From: Euan Kyle
To: [redacted]
Subject: RE: LGOIMA Request
Date: Monday, 14 December 2020 4:21:48 PM
Attachments: HCC-SSL Contract pdf
NZSEE2020_Submission_Ref-0069_Paper.pdf
image001.jpg
image002.jpg
image003.jpg
hccsmalllogo_12fb0640-f486-4c5a-a775-f4ab1b1dfb5d.jpg
12153HaHEmailSignatureFINAL_3cd6181d-2156-4dde-9fbd-b6f7f302ed05.JPG
13139RubbishandRecyclingEngagementEMAIL_5ddea2b0-952f-4aed-8ca4-d26306e488b2.jpg

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14/12/2020

[redacted]

Dear [redacted]

Request for Information – Local Government Official Information and Meetings Act 1987

We refer to your official information request dated 20 November 2020 for information regarding a project between Seismic Solutions and Hutt City Council.

Please find the contract and submission paper attached.

The project has been completed at this point of time with the publishing of the paper.

Please see a list of documents Hutt City Council has regarding the project:

- **Building Consent Monitoring.xlsx**
- **Earthquake-prone buildings register monitoring.xlsx**
- **List of Multi-Storey Buildings – 3 Storeys or Higher.xlsx**
- **URM Parapets and Facades – Final.xlsx**
- **Doc 1_Contract for Services WelTec_HCC.doc**
- **Doc 2_R&I_Fund_HCC_v270618.doc**
- **HCC-SSL Contract.PDF**
- **NZSEE2020_Submission_Ref-0069_Paper.PDF**

In order to provide you with further context in terms of the information you have requested, please note that the work relating to the project in question was outside of the scope of the ongoing contract that Hutt City Council already had in place with Seismic Solutions. The work relating to the project in question was carried out on a pro bono basis. This mutually benefited Hutt City Council by increasing our seismic resilience knowledge of the city while also advancing the seismic solutions staff careers in the research area. This means that the hourly rates listed in the contract weren't charged or paid in relation to any of the work specific to this project.

You have the right to seek an investigation and review by the Ombudsman of this decision. Information about how to make a complaint is available at www.ombudsman.parliament.nz or freephone 0800 802 602.

If you wish to discuss this decision with us, please feel free to contact me at euan.kyle@huttcity.govt.nz.

Yours sincerely

Hutt City Council

Euan Kyle
Senior Advisor, Official Information and Privacy

Hutt City Council, 30 Laings Road, Private Bag 31912, Lower Hutt 5040, New Zealand
T 04 570 6702 W www.huttcity.govt.nz

Encl HCC-SSL Contract.PDF

NZSEE2020_Submission_Ref-0069_Paper.PDF

From: Euan Kyle
Sent: Tuesday, 24 November 2020 2:36 PM
To: [redacted]
Subject: RE: LGOIMA Request

24/11/2020

[redacted]

Dear [redacted]

REQUEST FOR INFORMATION - LOCAL GOVERNMENT OFFICIAL INFORMATION AND MEETINGS ACT 1987: ACKNOWLEDGEMENT OF REQUEST

I am writing to acknowledge receipt of your official information request dated 20 November 2020 for information regarding a project between Seismic Solutions and Hutt City Council.

We received your request on 20 November 2020. We will endeavour to respond to your request as soon as possible and in any event no later than 20 working days after the day your request was received. If we are unable to respond to your request by then, we will notify you of an extension of that timeframe. Please note, that the days between 20th December 2020 and 10th January 2021 are not considered working days.

If any additional factors come to light which are relevant to your request, please do not hesitate to contact us so that these can be taken into account.

Yours sincerely,

Euan Kyle
Senior Advisor, Official Information and Privacy

Hutt City Council, 30 Laings Road, Private Bag 31912, Lower Hutt 5040, New Zealand
T 04 570 6702 W www.huttcity.govt.nz

Euan Kyle
Senior Advisor – OIA & Privacy

Hutt City Council, 30 Laings Road, Private Bag 31912, Lower Hutt 5040, New Zealand

T 04 570 6702, W www.huttcity.govt.nz

From: Contact
Sent: Friday, 20 November 2020 12:13 PM
To: Information Management Team
Subject: LGOIMA Request

Name	[redacted]
Organisation	
Address	
Telephone	
Mobile	
Email	[redacted]
Response By	Email
Information requested	Hello, I would like to make a request of information regarding to a project between Seismic Solutions and Hutt City Council. The project is about creating a database of buildings in Lower and Upper Hutt which might pose risks in case of earthquakes. I would like to request agreement and contract between Seismic Solutions and Hutt City Council regarding the project, the progress of the project, and the list of documents Hutt City Council has regarding the project.
File upload	
Urgency Reason	WelTec students took part in the project as their final year project. In the beginning, students were told, they will get weekly allowance from Hutt City Council for working on this project. However, when a student decided to work on this project, the student was told that there will be no allowance from Hutt City Council. Another student was not even informed about the allowance whatsoever. Therefore, I am interested in what was the contract like.
Invisible CAPTCHA	2020-11-20 11:30:30

SERVICE CONTRACT FOR BCA REQUIREMENTS

[Instructions (please delete): Refer to User Guide to Short Form Services Contract - LEG-GDL-002 - when preparing this contract]

PARTIES

Hutt City Council a BCA - Territorial Authority (Council)
Seismic Solutions Limited (the Supplier)

It is agreed that the supplier will provide the services to Council on the terms and conditions attached.

Signed on behalf of **Hutt City Council BCA** by: **Derek Kerite** Date: **10 December 2018**	10/12/18
In the presence of: Witness: **Jekkie Suwanposee** Occupation: **Executive Assistant** Address: **Hutt City Council**	10/12/18
Signed on behalf of **Seismic Solutions Limited** by: In the presence of: Witness: Occupation: Address: Date:	Dr. Najif Ismail, Director 10/12/18

TERMS AND CONDITIONS

1 **Contract term**

1.1 This contract for services commences on the commencement date set out in Schedule 1 and ends on the expiry of the term set out in Schedule 1 unless terminated earlier in accordance with this contract.

