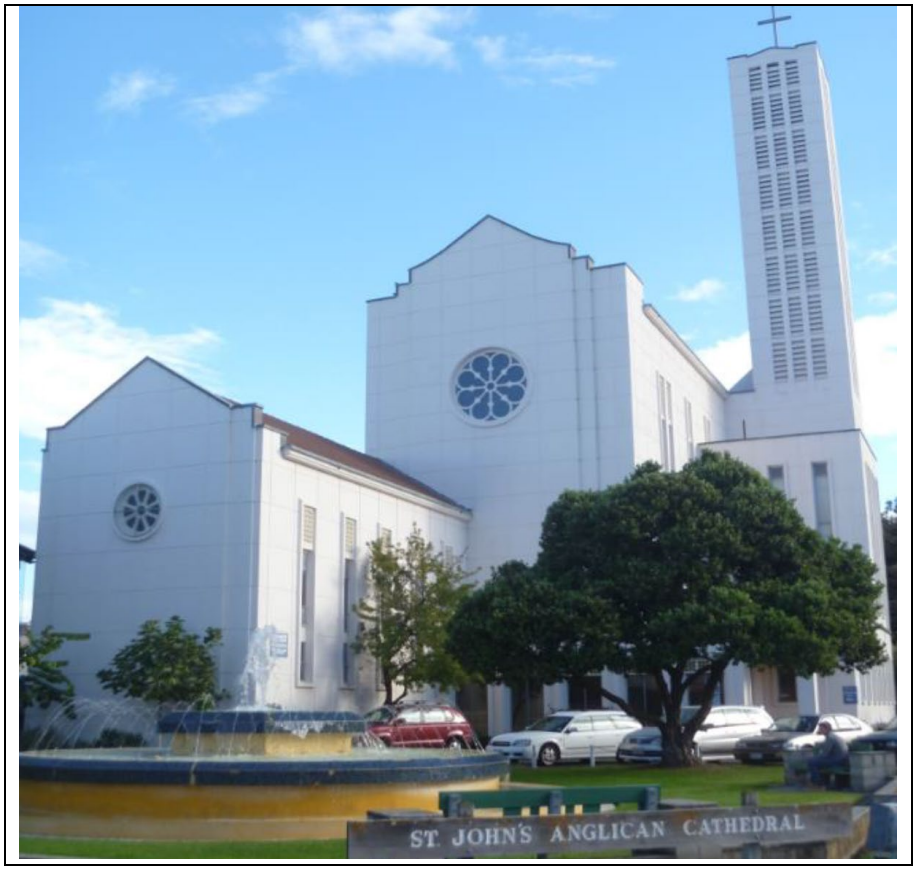
Waiapu Cathedral of St. John the Evangelist, Napier

Seismic Risk Report



12 June 2023

Contents

Document Status and Authorisation

Stage	Person	Date
Draft prepared by:	Dave Brunsdon	8 May 2023
Update following discussion with Diocese Earthquake Strengthening Committee:	Dave Brunsdon	29 May 2023
Final version:	Dave Brunsdon	12 June 2023

1. Purpose

This seismic risk report summarises known seismic information on the Cathedral structure from recent work by WSP. The report provides a qualitative risk assessment which evaluates the current seismic risk to occupants and users of the building and people in surrounding areas.

The purpose of the report is to outline the current seismic risk profile to assist decision-making in relation to continued use while broader planning about the future of the building is undertaken.

Recommendations are made in relation to continued occupancy, any practical short-term risk mitigation measures are identified and key communications messages outlined.

