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CIVIL ▲ STRUCTURAL ▲ FOUNDATION

9735

31 October 2019

Hutt City Council
Private Bag 31912
Lower Hutt

Attention: [redacted]

Dear [redacted]

Initial Seismic Assessment Report
Huia Pool Buildings - Huia Street, Lower Hutt

We have now completed an Initial Seismic Assessment (ISA) of the two Huia Pool buildings at Huia Street using the Initial Evaluation Procedure (IEP) as described in Part B of the guideline document, *The Seismic Assessment of Existing Buildings-Technical Guidelines for Engineering Assessments*, dated August 2017. The assessment was carried out after reviewing original structural drawings and completing a site visit on 17 October 2019.

Separate assessments have been undertaken for each of the two buildings.

Building 1 Original 1979 Building (East side of site.)
Building 2 New 2015 Building (Western side of site.)

Executive Summary

These buildings have been rated as Importance Level 3 (IL3) in accordance with NZS1170.5:2004.

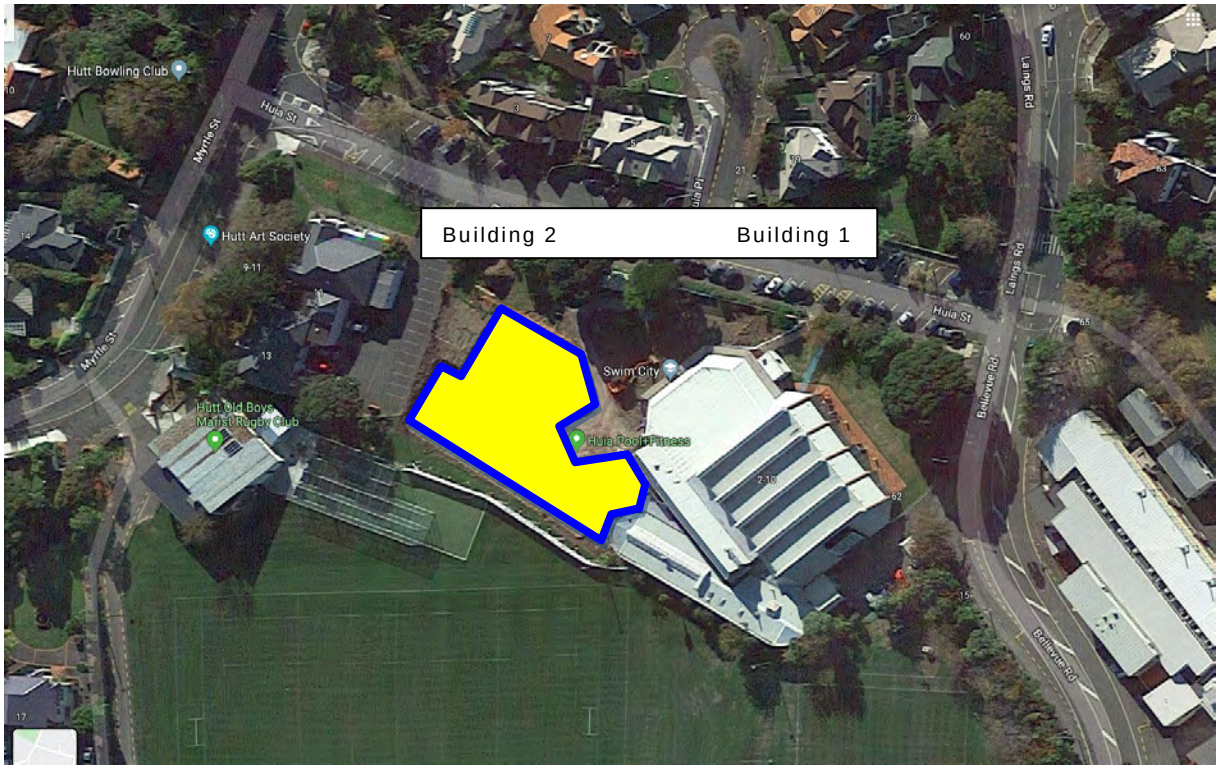
The assessed potential earthquake ratings are

Building 1 40%NBS (IL3);'Grade C': not potentially earthquake prone, but earthquake risk
Building 2 >100%NBS (IL3);'Grade A+': neither potentially earthquake prone nor earthquake risk

A "Severe Structural Weakness" (SSW) is a structural weakness for which rupture would lead to a catastrophic collapse.

Building 1 No potential SSWs were identified in this building
Building 2 No potential SSWs were identified in this building

The Initial Seismic Assessment (ISA) is considered to provide a relatively quick, high-level and qualitative measure of the building's performance. A more reliable result will be obtained from a Detailed Seismic Assessment (DSA). A DSA could find structural aspects of concern that have not been identified from the IEP. Alternatively, a detailed structural assessment may show that structural aspects of potential concern identified in the IEP may have in fact been addressed in the design of the building.



Introduction

Hutt City Council has engaged Sawrey Consulting Engineers Ltd (SCE) to carry out an Initial Seismic Assessment (ISA) of the two Huia Pool buildings at 16 Huia Street, the north end of the Hutt Recreation Ground. This ISA is based on the Initial Evaluation Procedure (IEP) as defined in *Technical Guidelines for Engineering Assessments* referenced above.

Earthquake Prone Building (EPB) methodology is used to identify earthquake-prone buildings, and has been produced by the Ministry of Business, Innovation and Employment in accordance with the Building Act 2004. This ISA meets the requirements of an engineering assessment as prescribed in the EPB methodology.

Background to the IEP and Its Limitations

The IEP procedure was developed in 2006 by the New Zealand Society for Earthquake Engineering (NZSEE) and updated in 2017 to reflect experience with its application and also as a result of experience from the Canterbury earthquakes of 2010/11. It is a tool to assign a percentage of New Building Standard (%NBS) rating and associated grade to a building as part of an Initial Seismic Assessment of existing buildings.

The IEP enables building owners and managers to review their building stock as part of an overall risk management process.

Characteristics and limitations of the IEP include:

- An IEP assessment is primarily concerned with life safety. It does not consider the susceptibility of the building to damage, and therefore to economic losses.
- It tends to be somewhat conservative, identifying some buildings as earthquake prone, or having a lower %NBS score, which subsequent detailed investigation may indicate is less than actual

performance. However, there will be exceptions, particularly when potential critical structural weaknesses (CSWs) are present that have not been recognised from the level of investigation employed.

- An IEP can be undertaken with variable levels of available information: e.g. exterior only inspection, structural drawings available or not, interior inspection, etc. The more information available, the more representative the IEP result is likely to be. The IEP records the information that has formed the basis of the assessment and consideration of this is important when determining the likely reliability of the result.
- It is an initial, first-stage review. Buildings or specific issues which the IEP process flags as being problematic or as potentially critical structural weaknesses need further detailed investigation and evaluation. A Detailed Seismic Assessment is recommended if the seismic status of a building is critical to any decision making.
- The IEP assumes that buildings have been designed and built in accordance with the building standard and good practice current at the time. In some instances, a building may include design features ahead of its time, leading to better than predicted performance. Conversely, some unidentified design or construction issues not picked up by the IEP process may result in the building performing not as well as predicted.
- It is a largely qualitative process, and should be undertaken or overseen by an experienced engineer. It involves considerable knowledge of the earthquake behaviour of buildings, and judgement as to key attributes and their effect on building performance. Consequently, it is possible that the %NBS derived for a building by independent experienced engineers may differ.
- An IEP may over-penalise some apparently critical features which could have been satisfactorily taken into account in the design.
- An IEP does not take into account the seismic performance of non-structural items such as ceilings, plant, services or general glazing that are not considered to present a significant life safety hazard.

Experience to date is that the IEP is a useful tool to identify potential issues and expected overall performance of a building in an earthquake. However, the process and the associated %NBS rating and grade should be considered as only providing an indicative indication of the building's compliance with current code requirements. A detailed investigation and analysis of the building will typically be required to provide a definitive assessment.

Each IEP has been based on 1) a review of drawings, 2) an inspection of the exterior and interior, and 3) consideration of the geotechnical report. Therefore, each IEP can be considered to be a moderately comprehensive assessment at the ISA level. The ratings tabulated in the executive summary, if ratified by the Territorial Authority, would lead to Building 3 being designated "earthquake prone" and the other three buildings not being designated "earthquake prone".

Basis for the Assessment

The information we have used for our IEP assessment includes:

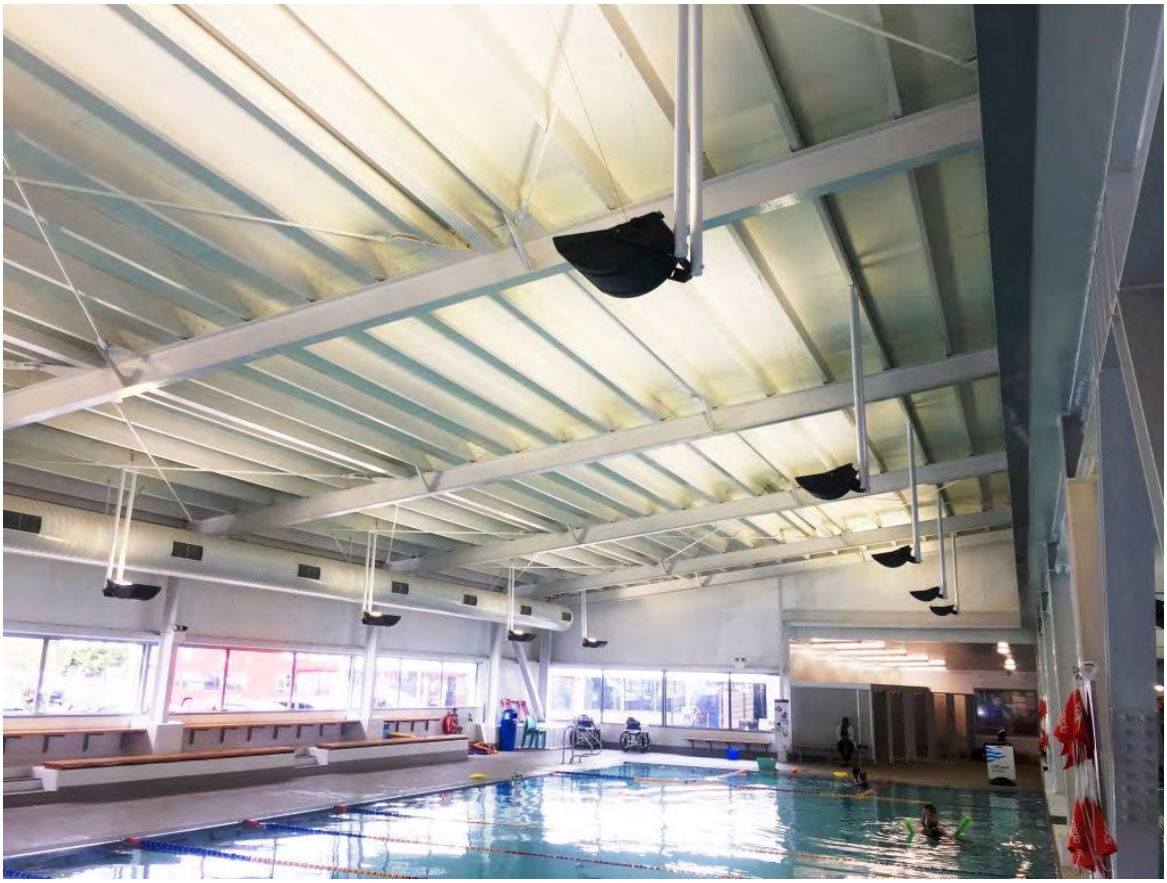
- The two buildings were designed/built in 1979 and 2015 respectively.
- Adjustment factors (F) have been adopted for the two buildings:
  Building 1 F = 1.2.
  Building 2 F = 1.2

