

CONFIDENTIAL
Counties Manukau District Health Board
Galbraith Assessment Update

Recommendation

It is recommended that the Board:

Receive this paper

Note that the Audit Risk and Finance Committee requested at their 23 April 2018 meeting that the Galbraith Assessment Update be forwarded to the 16 May 2018 CMDHB Board meeting and to add a 'no remediation/new build' option as the cost of remediation would be better spent on a new building

Note that the Hospital Services Directorate have updated the post disaster Emergency Response assuming that the Galbraith building is non-operable and must be evacuated; and that a more detailed evaluation of critical building services resilience is in progress

Note that the preferred Galbraith investment option is a critical decision that will inform Facilities Master Plan business case development and funding approval priorities

Note that the Executive Leadership Team approved the Galbraith Assessment Update paper for forwarding to the CMDHB Board meeting of 16 May 2018

Note the Galbraith building communication approach to advise staff, patients and the public of the earthquake prone rating that is now confirmed by the Beca independent structural review

Recommend changes to the planned Galbraith building investment options assessment process and risk considerations

Prepared and submitted by Marianne Scott, Master Planner on behalf of Margie Apa, Director Population Health and Strategy and Margaret White, Chief Financial Officer

DSA Detailed Seismic Assessment
FMP CM Health Facilities Master Plan

Executive Summary

In February 2018, the CMDHB Board approved '*management next steps to progress urgent bed capacity options for winter 2018 and continued short term occupation of the Galbraith building to mitigate clinical risks to patient health outcomes*'. ELT is progressing urgent service capacity activities to manage immediate requirements while at the same time developing Programme business cases to integrate the short to longer term capacity and financial assumptions.

Reaching a decision on the future use of the Galbraith building has a significant impact on investment priorities and related business case submissions for Crown funding. A number of Galbraith assessments have been commissioned to confirm the seismic rating and potential seismic strengthening options. Now that we have completed a peer review of the seismic rating that confirms Galbraith to be an earthquake prone building (Appendix 3), we are ready to implement a range of communication approaches to provide informative and simple to understand messages for the public, patients and staff.

An update on the Galbraith investment options was tabled at the Audit Risk and Finance (ARF) Committee at their 23 April 2018. The Committee noted the difficult and perplexing issues this raises and requested that the following be tabled with the CMDHB Board at their next meeting:

- to include a 'do nothing' Galbraith seismic strengthening option,
- that if there is a no (viable) remediation option below a 67%NBS solution the paper should set out ways to mitigate the risk the CMDHB Board is taking (immediate-long term);
- which is effectively a new building.

This request was based on the recognized complexity, invasiveness, duration and indicative cost (>\$74m) of remediation works compared to alternative new long term facility solutions.

Purpose

To provide the CMDHB Board with an update on the Galbraith seismic assessments to date and to discuss related risks and potential mitigation impacts on Facilities Master Plan (FMP) business case development and funding approval priorities.

Background

The strategic context of the Galbraith assessment process is outlined in the 'Galbraith Assessment Update' tabled with the Audit Risk and Finance Committee at the 23 April 2018 meeting (refer to Appendix 2).

In short, this update outlines assessments completed to date and the emerging picture of high complexity, difficulty and cost of the remediation options. From a value for money perspective, **none of the Galbraith investment options add health services capacity** - they focus on reducing the life safety risks in the (unlikely) event of a moderate to major earthquake. This is significantly challenging for a DHB with limited financial resources and responsibilities for ensuring timely access to high quality health services for our community; while at the same time ensuring the health and safety of patients, staff and visitors in our facilities.

