLOOR PLAN

SCALE 1 : 100

FPSL 10029
F01
APRIL 2010

peter dunbar
architectural designer

31 colombo street
christchurch
ph 331 6026
fax 9606023

PROPOSED
TOILET
ALTERATION

Ouruhia Hall

CHRISTCHURCH

FOR
CITY CARE LTD

Proposed Floor Plan

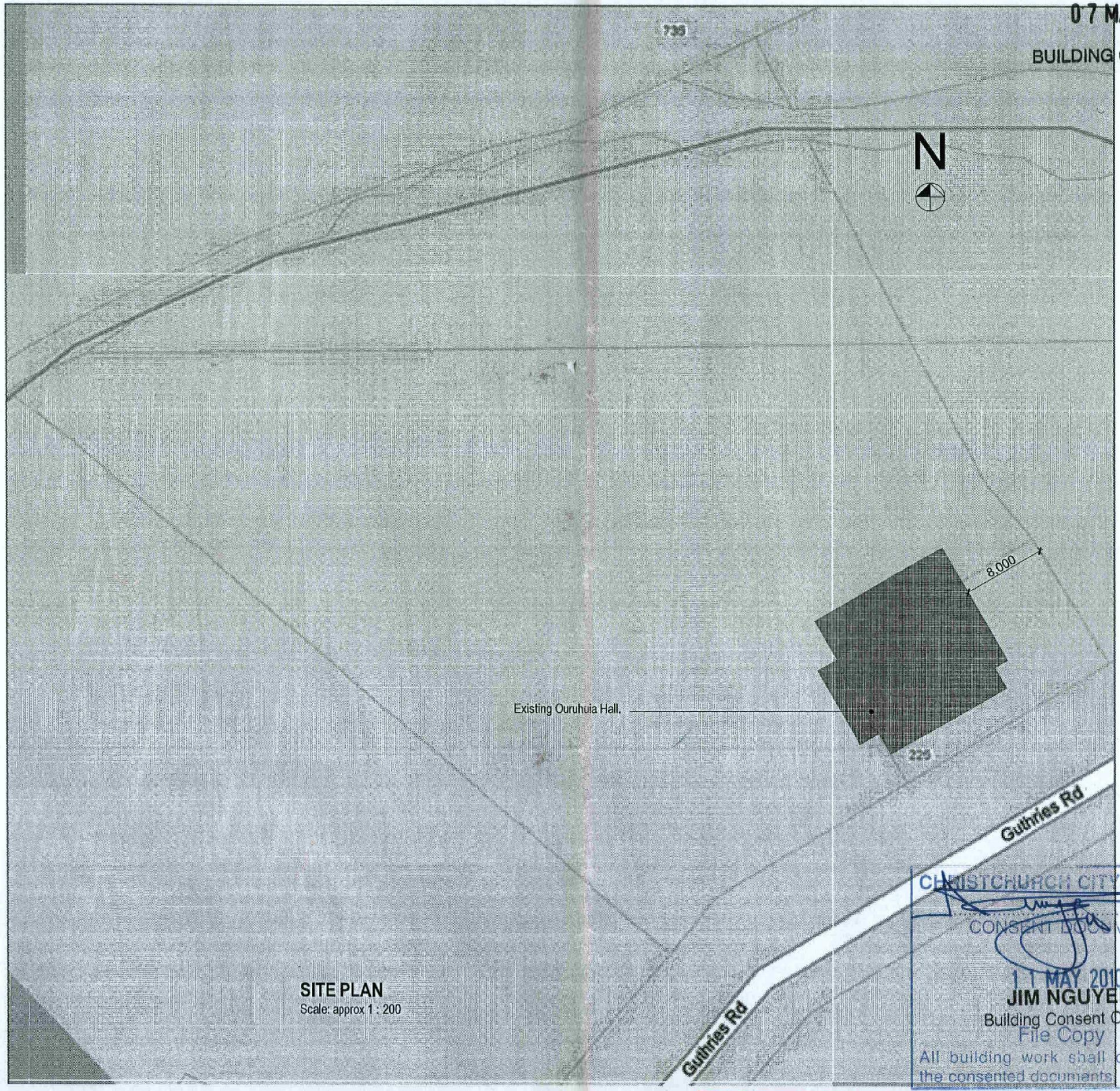
date : 10/03/2010

scale :

Revision :