Building Descriptions

The two buildings are located on the south side of Huia Street in the city of Lower Hutt. They are stand-alone structures.

Building 1 – Original 1979 Huia Pool Building

- There are four areas 1) Main Pool 2) Learners Pool 3) Changing facilities 4) Two storey offices
- The main pool, in the transverse direction, has deep reinforced concrete columns with steel trusses above.
- The main pool, in the longitudinal direction, has steel cross braced frames.
- The main pool has a flat light timber roof everywhere.
- The Learners pool, in both directions, there are half height reinforced concrete columns and glulam timber eccentrically braced frames with a flat light timber roof.
- The downstairs office area, in both directions, is reinforced concrete masonry with a with a reinforced concrete floor above.
- The downstairs office area has a reinforced concrete beam
- The upstairs offices (staff room and activities room) have reinforced concrete stairs leading up to the area, and the floor is reinforced concrete on flange hung precast double T's spanning transversely.
- The upstairs offices, in both directions are reinforced concrete masonry with a steep timber framed roof.
- The upstairs offices have a plant room at one end; there are large unrestrained header tanks in the ceiling space.
- The changing facilities has slender, circular, reinforced concrete columns supporting a light timber roof.
- The external longitudinal wall is reinforced concrete masonry; internal walls are light timber partitions.
- There is a pop-top skylight in the middle of the men's changing area.
- There is a large plant room behind the men's changing area.



Building 2 – Additional 2015 Building with Hydrotherapy Pool, Programme Pool & Gymnasium.

- Downstairs offices, staff room and changing facilities at the east end.
- Downstairs are two swimming pools; and a plant room at the west end.
- Access to the upstairs is via stairs and lift at the east end, and stairs at the west end.
- Upstairs there are offices and toilet facilities at the east end. Upstairs is a weights gym; and a plant room at the west end. Roof bracing is tension only cross braced frames.
- Upstairs floor is rib and infill with 90mm topping concrete.
- Stairs appear to be pre-cast reinforced concrete with a low friction bearing strip at the bottom and 100mm seating at the top.
- Reinforced concrete masonry walls around the ground floor offices, staff room, changing facilities at the east end.
- Reinforced concrete masonry walls around the plant room and storage room at the west end.
- Transverse direction is moment frames.
- Longitudinal direction upstairs is cross braced frames.
- These are a mix of tension only systems and tension-compression systems.
- Longitudinal direction downstairs is eccentrically braced frames.
- There are large lights and fully glazed wall over one of the swimming pools.
- A moment frame beam is welded into the centre of a cross braced frame.
- The foundations for steel posts are reinforced concrete plinths on a 500mm thick slab on a 2m deep subgrade.

Building 1 IEP Assessment Result

Our IEP assessment of this older building indicates the building can achieve 40%NBS (IL3) in the transverse direction and 60% NBS in the longitudinal direction. The IEP assessment of this building therefore indicates an overall earthquake rating of 40%NBS (IL3), corresponding to a 'Grade C' building as defined by the New Zealand Society for Earthquake Engineering (NZSEE) building grading scheme. This is above 34%NBS, but below the threshold for earthquake risk buildings (67%NBS) as recommended by the NZSEE. The key assumptions made during our assessment are shown in Table 1 that follows. Refer also to the attached IEP assessment and engineering assessment technical summary.

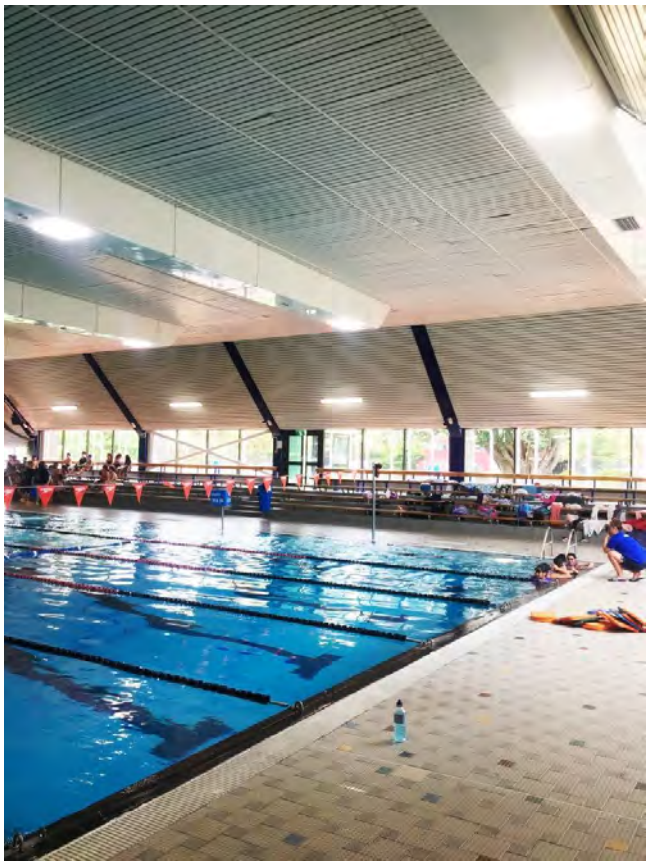


Table 1: IEP Assessment Results

Building 1 IEP Item	Assumption	Justification
Date of Building Design	1979	Original drawings
Soil Type	D	Ref: Greater Wellington Regional Council Map. 2014 Geotechnical Report by Opus.
Building Importance	3	AS/NZS1170.0
Ductility of Structure	2	The Guideline section C6.5 and C6.6. Reinforced concrete columns and reinforces masonry walls.
Plan Irregularity Factor, A		*The Seismic Assessment of Existing Buildings -Technical Guidelines for Engineering Assessments*, August 2017, Part B, Appendix BA, Figure BA.5
Longitudinal	Significant	Apparent grouping of reinforced masonry walls and a cross braced frame around the amenities and changing area. No roof bracing observed over main pool. Centre of mass closer to the 2 storey amenities than the centre of the plan area.
Transverse	Significant	The amenities block has more transverse reinforced concrete masonry walls around the showers and therapeutic pool then around the reception. So the CoM is > 0.3xW from the COR; Wall spacing is > 2D.
Vertical Irregularity Factor, B	Insignificant	*The Seismic Assessment of Existing Buildings-Technical Guidelines for Engineering Assessments*, August 2017, Part B, Appendix BA, Figure BA.5. Reinforced concrete (RC) columns & RC masonry are continuous for the full height of the 2-storey building. At the learners pool the RC columns terminate at 2.3m and there is an LVL eccentrically braced frame above. Largely single storey.
Short Columns Factor, C	No	Short columns were not observed.
Pounding Factor, D	1	Gap between buildings. No pounding issue.
Site Characteristics		*The Seismic Assessment of Existing Buildings-Technical Guidelines for Engineering Assessments*, August 2017, Part B, section B4.2. Opus Geotechnical Report 2014. Greater Wellington Regional Council Flex Map Viewer, moderate liquefaction potential, low slope failure potential.
Longitudinal	Insignificant	Longitudinally, the heavy concrete structure appears to be well tied together.
Transverse	Significant	Seating of precast double tee beams for the upstairs floor are a potential life-safety risk. Affected by potential liquefaction etc.
Factor F	1.2	Various structural systems: 1) Reinforced concrete (RC) frame; 2) RC masonry; 3) RC short precast walls; 4) Steel cross braced frames; 5) Timber eccentrically braced frames; 6) Precast floor units 7) RC cantilever columns. Connections between the systems to be checked in DSA. Seems well built with structural robustness. Structure is visible.

Building 2 IEP Assessment Result

Our IEP assessment of this building indicates the building can achieve >100%NBS (IL3) in each orthogonal direction. The IEP assessment of this building therefore indicates an overall earthquake rating of >100%NBS (IL3), corresponding to a 'Grade A+' building as defined by the New Zealand Society for Earthquake Engineering (NZSEE) building grading scheme. This is above 34%NBS, and above the threshold for earthquake risk buildings (67%NBS) as recommended by the NZSEE.

The key assumptions made during our assessment are shown in Table 2 that follows. Refer also to the attached IEP assessment and engineering assessment technical summary.

