SPL CONSULTANTS

20 DUNARNAN STREET
AVONSIDE

For

E SAWERS & S SAVAGE

INITIAL STRUCTURAL REVIEW REPORT

Job No.1567

April 2015

CONSULTING ENGINEERS SURVEYING PROJECT MANAGEMENT

PO Box 314094, Orewa 0946 AK 09 426 9283 CHCH 03 281 8742 admin@splconsultants.co.nz www.splconsultants.co.nz

1.0 INTRODUCTION

We have been engaged to complete an assessment and review of the structural damage incurred by the existing dwelling located at 20 Dunarnan Street, Avonside, during the earthquake sequence of 2010/2011 in the Canterbury Region.

Our findings and remedial repair strategy for the dwelling are outlined in the following report.

Site Address	20 Dunarnan Street, Avonside
Local Authority	Christchurch City Council
Insurer	Southern Response
Property Reference	D3430254
Inspection Date	22nd October 2014
Inspected By	Hugo McGrath
Our Reference	1567

2. PROPERTY DESCRIPTION

The property can be described as follows:

Land Technical Category	The CERA Canterbury Land Information Assessment Map (June 2011) maps this site as a Green Zone. The site has subsequently been categorized by CERA as **Technical Category 2 (TC2) Yellow**, indicating "minor to moderate land damage from liquefaction is possible in future large earthquakes"
Dwelling	Single Storey
Construction	Timber Frame
Foundation	Type B2 foundation and floor type – this is described as a “Timber-framed suspended timber floor structures with perimeter concrete foundation. Brick or concrete masonry exterior cladding (veneer)”.

	Type B1 foundation and floor type in the dining room - this is described as a "Timber-framed suspended timber floor structures with perimeter concrete foundation. Stucco, weatherboard or light texture-clad house".
Roof	Concrete tiles
External Cladding	Brick Veneer and Weatherboard
Internal Linings	10mm Plasterboard
Garage	Freestanding garage, and a free standing garage converted into a sleepout.

3. NOTED DAMAGE

The residential dwelling suffered moderate to severe structural damage during the earthquake sequence of 2010/2011. The primary structural damage observed is summarised below:

- Minor to severe cracking of Perimeter Foundation Wall. A few cracks between 10 and 15mm and one 20mm+ crack.
- Differential settlement of suspended timber floor (refer to attached Floor Levels drawing).
- Minor to Moderate structural damage to internal linings.
- Evidence of stretching of the foundation/floor with large gaps in internal wall and roof linings in some rooms.
- Moderate to severe "staircase" cracking of brick veneer.
- Moderate to severe cracking of external brick veneer.

4. FLOOR LEVEL SURVEY

A floor level survey was carried out during our inspection using a Zip Level. The levels were taken to determine the extent of any floor level variations across the footprint of the dwelling.

The measurements were taken on top of the existing floor coverings which have been adjusted to a common floor level. Post-earthquake floor levels have been recorded for the footprint of the dwelling and have been transposed onto a Floor Level Plan by SPL Consultants Ltd. A copy of the Floor Level Plan is attached in Appendix A.

The following summarises the key findings of the level survey:

- Maximum Variation across the ground floor = 95mm (> 50mm MBIE criteria for re-level and very close to > 100mm MBIE criteria for foundation re-build).
- Maximum slope recorded 1.3% approximately (>0.5% MBIE criteria).

5. REPAIR METHODOLOGY

Based on our site observations and review of the existing dwelling, we recommend that the following remedial works are completed:

- Replace damaged perimeter wall sections with engineered design enhanced perimeter wall foundation where required. Approximately 40 - 50% of perimeter wall to be replaced. (Geotechnical reports specifies 200kPa ultimate bearing capacity can be assumed.)

- Re-level the rest of the house by jacking the perimeter foundation using engineered resin or mechanical jacking/grout filling with jacking and packing / trimming the piles and bearers in accordance with MBIE Appendix A1.1. This will be subject to confirmation by a geotechnical engineer's report that will need to confirm the adequate bearing capacity and the appropriateness of the proposed method.

- A thorough inspection of the existing perimeter foundation wall should be completed by one of our engineers once the dwelling has been re-levelled. In some areas the perimeter foundation will need to be exposed to allow this inspection to be completed.

- All minor cracks (<10mm) within the existing concrete perimeter wall are to be repaired with an epoxy injection in accordance with the repair method outlined in section A4.4 of the MBIE Guidelines.

- All moderate cracking (10-20mm) of the concrete perimeter wall are to be repaired using grout injection in accordance with section A4.4 of the MBIE Guidelines.

- Replace brick veneer cladding with medium weight brick veneer.

- Should the house be completely rebuilt, it is suggested to replace the heavy roof with lightweight materials.