The practical realities of construction works to strengthen the Galbraith building seismic performance related are complex and inter-related. The following impacts have been explored for each option as part of the FMP programme business case development for Immediate Demand and Facilities Remediation. Key impacts and risk trade-offs to be weighed up for each option relates primarily to:

- (i) Health service delivery, i.e. can patients still access services when they need it when there are construction works in progress?
- (ii) Health and safety, i.e. will there be significant dust, vibration, noise to a level that will adversely impact patients, staff and visitors when there are construction works in progress?
- (iii) Construction works viability, i.e. can the construction works be safely managed within the Middlemore site and Galbraith access points?
- (iv) Economic profile, i.e. is it wise to invest in this option (strengthening and ongoing maintenance) compared to the value for money from other options or new building alternatives

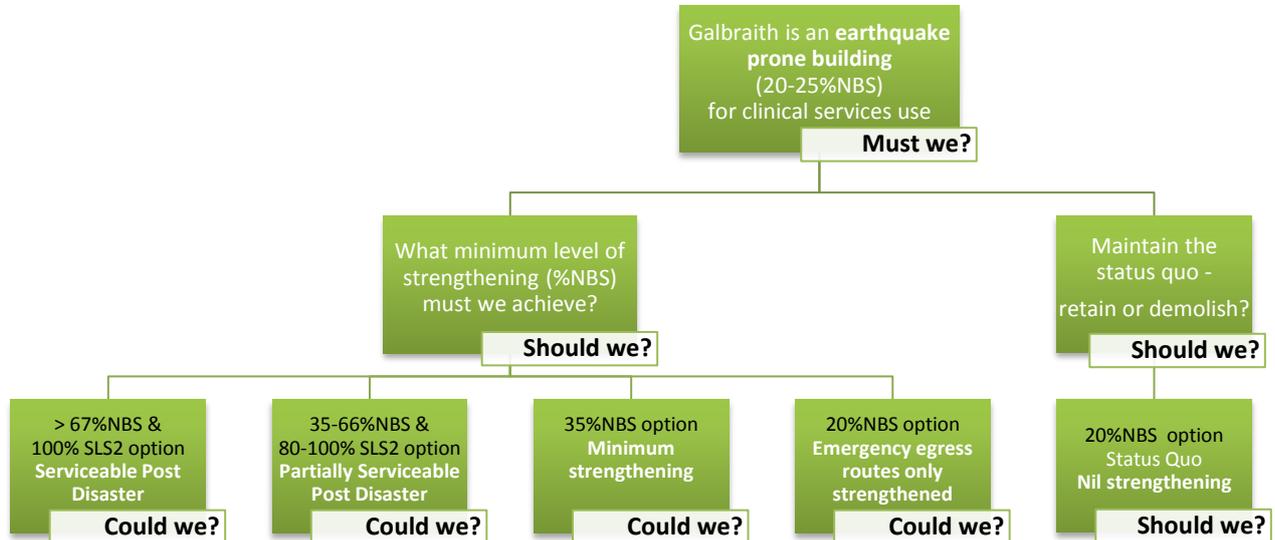
Now that we have an indicative profile of each Galbraith investment option, we have considered the relative risks and potential trade-offs for CMDHB Board discussion (refer Discussion section; bullet 3).

Discussion

1. Seismic strengthening options identified to date

The future use and related investment in the Galbraith building at Middlemore Hospital is dependent on two key assessment processes as part of business case developments. They are:

- (i) **Seismic risk rating** delivered via a preliminary detailed seismic assessment (DSA) report from Holmes Consulting and with a peer review from Beca due early May 2018. The peer review will formalize the seismic risk rating and trigger formal statutory notifications and broad communications to staff, patients and the public
- (ii) **Seismic strengthening options** that will inform not only the Facilities Remediation Programme Business Case but also planned medium to long term investments in new or upgraded facilities. The diagram below provides a summary of the Galbraith investment options being explored.



2. Indicative remediation works impacts and risks for a ‘minimum strengthening option’

On advice from the ELT in mid-March 2018, we sought external advice from RCP regarding the potential construction programme impacts for ‘a minimum 35%NBS strengthening option’. The RCP report outlines the 2-3 year duration of strengthening works, range of risks in terms of noise, dust, asbestos removal and vibration. Updated cost consultant estimate based on this report is over \$74m (excluding costs of remediating or relocating critical building services infrastructure).

The strengthening works Staging Plan (refer Appendix 1) indicates a 3 stage approach with major decanting requirements for clinical services located on levels 2-5, notably the 2-year relocation requirements for the Maternity Wards and Assessment Labour and Birthing Unit. We are currently assessing the practical realities and potential clinical risks of decanting maternity service with the Women’s Health leadership team.