Sheet # 3

of 7



SITE PLAN
Scale: approx 1 : 200

peter dunbar
architectural designer

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fax 9606023

PROPOSED TOILET ALTERATION

Ouruhuia Hall

CHRISTCHURCH

FOR
CITY CARE LTD

Site Plan

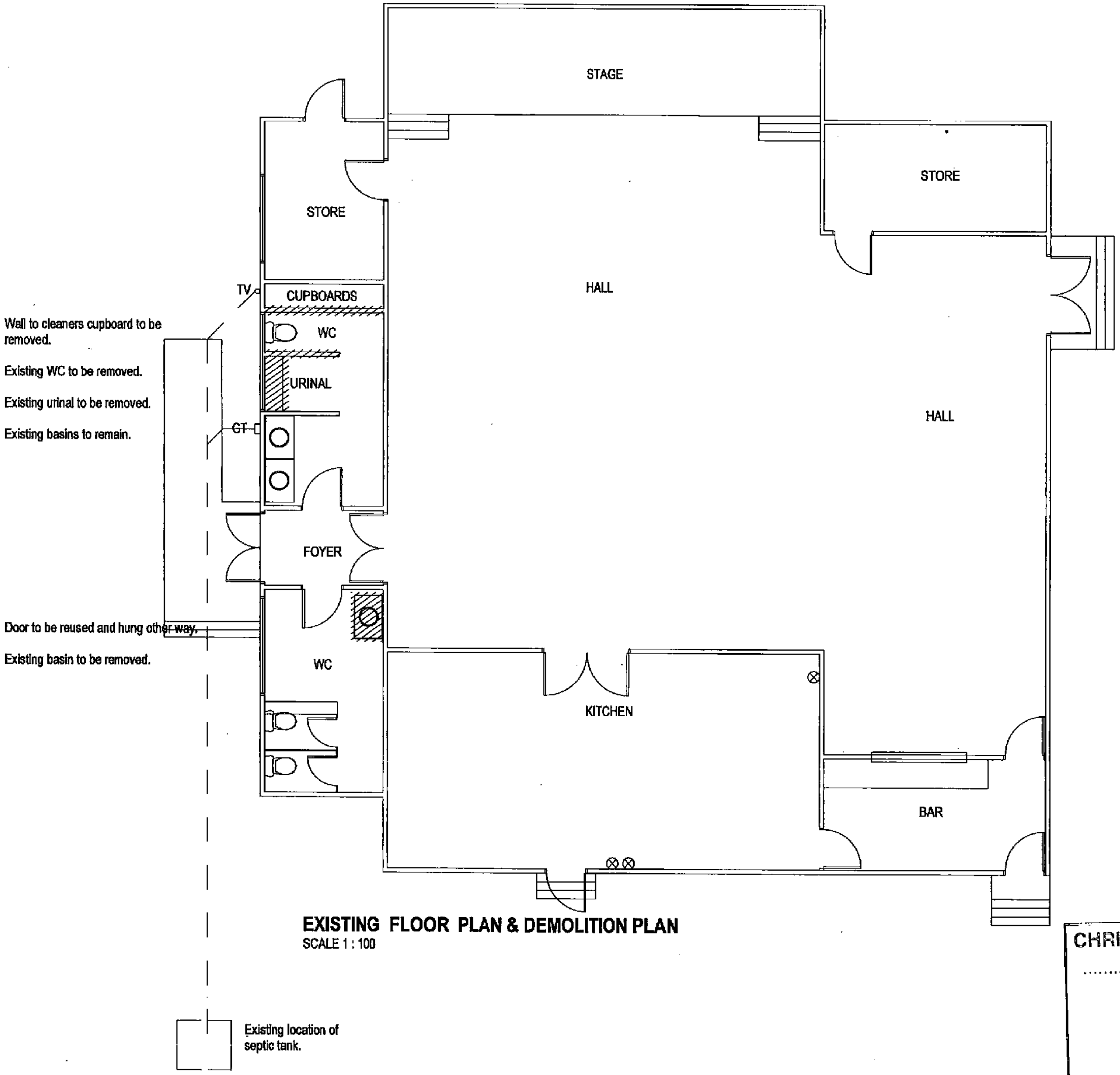
date : 10/03/2010

scale :

Revision :