- Builder to undertake a detailed inspection of the under floor and roof structures, in accordance with NZS3604, to determine the extent of damage (if any) and notify the findings to the engineer for review, and, following approval, repair/replace any earthquake damaged elements in accordance with NZ3604 and the Building Code.

- Bracing elements to be installed in accordance with a full bracing review.

- All minor damage to internal wall linings to be repaired.

- All of the above work will need to be designed and supervised by a structural/geotechnical chartered professional engineer and undertaken by a licensed building practitioner.

6. INVESTIGATIONS/INSPECTIONS REQUIRED

The following site inspections should be allowed for:

Structural inspections:

- Post re-level floor levels
- Inspection of perimeter foundation after re-level and after rebuild
- Pre-pour inspection of new piles (if any)
- Final inspection

Geotechnical inspections:

- None required as a shallow geotech report has been completed
- Bearing Capacity of existing soil prior to pouring concrete (if required)

The following Producer Statements will be required as part of the proposed works:

- PS1 (design) from Re-levelling Contractor
- PS4 (construction) from Re-levelling Contractor

7. DISCLAIMER

The inspections of the building discussed in this report have been undertaken to assess structural earthquake damage. No analysis has been undertaken to assess the strength of the building or to determine whether or not it complies with the relevant building codes, except to the extent that SPL Consultants Ltd expressly indicates otherwise in the report. Our engineers have not made any assessment of structural stability or building safety in connection with future aftershocks or earthquakes – which have the potential to damage the building and to jeopardise the safety of those either inside or adjacent to the building.

This report is necessarily limited by the restricted ability to carry out inspections due to potential structural instabilities/safety considerations, and the time available to carry out such inspections. The report does not address defects that are not easily observed on visual inspection, including defects in inaccessible places and latent defects. Where site inspections were made, they were restricted to visual external and internal inspections.

Prepared By:

Hugo McGrath
For SPL Consultants Ltd

Reviewed By:

Damian Crampton
Principal Engineer

APPENDIX A

POST EARTHQUAKE FLOOR LEVELS PLAN

1. Post Earthquake Floor Levels as observed on 22rd October 2014 with the dwelling floor coverings in place.

2. Level observations made by: Jesse Boyle

3. Levels measured using Zip Level: Serial No. 24738.

4. Zip Level Calibration Procedure completed.

5. Zip level check to a measured height found to be within ±2mm.

6. Datum checked after each room and found to be within ±2mm

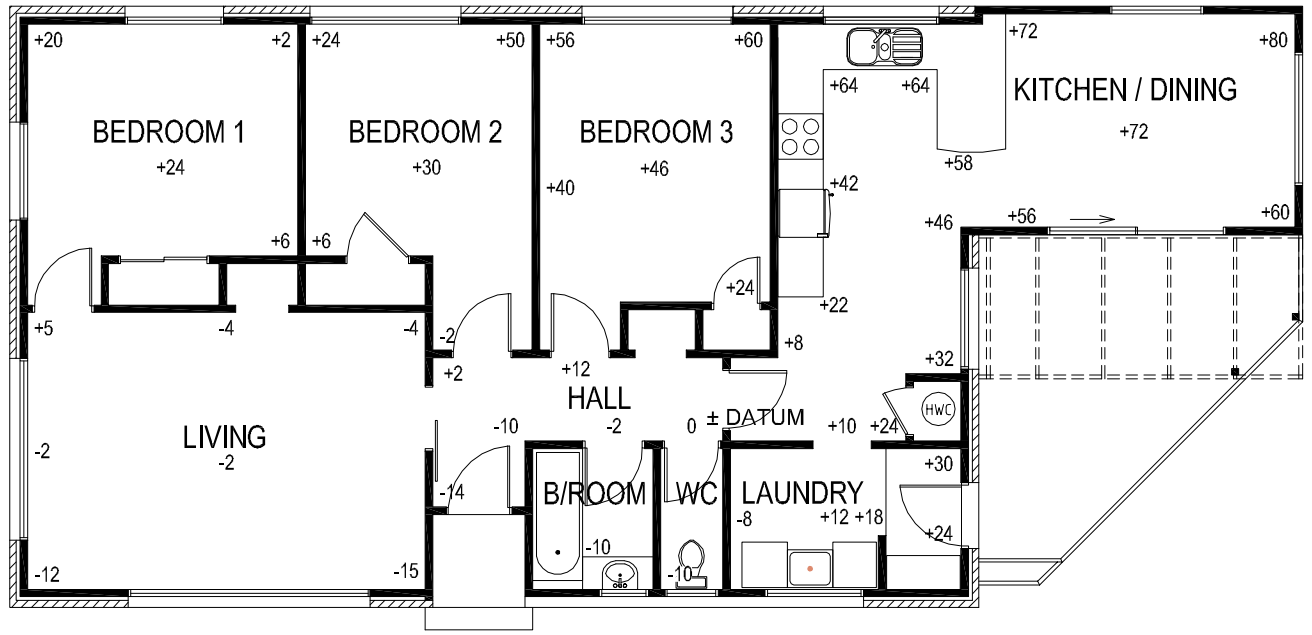
7. Floor covering differentials: (Accounted for).