3. Risk considerations for a ‘minimum strengthening option’

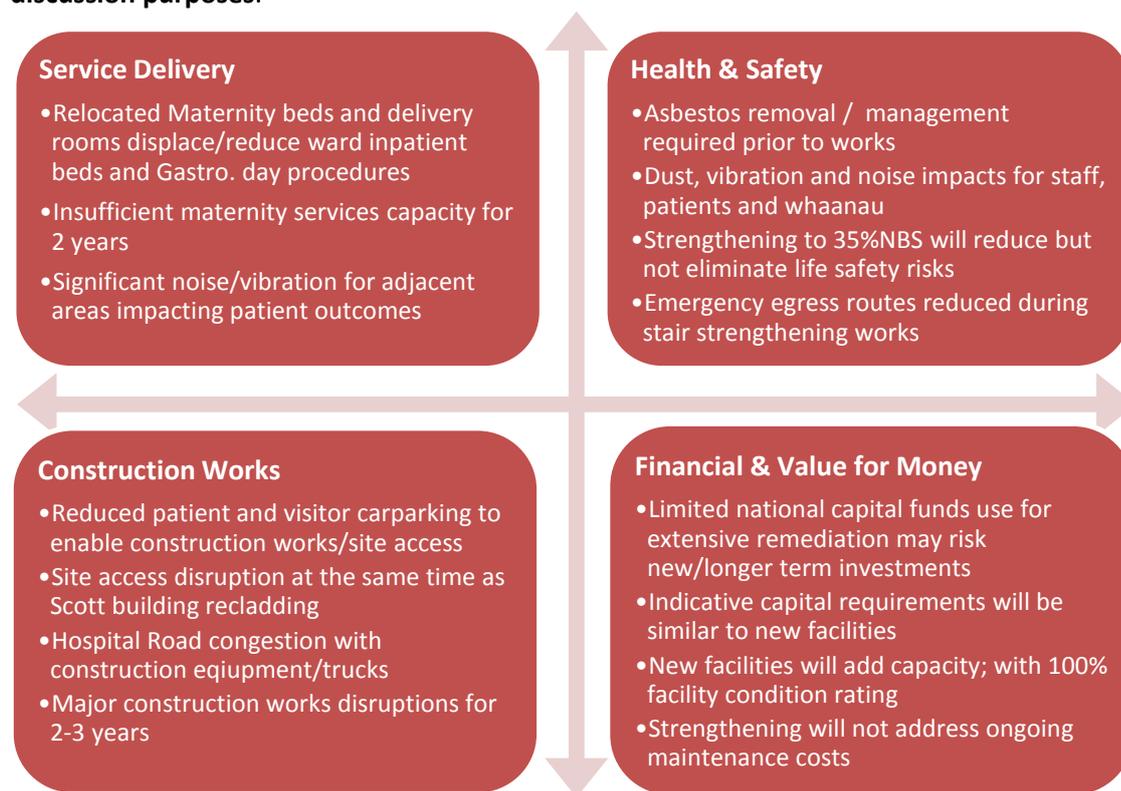
In February 2018, the CMDHB Board considered the four key risk category impacts related to short term (1-5 year) use of the Galbraith building. The key risk trade-offs considered at that time focused on:

- community access to critical health services (notably maternity and inpatient ward beds) compared to,
- the low likelihood¹ but high health & safety impacts in the event of a moderate to major earthquake.

The caveat to this decision to support management to continue short term use of the Galbraith building was to secure commitment to fit for purpose long term facilities solutions. The matrix below outlines

¹ The Auckland Region is zoned as a low seismic risk area.

some (not all) key risk considerations and trade-offs for a ‘minimum Galbraith strengthening option’ for discussion purposes.



4. Galbraith building communication approach

Now that we have completed a peer review of the seismic rating that confirms Galbraith to be an earthquake prone building, we are ready to implement a range of communication approaches to provide informative and simple to understand messages for the public, patients and staff. We are working collaboratively with all our stakeholders, including local, regional and national sector leaders. Launch of our communications (see below) are scheduled for 18 May 2018.