Sheet # 1

of. 8



EXISTING FLOOR PLAN & DEMOLITION PLAN
SCALE 1 : 100

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architectural designer

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fax 9606023

**PROPOSED
TOILET
ALTERATION**

Ouruhuia Hall
CHRISTCHURCH

FOR
CITY CARE LTD

Existing Floor Plan

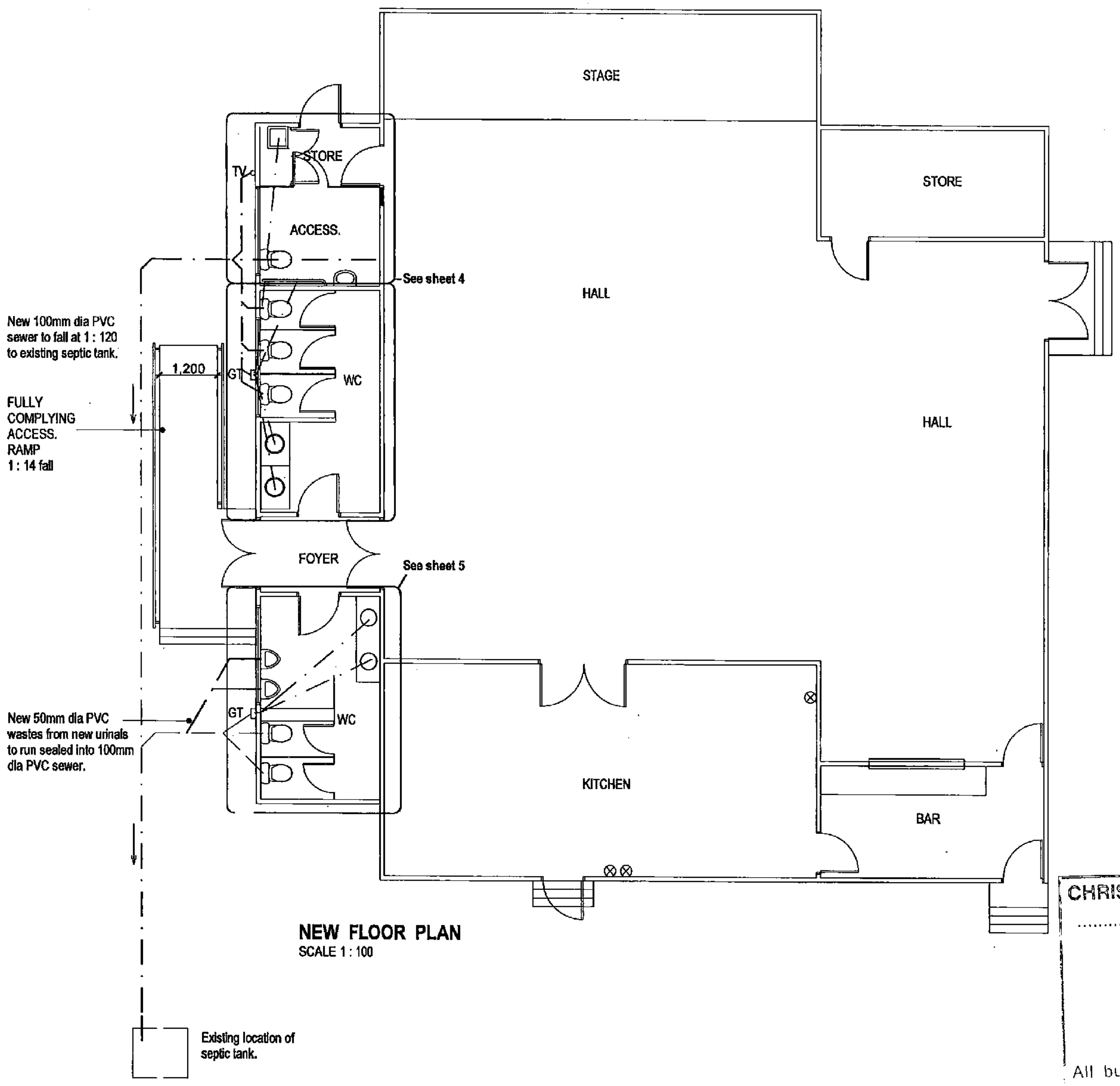
date : 10/03/2010

scale :

Revision :

Sheet # 2
of. 8

RECEIVED
07 MAY 2010
BUILDING CONSENTS



NEW FLOOR PLAN
SCALE 1 : 100

CHRISTCHURCH CITY COUNCIL
CONSENT DOCUMENT
11 MAY 2010
File Copy
All building work shall comply with the consented documents.