Hall to WC	+2 mm
Hall to Bed 3	+18 mm
Hall to Bed 2	+16 mm
Living to Bed 1	+12 mm
Kitchen to Dining	+12 mm
Kitchen to Laundry	+6 mm
Laundry to Laundry Entry	-140 mm

8. Dwelling: Maximum differential in levels: 95mm
Maximum Local Floor Grade: 1 in 105

9. Key: +2 : Recorded level

10. Levels shown here are as observed on-site AND include where appropriate, correction for any variation in multiple check readings observed in any one location.



SPL CONSULTANTS

PO Box 314094 I Orewa I Auckland 0946
P 09 426 9283 I F 09 426 1956
admin@splconsultants.co.nz I www.splconsultants.co.nz

CONSULTING ENGINEERS SURVEYING PROJECT MANAGEMENT

PROPOSED WORKS FOR:

S Savage
20 Dunarnan Street
Avonside
Christchurch 8061

DRAWING TITLE:

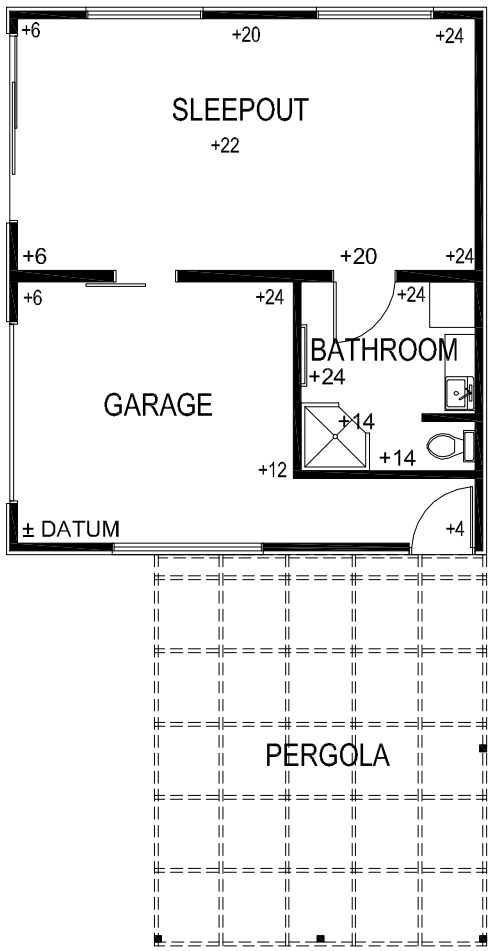
Proposed Remedial Works
Post-Earthquake Floor Levels
Main House

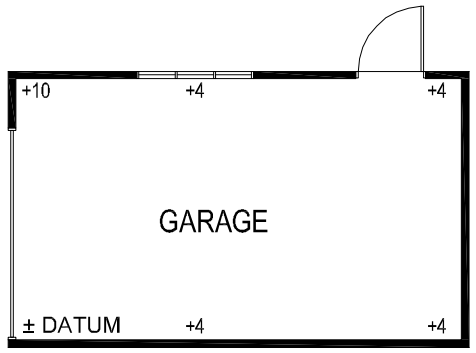
DATE	Apr 2015
SCALE	1:100
DRAWN BY	EW
CHECKED BY	DC
DESIGNED BY	EW
ARROW/SR	D3430254
SHEET	2
NO OF SHEETS	3

REVISION

JOB NO 1567

DRAWING NO S100





SPL CONSULTANTS
PO Box 314094 I Orewa I Auckland 0946
P 09 426 9283 I F 09 426 1956
admin@splconsultants.co.nz I www.splconsultants.co.nz
CONSULTING ENGINEERS SURVEYING PROJECT MANAGEMENT

PROPOSED WORKS FOR:

S Savage
20 Dunarnan Street
Avonside
Christchurch 8061

DRAWING TITLE:

Proposed Remedial Works
Post-Earthquake Floor Levels
Sleepout & Garage

DATE	17/03/2015
SCALE	1:100
DRAWN BY	EW
CHECKED BY	DC
DESIGNED BY	EW
ARROW/SR	D3430254
SHEET 3	NO OF SHEETS 3

REVISION

JOB NO 1567

DRAWING NO S110