These communications will contextualize risk in terms of the low risk of earthquakes in the Auckland region and that we are taking a holistic view when considering both health service and building hazard risks. We will reinforce that CM Health has taken a proactive and responsible DHB approach; meeting our legislative requirements to provide health services for our community and meet health and safety responsibilities. At the same time, we reinforce that patient, visitor and staff safety and wellbeing remains a priority.

A range of communications will be implemented, including (but not limited to):

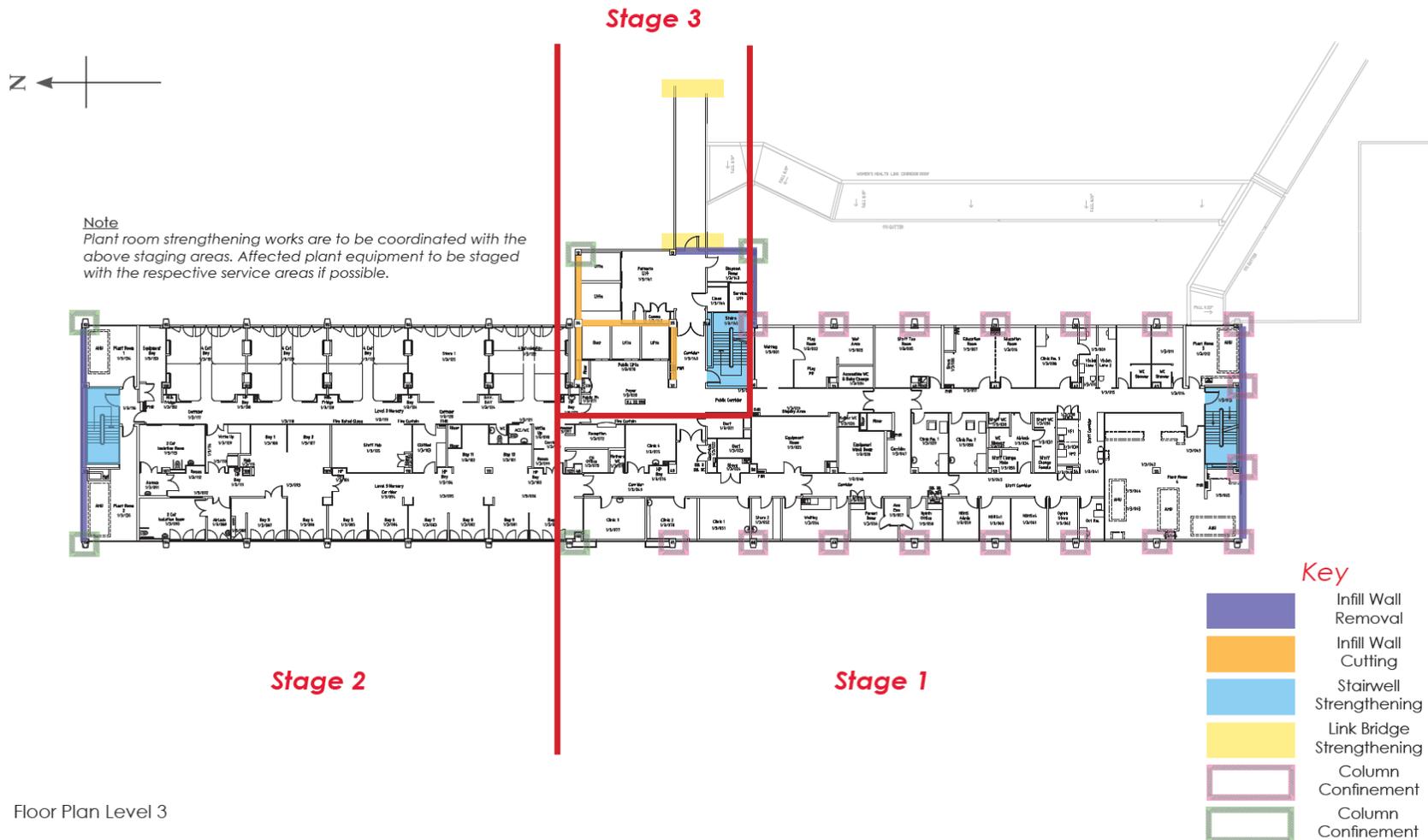
- Lightbox at entrances to Galbraith with interchangeable information posters
- A number of brochures and posters that focus on the history of Galbraith, Earthquake Risk, What earthquake prone means, Asbestos and What to do in an emergency
- Brochures targeting specific groups of people, e.g. Women’s Health and Inpatient Ward services
- Provide online internal and external information, email for staff, face-to-face forums
- Media release
- Volunteers (at Galbraith entrances when information first released)