2 Performance of services

2.1 The Supplier will perform the services outlined in Schedule 1 with reasonable care, skill and diligence in accordance with this contract and with:

2.1.1 Council's Policies stipulated in Schedule 2;

2.1.2 The Quality Assurance requirements stipulated in Schedule 3;

2.1.3 Professional industry standards and codes of conduct;

2.1.4 All relevant laws and codes of practice;

2.1.5 Reasonable directions from Council.

2.2 The Supplier warrants that:

2.2.1 The Supplier has the necessary skills, qualifications and resources to provide the services to Council in accordance with this contract; and

2.2.2 No material used by the Supplier in the provision of the Services infringes any patent, trademark or other intellectual property right of a third party;

2.2.3 It has in place and will comply with a health and safety plan that meets the requirements of the Health and Safety in Employment Act 1992 and is consistent with Council policy.

2.3 The Supplier will keep an accurate and complete written record of the Services and on request and at its own cost provide Council with a copy of those records.

3 Supply of labour, materials and consents

3.1 Unless specified in Schedule 1, the Supplier will supply at its own cost everything necessary for the performance of the Services under this contract.

3.2 The Supplier will at its own cost obtain any consents and permits required by law in order to perform the Services other than those set out in Schedule 1.

4 Appointment of subcontractors

4.1 Other than the approved subcontractors set out in Schedule 1, the Supplier will not appoint a subcontractor to perform any part of the Services without the prior written approval of Council.

5 Performance of employees, agents and subcontractors

5.1 The Supplier will ensure that all its employees, subcontractors, agents and advisers comply with the Supplier's restrictions and obligations under this contract.

5.2 The Supplier will at no cost to Council remedy any error made or contributed to by the Supplier or any of the Supplier's employees, agents, subcontractors or advisers.

6 Failure to provide services

6.1 Where the Supplier fails to provide all or any part of the Services, Council may, direct Council's own personnel or another contractor to provide the Services and all costs incurred will be the responsibility of the Supplier.

6.2 If the Supplier fails to perform Services, without prior agreement, for more than 5 Working Days Council may immediately by written notice to the Supplier terminate this contract.

7 Payments of service fees

7.1 Council will pay the Supplier the service fees, as set out in Schedule 1, for performance of the Services on receipt of a valid tax invoice from the Supplier and in accordance with Schedule 1.

7.2 If in Council's opinion, the Supplier has failed to perform the Services in accordance with this contract, Council, may make deductions from the service fees accordingly.

7.3 If Council disputes an invoice (or part of an invoice) issued by the Supplier then Council must notify the Supplier of the dispute and the reasons for the dispute, and may withhold payment of the disputed part of the invoice until the dispute is resolved.

8 Set off

8.1 Council may deduct from any amount payable to the Supplier any overpayment made by Council to the Supplier or any amount payable by the Supplier to Council.

9 Dispute resolution

9.1 A party to this contract may not commence any court or arbitration proceedings relating to a dispute under this contract unless it has complied with the clauses below relating to dispute resolution (except where the party seeks urgent interlocutory or injunctive relief).

9.2 A party claiming that a dispute has arisen must give written notice, within 5 Working Days of the dispute arising to the other party specifying the nature of the dispute.

9.3 On receipt of such notice, the parties must endeavour to resolve the dispute using informal dispute resolution techniques. If the parties cannot agree then the matter must be submitted to arbitration.

10 Force Majeure

10.1 Neither party will be liable for any delay or failure to perform its obligations under this contract if such delay or failure is the direct result of a Force Majeure event

10.2 If a delay or failure to perform the party's obligations under this contract as a direct result of a force majeure event exceeds 20 Working Days then either party may immediately terminate this contract by written notice to the other party.

11 Termination

11.1 Council may immediately terminate this contract by notice in writing to the Supplier if:

11.1.1 The Supplier becomes or takes any step towards becoming insolvent;

11.1.2 The Supplier commits a serious breach of the contract provided that the Supplier receives written notice of this breach from Council.

11.2 Either party may terminate this contract on 10 Working Day's written notice.

12 Confidentiality

12.1 Neither party may disclose any Confidential Information unless:

12.1.1 It is authorised in writing by the other party;

12.1.2 It is required by law; or

12.1.3 The information is already in the public domain other than as a result of a breach by a party of this confidentiality obligation.

The obligation in this clause will survive termination or expiry of this contract.

12.2 Nothing in this clause restricts or affects any right or duty Council may have as a territorial authority to disclose or report to any person on this contract, its terms or the provision of the Services.

12.3 The Supplier acknowledges that Council is subject to the Local Government Official Information and Meetings Act 1987 and may be required to release information about the Services and the Supplier.

13 Insurance

13.1 The Supplier will effect and maintain insurance cover stipulated in Schedule 1 and will provide evidence of this insurance if required by Council.

14 Indemnity

14.1 The Supplier will be liable for and indemnifies Council against each liability, expense, loss, cost, claim or damage (including legal fees on a solicitor and client basis and debt collection fees) incurred by Council which arises directly or indirectly from:

14.1.1 The negligence, wilful act or omission or breach of this contract by the Supplier or its employees, agents, subcontractors or advisers; or

14.1.2 Any breach of any warranty given by the Supplier under this contract.

14.2 The Supplier's obligations under this clause survive termination or expiry of the contract.

15 Notices

15.1 All notices and other communications are to be in writing and sent to the relevant party's contact person as detailed in Schedule 1.

16 Assignment

16.1 The Supplier will not assign its rights under this contract without the written consent of Council.

17 Taking bribes

17.1 The Supplier will not accept any payment, gift or other considerations from any person that would place the Supplier or Council under any obligation to that person.

18 Statements to the media

18.1 The Supplier will not make any press statements or media releases in respect of this contract and will refer any requests from the media to Council.

19 Entire agreement

19.1 This contract (including all the schedules and attachments) records the entire arrangement between the parties relating to the provision of the Services and supersedes all previous arrangements, whether written, oral or both.

20 Relationship

20.1 Nothing in this contract constitutes the parties as employer/employee, partners or as agents for each other. No party has any authority to bind the other or act on its behalf except to the extent expressly provided for by this contract.

21 Amendment

21.1 This contract cannot be amended, modified, varied or supplemented except in writing signed by the duly authorised representatives of the parties.

22 Waiver

22.1 A right under this contract cannot be waived except by notice in writing signed by that party.

22.2 No waiver of any breach of this contract is a waiver of any other or subsequent breach.

23 Costs

23.1 Each party shall bear its own cost incurred in the preparation and execution of this contract.

24 Council as a territorial authority

24.1 The Supplier will not be entitled to any compensation for loss or damage suffered as a result of Council properly exercising its statutory rights, powers or duties as the territorial authority.