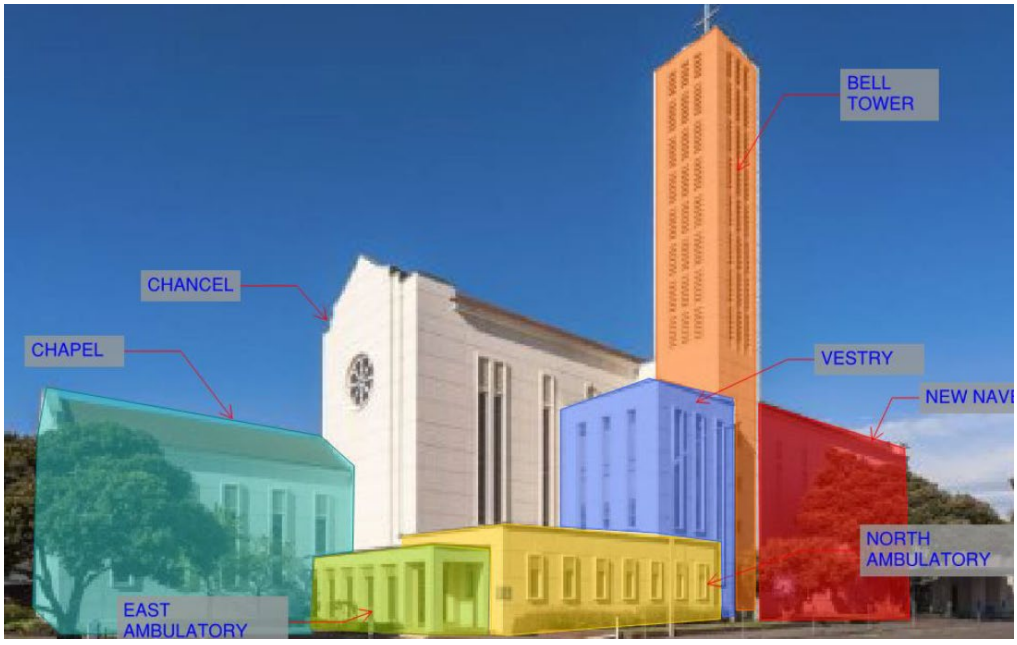
The qualitative risk assessment undertaken is supported by the application of the 2021 BRANZ Decision-making Framework for Earthquake-prone Buildings for council-owned buildings (refer to the appended Risk Evaluation Table).

2. Basis of this Report

Engineering assessment reports	Detailed Seismic Assessment by WSP - 7 December 2021
Kestrel inspection of the building	10 May 2023
Discussions with Diocese Earthquake Strengthening Committee	24 May 2023
Other information as relevant	Nothing specific

3. Description of Building

Date of construction	The building comprises several interconnected sections that were constructed in three stages between 1956 and 1960.
Number of storeys	The Bell Tower is approximately 40m high; the Chancel and Nave have a roof ridge of approximately 23m; the Chapel has a roof ridge height of approximately 11m; and there are associated connected single storey structures on the sides of the main building.
MBIE EPB Profile Category	Profile Category B – equivalent of three or more storeys (12m) in height, pre-1976.
Primary structure	Reinforced concrete
Secondary structure (incl. heavy non-structural elements)	Roofing tiles above the Nave and Chancel.
Current Usage	Workplace for Admin personnel. Used for weekly services and meetings; periodically for larger funerals and weddings, concerts and events and tourist groups.
Importance Level	Importance Level 3 (IL3) - Public assembly building with an area greater than 1000m^2 and groups of greater than 300 people.



4. Summary of Seismic Assessment

Form and date of assessment	Detailed Seismic Assessment by WSP dated December 2021
Rating and Critical Structural Weaknesses	The overall rating for the building is 20%NBS (IL3). The component scores and identified Structural Weaknesses are: • 20%NBS for the Bell Tower (lack of strength of slender walls with large openings at the base of the tower); • 20%NBS for the Nave (lack of strength of the end piers and internal piers, and roof level eaves beams); • 25%NBS for the Vestry (lack of strength of internal piers); • 30%NBS for the Chancel (lack of strength of internal piers)
Earthquake prone status/ council notification and expiry date	A copy of the December 2021 WSP DSA was forwarded to Napier City Council in 2022. An EPB notice has yet to be issued by NCC to the Diocese, and so the applicable statutory time period of 15 years has yet to commence.

5. Evaluation of Current Seismic Risk

Current usage characteristics	Maximum number of people:	Up to a maximum of 650 people in the main church areas at major events (~20 per year) for a period of up to 4 hours
	Maximum weekly occupancy:	~100 people at Sunday morning service
	Average number of people during weekday:	Gatherings of approx. 10 in the main church (during the day) and 10 to 30 in the Lounge/ Choir room for 1 to 2 hours at a time. Staff in offices – 4 to 6
	Average weekly usage time:	600 to 700 person hours per week

Summary of main structural vulnerabilities	The lower section of the Bell Tower is highly loaded in an earthquake due to a combination of the slender walls and large openings, and has a corresponding low level of strength to resist strong ground shaking. The piers in the walls of the Nave, Chancel and Vestry are also tall and slender, with limited lateral strength. With no diagonal bracing, the roof of the Nave has limited stiffness and strength to tie the walls together and transfer loads to the end walls. There is also no bracing within the roof sub-structure above the ceiling of the Nave. Neither the building or any part of it is identified as dangerous in terms of the Building Act.
Outline of possible failure modes	In the event of a large earthquake, the following failure modes are possible: • Collapse of the Bell Tower, with the potential for the upper part of the tower to fall outside the property boundary • Failure of sections of the end and side walls of the Nave (depending on the direction of the earthquake), which could in turn lead to collapse of part of the roof • Similar failures could occur in the middle sections of the Chancel and Vestry walls It is considered unlikely that all of these failure modes would occur in the one earthquake.
Summary of strengthening options	The main roof sub-structure of the Nave can have steel bracing added within the ceiling space to provide strength above ceiling level both across and along the building. The Bell Tower walls could be strengthened by providing additional strength to the lower levels of the walls. Reducing the height of the Bell Tower is an alternative option, but in itself would not address the vulnerabilities in the main structure of the remainder of the cathedral. The Nave, Chancel and Vestry could be strengthened by the addition of steel framing at the roof-to-wall connections and jacketing the inside of the perimeter walls.