Appendices

1. Indicative Staging Plan for Galbraith building strengthening to 35%NBS (RCP Report;pg 30, 05/04/18)
2. Galbraith Assessment Update paper tabled with the Audit Risk and Finance Committee, 23/04/18
3. Middlemore Hospital – Galbraith Building: Independent Structural Review, Beca, 26/04/18

Appendix 1: Indicative Staging Plan for Galbraith building strengthening to 35%NBS

Staging Plan



Floor Plan Level 3



Resource Coordination Partnership

Project Management • Portfolio Management • Infrastructure Management

Source: Galbraith Block, Seismic Strengthening Construction Report for 35% of NBS IL4. RCP 05/04/18

CONFIDENTIAL
Counties Manukau District Health Board
Audit Risk & Finance Committee
Galbraith Assessment Update

Recommendation

It is recommended that the Audit Risk and Finance Committee:

Receive this Galbraith Assessment Update

Note that ARF will review and endorse the following business case steps:

- Complete work to confirm the preferred way forward Galbraith and implications for the Programme business cases and economic case by June 2018
- Programme financial case in July 2018
- Programme and related Tranche business case endorsement in August 2018 for forwarding to Board to approve in September 2018

Prepared and submitted by Marianne Scott, Master Planner on behalf of Margie Apa, Director Population Health and Strategy and Margaret White, Chief Financial Officer

DSA Detailed Seismic Assessment
FMP Facilities Master Plan
NBS New Building Standard (expressed as a percentage for existing buildings)

Executive Summary

The focus of Galbraith assessments in March 2018 related to exploration of potential strengthening options. Review of these options and early cost estimates by ELT resulted in a request for more detailed assessment of a ‘minimum Galbraith option’ – to reach 35%NBS. This request was based on the grounds that it is clearly uneconomic to bring the building up to post disaster use (>67%NBS) and the extreme disruptive effects of remediation on health service delivery when weighed up against the current estimates for a new building and value for money.

Our approach to assessment of this minimum option and early findings are that the complexity and invasiveness of remediation works is very high, with potentially major decanting challenges and service disruption risks. Our Galbraith assessment approach is to explore, test and refine as outlined diagram below.



Purpose

To provide an update on independent expert assessments regarding the Galbraith building seismic condition and what a 'minimum Galbraith investment option' would mean for life safety risk mitigation, implementation and cost.

Background

The Facilities Master Plan (FMP) priority programmes to address immediate service capacity and facilities remediation issues are significantly dependent on assessment outcomes and decisions on a preferred investment option for the Galbraith building. A peer review of the preliminary detailed seismic assessment (DSA) is due by early May 2018. This report will trigger staff and public communications and formal notification to Council and government agencies.

While we await the peer review, ELT has been working through independent advice on potential Galbraith strengthening options, remediation works programme realities, service interruptions, impacts on site-wide critical infrastructure resilience and indicative costs.

A preferred way forward for Galbraith is expected to impact the broader 10 year FMP portfolio in terms of individual project priorities and solutions to meet medium to long term requirements.

Discussion

1. Final seismic rating for the Galbraith Building

An initial seismic evaluation of the Galbraith building in August 2017 by Beca and Holmes consultants recommended progression to a detailed seismic assessment (DSA). This was initiated in December 2017 with the following key outputs to date.