25 Governing law and jurisdiction

25.1 The law of New Zealand applies to this contract.

26 Definitions

26.1 In this contract, unless the context otherwise requires:

Working Day means any day except -

a Saturday, Sunday, Good Friday, Easter Monday, Anzac Day, the Sovereign's Birthday, Labour Day, and Waitangi Day; and

b The day observed in the appropriate area as the anniversary of the province of which the area forms a part; and

c A day in the period beginning on 20 December in any year and ending with the close of 10 January in the following year.

Confidential information of a party means any information relating to that party's business and employees which comes into the possession of the other party as a result of this contract or the performance of this contract but excludes information which is:

a generally available to the public (but not because the other party has disclosed it or allowed it to be disclosed); or

b independently developed by the other party or a third party.

Force Majeure event means earthquake (including fire following), war and other hostilities, terrorism or sabotage, ionising radiation or contamination from radioactivity, rebellion, revolution, military or usurped power or civil war; or tempest or flood.

Services means the services set out in Schedule 1;

Term means the term of the contract set out in Schedule 1.

26.2 References to a party include that party's successors and permitted assigns or transferees.

SCHEDULE 1

Scope of Services (Key performance Indicators)

1. Review the structural design of specific building consent applications as requested by Hutt City Council BCA. The scope of the review will be dependent on the project and will be identified by HCC prior to commencement of each individual review.
2. Ensure that each regulatory review is completed within 5 working days unless another acceptable timeframe is previously agreed to by HCC. Timeframes for full peer reviews (PS2) will be agreed prior to commencement of work.
3. A Producer Statement (PS2) is provided for any full structural reviews or when required by HCC.
4. At the conclusion of each review appropriate documentation is provided to HCC showing decisions, reasons for the decisions and the outcomes.
5. Maintain a current Chartered Professional Engineer registration.

Business Contact details: Seismic Solutions Limited, PO Box 45133, Waterloo, Lower Hutt 5042

Supplier's contact person: Dr. Najif Ismail

Professional Qualifications: PhD in Civil Engrg, MSc in Civil Engrg, BSc (Hons.) in Civil Engrg

Contact details: Email: najif@seismicsolutions.co.nz Phone: 021 2166562

Licences/consents supplied by Council: .....

Services: *Details of scope of service*: As listed above

Service fee (plus GST): Charged on the following hourly rates: Senior Structural Engineer @ $240.00 per hour; Structural Engineer @ $145.00 per hour; Structural Technician/ Drafter @ $115.00 per hour

Time frame for payment

(to be consistent with Council's payment policy) eg: .....

Insurance requirements: Professional Indemnity Insurance (Cover: $ 1,000,000.00)

Public liability: Public Liability Insurance (Cover: $ 2,000,000.00)

Public insurance *(if appropriate)*: .....

Approved subcontractors: N/A

Commencement Date: 3 December 2018

Council's contact person: Derek Kerite – Building Manager

Contact details: Email: derek.kerite@huttcity.govt.nz Phone: 04 5706960

SCHEDULE 2 – COUNCIL POLICIES

Producer Statement Policy

SCHEDULE 3 – QUALITY ASSURANCE REQUIREMENTS

As a BCA, there is a requirement set out in Regulation 17 of the Building (Accreditation of Building Consent Authorities) Regulations 2006 for Assuring Quality.

Note:

- The Building Manager is to identify quality assurance requirements and levels for each contract from the following schedule, before commencement of the contract.
- A time frame response is required for building consent applications as regulated by the Building Act 2004 and related amendments.
- Upon receipt of an application, building consents are to be granted or refused within 20 working days. A response timeframe of 5 working days is required from the contractor, unless a request for further reasonable information is made through the building consents officer to suspend the building application.

Quality Assurance for BCAs		**Quality Assurance required of contractors by BCAs**			
Building Manager or Team Coordinator to identify scope of engagement required by BCA Regulation 17 Chose the appropriate requirements for each contract		Tick (✓) as required Cross (x) if not required	Suggested described evidence required (To be collected at time of signing contract. Evidence attached to contract.)	Tick (✓) received attached to contract	Audit Review. Outcomes process followed
1.	**Documented polices and procedures - Policies and procedures** are a set of documents that describe an organization's policies for operation and the procedures necessary to fulfill the policies.	✓	High level overview of polices and procedures identified as being used by contractor at time of signing this document and examples	✓	
2.	**Quality Policy** - The overall intentions and direction of an organization as regards quality as formally expressed by top management.	✓	Copy of quality policy as expressed by contactors top management	✓	
3.	**Operation to be limited to "Scope"** - an area in which something acts or operates or has power or control:		Identified area of scope as identified by this contract		
4.	**Internal Performance review** - Performance appraisal, also known as employee appraisal, is a method by which the job performance of an employee is evaluated (generally in terms of quality, quantity, cost and time).	✓	Review of performance parameters for this contract responded within 5 working days of signing contract unless suspended through consenting officer see documented process refer to communication log for project	✓	
5.	**Continuous Improvement-Continuous Improvement Process** (CIP, or CI) is a management process whereby delivery (customer valued) processes are constantly evaluated and improved in the light of their efficiency, effectiveness and flexibility.		Improvement identified in service provide by contractor through process procedures as identified by contractor or consenting officer		

6.	**Corrective action system** - action to eliminate the cause of a detected nonconformity or other undesirable situation. Note: There can be more than on cause for a non-conformance. Corrective action is taken to prevent recurrence, whereas preventive action is taken to prevent occurrence.		Non conformance reported to Building Manager Time frames not adhered to after signing contract with out justification		
7.	**Human Resource management** - The talents and skills of a human or humans that contributes to the production of goods and services.	✓	Identified qualifications of consultant undertaking the work or supervision by CPEng engineer in appropriate field check of Register	✓	
8.	**Procedure for ensuring necessary technical and administrative information facilities and equipment** are – Available, Appropriate, Remain fit for purpose - obtainable or accessible and ready for use or service Able to meet the need; suitable or fitting. be agreeable or acceptable to	✓	Identified place of work appropriate forms of communication available through contact details as identified by this contract	✓	
9.	**Comprehensive internal audits** - An audit performed on a company by its own employees. Usually is more comprehensive but less objective than an external audit conducted by outside, independent auditors.	✓	Copy of last audit review under taken by contractors company Site visit by quality manager confirming audit process under taken E-mail response from contractor about auditing process	✓	
10.	**Conflict of interest management** - Any relationship that is or appears to be not in the best interest of the organization. A conflict of interest would prejudice an individual's ability to perform his or her duties and responsibilities objectively	✓	As managed by this contract and signed by contractor	✓	
11.	**Communication Procedure** - Communication is the process of conveying information from a sender to a receiver with the use of a medium in which the communicated information is understood the same way by both sender and receiver	✓	Outcomes of procedure of contractors communication with council	✓	
12.	**Document control** - Measures taken to regulate the preparation, review, approval, release, distribution, access, storage, security, alteration, change, withdrawal or disposal of documents. Document control procedures do not necessarily need to cover every one of these factors.	✓	Site visit by quality manager confirming audit process under taken E-mail response from contractor about document control process	✓	