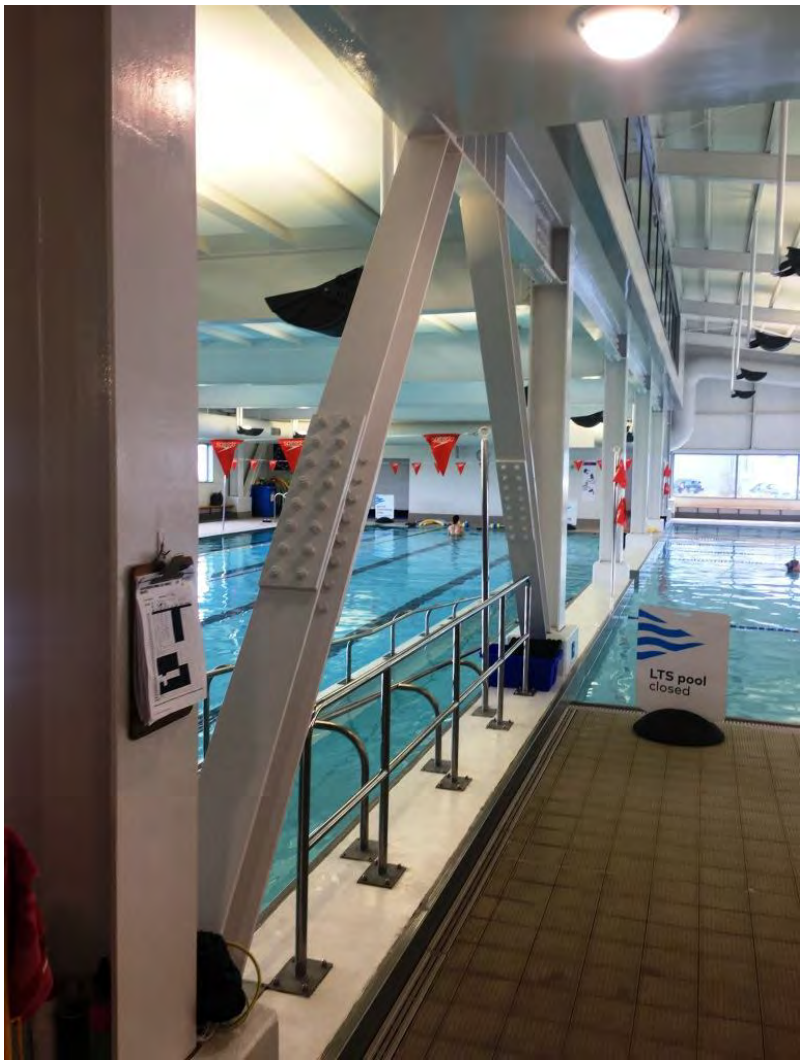


Table 2: IEP Assessment Results

Building 2; IEP Item	Assumption	Justification
Date of Building Design	2015	Original drawings
Soil Type	D	Greater Wellington Regional Council Flex Map Viewer, moderate liquefaction potential, low slope failure potential. Opus geotechnical report.
Building Importance Level	3	AS/NZS1170.0
Ductility of Structure	3	The Guideline section C6.5 and C6.6. Recently constructed reinforced masonry and structural steel.
Plan Irregularity Factor, A	Not Significant	*The Seismic Assessment of Existing Buildings -Technical Guidelines for Engineering Assessments*, August 2017, Part B, Appendix BA, Figure BA.5. 2 pairs of eccentrically braced frames at ground along either side of the upstairs slab. Cross braced frames above and along the north external wall. Similar elastic stiffness expected, therefore centre of mass and rigidity are probably similar locations.
Vertical Irregularity Factor, B	Not Significant	*The Seismic Assessment of Existing Buildings-Technical Guidelines for Engineering Assessments*, August 2017, Part B, Appendix BA, Figure BA.5. No vertical irregularity observed.
Short Columns Factor, C	No	Short columns were not observed.
Pounding Factor, D	1	Seismic gap appears to be greater than 100mm.
Site Characteristics	Significant	*The Seismic Assessment of Existing Buildings-Technical Guidelines for Engineering Assessments*, August 2017, Part B, section B4.2. Greater Wellington Regional Council Flex Map Viewer, moderate liquefaction potential, low slope failure potential. 500mm thick slab on 2m subgrade. Geotechnical report shows a small area of liquefiable lenses at foundation depth.
Factor F	1.2	The structure is visible and apparently well built.

IEP Grades and Relative Risk

Table 3 taken from the Technical Guidelines referred to earlier provides the basis for a proposed grading system for existing buildings, as one way of interpreting the %NBS earthquake rating.

Table 3: Relative Earthquake Risk

Building Grade	Percentage of New Building Strength (*%NBS*)	Approx. Risk Relative to a New Building	Life-safety Risk Description
A+	>100	<1	low risk
A	80 to 100	1 to 2 times	low risk
B	67 to 79	2 to 5 times	low or medium risk
C	34 to 66	5 to 10 times	medium risk
D	20 to 33	10 to 25 times	high risk
E	<20	more than 25 times	very high risk

Building 1 has been classified by the IEP as a 'Grade *C*' building and is therefore considered to be a medium life-safety risk.

Building 2 has been classified by the IEP as a 'Grade *A+*' building and is therefore considered to be a low life-safety risk.

NZSEE (which provides authoritative advice to the legislation makers, and should be considered to represent the consensus view of New Zealand structural engineers) classifies buildings achieving greater than 67%NBS as "Low or medium Risk", and having "Acceptable (improvement may be desirable)" building structural performance.

Seismic Restraint of Non-Structural Items

During an earthquake, the safety of people can be put at risk due to non-structural items falling on them. These items should be adequately seismically restrained, where possible, to the NZS 4219:2009 "The Seismic Performance of Engineering Systems in Buildings".

We have not checked whether tall or heavy furniture has been seismically restrained or not. These issues are outside the scope of this initial assessment but could be the subject of another investigation.

Other Issues

Other issues pertaining to the gravity support of the structures have not been identified.

Conclusion

Our ISA assessment for these buildings, carried out using the IEP indicates overall scores of:

Building 1 — 40%NBS (IL3 50yr), which corresponds to a 'Grade C' building, as defined by the NZSEE building grading scheme. This is *above* the threshold for Earthquake Prone Buildings (34%NBS) and *below* the threshold for Earthquake Risk Buildings (67%NBS) as defined by the NZSEE and the New Zealand Building Code.

Building 2 — >100%NBS (IL3 50yr), which corresponds to a 'Grade A+' building, as defined by the NZSEE building grading scheme. This is *above* the threshold for Earthquake Prone Buildings (34%NBS) and *above* the threshold for Earthquake Risk Buildings (67%NBS) as defined by the NZSEE and the New Zealand Building Code.

The ISA is considered to provide a relatively quick, high-level and qualitative measure of the building's performance. In order to confirm the seismic performance of this building with more reliability you may wish to request a Detailed Seismic Assessment (DSA). A DSA would likely focus on issues such as roof diaphragms, the stability of longitudinal block walls and the seismic bracing of non-structural elements.

A DSA would also investigate other potential weaknesses that may not have been considered in the initial seismic assessment.

We trust this letter and initial seismic assessment meets your current requirements. We would be pleased to discuss further with you any issues raised in this report. Please do not hesitate to contact us if you would like clarification of any aspect of this letter.

Yours faithfully

SAWREY CONSULTING ENGINEERS LTD

[redacted]

SAWREY
CONSULTING ENGINEERS LTD

Initial Seismic Assessment
Appendix 1 – Technical Summary
Appendix 2 – IEPs [Initial Evaluation Procedures]
Huia Pool
6 Huia Street

For
Hutt City Council

Project 9735
October 2019

Appendix A – Engineering Assessment Technical Summary

Old Building – [located to the east, built in 1979]

Building Information	
Building Name/Description	Huia Pool – Main pool, learners pool, toilet facilities, therapeutic pool, changing facilities, reception, staff room.
Street Address	6 Huia Street
Territorial Authority	Hutt City Council
No. of Storeys	Two storeys plus a mezzanine in the plant room.
Area of Typical Floor (approx.)	Ground floor: 2328m^2; Upstairs:200.4m^2 ;Plant Mezzanine:42m^2
Year of Design (approx.)	1979
NZ Standard Designed to	NZS Standard (NZSS 4203:1976)
Structural System including Foundations	Various structural systems: 1) reinforced concrete (RC) frame 2) RC masonry 3) RC short precast walls 4) steel cross braced frames 5) timber eccentrically braced frames 6) precast floor units 7) RC cantilever columns. No roof bracing. Foundation is slab on grade with 600 deep strip footings below RC masonry walls. The slab at the bottom of the pool is 350mm thick and approximately 3.3m deep.
Key Features of Ground Profile and Identified Geohazards	Relatively flat site and away from slopes. Greater Wellington Regional Council hazard mapping indicates the liquefaction hazard at the site is "moderate". The Opus Geotechnical report states "a 1m thick localised lens of liquefaction potential at 2m depth .. although there is some potential for liquefaction in this layer it is relatively low (less than 10mm of settlement)."
Previous Strengthening	None
Heritage Issues/Status	None
Other	N/A

Assessment Information	
Consulting Practice	Sawrey Consulting Engineers Ltd
CPEng Responsible	[redacted]
Date/Version of Drawings Reviewed	Architectural by Burwell Hunt in 1979 have been seen. Structural drawings for design by Bill Lovell - Smith & Associates in 1979
Geotechnical Report(s)	Opus January 2014 for the adjacent new building.
Date Building Inspected	17 October 2019
Previous Assessment Reports	None
Other Relevant Information	None

Summary of Engineering Assessment Methodology and Key Parameters Used	
Occupancy Type(s) and Importance Level	Swimming pool, Importance Level IL3.
Site Subsoil Class	D
Summary of Assessment Methodology Used	Initial Evaluation Procedure (IEP) in accordance with *The Seismic Assessment of Existing Buildings-Technical Guidelines for Engineering Assessments*, dated August 2017 (The Guidelines) Part B – Initial Seismic Assessment.
Other Relevant Information	None
Assessment Outcomes	
Assessment Status	Final
Assessed Seismic Rating	40%NBS (IL3)
Seismic Grade	C
Describe the Governing Critical Structural Weakness and Likely Mode of Failure	No CSWs. Modes/locations of potential failure as follows: Axial strength of the longitudinal cross braced frame along the north wall of the main pool. Bending strength of the cantilever columns over the learner's pool under transverse actions. Shear strength of transverse reinforced concrete masonry shear walls supporting upstairs floor.
Comment on Parts Identified and Assessed	A number of parts have been identified for further assessment: Seating of the precast floor units. Stability and strength of cantilever columns supporting reinforced concrete masonry walls in/outwards (longitudinal wall to the rear of the changing facilities and transverse wall to the rear of the main pool area). Strength of the upstairs reinforced concrete masonry walls outwards (or inwards). Strength of structure supporting the header tanks at the level 3 mezzanine (upstairs attic space). Seismic restraint of the header tanks.
Recommendations	NZSEE recommends upgrading to as near as reasonably practicable to new building standard (i.e. 100%NBS), and considers 80%NBS to be the minimum seismic rating for an existing building to be considered "low risk". A DSA would likely focus on issues identified above, and would supersede the results of this ISA. The detailed seismic assessment would likely include a description of one or two strengthening concepts where required to improve the building strength to a nominated %NBS.