peter dunbar
architectural designer

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PROPOSED
TOILET
ALTERATION

Ouruhuia Hall
CHRISTCHURCH

FOR
CITY CARE LTD

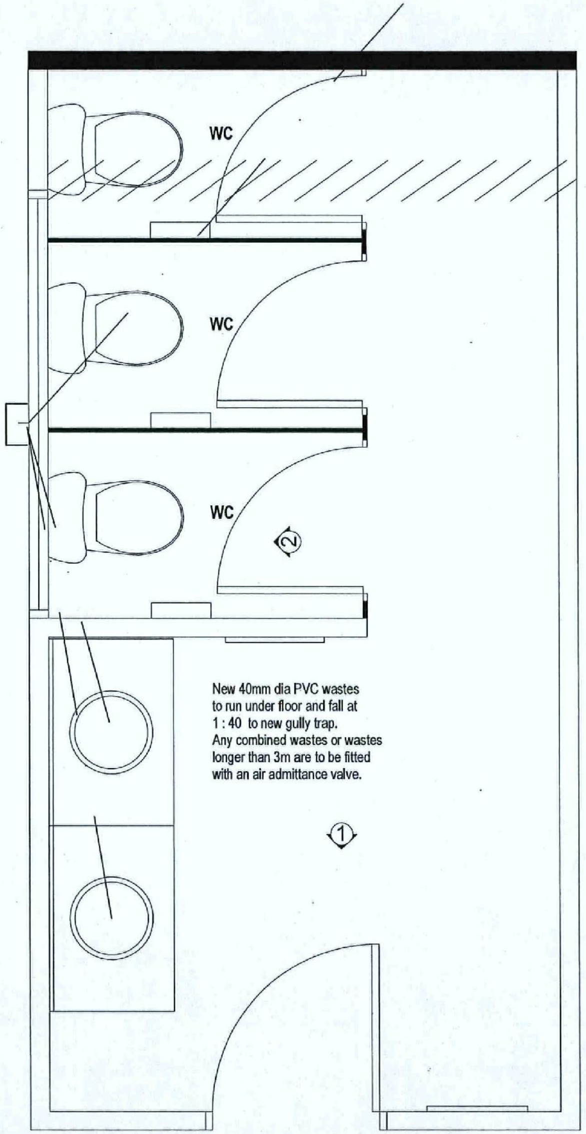
Proposed Floor Plan

date : 10/03/2010
scale :
Revision :
Sheet # 3
of. 8

RECEIVED

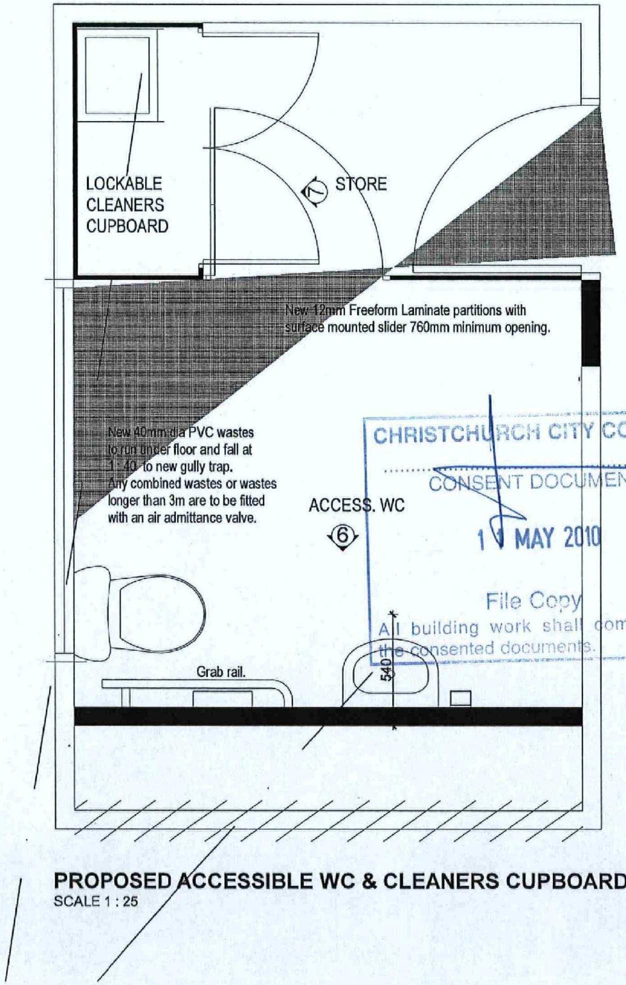
07 MAY 2010

BUILDING CONSENTS



New 40mm dia PVC wastes to run under floor and fall at 1 : 40 to new gully trap. Any combined wastes or wastes longer than 3m are to be fitted with an air admittance valve.

PROPOSED WOMENS WC
SCALE 1 : 25



New 12mm Freeform Laminate partitions with surface mounted slider 760mm minimum opening.

New 40mm dia PVC wastes to run under floor and fall at 1 : 40 to new gully trap. Any combined wastes or wastes longer than 3m are to be fitted with an air admittance valve.

CHRISTCHURCH CITY COUNCIL
CONSENT DOCUMENT
11 MAY 2010
File Copy
All building work shall comply with the consented documents.

PROPOSED ACCESSIBLE WC & CLEANERS CUPBOARDS
SCALE 1 : 25

peter dunbar
architectural designer

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fax 9606023

PROPOSED
TOILET
ALTERATION

Ouruhuia Hall

CHRISTCHURCH

FOR
CITY CARE LTD

Proposed Floor Plans

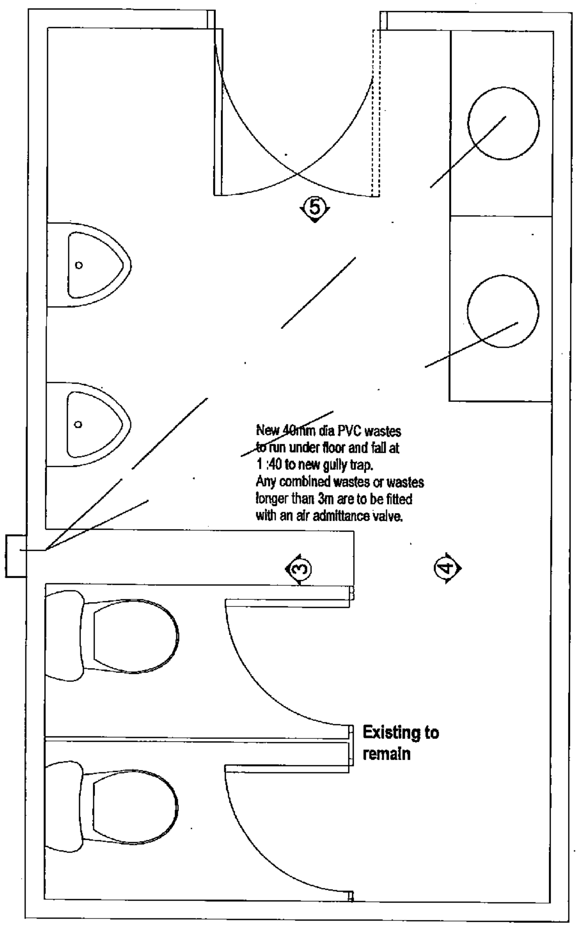
date : 10/03/2010

scale :