13.	**Contract Management** - An agreement formally executed by both customer and supplier (enforceable by law) which requires performance of services or delivery of products at a cost to the customer in accordance with stated terms and conditions. Also agreed requirements between a supplier and customer transmitted by any mean	✓	This contract	✓	
14.	**Records Management** - A set of interconnected and managed processes that function together to achieve a specific management objective	✓	Copy of documentation sent and received in the process of this contract. Reviewed annually by BCA	✓	
15.	**Management review of effectiveness** - To look at the extent to which the system fulfils its purpose.	✓	Identified outcomes of this contract	✓	
16.	**Quality Manager** -All activities of the overall management function that determine the quality policy, objectives and responsibilities and implement them by means such as quality planning, quality control and quality improvement within the quality system	✓	Contractor to identify quality manager at the time of signing this contract Najif Ismail Email: najif@seismicsolutions.co.nz Phone: 0212166562	✓	
17.	**Working under Council's BCA documentation** - Using our process and documentation		BCA Accreditation complies with requirements		

nzsee
NEW ZEALAND SOCIETY FOR EARTHQUAKE ENGINEERING

Earthquake prone building policy implementation in Lower Hutt

N. Ismail
Seismic Solutions Limited, Lower Hutt.

C. Hoddinott, D. Kerite & C. Stevens
Hutt City Council, Lower Hutt.

ABSTRACT

Lower Hutt building stock dates back to early nineteenth century, with the majority of older buildings concentrated in central business district and around historic precincts in Jackson street. Inevitably, buildings built at different times pose different challenges and levels of risk. Lower Hutt was focused in this project, which is a wedge-shaped alluvial plain between two mountain ranges and the harbour. Wellington fault, deemed to have a high probability of generating medium to large magnitude earthquake in near future, runs along the western side of the valley. To describe the building inventory, historical development in design standards was discussed first, with a view to associate potential structural weaknesses to building age. Earthquake prone building policy background was briefly discussed, and the implementation approach adopted was discussed. Building inventory information was gathered from several databases, including those available in public domain as well as the databases developed in-house by HCC for different seismic resilience initiatives. The databases were collated geospatially and were interrogated to find patterns, to understand potential vulnerabilities associated to the Lower Hutt building stock, and to identify buildings that merit further attention.

1 INTRODUCTION

A brief history of earthquakes in New Zealand, how they correspond to the development of the building standards, and the legal continuum to manage earthquake risk associated to existing buildings in New Zealand is discussed in this section.

1.1 Historical New Zealand earthquakes and standards

Seismic resistant design practices has developed over time in New Zealand, as new knowledge emerged from research and lessons were learnt from past earthquakes. Earthquakes in New Zealand have caused 501 deaths directly or indirectly between 1840 and 2016. The history of buildings in Lower Hutt precede the earliest

standards for seismic design, and therefore the complete range of earthquake actions standards need to be referred to in order to compare historic design to modern day code, for the whole building stock.

The 1855 Wairarapa earthquake is believed to be the largest magnitude historical earthquake in New Zealand, estimated to be M_W 8.1 and centred at Wairarapa fault (Grapes & Downes 1997). 74 years later, the M_w 7.3 Murchison earthquake in 1929 caused 17 deaths, mostly from landslides, and damaged many chimneys and brick buildings in Nelson, Greymouth and Westport. Despite the inadequacy observed in the behaviour of unreinforced masonry (URM) buildings under seismic loads, no national regulations followed until the 1931 M_w 7.4 Napier earthquake killed 256, mostly as the result of the collapse of URM buildings and facades in Napier, Hastings and Wairoa (McSaveney 2006). In response, the Draft General Earthquake Building By- law was drafted with 0.1g (where 'g' is the gravitational acceleration at mean sea level) as the minimum required horizontal loading in structural design. Up to this point there was no requirements for seismic load resisting design in New Zealand. Eventually the NZSS No. 95 bylaws (NZSS 1935) were enacted, which were merely a revised version of the previous draft document. However, the minimum required horizontal loading finally was 0.08g. Chapter 8 of NZSS 1900 (NZSS 1965) required 0.12g to be the minimum required horizontal loading in design in Wellington region, which could be scaled based on hazard zone map for other regions.

In NZS 4203 (NZS 1976), the minimum required horizontal loading in design for use in Wellington region was increased to 0.29g, an unprecedented increase which makes 1976 a landmark in seismic design. Revised NZS 4203 (NZS 1992) introduced limit-state design and resulted in further increase in seismic design coefficient for lower Hutt CBD to roughly 0.43. The current seismic loading standards, NZS 1170.5 (NZS 2004), have been amended overtime and still can benefit from further amendments. As an indication, the earthquake loading used to design a building to current earthquake loading standards is 5-6 times larger of that has been used to design buildings prior to 1976. Following the 2010/2011 Canterbury earthquake series, the Canterbury Earthquake Royal Commission recommended review of NZS 1170.5 provisions, in particular provisions relating to spectral ordinate, torsional effects, vertical accelerations, design actions on floors acting as diaphragms, and effects of beam elongation (CERC 2012). Refer to Figure 1 for a visualisation of the development of the New Zealand seismic loadings standards between 1900 and 2012, with a timeline of earthquakes of magnitude ≥M_w 6.