Interim risk mitigation options	The size of the building and the identified vulnerabilities to many of the walls of the structure mean that there are limited opportunities for local interim mitigation work. The WSP recommendation of a comprehensive audit of the non-structural items (incl. the organ, suspended cross and various statues) is endorsed. The provision of additional restraint to these elements would reduce the risk to occupants in more moderate earthquakes.
Seismic Hazard	The building is located in an area of High Seismic Hazard. This is influenced by the proximity of the Hikurangi Subduction Zone – the interface whether the Pacific and Australian plates meet. The likelihood of a fault rupture occurring on this interface and generating an earthquake of greater than Magnitude 8 is 26% in the next 50 years. An earthquake of this magnitude would cause significant damage to the Cathedral. The likelihood of an earthquake of this scale occurring in any given year, or over a 5 to 10 year period, is correspondingly much lower.
Intended time frame for seismic risk to be addressed	Not yet determined – when NCC issue the Earthquake Prone Building notice, a period of 15 years will apply.

6. Impacts of Closure

Ability to use other facilities	Other off-site facilities could be used for meetings and small church services, but none are of comparable size. For large church services or other functions, the key features of the Cathedral could not be replicated elsewhere. The quiet and large open space within the Cathedral also provides a place of refuge and sanctuary, for both the congregation and the wider public.
Effects on the community	Closure of the Cathedral without a clear forward vision for more than a short period is likely to create uncertainty amongst the congregation. It is considered that this uncertainty would lead to members leaving the church permanently. The Aotearoa Chapel has a large significance to iwi, with associated impacts if no longer able to be accessed for any period of time. There would also be other impacts on the wider community, including the homeless community who see the Cathedral as an alternative home. Tourists would also be unable to view the interior.

Costs and economic impacts	Closure of the Cathedral would lead to a loss of income from hireage and tithes from parishioners and donations from visitors. There would also be an adverse impact on bequests. This would only be offset to a small degree by a reduction in operating costs. If closed for any period of time, it is considered that the impacts on the Diocese (both the organisation and the congregation) is such that it would be unable to be re-opened.

7. Summary and Recommendations

Occupancy recommendations	The likelihood of an earthquake of sufficient magnitude to cause structural failure to the building (or major parts) over the next few years while plans for strengthening are being developed is considered very low. It is therefore considered that continued occupancy and use of the building is appropriate while plans for the building are being developed and implemented. An indicative timeline should however be developed and actively monitored. Given the relatively uniform nature of the risk across all sections of the Cathedral and the short-term nature of access to and use of the Bell Tower, it is not considered necessary to continue with the current access restrictions.
Required actions	Staff and regular users of the building should be briefed on the seismic status of the building, including a refresh of the earthquake drills and evacuation process. This should be included in the induction of new staff. Other people accessing the building should be briefed through Council's EPB notices (when issued) that should be placed immediately adjacent to all entrances. Prior to receiving Council's EPB notices, the Diocese should prepare and display its own risk notification placards.
Key communications messages	The building has a low seismic rating due to the presence of structural weaknesses in the walls, including the Bell Tower. The building is not dangerous in terms of the Building Act, or in any imminent risk of failure in a moderate earthquake. In the unlikely event of an earthquake occurring, people should stay inside the building and not leave the building until

	after all shaking has ceased and the all-clear to exit the building has been given. Refer to the occupancy recommendations above.
Annual monitoring	There should be a review in June of each year which revisits the condition of the building, verifies that the EPB notices are effectively displayed and provides a written update on progress with planning for the seismic remediation of the building.