Revision :

Sheet # 4

of. 8



PROPOSED MENS WC
SCALE 1 : 25

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architectural designer

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fax 9606023

PROPOSED
TOILET
ALTERATION

Ouruhuia Hall
CHRISTCHURCH

FOR
CITY CARE LTD

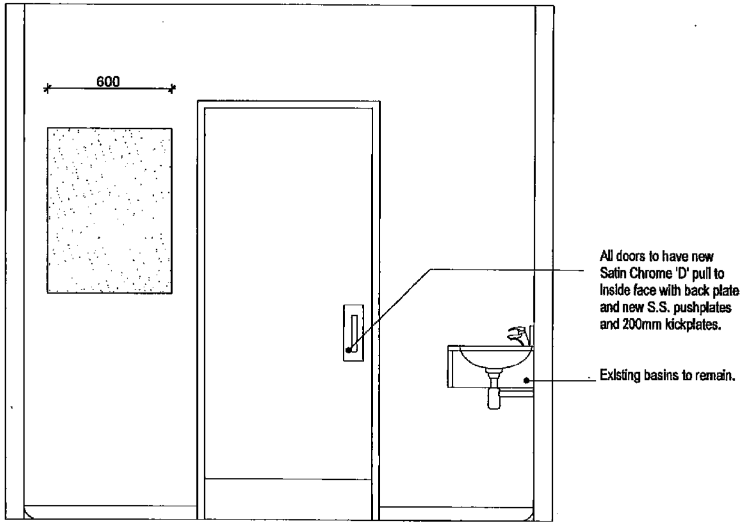
Proposed Floor Plans

date : 10/03/2010

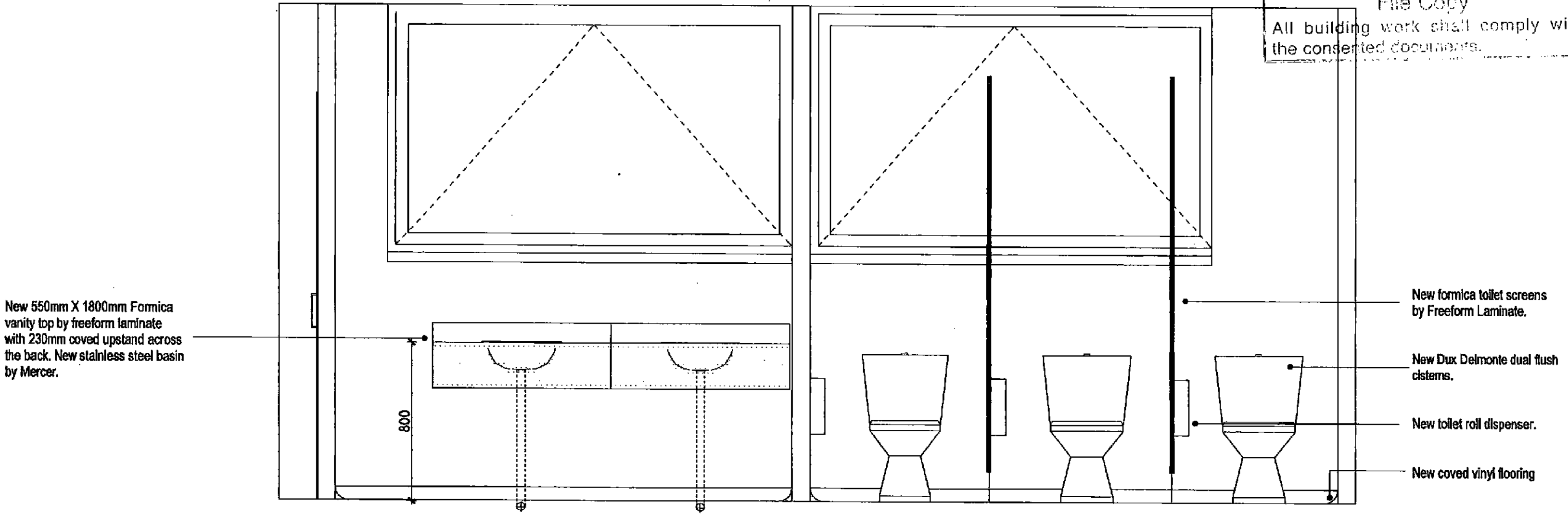
scale :

Revision :