Ref.	Assessment	Outcome
1.1	Completed August 2017 - Beca Galbraith Building Resilience	Preliminary review of the potential Middlemore site wide impacts on critical building services infrastructure (power, air-conditioning etc.) if Galbraith is not serviceable post disaster. This initial evaluation identified risks to a number of building plant and service running through, or from, the Galbraith building to other Middlemore building with post disaster functions.
1.2	Completed February 2018 - Holmes Consulting Galbraith DSA (Stage 1) Report	Preliminary seismic rating that Galbraith is an <i>earthquake prone building</i> ($\leq 34\%$ NBS) for clinical services use, i.e. 20% at IL4 (post disaster services) and 25% at IL3. This report was circulated to ELT and ARF in February 2018.
1.3	Pending April/May 2018 - Beca Peer Review of the Holmes DSA (Stage 1) Report	This report will confirm the final seismic rating. An <i>earthquake prone rating is anticipated</i> and will trigger: <ul style="list-style-type: none">• broad communications with staff, patients and public, and• formal notifications with Auckland Council, government agencies and related public notices on the Galbraith building (as per legislative requirements)
1.4	Pending May/June 2018 - Middlemore Emergency Plan update and related Seismic Guidelines/Policy for CM Health Buildings	Internal review and update of CM Health's Emergency Plan that ensures community access to essential services post disaster. Draft decanting plan for the full Galbraith building was initiated in late 2017. Once completed, CM Health will table this plan with the Northern Regional Emergency Planning group to clarify regional dependencies and impacts. The Seismic Guidelines/Policy will draw on guidelines from the Capital and Coast DHB and local/regional stakeholder engagement.

2. Galbraith strengthening options

On the assumption that Galbraith will prove to be an earthquake prone building, we progressed work on a range of strengthening options. Key considerations are health (and life) safety risk reduction, service delivery continuity and capacity in the short to long term.

Options assessment **includes consideration of critical facilities infrastructure** (building services and related pipework/plant) serving the broader Middlemore site.

Ref.	Assessment/Advice	Key Findings/Outcomes
2.1	Completed February 2018 - Holmes Consulting Outline of Galbraith strengthening options	Diagrams of Galbraith strengthening options: a) stairs & Bray link, b) address earthquake prone deficiencies, c) strengthen for IL3 use and d) strengthen for IL4 use (<i>Appendix1</i> summary diagram)
2.2	Completed March 2018 - Rider Levett Bucknall Cost Estimates of strengthening options	Crude seismic strengthening costs for each option range from \$3.75 - \$72m. Additional costs to protect critical infrastructure that serves other MMH buildings for some options c. \$19m for structural elements only; further assessment is in progress. Other cost considerations TBD include decanting, life expired plant/infrastructure, joinery etc. not included in the structural cost estimate. As we assess the issues in more detail, we expect significant cost estimate increases (as per the ADHB experience).
2.3	Completed March 2018 - ELT review of options and indicative costs	Request to investigate in more detail a minimum Galbraith investment option (35%NBS) and clarify the life safety risk impacts and further assess the operational impacts and timeline of remediation works.
2.4	Completed March 2018 - Holmes Consulting clarification of strengthening option risks	Further clarification of the life safety and operational impacts of each strengthening option (#2.2). Continuity of building services would require significant bracing to maintain operations (<i>Appendix 2</i> summary diagram).

3. Assessing a minimum Galbraith (35%NBS of IL4) option

Since ELT requested a more detailed assessment of a 'minimum Galbraith strengthening option' (*Appendix 1* diagram, options A/B), preliminary advice has been sought to scope a potential programme for construction works and impact on site wide critical infrastructure resilience.

We are mindful of the significant costs of consultant advice and need to achieve best value for money while staying within allocated budget. Our overall approach to contain costs is to seek high level advice on the major issues/impact and indicative costs before procuring more detailed advice. The aim is to **not spend money on detailed assessment of strengthening options that are clearly neither economic nor operationally viable.**

The table below summarises consultant advice completed, in progress and planned. Key risks and impacts identified in the completed reports to date are provided below the table.