New Building [located to the west, built in 2015]

Building Information	
Building Name/Description	Huia Pool and Fitness – Two pools, changing facilities, offices, staff room, plant room. Upper level weights gymnasium over one pool.
Street Address	6 Huia Street
Territorial Authority	Hutt City Council
No. of Storeys	Two storeys. One storey over the pools.
Area of Typical Floor (approx.)	Ground floor: 1300m^2; Upper Level: 500m^2
Year of Design (approx.)	2015
NZ Standard Designed to	AS/NZS 1170 [Parts 0 to 3]:2002. NZS 1170.5:2004)
Structural System including Foundations	Building layout is a main two storey building housing one pool with associated facilities & offices at one end and the plant room at the other end. The second pool is housed in a large single storey lean-to structure to one side of the main building. The lean-to structure is slightly offset from the main building. Thus there are three longitudinal frames, and a series of transverse frames. EQ resisting elements Lvl G Main Lvl 1 Main Lean-to Longitudinal frames EBFs X braces, CBFs CBFs Transverse frames MRFs MRFs MRFs Gym floor 150 interspan with 90 topping on 530UB82 beams. Secondary surrounding structures are constructed of reinforced blockwork, structural steel MRFs etc. The foundation below pool level appears to be a “raft”, 1.5 m below ground level.
Key Features of Ground Profile and Identified Geohazards	Relatively flat site and away from slopes. Greater Wellington Regional Council hazard mapping indicates the liquefaction hazard at the site is “moderate”. The Opus Geotechnical report states “a 1m thick localised lens of liquefaction potential at 2m depth .. although there is some potential for liquefaction in this layer it is relatively low (less than 10mm of settlement).”
Previous Strengthening	None
Heritage Issues/Status	None
Other	N/A

Assessment Information	
Consulting Practice	Sawrey Consulting Engineers Ltd
CPEng Responsible	[redacted]
Date/Version of Drawings Reviewed	Architectural and Structural drawings by WSP Opus in 2015
Geotechnical Report(s)	Opus January 2014 for the adjacent new building.
Date Building Inspected	17 October 2019
Previous Assessment Reports	None
Other Relevant Information	None

Summary of Engineering Assessment Methodology and Key Parameters Used	
Occupancy Type(s) and Importance Level	Swimming pool, Importance Level IL3.
Site Subsoil Class	D
Summary of Assessment Methodology Used	Initial Evaluation Procedure (IEP) in accordance with *The Seismic Assessment of Existing Buildings-Technical Guidelines for Engineering Assessments*, dated August 2017 (The Guidelines) Part B – Initial Seismic Assessment.
Other Relevant Information	None
Assessment Outcomes	
Assessment Status	Final
Assessed Seismic Rating	100%NBS (IL3)
Seismic Grade	A+
Describe the Governing Critical Structural Weakness and Likely Mode of Failure	No CSWs. Yielding at selected locations in accordance with capacity design principles.
Comment on Parts Identified and Assessed	Items including stairs, lights over pool, glazed wall were seen. No immediate concerns.
Recommendations	Nil. A DSA would supersede the results of this ISA.

Appendix B – Initial Evaluation Procedure (IEP)

IEP for Original Building (East)
IEP for Additional Building (West)

Initial Evaluation Procedure (IEP) Assessment - Completed for Hutt City Council Page 1

WARNING!! *This initial evaluation has been carried out solely as an initial seismic assessment of the building following the procedure set out in the "The Seismic Assessment of Existing Buildings" Technical Guidelines for Engineering Assessments, July 2017. This spreadsheet must be read in conjunction with the limitations set out in the accompanying report, and should not be relied on by any party for any other purpose. Detailed inspections and engineering calculations, o r engineering judgements based on them, have not been undertaken, and these may lead to a different result or seismic grade.*

Street Number & Name:	**6 Huia Street**	**Job No.:**	**9735**
AKA:	**Huia Swimming Pool**	**By:**	**ULM**
Name of building:	**Old Building - located to the east - 1979 design**	**Date:**	**24/10/2019**
City:	**Lower Hutt**	**Revision No.:**	**42644 v 1**

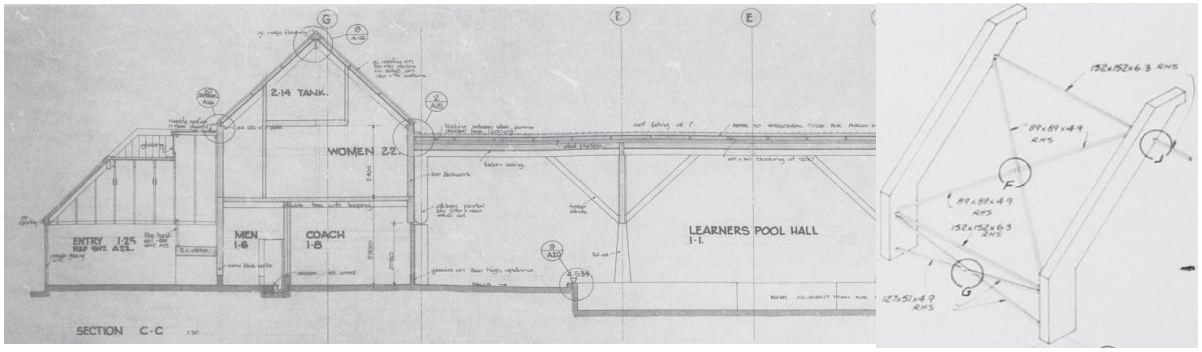
Table IEP-1 Initial Evaluation Procedure Step 1

Step 1 - General Information

1.1 Photos (attach sufficient to describe building)

NOTE: THERE ARE MORE PHOTOS ON PAGE 1a ATTACHED

1.2 Sketches (plans etc, show items of interest)



NOTE: THERE ARE MORE SKETCHES ON PAGE 1a ATTACHED

1.3 List relevant features (Note: only 10 lines of text will print in this box. If further text required use Page 1a)

There are four areas 1) Main Pool 2) Learners Pool 3) Changing facilities 4) Two storey offices
The main pool, in the transverse direction, has deep reinforced concrete columns with steel trusses above.
The main pool, in the longitudinal direction, has steel cross braced frames. The main pool has a flat light timber roof everywhere.
The Learners pool, in both directions, there are half height reinforced concrete columns and glulam timber eccentrically braced frames with a flat light timber roof.
The downstairs office area, in both directions, is reinforced concrete masonry with a with a reinforced concrete floor above.
The downstairs office area has a reinforced concrete beam above to support the precast double Ts for the upstairs floor.
The upstairs offices (staff room and activities room) have reinforced concrete stairs leading up to the area, and the floor is reinforced concrete on flange hung precast double T's spanning transversely. The upstairs offices, in both directions are reinforced concrete masonry with a steep timber gable roof.
The upstairs offices have a plant room at one end; there are header tanks in the ceiling space.

1.4 Note information sources Tick as appropriate

Visual Inspection of Exterior	☑	**Specifications**	☑
Visual Inspection of Interior	☑	**Geotechnical Reports**	☑
Drawings (note type)	☑	**Other (list)**	☐

Inspection of interior & exterior on Thursday 17 October 2019. Architectural by Burwell Hunt in 1979 have been seen. Structur al drawings for design by Bill Lovell - Smith & Associates in 1979 have been seen. Specification and recent geotechnical report seen.

Initial Evaluation Procedure (IEP) Assessment - Completed for Hutt City Council

Street Number & Name:	6 Huia Street	Job No.:	9735
AKA:	Huia Swimming Pool	By:	ULM
Name of building:	Old Building - located to the east - 1979 design	Date:	24/10/2019
City:	Lower Hutt	Revision No.:	42644 v 1

Table IEP-1a Additional Photos and Sketches

Add any additional photographs, notes or sketches required below:

Note: print this page separately

fig 1 - Pre-cast floor units

fig 2 - Front reinforced

fig 3 - Ground floor plan

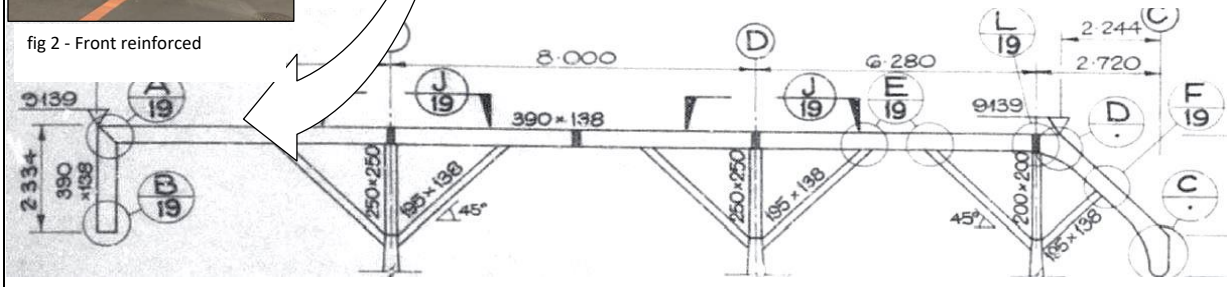


fig 4 - timber eccentrically braced frame (on cantilever reinforced concrete columns).