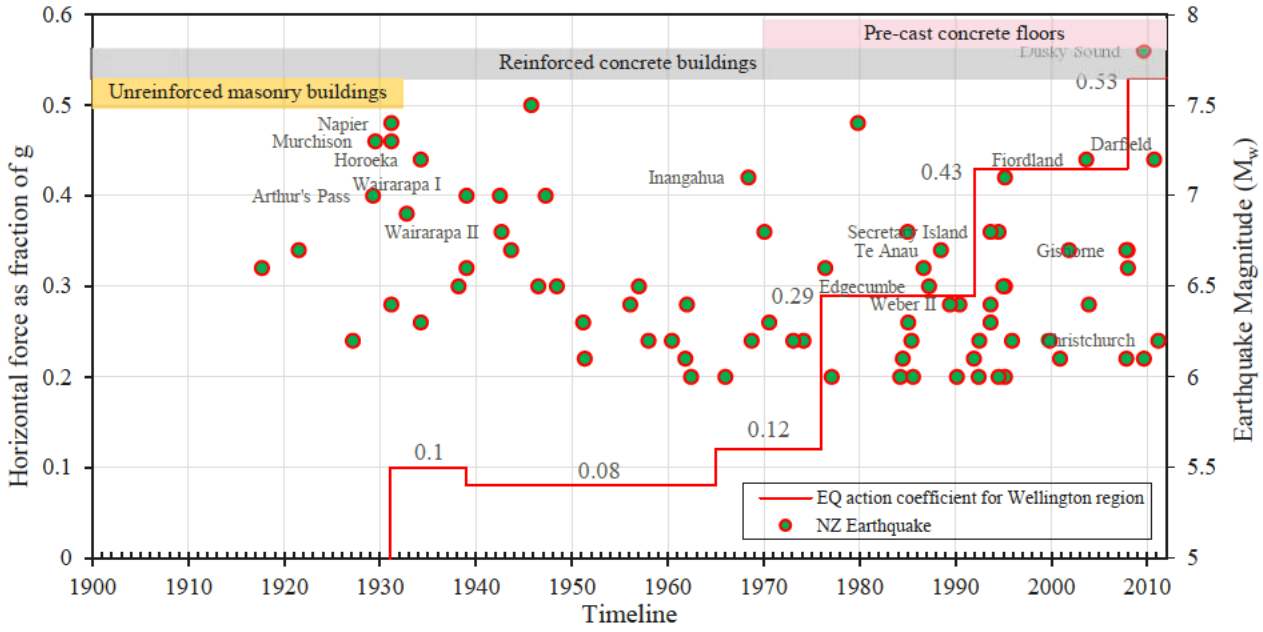


Figure 1: Historical development of New Zealand standards and earthquakes ≥ Mw 6 (1900-2012)

It is noteworthy that the current version of NZS 1170.5 (NZS 2004) does not include explicit requirement for collapse prevention by the exhibition of ductility at the maximum considered earthquake, which is an approximately 1/2500 year event that corresponds to a return period factor of 1.8. The seismic loadings code has developed over time mainly from experience of New Zealand earthquake events and will continue to do so as more lessons are learned and understanding about earthquake resilience increases.

1.2 Existing buildings and earthquake risk management

Earthquake loading standards have changed overtime in New Zealand and many existing buildings may not meet the seismic resistance requirements of the present day. Therefore, to be used in conjunction with the Building Act 2004, the Ministry of Business Innovation and Employment issued the potentially earthquake prone buildings (EPB) methodology (MBIE 2017) to identify, assess, and manage EPBs. The EPB methodology introduced three profile categories to identify potential EPBs: all buildings constructed of brick, block or stone masonry without any reinforcement (URM) built in any year fall under profile A; profile B are buildings built before 1976 that are taller than 12 metres or three storey high; and low-rise buildings built before 1935 that do not fall into profile A are classified as profile C (see Fig. 2). Structures of any type of material that has a significant amount of URM present such as masonry facades, bearing wall, gable end wall and brick chimneys are also classified as profile A (see Fig. 2). The profile categories proposed in EPB methodology worked to address "worst of the worst" buildings. However, there still exists an opportunity to address potential EPBs that might have been left out in this seismic resilience initiative. To identify potential EPBs that might not fit well with the profile categories A to C, two new categories were introduced herein: 1). profile D for buildings built between 1935 and 1976 but less than 10 m in height and profile E for buildings more than 10 m high built after 1976. Preliminary study presented herein was aimed to identify buildings that could have been left out in EPB methodology and to understand relative seismic risk at a high level by interrogating the identified buildings' geospatial attributes. This project can serve as the first step in moving forward to achieving seismic resilient in Lower Hutt.

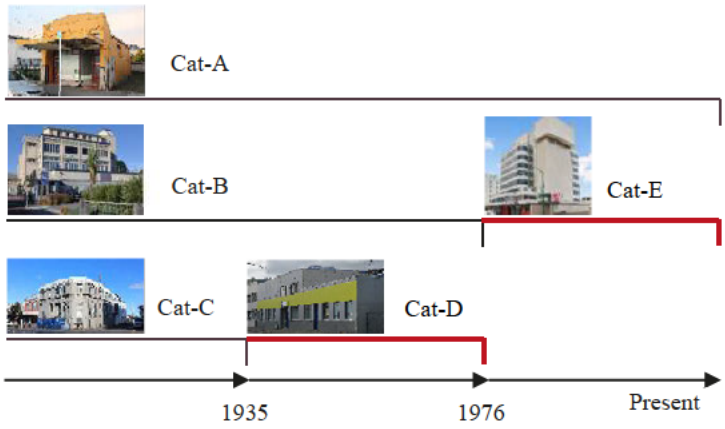


Figure 2: Building profile categories identified in EPB Methodology

2 LOWER HUTT BUILDING STOCK AND EARTHQUAKE HAZARD

2.1 Lower Hutt building stock

It is difficult to obtain information around historic building construction in Lower Hutt but population growth may serve as an indicator. The Lower Hutt population has increased over time. Before 1840 the Hutt valley was dense forest and swampland, with three Maori Pa sites Tatau-o-te-po, Pito-one and Hikoikoi in the present-day Petone area. In the year 1840, the first immigrant ship arrived, and settlers built a township on the banks of the Hutt river, known as Brittania. Only months later most settlers moved to Thorndon because of flooding

from the Hutt river. In 1855 the Wairarapa earthquake raised land in Muka Muka by 2.7 metres (GeoNet 2019) and some of the Hutt valley, draining areas of swampland. Settlers moved back to Lower Hutt and by the 1870's industrial and residential developments had accelerated. The stop-banks begun construction in 1901, and the Seaview oil tanks in the 1930's. The population of Lower Hutt passed 20,000 in 1940 and it became a city. A large number of public/commercial buildings were constructed in the next decade or so. In 1989 new boundaries were established after re-organisation of the local government (Ihimaera-Smiler 2014).