Sheet #
5
of. 8



Elevation 1
Scale 1 : 25



Elevation 2
Scale 1 : 25

peter dunbar
architectural designer

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fax 3606023

PROPOSED
TOILET
ALTERATION

Ouruhuia Hall

CHRISTCHURCH

FOR
CITY CARE LTD

Proposed Elevations

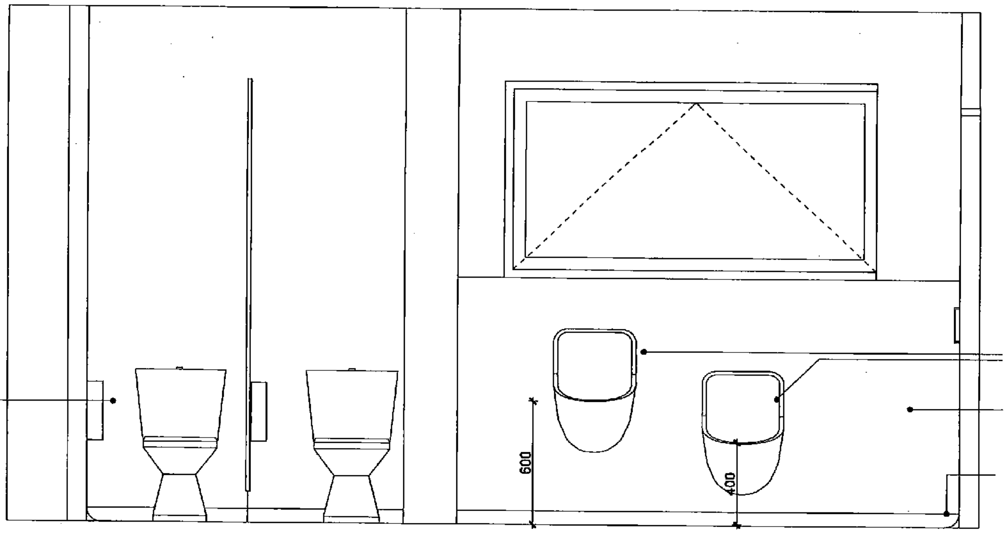
date : 10/03/2010

scale :

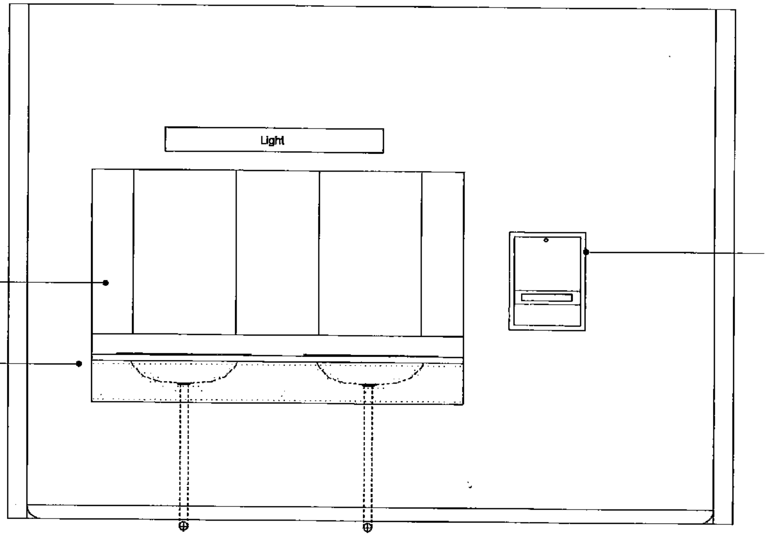
Revision :

Sheet # 6

of. 8



Elevation 3
Scale 1 : 25



Elevation 4
Scale 1 : 25

peter dunbar
architectural designer

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christchurch
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fax 9606023

PROPOSED
TOILET
ALTERATION

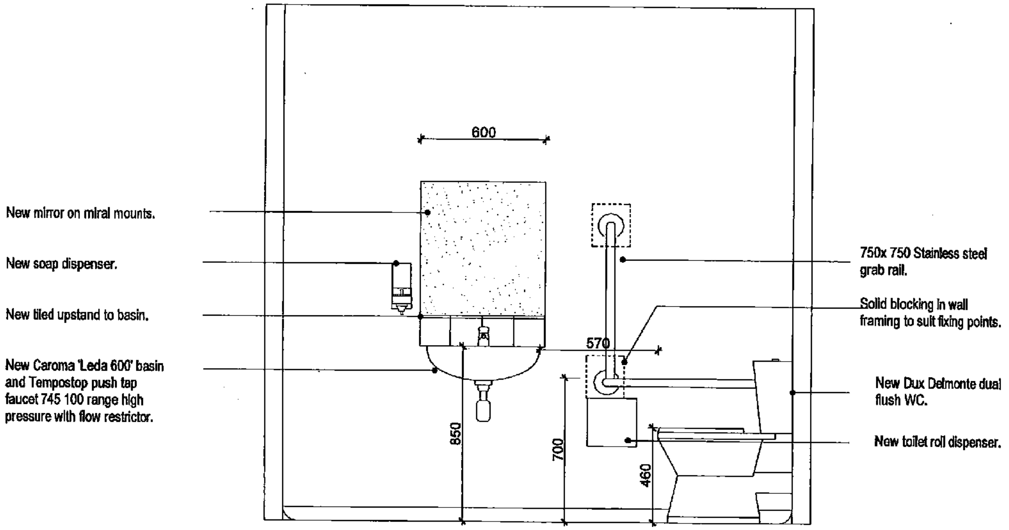
Ouruhuia Hall
CHRISTCHURCH

FOR
CITY CARE LTD

Proposed Elevations

date : 10/03/2010
scale :
Revision :