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Initial Evaluation Procedure (IEP) Assessment - Completed for Hutt City Council

Street Number & Name:	**6 Huia Street**	**Job No.:**	**9735**
AKA:	**Huia Swimming Pool**	**By:**	**ULM**
Name of building:	**Old Building - located to the east - 1979 design**	**Date:**	**24/10/2019**
City:	**Lower Hutt**	**Revision No.:**	**42644 v 1**

Table IEP-2 Initial Evaluation Procedure Step 2

Step 2 - Determination of *(%NBS)*$_b$

(Baseline *(%NBS)* for particular building - refer Section B5)

2.1 Determine nominal *(%NBS)* = *(%NBS)*$_{nom}$

	Longitudinal	Transverse
a) Building Strengthening Data		
Tick if building is known to have been strengthened in this direction	☐	☐
If strengthened, enter percentage of code the building has been strengthened to	N/A	N/A
b) Year of Design/Strengthening, Building Type and Seismic Zone		
Pre 1935	○	○
1935-1965	○	○
1965-1976	○	○
1976-1984	◉	◉
1984-1992	○	○
1992-2004	○	○
2004-2011	○	○
Post Aug 2011	○	○
Building Type:	RC Building 1976-84	RC Building 1976-84
Seismic Zone:	Zone A	Zone A
c) Soil Type		
From NZS1170.5:2004, Cl 3.1.3 :	D Soft Soil	D Soft Soil
From NZS4203:1992, Cl 4.6.2.2 : (for 1992 to 2004 and only if known)	**Not applicable**	**Not applicable**
d) Estimate Period, *T*		
Comment: Two storey steel moment frame and steel portal frame.		
h_n =	8.1	8.1 m
A_c =	1.00	1.00 m^2
Moment Resisting Concrete Frames: $T = \max\{0.09h_n^{0.75}, 0.4\}$	○	○
Moment Resisting Steel Frames: $T = \max\{0.14h_n^{0.75}, 0.4\}$	○	○
Eccentrically Braced Steel Frames: $T = \max\{0.08h_n^{0.75}, 0.4\}$	○	○
All Other Frame Structures: $T = \max\{0.06h_n^{0.75}, 0.4\}$	○	○
Concrete Shear Walls $T = \max\{0.09h_n^{0.75}/A_c^{0.5}, 0.4\}$	○	○
Masonry Shear Walls: $T \leq 0.4$sec	◉	◉
User Defined (Input Period):	○	○
Where h_n = height in metres from the base of the structure to the uppermost seismic weight or mass. **T:**	0.40	0.40
e) Factor A: Strengthening factor determined using result from (a) above (set to 1.0 if not strengthened) **Factor A:**	1.00	1.00
f) Factor B: Determined from NZSEE Guidelines Figure 3A.1 using results (a) to (e) above **Factor B:**	0.20	0.20
g) Factor C: For reinforced concrete buildings designed between 1976-84 Factor C = 1.2, otherwise take as 1.0. **Factor C:**	1.00	1.00
h) Factor D: For buildings designed prior to 1935 Factor D = 0.8 except for Wellington and Napier (1931-1935) where Factor D may be taken as 1.0, otherwise take as 1.0. **Factor D:**	1.00	1.00
***(%NBS)*$_{nom}$ = AxBxCxD** ***(%NBS)*$_{nom}$**	20%	20%

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Initial Evaluation Procedure (IEP) Assessment - Completed for Hutt City Council Page 3

Street Number & Name:	6 Huia Street	Job No.:	9735
AKA:	Huia Swimming Pool	By:	ULM
Name of building:	Old Building - located to the east - 1979 design	Date:	24/10/2019
City:	Lower Hutt	Revision No.:	42644 v 1

Table IEP-2 Initial Evaluation Procedure Step 2 continued

2.2 Near Fault Scaling Factor, Factor E

If $T \leq 1.5$sec, Factor E = 1

		Longitudinal	Transverse
a) Near Fault Factor, *N(T,D)* (from NZS1170.5:2004, Cl 3.1.6)	N(T,D):	1	1
b) Factor E = 1/N(T,D)	Factor E:	1.00	1.00

2.3 Hazard Scaling Factor, Factor F

a) Hazard Factor, *Z*, for site

Location: Hutt Valley-south of Taita Gorge — Refer right for user-defined locations

Z =	0.4	(from NZS1170.5:2004, Table 3.3)
Z_{1992} =	1.2	(NZS4203:1992 Zone Factor from accompanying Figure 3.5(b))
Z_{2004} =	0.4	(from NZS1170.5:2004, Table 3.3)

b) Factor F

For pre 1992	=	$1/Z$
For 1992-2011	=	Z_{1992}/Z
For post 2011	=	Z_{2004}/Z

	Longitudinal	Transverse
Factor F:	2.50	2.50

2.4 Return Period Scaling Factor, Factor G

a) Design Importance Level, I

(Set to 1 if not known. For buildings designed prior to 1965 and known to be designed as a public building set to 1.25. For buildings designed 1965-1976 and known to be designed as a public building set to 1.33 for Zone A or 1.2 for Zone B. For 1976-1984 set I value.)

	Longitudinal	Transverse
	Class 2	Class 2
I =	1.3	1.3

b) Design Risk Factor, R_o (set to 1.0 if other than 1976-2004, or not known)

	Longitudinal	Transverse
	Item 1	Item 1
R_o =	1	1

c) Return Period Factor, R (from NZS1170.0:2004 Building Importance Level)

	Longitudinal	Transverse
Choose Importance Level	○ 1 ○ 2 ◉ 3 ○ 4	○ 1 ○ 2 ◉ 3 ○ 4
R =	1.3	1.3

d) Factor G = IR_o/R

	Longitudinal	Transverse
Factor G:	1.00	1.00

2.5 Ductility Scaling Factor, Factor H

a) Available Displacement Ductility Within Existing Structure

Comment: Reinforced concrete columns & reinforced masonry walls

	Longitudinal	Transverse
μ =	2.00	2.00

b) Factor H

		k_μ (Longitudinal)	k_μ (Transverse)
For pre 1976 (maximum of 2)	=	1.57	1.57
For 1976 onwards	=	1	1
Factor H:		1.00	1.00

(where k_μ is NZS1170.5:2004 Inelastic Spectrum Scaling Factor, from accompanying Table 3.3)

2.6 Structural Performance Scaling Factor, Factor I

a) Structural Performance Factor, S_p (from accompanying Figure 3.4)

Tick if light timber-framed construction in this direction

	Longitudinal	Transverse
	☐	☐
S_p =	0.70	0.70

b) Structural Performance Scaling Factor = $1/S_p$

	Longitudinal	Transverse
Factor I:	1.43	1.43

Note Factor B values for 1992 to 2004 have been multiplied by 0.67 to account for Sp in this period

2.7 Baseline *%NBS* for Building, *(%NBS)*$_b$

(equals $(\%NBS)_{nom}$ x E x F x G x H x I)

	Longitudinal	Transverse
	71%	71%

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Initial Evaluation Procedure (IEP) Assessment - Completed for Hutt City Council

Street Number & Name:	**6 Huia Street**	**Job No.:**	**9735**
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City:	**Lower Hutt**	**Revision No.:**	**42644 v 1**

Table IEP-3 Initial Evaluation Procedure Step 3

Step 3 - Assessment of Performance Achievement Ratio (PAR)
(Refer Appendix B - Section B3.2)

a) Longitudinal Direction

potential CSWs | **Effect on Structural Performance (Choose a value - Do not interpolate)** | **Factors**

3.1 Plan Irregularity

Effect on Structural Performance ○ *Severe* ◉ *Significant* ○ *Insignificant* **Factor A** 0.7

Apparent grouping of reinforced masonry walls and a cross braced frame around the amenities and changing area. No roof bracing observed over main pool. Centre of mass closer to the 2 storey amenities than the centre of the plan area.

3.2 Vertical Irregularity

Effect on Structural Performance ○ *Severe* ○ *Significant* ◉ *Insignificant* **Factor B** 1.0

Reinforced concrete (RC) columns & RC masonary are continuous for the full height of the 2storey building. At the learners pool the RC columns terminate at 2.3m and there is an LVL eccentrically braced frame above. Largely single storey.

3.3 Short Columns

Effect on Structural Performance ○ *Severe* ○ *Significant* ◉ *Insignificant* **Factor C** 1.0

None.

3.4 Pounding Potential

(Estimate D1 and D2 and set D = the lower of the two, or 1.0 if no potential for pounding, or consequences are considered to be minimal)

a) Factor D1: - Pounding Effect

Note:
Values given assume the building has a frame structure. For stiff buildings (eg shear walls), the effect of pounding may be reduced by taking the coefficient to the right of the value applicable to frame buildings.

Factor D1 For Longitudinal Direction: 1.0

Table for Selection of Factor D1	Severe	Significant	Insignificant
Separation	0<Sep<.005H	.005<Sep<.01H	Sep>.01H
Alignment of Floors within 20% of Storey Height	◉ 1	○ 1	○ 1
Alignment of Floors not within 20% of Storey Height	○ 0.4	○ 0.7	○ 0.8

b) Factor D2: - Height Difference Effect

Factor D2 For Longitudinal Direction: 1.0

Table for Selection of Factor D2	Severe	Significant	Insignificant
	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

Factor D 1.0

3.5 Site Characteristics - *Stability, landslide threat, liquefaction etc as it affects the structural performance from a life-safety perspective*

Effect on Structural Performance ○ *Severe* ○ *Significant* ◉ *Insignificant* **Factor E** 1.0

Greater Wellington Regional Council Flex Map Viewer, moderate liquefaction potential, low slope failure potential. Longitudinaly, the heavy concrete structure appears to be well tied together.

3.6 Other Factors - *for allowance of all other relevant characterstics of the building*

For ≤ 3 storeys - Maximum value 2.5
otherwise - Maximum value 1.5.
No minimum.

Factor F 1.2

Record rationale for choice of Factor F:

Various structural systems: 1) Reinforced concrete (RC) frame 2) RC masonry 3) RC short precast walls 4) Steel cross braced frames 5) Timber eccentrically braced frames 6) Precast floor units 7) RC cantilever columns. Connections between the systems to be checked in DSA. Seems well built with structural robustmness. Structure is visible.