Figure 3 shows the geospatial building data for Lower Hutt and location of fault lines as report by Langridge et al. (2016).Analysis of the building data showed that 72 URM buildings existed in Lower Hutt as of 2015, of these many have undergone some level of strengthening since then. Many pre-1935 buildings also prevail in Lower Hutt, which have been considered in the EPB initiative. A large portion of Lower Hutt buildings was built between 1935 and 1976 in areas of high earthquake risk and therefore this merit further investigation. Likewise, the EPB methodology addressed mostly pre-1976 high rise buildings but research has shown that typical weaknesses are present in buildings even built several years after 1976 (Puranam et al. 2019). The experiences of the 2010/2011 Christchurch and the 2016 Kaikoura Earthquakes highlighted key structural vulnerabilities in buildings built after 1976, which have not been sufficiently addressed in EPB profiles. This being the motivation, an effort was made herein to investigate further number, location, and characteristics of these buildings. The current building stock excluding single family dwellings in Lower Hutt is pre-dominantly 1-2 stories high (approx. 40,000 buildings), with around 84 known three or more story high buildings.

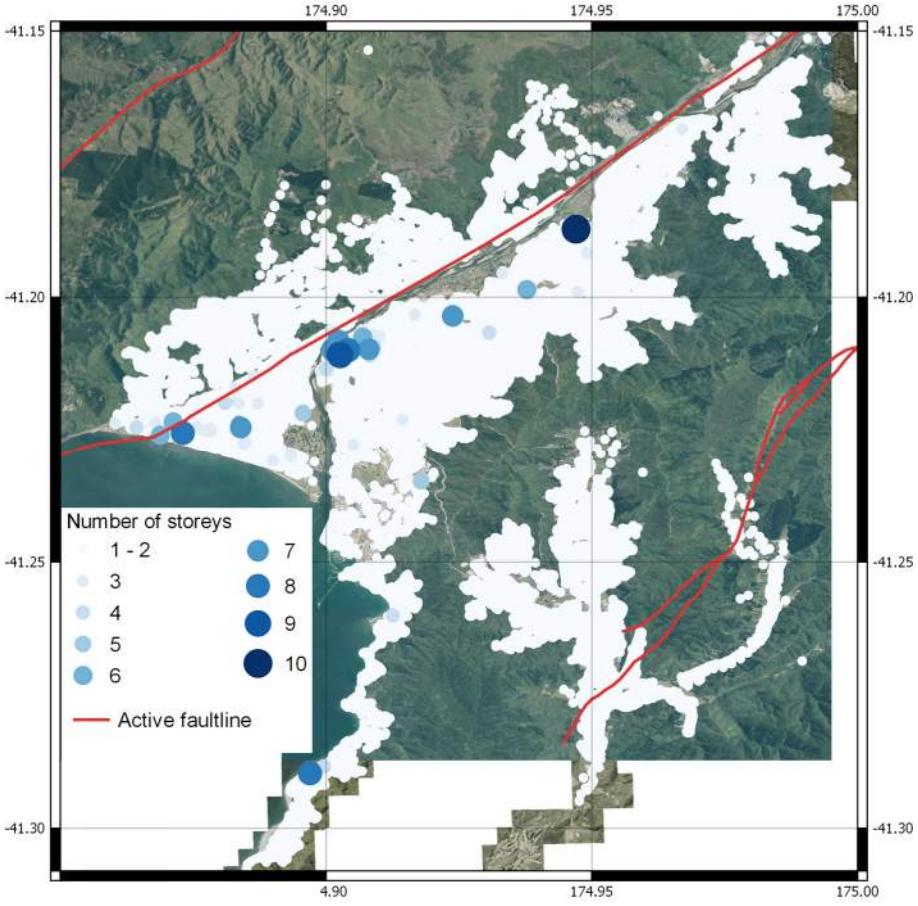


Figure 3: Spatial distribution and height of buildings in Lower Hutt

2.2 Earthquake hazard in Lower Hutt

Lower Hutt is particularly susceptible to earthquake hazards as found through its short history and paleo seismology. The Hutt valley is a sediment filled basin fanning from Taita to Petone, at which point is up to

about 350 metres deep (Boon et al. 2011). The Wellington fault runs along the base of its western hills, parallel to the Otaki and Whiteman's valley faults, and further East is the Wairarapa fault. Wellington fault is an oblique dextral strike-slip fault (GNS 2018), expected to offset about 5 metres horizontally at the surface, and capable of generating a M_w 7.5 earthquake (Saunders et al. 2016), with a probability of producing large earthquakes every 500 to 1000 years (GNS 2018). The segment of Wellington fault adjacent to Hutt valley last ruptured 710 to 870 years ago (Van Dissen et al. 1992), with a probability of 11% to rupture in the next 100 years (Rhoades et al. 2010). Geomorphological studies show that slip on the Wairarapa fault produces uplift in the Hutt valley basin but is overwhelmed by subsidence caused by the Wellington fault. The estimated mean subsidence of the Hutt valley caused by a single rupture event on the Wellington fault ranges from no subsidence at the Taita Gorge to 1.9 m near Petone, 1.5 m near Seaview, and 1.7 m in Lowe Hutt central near the Ewen Bridge (Townsend et al. 2015). Section 14H 1.1.1 of the Hutt City District Plan states the predicted vertical movement in the next large earthquake to be up to 0.5 m. Another active fault-line in Hutt valley is the Whitemans valley fault, which poses only a small contribution to the overall seismic hazard in the region (Begg & VanDissen 1998) because of its recurrence interval of about 15 times that of the Wellington fault. It is believed that the Whiteman valley fault extend into Wainuiomata. More or less all Lower Hutt buildings are within 6 kilometres distance from one the aforementioned fault lines. In the Hutt City District Plan, around 150 m wide zone around Wellington fault has been designated as Wellington Fault Special Study (WFSS) area to mitigate fault rupture hazard (GNS 2016), however limited information exists on management of consent applications in this region. The Greater Wellington GIS viewer shows that liquefaction risk is high in area around Petone, Seaview and reduces in suburbs farther away from shore towards hills. Whereas slope failure risk is high in hilly suburbs. The combined earthquake risk is high around Petone and Seaview, whilst Lowe Hutt central is zoned between moderate high to moderate.