Appendix: Application of the BRANZ Decision-making Framework for Earthquake-prone Buildings

Date of Risk Evaluation: 26 May 2023

Step	Considerations	Information/ Comments
Step 1: Building assessment and further examination of key vulnerabilities	The seismic assessment is a Detailed Seismic Assessment?	Yes
	Report status and nature of review undertaken?	Final report. No full Peer Review undertaken
	Seismic rating?	20%NBS (IL3)
	Have all secondary structural and heavy non-structural elements been identified?	Yes, but require further more specific investigation
	What are the structural elements of the building that score less than 34%NBS?	The lower section of the Bell Tower is highly loaded due to a combination of the slender walls and large openings, and has a corresponding low level of strength to resist earthquakes. The piers in the walls of the Nave, Chancel and Vestry are also tall and slender, with limited lateral strength.
	What are the modes of failure and the area of the building that is affected?	In the event of a large earthquake, the following failure modes are possible: • Collapse of the Bell Tower, with the potential for the upper part of the tower to fall outside the property boundary (review the openings in the base of the tower) • Failure of sections of the end and side walls of the Nave, which could in turn lead to collapse of part of the roof • Similar failures could occur in the middle sections of the Chancel and Vestry walls It is considered unlikely that all of these failure modes would occur in the one earthquake.
	Are there other seismic vulnerabilities that score above 34%NBS?	No
	Is the building or any part of it identified as dangerous in terms of the Building Act?	No

<table>
<tr><th>Step</th><th>Considerations (Using the tables from the BRANZ framework)</th><th>Comments and Rating</th></tr>
<tr><td>Step 2: Exposure of people to building risk</td><td>
Table 1 Life safety risk exposure
<table>
<tr><th></th><th colspan="3">Life safety risk exposure category</th></tr>
<tr><th></th><th>High</th><th>Moderate</th><th>Low</th></tr>
<tr><td>Maximum number of people in building at any time</td><td>>100</td><td>10–100</td><td><10</td></tr>
<tr><td>Average number of people in building at any one time</td><td>>50</td><td>5–50</td><td><5</td></tr>
<tr><td>Average user time in building (duration of use)</td><td>Over 8 hours a day</td><td>2–8 hours a day</td><td><2 hours</td></tr>
<tr><td>Average weekly usage (person-hours per week)</td><td>>2,000</td><td>50–2,000</td><td><50</td></tr>
<tr><td>Exposure to people outside the building</td><td>Risk of collapse onto high-use footpath (>100 people per hour); risk of collapse onto neighbouring structure</td><td>Risk of collapse onto adjacent moderate-use footpath (5–100 people per hour)</td><td>Risk to low-use footpath (<5 people per hour)</td></tr>
</table>
</td><td>
Max occupants: 650
Avge occupants: <50
Avge user time: ~2 hours
Avge weekly usage: 600-700 person hours
External exposure: Some external collapse risk to road and neighbouring property
➢ Rating: High
</td></tr>
<tr><td>Step 3: Risk mitigation measures – period of exposure</td><td>
Table 2 Period of exposure
<table>
<tr><th></th><th>Seismic hazard zone</th><th colspan="3">Period of exposure category</th></tr>
<tr><th></th><th></th><th>Long</th><th>Medium</th><th>Short</th></tr>
<tr><td rowspan="3">Likely period until strengthening commenced</td><td>High</td><td>>3 years</td><td>1–3 years</td><td><1 year</td></tr>
<tr><td>Medium</td><td>>6 years</td><td>2–6 years</td><td><2 years</td></tr>
<tr><td>Low</td><td>>9 years</td><td>3–9 years</td><td><3 years</td></tr>
</table>
</td><td>
High seismic hazard zone
The planning of strengthening work is likely to take more than 3 years
➢ Category:Long
</td></tr>
</table>

Overall Exposure

Table 3 Degree of exposure

Exposure to risk (from Table 1)	Period of exposure (from Table 2)		
	Short	Medium	Long
Low	I	I	II
Moderate	I	II	III
High	II	III	III

➢ **Rating:** III

Step 4: Consequences of building closure

Table 4 Consequence of closure

	Consequence of closure category		
	High	Moderate	Low
Ability to deliver services by other means	Service cannot be delivered through alternative means	Service can be partially delivered outside of the building	Service easily delivered through other means
Impact on vulnerable communities (homeless, disabled, high needs, children, elderly)	Vulnerable community significantly impacted as they cannot be easily catered for	Vulnerable community impacted but services/ amenities can be found nearby	Limited or no vulnerable community use the building/services
Impact on neighbouring businesses	Neighbouring businesses significantly impacted by direct loss of customers	Neighbouring business affected by reduced foot traffic	Limited or no impact on neighbouring businesses
Impact on staff	Significant numbers of staff affected by closure	Some staff notably impacted by building closure	Few or no staff impacted

Smaller services could be delivered in other locations, but not large services

Some impact on vulnerable communities

Significant impact on Diocese revenue

Limited impact on neighbouring businesses

A number of staff would be impacted

➢ **Category:** Moderate

Step 5: Overall assessment of building risk

Table 5 Overall assessment

Degree of exposure to risk (Table 3)	Consequences of closure (Table 4)		
	High	Moderate	Low
II	A	B	B
III	B	B	C

➢ **Overall risk rating: B – remain open**