PAR

3.7 Performance Achievement Ratio (PAR)
(equals **A x B x C x D x E x F**)

Longitudinal **0.84**

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Initial Evaluation Procedure (IEP) Assessment - Completed for Hutt City Council

Street Number & Name:	**6 Huia Street**	**Job No.:**	**9735**
AKA:	**Huia Swimming Pool**	**By:**	**ULM**
Name of building:	**Old Building - located to the east - 1979 design**	**Date:**	**24/10/2019**
City:	**Lower Hutt**	**Revision No.:**	**42644 v 1**

Table IEP-3 Initial Evaluation Procedure Step 3

Step 3 - Assessment of Performance Achievement Ratio (PAR)
(Refer Appendix B - Section B3.2)

b) Transverse Direction

Factors

potential CSWs — **Effect on Structural Performance** (Choose a value - Do not interpolate)

3.1 Plan Irregularity

Effect on Structural Performance ○ *Severe* ◉ *Significant* ○ *Insignificant* **Factor A** 0.7

The amenities block has more transverse reinforced concrete masonry walls around the showers and therapeutic pool then around the reception. So the CoM is > 0.3xW from the COR; Wall spacing is > 2D.

3.2 Vertical Irregularity

Effect on Structural Performance ○ *Severe* ○ *Significant* ◉ *Insignificant* **Factor B** 1.0

Reinforced concrete (RC) columns & RC masonary are continuous for the full height of the 2storey building. At the learners pool the RC columns terminate at 2.3m and there is an LVL eccentrically braced frame above. Largely single storey.

3.3 Short Columns

Effect on Structural Performance ○ *Severe* ○ *Significant* ◉ *Insignificant* **Factor C** 1.0

None observed.

3.4 Pounding Potential

(Estimate D1 and D2 and set D = the lower of the two, or 1.0 if no potential for pounding, or consequences are considered to be minimal)

a) Factor D1: - Pounding Effect

Note:
Values given assume the building has a frame structure. For stiff buildings (eg shear walls), the effect of pounding may be reduced by taking the coefficient to the right of the value applicable to frame buildings.

Factor D1 For Transverse Direction: 1.0

Table for Selection of Factor D1	Severe	Significant	Insignificant
Separation	0<Sep<.005H	.005<Sep<.01H	Sep>.01H
Alignment of Floors within 20% of Storey Height	◉ 1	○ 1	○ 1
Alignment of Floors not within 20% of Storey Height	○ 0.4	○ 0.7	○ 0.8

b) Factor D2: - Height Difference Effect

Factor D2 For Transverse Direction: 1.0

Table for Selection of Factor D2	Severe	Significant	Insignificant
	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

Factor D 1.0

3.5 Site Characteristics - *Stability, landslide threat, liquefaction etc as it affects the structural performance from a life-safety perspective*

Effect on Structural Performance ○ *Severe* ◉ *Significant* ○ *Insignificant* **Factor E** 0.7

Greater Wellington Regional Council Flex Map Viewer, moderate liquefaction potential, low slope failure potential. Seating of precast double tee beams for the upstairs floor are a potential lifesafety risk.

3.6 Other Factors - *for allowance of all other relevant characterstics of the building*

For ≤ 3 storeys - Maximum value 2.5
otherwise - Maximum value 1.5.
No minimum.

Factor F 1.20

Record rationale for choice of Factor F:

Various structural systems: 1) Reinforced concrete (RC) frame 2) RC masonry 3) RC short precast walls 4) Steel cross braced frames 5) Timber eccentrically braced frames 6) Precast floor units 7) RC cantilever columns. Connections between the systems to be checked in DSA. Seems well built with structural robustmness. Structure is visible.

PAR

3.7 Performance Achievement Ratio (PAR)
(equals **A x B x C x D x E x F**)

Transverse **0.59**

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Initial Evaluation Procedure (IEP) Assessment - Completed for Hutt City Council

Street Number & Name:	6 Huia Street	Job No.:	9735
AKA:	Huia Swimming Pool	By:	ULM
Name of building:	Old Building - located to the east - 1979 design	Date:	24/10/2019
City:	Lower Hutt	Revision No.:	42644 v 1

Table IEP-4 Initial Evaluation Procedure Steps 4, 5, 6 and 7

Step 4 - Percentage of New Building Standard *(%NBS)*

		Longitudinal	Transverse
4.1	**Assessed Baseline *%NBS* *(%NBS)*$_b$** (from Table IEP - 1)	71%	71%
4.2	**Performance Achievement Ratio (PAR)** (from Table IEP - 2)	0.84	0.59
4.3	**PAR x Baseline *(%NBS)*$_b$**	60%	40%
4.4	**Percentage New Building Standard *(%NBS)* - Seismic Rating** (Use lower of two values from Step 4.3)		40%

Step 5 - Is *%NBS* < 34? NO

Step 6 - Potentially Earthquake Risk (is *%NBS* < 67)? YES

Step 7 - Provisional Grading for Seismic Risk based on IEP

Seismic Grade C

Additional Comments (items of note affecting IEP based seismic rating)

A detailed seismic assessment would likely foucus on:
Rigid diaphragm analysis including torsion and accidental eccentricity of the upstairs floor.
Connections between structural systems of varying stiffness. For example, at the transverse bracing line to the rear of the m ain pool area, the upstairs slab ends, and no roof bracing is shown on the drawings. This bracing line may move more than the others.
Seating of the precast floor units.
Longitudinal bracing behind the tiered seating.
Strength of cantilever columns and plinths in the transverse direction of the learner's pool area.
Stability and strength of cantilever columns supporting reinforced concrete masonry walls (longitudinal wall to the rear of t he changing facilities and transverse wall to the rear of the main pool area).
strength of the upstairs reinforced concrete masonry walls outwards (or inwards).
Strength of structure supporting the header tanks at the level 3 mezzanine (upstairs attic space).

Relationship between Grade and *%NBS*:

Initial Evaluation Procedure (IEP) Assessment - Completed for Hutt City Council

Street Number & Name:	6 Huia Street	Job No.:	9735
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Name of building:	Old Building - located to the east - 1979 design	Date:	24/10/2019
City:	Lower Hutt	Revision No.:	42644 v 1

Table IEP-5 Initial Evaluation Procedure Step 8

Step 8 - Identification of potential Severe Structural Weaknesses (SSWs) that could result in significant risk to a significant number of occupants

8.1	Number of storeys above ground level	2
8.2	Presence of heavy concrete floors and/or concrete roof? (Y/N)	Y

Potential Severe Structural Weaknesses (SSWs):

Note: Options that are greyed out are not applicable and need not be considered.

Occupancy not considered to be significant - no further consideration required

Risk not considered to be significant - no further consideration required

The following potential Severe Structural Weaknesses (SSWs) have been identified in the building that could result in significant risk to a significant number of occupants:

1. None identified
2. Weak or soft storey (except top storey)
3. Brittle columns and/or beam-column joints the deformations of which are not constrained by other structural elements
4. Flat slab buildings with lateral capacity reliant on low ductility slab-to-column connections
5. No identifiable connection between primary structure and diaphragms
6. Ledge and gap stairs

IEP Assessment Confirmed by [redacted] **Signature**

Name

CPEng. No

Initial Evaluation Procedure (IEP) Assessment - Completed for Hutt City Council Page 1

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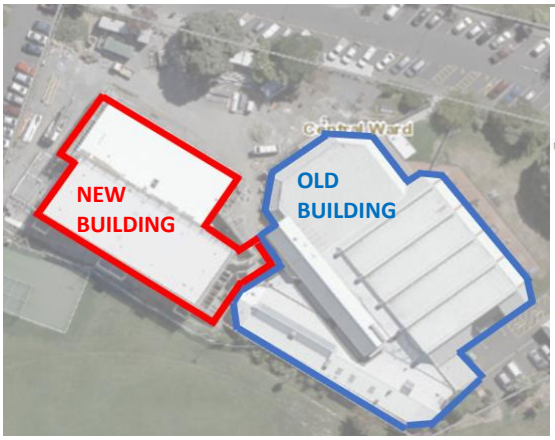
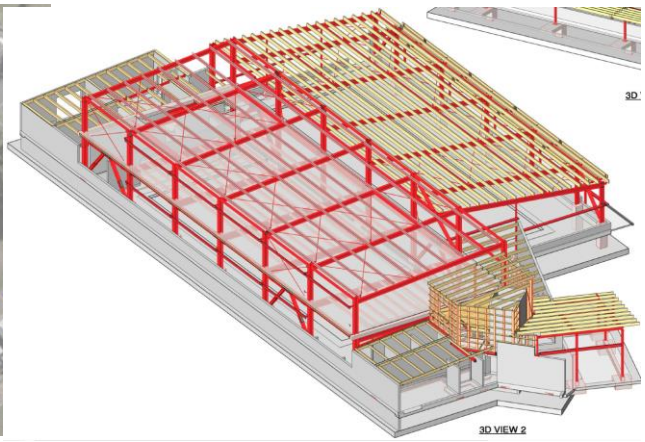
Street Number & Name:	**6 Huia Street**	**Job No.:**	**9735**
AKA:	**Huia Swimming Pool**	**By:**	**ULM**
Name of building:	**New Building - located to the west - 2015 design**	**Date:**	**28/10/2019**
City:	**Lower Hutt**	**Revision No.:**	**42666 v 1**

Table IEP-1 Initial Evaluation Procedure Step 1

Step 1 - General Information

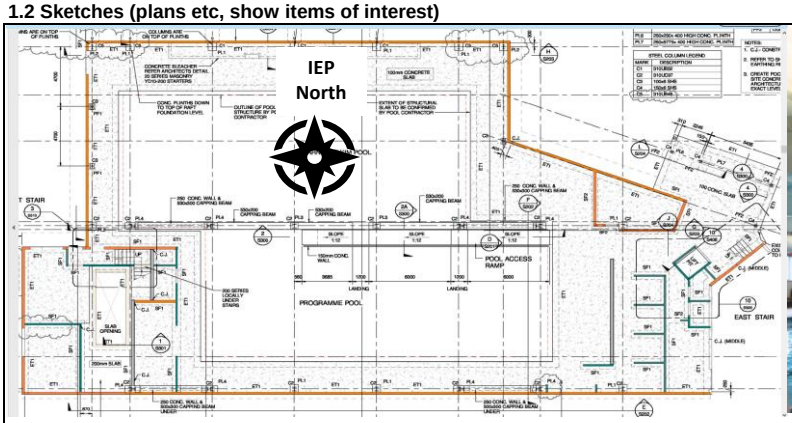
1.1 Photos (attach sufficient to describe building)