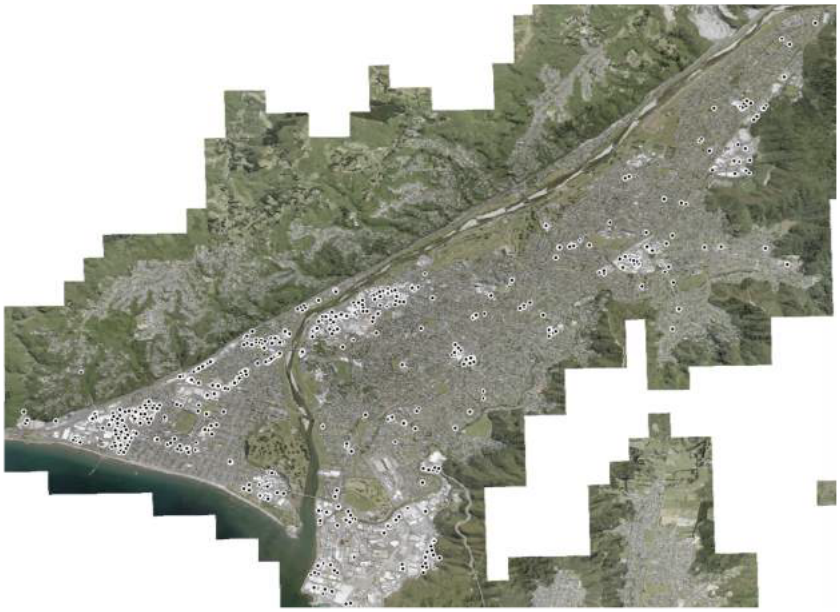
3 SEISMIC RESILIENCE DATABASE INITIATIVE

3.1 Source dataset

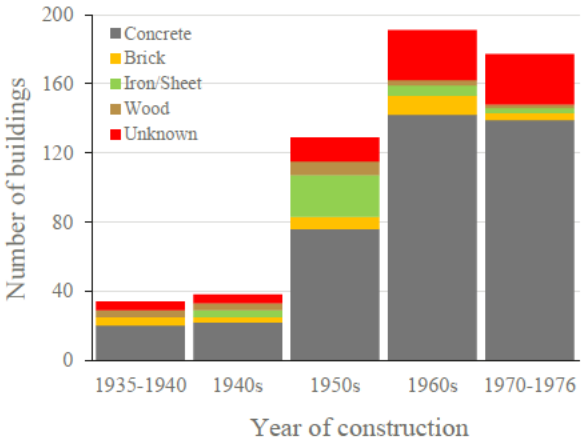
Two main datasets were sourced for the study with the help from Land Information Systems team at HCC. Of these, the first dataset was building polygons from Quotable Value filtered to exclude residential, parking, vacant, and rural properties. This dataset (with 10,807 data entries) was further refined by merging entries with same OBJECTID, bringing the total property polygons to 3661. The remaining 3661 dataset entries were then matched with the HCC building polygon dataset (with 72,510 building polygons). The building polygons with intersecting centroid were identified and the remaining 92 polygons with conflicting centroids were further analysed using HCC public viewer. The final merged dataset consisted of 2352 building polygons (see Fig. 3 for geospatial distribution of these building polygons). Data attributes from other datasets developed as part of other HCC seismic resilience initiatives were collated with processed building polygon dataset.

3.2 Profile D buildings

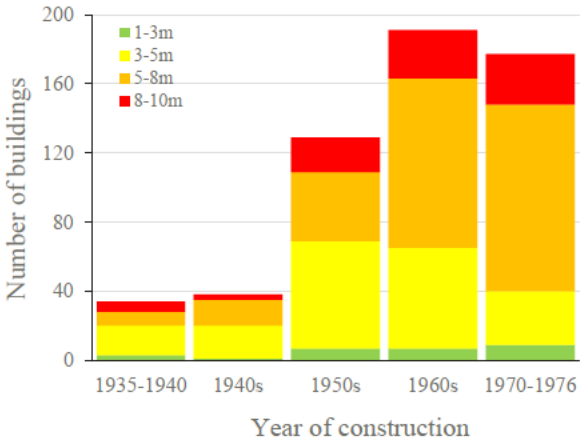
The source dataset was filtered for height, resulting in 2099 buildings with height less than 10 m. Of these, 569 buildings fitted the proposed profile D. Around 50-60% of these buildings were within the WFSS area, posing larger earthquake risk to Hutt city building stock. Figure 4a shows spatial distribution of the profile D buildings. The building dataset was interrogated for primary wall material, which does not represent the lateral load resisting system accurately but can be a rough indication about possible construction type used for the building. By far the most prevalent construction material used for this type of buildings was concrete i.e. more than 75% of the buildings in the dataset (see Fig. 4b), with pre-1950 buildings mostly low-rise and post-1950 ranging from low to medium height buildings (see Fig. 4c). When interrogated the dataset for condition of the building, most of the buildings in profile D ranged between good to average condition.



(a) geospatial distribution



(b) wall material

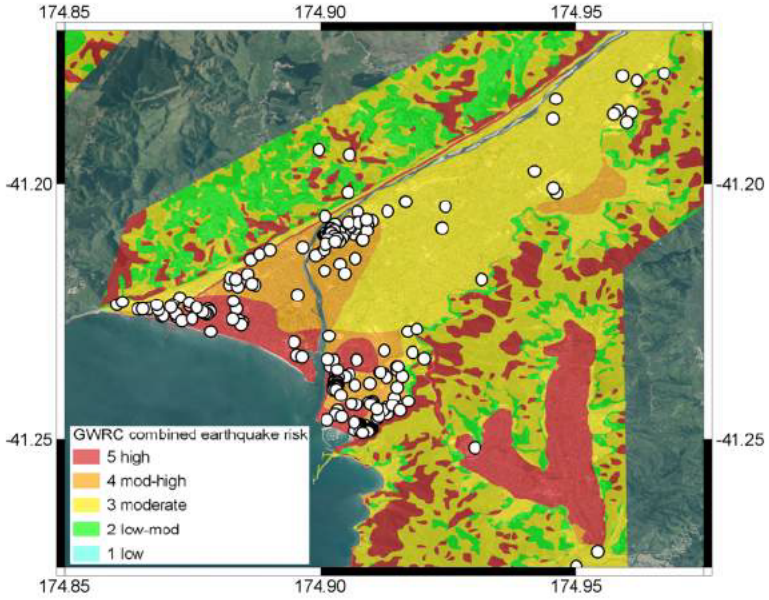


(c) building height

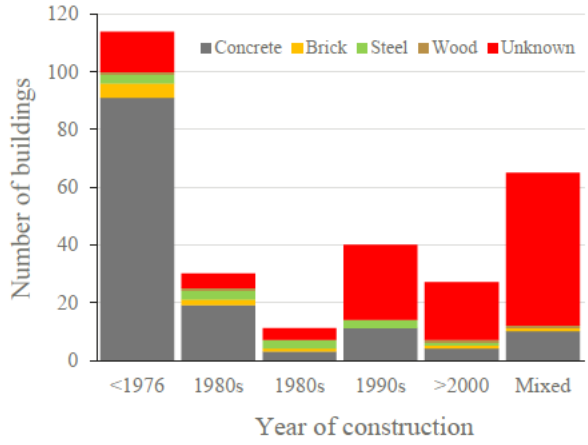
Figure 4: Geospatial distribution and characteristics of profile D buildings (569 buildings)