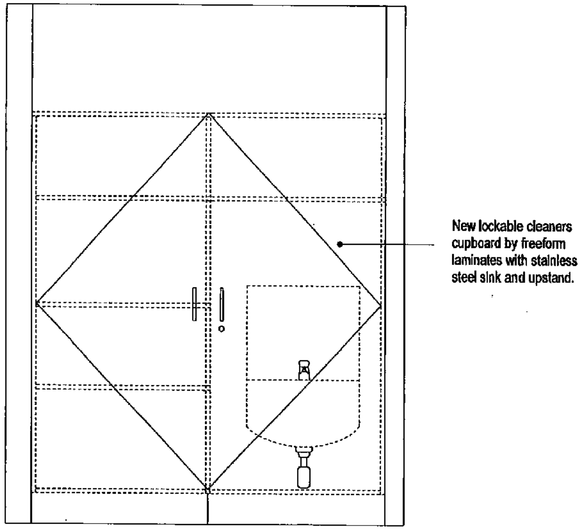
Sheet # 7
of. 8



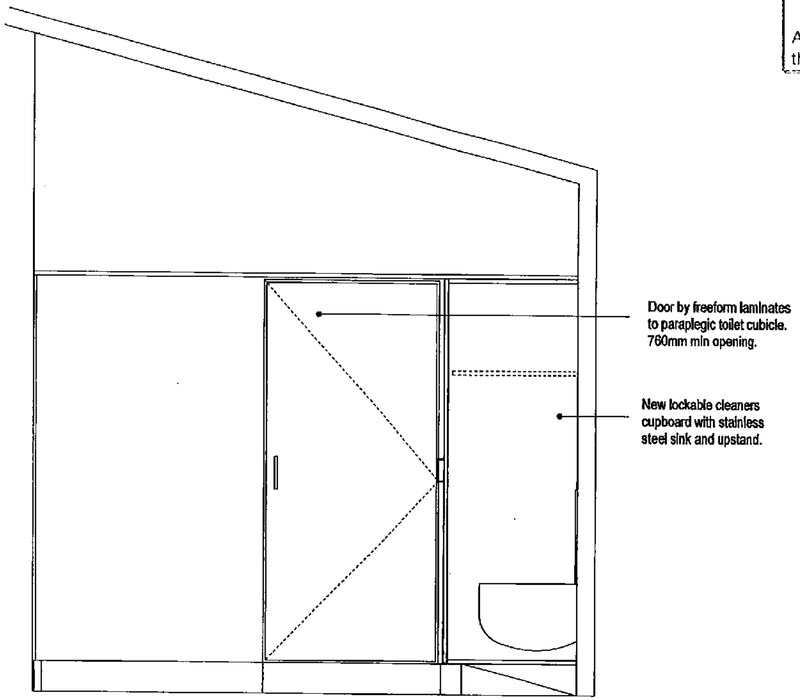
Elevation 6
Scale 1 : 25

RECEIVED
07 MAY 2010
BUILDING CONSENTS

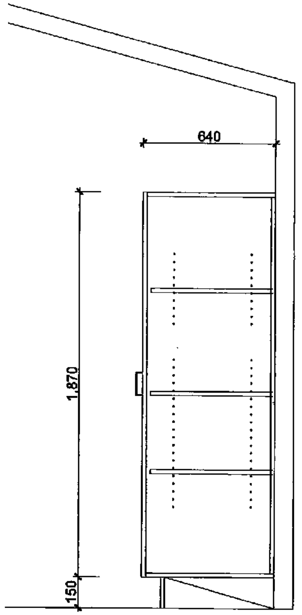
CHRISTCHURCH CITY COUNCIL
CONSENT DOCUMENT
11 MAY 2010
File Copy
All building work shall comply with the consented documents.



Elevation 7
Scale 1 : 25



Section Through Cupboard
Scale 1 : 25



Section Through Cupboard
Scale 1 : 25

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architectural designer

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fax 9606023

PROPOSED
TOILET
ALTERATION

Ouruhuia Hall
CHRISTCHURCH

FOR
CITY CARE LTD

Proposed Elevations

date : 10/03/2010

scale :

Revision :

Sheet # 8
of. 8

Appendix D

CERA Building Evaluation Form

Detailed Engineering Evaluation Summary Data

V1.11

Location

Building Name: Ouhuria Public Hall
Reviewer: Hamish Mackinven
CPEng No: 1003941
Building Address: Unit: No: 225 Street: Guthries Road
Company: GHD
Legal Description: Res 4939
Company project number: 513059603
Company phone number:

GPS south: Degrees 43 Min 26 Sec 29.00
GPS east: Degrees 172 Min 39 Sec 11.00
Date of submission: 6/3/2013
Inspection Date: 1/18/2012
Revision: FINAL
Building Unique Identifier (CCC): BU 0391-03 EQ2
Is there a full report with this summary? yes

Site

Site slope: flat
Max retaining height (m):
Soil type: mixed
Soil Profile (if available):
Site Class (to NZS1170.5): D
Proximity to waterway (m, if <100m): 80
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):
Ground floor split?
Ground floor elevation above ground (m):
Storeys below ground 0
Foundation type: strip footings
if Foundation type is other, describe:
Building height (m): 4.00
height from ground to level of uppermost seismic mass (for IEP only) (m): 5
Floor footprint area (approx):
Age of Building (years): 49
Date of design: 1935-1965