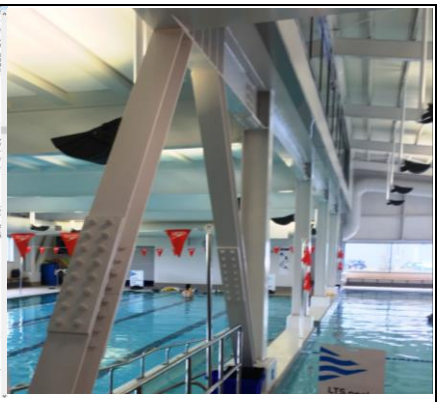




NOTE: THERE ARE MORE PHOTOS ON PAGE 1a ATTACHED

1.2 Sketches (plans etc, show items of interest)





NOTE: THERE ARE MORE SKETCHES ON PAGE 1a ATTACHED

1.3 List relevant features (Note: only 10 lines of text will print in this box. If further text required use Page 1a)

Downstairs offices, staff room and changing facilities at the east end. Downstairs are two swimming pools; and a plant room at the west end. Access to the upstairs is via stairs and lift at the east end, and stairs at the west end. Upstairs there are offices and toilet facilities at the east end. Upstairs is a weights gym; and a plant room at the west end. Roof bracing is tension only cross braced frames. Upstairs floor is rib and infill with 90mm topping concrete. Stairs appear to be pre-cast reinforced concrete with a low friction bearing strip at the bottom and 100mm seating at the top. Reinforced concrete masonry walls around the ground floor offices, staff room, changing facilities at the east end. Reinforced concrete masonry walls around the plant room and storage room at the west end. Transverse direction is moment frames. Longitudinal direction upstairs is cross braced frames. These are a mix of tension only systems and tensions compression systems. Longitudinal direction downstairs is eccentrically braced frames. There are large lights and fully glazed wall over one of the swimming pools. A moment frame beam is welded into the centre of a cross braced frame. The foundations for steel posts are reinforced concrete plinths on a 500mm thick slab on a 2m deep subgrade.

1.4 Note information sources Tick as appropriate

Visual Inspection of Exterior	☑	**Specifications**	☑
Visual Inspection of Interior	☑	**Geotechnical Reports**	☑
Drawings (note type)	☑	**Other (list)**	☐

Inspection of interior & exterior on Thursday 17 October 2019. Geotechnical report by Opus (January 2014). Structural engineering drawings and specification by Opus (December 2015).

Initial Evaluation Procedure (IEP) Assessment - Completed for Hutt City Council

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Name of building:	**New Building - located to the west - 2015 design**	**Date:**	**28/10/2019**
City:	**Lower Hutt**	**Revision No.:**	**42666 v 1**

Table IEP-1a Additional Photos and Sketches

Add any additional photographs, notes or sketches required below:

Note: print this page separately

fig 1 - Seismic gap (left: new building; right: old building).

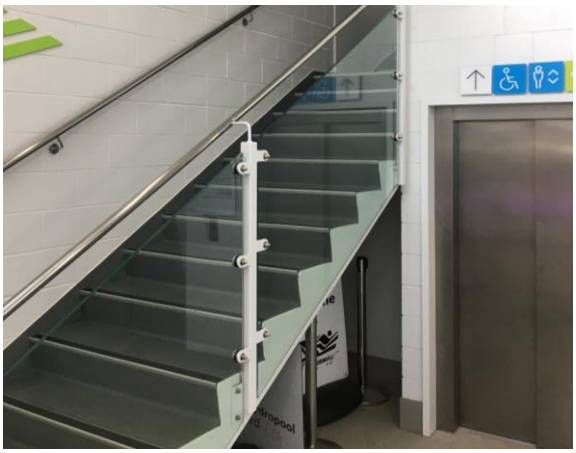

fig 2 - Pre-cast stairs and reinforced concrete lift core.

fig 3 - Eccentrically braced frame and interspan floor above.

fig 4 - Tension only brace fixings.

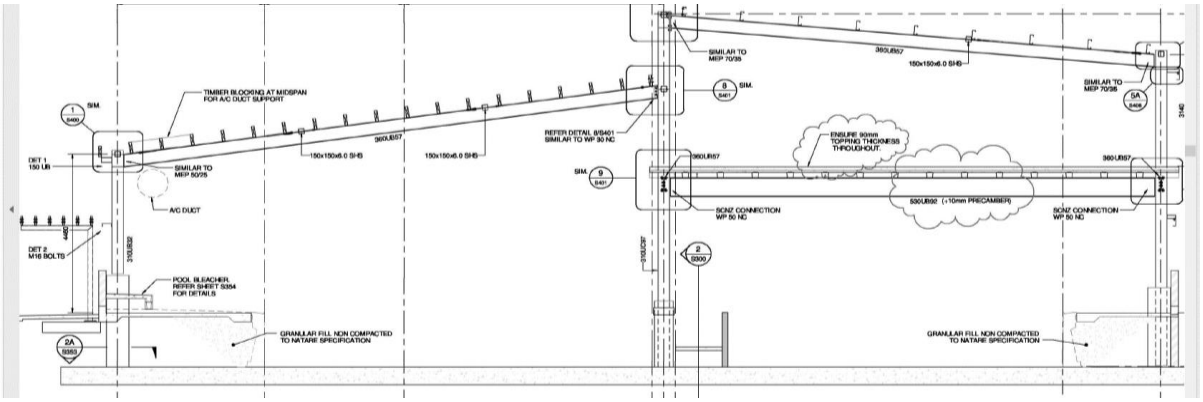

fig 5 - Typical transverse steel moment frame.

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Initial Evaluation Procedure (IEP) Assessment - Completed for Hutt City Council

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Name of building:	**New Building - located to the west - 2015 design**	**Date:**	**28/10/2019**
City:	**Lower Hutt**	**Revision No.:**	**42666 v 1**

Table IEP-2 Initial Evaluation Procedure Step 2

Step 2 - Determination of *(%NBS)*$_b$

(Baseline *(%NBS)* for particular building - refer Section B5)

2.1 Determine nominal *(%NBS)* = *(%NBS)*$_{nom}$

	Longitudinal	Transverse
a) Building Strengthening Data		
Tick if building is known to have been strengthened in this direction	☐	☐
If strengthened, enter percentage of code the building has been strengthened to	N/A	N/A
b) Year of Design/Strengthening, Building Type and Seismic Zone		
Pre 1935	○	○
1935-1965	○	○
1965-1976	○	○
1976-1984	○	○
1984-1992	○	○
1992-2004	○	○
2004-2011	○	○
Post Aug 2011	◉	◉
Building Type:	**Not applicable**	**Not applicable**
Seismic Zone:	**Not applicable**	**Not applicable**
c) Soil Type		
From NZS1170.5:2004, Cl 3.1.3 :	D Soft Soil	D Soft Soil
From NZS4203:1992, Cl 4.6.2.2 : (for 1992 to 2004 and only if known)	**Not applicable**	**Not applicable**
d) Estimate Period, *T*		
Comment:	h_n = 8.4	8.4 m
Two storey steel moment frame and steel EBF and steel CBF and masonry shear walls.	A_c = 1.00	1.00 m^2
Moment Resisting Concrete Frames: $T = \max\{0.09h_n^{0.75}, 0.4\}$	○	○
Moment Resisting Steel Frames: $T = \max\{0.14h_n^{0.75}, 0.4\}$	○	◉
Eccentrically Braced Steel Frames: $T = \max\{0.08h_n^{0.75}, 0.4\}$	◉	○
All Other Frame Structures: $T = \max\{0.06h_n^{0.75}, 0.4\}$	○	○
Concrete Shear Walls $T = \max\{0.09h_n^{0.75}/A_c^{0.5}, 0.4\}$	○	○
Masonry Shear Walls: $T \leq 0.4$sec	○	○
User Defined (Input Period):	○	○
Where h_n = height in metres from the base of the structure to the uppermost seismic weight or mass.	**T:** 0.40	0.69
e) Factor A: Strengthening factor determined using result from (a) above (set to 1.0 if not strengthened)	**Factor A:** 1.00	1.00
f) Factor B: Determined from NZSEE Guidelines Figure 3A.1 using results (a) to (e) above	**Factor B:** 1.00	1.00
g) Factor C: For reinforced concrete buildings designed between 1976-84 Factor C = 1.2, otherwise take as 1.0.	**Factor C:** 1.00	1.00
h) Factor D: For buildings designed prior to 1935 Factor D = 0.8 except for Wellington and Napier (1931-1935) where Factor D may be taken as 1.0, otherwise take as 1.0.	**Factor D:** 1.00	1.00
***(%NBS)*$_{nom}$ = AxBxCxD**	***(%NBS)*$_{nom}$** 100%	100%

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Initial Evaluation Procedure (IEP) Assessment - Completed for Hutt City Council Page 3

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Name of building:	New Building - located to the west - 2015 design	Date:	28/10/2019
City:	Lower Hutt	Revision No.:	42666 v 1

Table IEP-2 Initial Evaluation Procedure Step 2 continued

2.2 Near Fault Scaling Factor, Factor E

If $T \leq 1.5$sec, Factor E = 1

		Longitudinal	Transverse
a) Near Fault Factor, *N(T,D)* (from NZS1170.5:2004, Cl 3.1.6)	N(T,D):	1	1
b) Factor E = 1/N(T,D)	Factor E:	1.00	1.00

2.3 Hazard Scaling Factor, Factor F

a) Hazard Factor, *Z*, for site

Location: Hutt Valley-south of Taita Gorge — Refer right for user-defined locations

Z =	0.4	(from NZS1170.5:2004, Table 3.3)
Z_{1992} =	1.2	(NZS4203:1992 Zone Factor from accompanying Figure 3.5(b))
Z_{2004} =	0.4	(from NZS1170.5:2004, Table 3.3)

b) Factor F

For pre 1992	=	$1/Z$
For 1992-2011	=	Z_{1992}/Z
For post 2011	=	Z_{2004}/Z

	Longitudinal	Transverse
Factor F:	1.00	1.00

2.4 Return Period Scaling Factor, Factor G

a) Design Importance Level, I

(Set to 1 if not known. For buildings designed prior to 1965 and known to be designed as a public building set to 1.25. For buildings designed 1965-1976 and known to be designed as a public building set to 1.33 for Zone A or 1.2 for Zone B. For 1976-1984 set I value.)