3.3 Profile E buildings

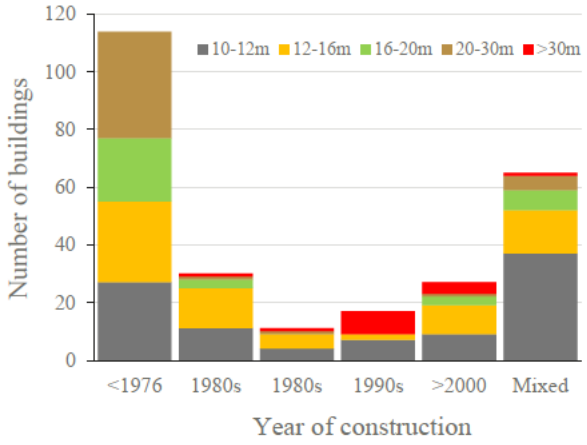
A filter was applied geospatial collated dataset to indicate buildings with any height value above 10, resulting in 306 building polygons. Of these 306 data points, duplicate entries for the same street address were removed and a total of 264 data entries remained, of these 114 buildings were built before 1976. It is noted that some of these data entries might be duplicate, showing multiple units in the same building but serves as a reasonable indicator for macro-scale preliminary study. The dataset requires refinement and validation, which could be undertaken in a future study. Spatial distribution of identified building with height more than 10m is shown in Figure 5a, with combined earthquake risk shown on Greater Wellington Regional Council's GIS viewer. The multi-storey dataset developed as part of another HCC project has a list of 85 buildings with 3 or more storeys, which seems to fit reasonably well with statistics presented herein. Information about wall material and building height in profile E buildings was found more ambiguous compared to profile D buildings (see Fig. 5b and 5c). Age of profile E buildings reported can be mis-leading at instances because some buildings might have been strengthened/ demolished or re-built recently. It can however be noted that several medium to high size buildings exists in high earthquake risk areas.



(a) spatial distribution and combined earthquake risk



(b) wall material



(c) building height

Figure 5: Buildings with height > 10m (114 pre-1976 + 150 profile E buildings)

3.4 Primary use of Profile D and E buildings

Figure 6 shows the main occupancy of these identified buildings. Most profile E buildings are used for commercial and/or community usage, whereas the profile D buildings for commercial or industrial premises.

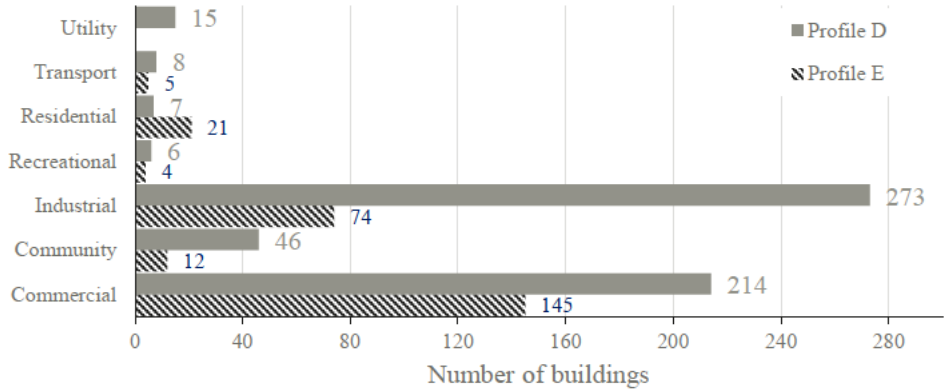


Figure 6: Characteristics of buildings with height > 10m and profile D

A unique characteristic of Lower Hutt building stock is the presence of a substantial low-rise industrial building built between 1935 and 1976 in area surrounding the Wellington fault line founded on deep soft soils. These buildings, when combined with the seismic hazard, can potentially be unsafe in a large earthquake. Whilst the building pose safety risk to occupants, it also is a major risk to economy of the city.

4 CONCLUDING REMARKS

Lower Hutt buildings are unique in its characteristics and is within proximity of three identified earthquake faults, with Wellington fault passing right through the city. EPB methodology and profile categories used to identify potential EPBs was briefly discussed. Whilst the EPB does address the majority of the potential EPBs and Hutt city council pro-actively managing the risk, the uniqueness of the location and construction practices adopted in relatively newer buildings built after 1935 are very likely to have seismic vulnerabilities. This was further interrogated and an overview of key outcomes of the analysis was reported. Collation of different databases is reasonably challenging because each was prepared for a certain purpose and more interconnection between information databases can be created by using a unique building identifier. Around 40,000 single/double story high buildings and only 85 three and more story high buildings prevail in Lower Hutt, of these 72 buildings are unreinforced masonry. Non-residential buildings built between 1935 and 1976 with a height less than 10 m are not addressed in the existing profile categories in EPB policy but around 569 buildings were identified to exist. These are mainly industrial/commercial buildings with possibly some known earthquake vulnerabilities. The buildings were referred to as profile D buildings. A large population of profile D buildings is within the Wellington Fault Special Study area, with reasonable uncertainty to manage this elevated seismic risk. The problem exacerbates owning to the presence of soft subsoil. Buildings with height more than 10m were categorised as profile E. Approximately, 264 buildings were identified. Of these, 114 buildings were built prior to 1976 but it is likely some of these buildings has also been strengthened later. Further investigation of other databases and satellite imagery resulted in 84 three and more story buildings.

5 ACKNOWLEDGMENTS

Guidance from John Floyd, the LIS manager at Hutt City Council, with processing source datasets is gratefully acknowledged. Wellington Institute of Technology students, Neil MacDonald and Theodore Ludong, helped with data analysis and write up.

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