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: frame system
Roof: timber framed
rafter type, purlin type and cladding lightweight metal cladding
Floors: timber
joist depth and spacing (mm) 5mm corrugated iron on 150 x 50 purlins
Beams: timber
type Timber as part of the portal frame
Columns: timber
typical dimensions (mm x mm) Timber as part of the portal frame
Walls: non-load bearing
0

Lateral load resisting structure

Lateral system along: lightweight timber framed walls
Note: Define along and across in detailed report!
2.286
Ductility assumed, μ:
note typical wall length (m)
Period along: 0.50 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
9.144
Ductility assumed, μ:
note typical bay length (m)
Period across: 0.50 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: plaster system
describe
Roof Cladding: Metal
describe
Glazing: timber frames
Ceilings: strapped or direct fixed
Timber panels attached
Services(list):

Available documentation

Architectural partial
original designer name/date Cutler Bros Builders 30/05/1963
Structural partial
original designer name/date Cutler Bros Builders 30/05/1963
Mechanical none
original designer name/date
Electrical none
original designer name/date
Geotech report none
original designer name/date

Damage

Site:
(refer DEE Table 4-2)
Site performance:
Describe damage:

Settlement: 0-25mm
notes (if applicable): Settlement noted by tenants in one area only
Differential settlement: none observed
notes (if applicable):
Liquefaction: 0-2 m³/100m²
notes (if applicable): Approx 1m3 of Liquefaction in paddock behind building
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:
Describe how damage ratio arrived at:
Describe (summary): Minor, non-structural cracking. Less than 5%

Across
Damage ratio: #DIV/0!
Describe (summary): Minor, non-structural cracking. Less than 5%

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

Diaphragms
Damage?: no
Describe:

CSWs:
Damage?: yes
Describe:

Pounding:
Damage?: no
Describe:

Non-structural:
Damage?: no
Describe:

Recommendations

Level of repair/strengthening required: significant structural
Describe:
Building Consent required: yes
Describe:
Interim occupancy recommendations: full occupancy
Describe:

Along
Assessed %NBS before e'quakes: ##### %NBS from IEP below
If IEP not used, please detail assessment methodology: Detailed Assessment
Assessed %NBS after e'quakes: 37%

Across
Assessed %NBS before e'quakes: ##### %NBS from IEP below
Assessed %NBS after e'quakes: 37%

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): 1935-1965
h_n from above: 5m

Seismic Zone, if designed between 1965 and 1992:
not required for this age of building
not required for this age of building

	along	across
Period (from above):	0.5	0.5
(%NBS)nom from Fig 3.3:		

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

Note 2: for RC buildings designed between 1976-1984, use 1.2

Note 3: for buildngs designed prior to 1935 use 0.8, except in Wellington (1.0)

	along	across
Final (%NBS)nom:	**0%**	**0%**

2.2 Near Fault Scaling Factor

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

	along	across
Near Fault scaling factor (1/N(T,D), **Factor A**:	#DIV/0!	#DIV/0!

2.3 Hazard Scaling Factor

Hazard factor Z for site from AS1170.5, Table 3.3:

Z_{1992}, from NZS4203:1992

Hazard scaling factor, **Factor B:** #DIV/0!

2.4 Return Period Scaling Factor

Building Importance level (from above): 2

Return Period Scaling factor from Table 3.1, **Factor C**:

2.5 Ductility Scaling Factor

	along	across
Assessed ductility (less than max in Table 3.2)		
Ductility scaling factor: =1 from 1976 onwards; or =kμ, if pre-1976, fromTable 3.3:		
Ductiity Scaling Factor, **Factor D**:	0.00	0.00

2.6 Structural Performance Scaling Factor:

Sp:		
Structural Performance Scaling Factor **Factor E**:	#DIV/0!	#DIV/0!

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

$\%NBS_b$:	**#DIV/0!**	**#DIV/0!**

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

3.1. Plan Irregularity, factor A: 1

3.2. Vertical irregularity, Factor B: 1

3.3. Short columns, Factor C: 1

3.4. Pounding potential

Pounding effect D1, from Table to right

Height Difference effect D2, from Table to right

Therefore, Factor D: 0

3.5. Site Characteristics 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

3.6. Other factors, Factor F

	Along	Across
For ≤ 3 storeys, max value =2.5, otherwise max value =1.5, no minimum		
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

3.7. Overall Performance Achievement ratio (PAR)	**0.00**	**0.00**
4.3 PAR x (%NBS)b: PAR x Baselline %NBS:	**#DIV/0!**	**#DIV/0!**
4.4 Percentage New Building Standard (%NBS), (before)		**#DIV/0!**

GHD

Level 11, Guardian Trust House
15 Willeston street, Wellington 6011
T: 64 4 472 0799   F: 64 4 472 0833   E: wgtnmail@ghd.com

Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
A	Michael Javier	Stephen Lee		Nick Waddington		29/11/12
FINAL	Michael Javier	Stephen Lee		Nick Waddington		06/03/2013