	Longitudinal	Transverse
I =	1	1

b) Design Risk Factor, R_o (set to 1.0 if other than 1976-2004, or not known)

	Longitudinal	Transverse
R_o =	1	1

c) Return Period Factor, R (from NZS1170.0:2004 Building Importance Level)

Choose Importance Level: ○ 1 ◉ 2 ○ 3 ○ 4 (Longitudinal) ○ 1 ◉ 2 ○ 3 ○ 4 (Transverse)

2015 Design IL3 and Ro=1.3 was adopted
2019 IEP assessment IL3 and R=1.3 are still correct.
Therefore Factor G = Ro/R = 1.0. Set to 1.0 by selecting IL2 on worksheet.

	Longitudinal	Transverse
R =	1.0	1.0

d) Factor G = IR_o/R

	Longitudinal	Transverse
Factor G:	1.00	1.00

2.5 Ductility Scaling Factor, Factor H

a) Available Displacement Ductility Within Existing Structure

Comment:
Recent construction. Reinforced masonry walls and structural steel.

	Longitudinal	Transverse
μ =	3.00	3.00

b) Factor H

		k_μ (Longitudinal)	k_μ (Transverse)
For pre 1976 (maximum of 2)	=	2.00	2.00
For 1976 onwards	=	1	1
Factor H:		1.00	1.00

(where k_μ is NZS1170.5:2004 Inelastic Spectrum Scaling Factor, from accompanying Table 3.3)

2.6 Structural Performance Scaling Factor, Factor I

a) Structural Performance Factor, S_p (from accompanying Figure 3.4)

Tick if light timber-framed construction in this direction: ☐ (Longitudinal) ☐ (Transverse)

	Longitudinal	Transverse
S_p =	0.70	0.70

b) Structural Performance Scaling Factor = $1/S_p$

	Longitudinal	Transverse
Factor I:	1.00	1.00

Note Factor B values for 1992 to 2004 have been multiplied by 0.67 to account for Sp in this period

2.7 Baseline *%NBS* for Building, *(%NBS)*$_b$

(equals $(\%NBS)_{nom}$ x E x F x G x H x I)

Longitudinal	Transverse
100%	100%

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Table IEP-3 Initial Evaluation Procedure Step 3

Step 3 - Assessment of Performance Achievement Ratio (PAR)
(Refer Appendix B - Section B3.2)

a) Longitudinal Direction

potential CSWs — **Effect on Structural Performance** (Choose a value - Do not interpolate) — **Factors**

3.1 Plan Irregularity

Effect on Structural Performance ○ *Severe* ○ *Significant* ◉ *Insignificant* **Factor A** 1.0

2 pairs of eccentrically braced frames at ground along either side of the upstairs slab. Cross braced frames above and along the north external wall. Similar elastic stiffness expected, therefore centre of mass and rigidity are probably similar locations.

3.2 Vertical Irregularity

Effect on Structural Performance ○ *Severe* ○ *Significant* ◉ *Insignificant* **Factor B** 1.0

None observed.

3.3 Short Columns

Effect on Structural Performance ○ *Severe* ○ *Significant* ◉ *Insignificant* **Factor C** 1.0

None observed.

3.4 Pounding Potential

(Estimate D1 and D2 and set D = the lower of the two, or 1.0 if no potential for pounding, or consequences are considered to be minimal)

a) Factor D1: - Pounding Effect

Note:
Values given assume the building has a frame structure. For stiff buildings (eg shear walls), the effect of pounding may be reduced by taking the coefficient to the right of the value applicable to frame buildings.

Factor D1 For Longitudinal Direction: 1.0

Table for Selection of Factor D1	Severe	Significant	Insignificant
Separation	0<Sep<.005H	.005<Sep<.01H	Sep>.01H
Alignment of Floors within 20% of Storey Height	◉ 1	○ 1	○ 1
Alignment of Floors not within 20% of Storey Height	○ 0.4	○ 0.7	○ 0.8

Siesmic gap appears to be greater than 100mm.

b) Factor D2: - Height Difference Effect

Factor D2 For Longitudinal Direction: 1.0

Table for Selection of Factor D2	Severe	Significant	Insignificant
	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

Siesmic gap appears to be greater than 100mm.

Factor D 1.0

3.5 Site Characteristics - *Stability, landslide threat, liquefaction etc as it affects the structural performance from a life-safety perspective*

Effect on Structural Performance ○ *Severe* ○ *Significant* ◉ *Insignificant* **Factor E** 1.0

Greater Wellington Regional Council Flex Map Viewer, moderate liquefaction potential, low slope failure potential. 500mm thick slab on 2m subgrade. Geotechnical report shows a small area of liquifiable lenses foundation depth.

3.6 Other Factors - *for allowance of all other relevant characterstics of the building*

For ≤ 3 storeys - Maximum value 2.5
otherwise - Maximum value 1.5.
No minimum.

Factor F 1.2

Record rationale for choice of Factor F:

Apparently well built. Much of the structure is visible.

3.7 Performance Achievement Ratio (PAR)
(equals **A x B x C x D x E x F**)

PAR

Longitudinal **1.20**

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Table IEP-3 Initial Evaluation Procedure Step 3

Step 3 - Assessment of Performance Achievement Ratio (PAR)
(Refer Appendix B - Section B3.2)

b) Transverse Direction

Factors

potential CSWs — **Effect on Structural Performance** (Choose a value - Do not interpolate)

3.1 Plan Irregularity

Effect on Structural Performance ○ *Severe* ○ *Significant* ◉ *Insignificant* — **Factor A** 1.0

Long reinforced concrete masonry shear walls with few openings are at each end of the level 1 slab. Steel moment frames above. Centre of mass and centre of rigidity are expected to be similar.

3.2 Vertical Irregularity

Effect on Structural Performance ○ *Severe* ○ *Significant* ◉ *Insignificant* — **Factor B** 1.0

None observed.

3.3 Short Columns

Effect on Structural Performance ○ *Severe* ○ *Significant* ◉ *Insignificant* — **Factor C** 1.0

None observed.

3.4 Pounding Potential

(Estimate D1 and D2 and set D = the lower of the two, or 1.0 if no potential for pounding, or consequences are considered to be minimal)

a) Factor D1: - Pounding Effect

Note:
Values given assume the building has a frame structure. For stiff buildings (eg shear walls), the effect of pounding may be reduced by taking the coefficient to the right of the value applicable to frame buildings.

Factor D1 For Transverse Direction: 1.0

Table for Selection of Factor D1	Severe 0<Sep<.005H	Significant .005<Sep<.01H	Insignificant Sep>.01H
Separation			
Alignment of Floors within 20% of Storey Height	◉ 1	○ 1	○ 1
Alignment of Floors not within 20% of Storey Height	○ 0.4	○ 0.7	○ 0.8

Siesmic gap appears to be greater than 100mm.

b) Factor D2: - Height Difference Effect

Factor D2 For Transverse Direction: 1.0

Table for Selection of Factor D2	Severe 0<Sep<.005H	Significant .005<Sep<.01H	Insignificant 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

Siesmic gap appears to be greater than 100mm.

Factor D 1.0

3.5 Site Characteristics - *Stability, landslide threat, liquefaction etc as it affects the structural performance from a life-safety perspective*

Effect on Structural Performance ○ *Severe* ○ *Significant* ◉ *Insignificant* — **Factor E** 1.0

Greater Wellington Regional Council Flex Map Viewer, moderate liquefaction potential, low slope failure potential. 500mm thick slab on 2m subgrade. Geotechnical report shows a small area of liquifiable lenses foundation depth.

3.6 Other Factors - *for allowance of all other relevant characterstics of the building*

For ≤ 3 storeys - Maximum value 2.5
otherwise - Maximum value 1.5.
No minimum.

Factor F 1.20

Record rationale for choice of Factor F:

Apparently well built. Much of the structure is visible.

PAR

3.7 Performance Achievement Ratio (PAR) (equals **A x B x C x D x E x F**) — **Transverse** **1.20**

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Table IEP-4 Initial Evaluation Procedure Steps 4, 5, 6 and 7

Step 4 - Percentage of New Building Standard *(%NBS)*

		Longitudinal	Transverse
4.1	**Assessed Baseline *%NBS (%NBS)*$_b$** (from Table IEP - 1)	100%	100%
4.2	**Performance Achievement Ratio (PAR)** (from Table IEP - 2)	1.20	1.20
4.3	**PAR x Baseline *(%NBS)*$_b$**	>100%	>100%
4.4	**Percentage New Building Standard *(%NBS)* - Seismic Rating** (Use lower of two values from Step 4.3)		>100%

Step 5 - Is *%NBS* < 34? NO

Step 6 - Potentially Earthquake Risk (is *%NBS* < 67)? NO

Step 7 - Provisional Grading for Seismic Risk based on IEP

Seismic Grade A+

Additional Comments (items of note affecting IEP based seismic rating)

No further comments.

Relationship between Grade and *%NBS*:

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Table IEP-5 Initial Evaluation Procedure Step 8

Step 8 - Identification of potential Severe Structural Weaknesses (SSWs) that could result in significant risk to a significant number of occupants

8.1	Number of storeys above ground level	2
8.2	Presence of heavy concrete floors and/or concrete roof? (Y/N)	Y

Potential Severe Structural Weaknesses (SSWs):

Note: Options that are greyed out are not applicable and need not be considered.

Occupancy not considered to be significant - no further consideration required

Risk not considered to be significant - no further consideration required

The following potential Severe Structural Weaknesses (SSWs) have been identified in the building that could result in significant risk to a significant number of occupants:

1. None identified
2. Weak or soft storey (except top storey)
3. Brittle columns and/or beam-column joints the deformations of which are not constrained by other structural elements
4. Flat slab buildings with lateral capacity reliant on low ductility slab-to-column connections
5. No identifiable connection between primary structure and diaphragms
6. Ledge and gap stairs

IEP Assessment Confirmed by [redacted] **Signature**

[redacted] **Name**

[redacted] **CPEng. No**

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