Ref.	Assessment/Advice	Key Findings/Outcomes
3.1	Completed April 2018 - RCP (high level) review of construction programme requirements for the 35%NBS option	Two 'minimum Galbraith strengthening' approaches were assessed. Emergency egress only (stairs and Bray links) and the more extensive 'minimum' strengthening works. Early indications challenge the potential viability and economic value of this option (refer commentary below).
3.2	Pending April 2018 - RLB cost update on 35%NBS option	In progress – RCP report has been forwarded to RLB to update. Note that a number of cost impacts are yet to be identified, e.g. decanting, whole of life costs to maintain/replace life expired equipment etc.

Ref.	Assessment/Advice	Key Findings/Outcomes
3.3	Pending April/May 2018 - Beca report on building services resilience options including seismic restraint	Meeting is planned with Beca to progress their initial August 2017 report (#1.1) to further develop solution options in light of a minimum investment scenario.
3.4	Pending May/June 2018 - RLB cost update on building services resilience options	Pending outcomes of the Beca report (#3.3)
3.5	Pending April/May 2018 - Auckland Council life safety and building code compliance expectations	The intention is to ascertain in principle how the Council would view any short term mandatory compliance requirements so we can factor these into business case option assessments and analyses as soon as possible.

The complexity, invasiveness and potential service disruption of these ‘minimum’ works is significant

The preliminary RCP construction programme report (*Appendix 3*) identifies significant impacts on the hospital operations for 2-3 years during building remediation works and a number of unknown potential costs, i.e.

- significant 3 stage decanting to enable works, e.g. upgrading space/relocating birthing mothers for the duration of works is an **operational (service continuity) viability concern** to be explored and **cost consideration**
- health and safety risks from noise, dust vibration
- weather tightness risks when replacing the façade (windows/panels)
- service continuity risks from building services disruption during plant strengthening/relocation
- significant unknowns in terms of Council requirements to meet 2018 compliance levels/upgrades for passive fire, seismic restraint etc

The minimum life safety requirements/expectations of Auckland Council have yet to be confirmed, i.e. **CM Health may not have a choice** as it will be the Auckland Council that will mandate and short term strengthening and related building code compliance upgrade requirements.

Appendices

1. Summary diagram - Middlemore Galbraith Block Outline of Strengthening Options, Holmes Consulting 23/03/18
2. Summary diagram – Middlemore Block Strengthening Options; life safety and operational impacts, Holmes Consulting 27/03/18
3. Galbraith Block, Seismic Strengthening Construction Report for 35% of NBS IL4. RCP 05/04/18

PROJECT: Galbraith Strengthening Long List
 JOB NO: 135113 DATE: 23/02/2018
 CSSK: 001 REV: 0

Middlemore Galbraith Block Outline of Strengthening Options

Note: For all strengthening options, the stage 1 and stage 2 buildings can be considered as structurally independent structures, which are not reliant on each other.

The proposed strengthening options reduce the building displacements such that connecting the buildings together is not required.

- Half to two thirds of the quantities/tonnages of damper scheme (i.e. half to two thirds of the number of bays)
- or
- Same number/layout of walls but two thirds of the strength/reinforcing
- or
- Same number of BRBF frames, but say two thirds of the strength/tonnages - and possibly(?) reduce to 1 bay per frame



~67% NBS (IL3)
80 - 100% SLS2



EQP 20% NBS (IL4)

Stair and Bray Link Structure Securing
 CSSK: Egress 00_series

Improve Egress Routes
No change to %NBS rating

Address EQP frame localised deficiencies

- level 7 plant structure bracing
- infill wall removal and/or restraint/separation from columns
- column confinement by bolting and FRP
- building 1 "short columns" to east and west elevation level 2 to underside 4 (IL4 only)
- building 1 south elevation cols, level 2 to level 5
- beam-column joint confinement by bolting, selected joints

CSSK: EQP 00_series



EQ Risk say 35-45% NBS (IL4)

Diaphragm and main roof bracing improvements, new basement walls and foundation thickenings over existing raft to enable new lateral elements (walls or steel frames)
 CSSK: EQR 221

CSSK: EQR 100_series

Anti-Fluid Viscous Dampers

Additional Concrete Shear Walls
 CSSK: EQR 200_series

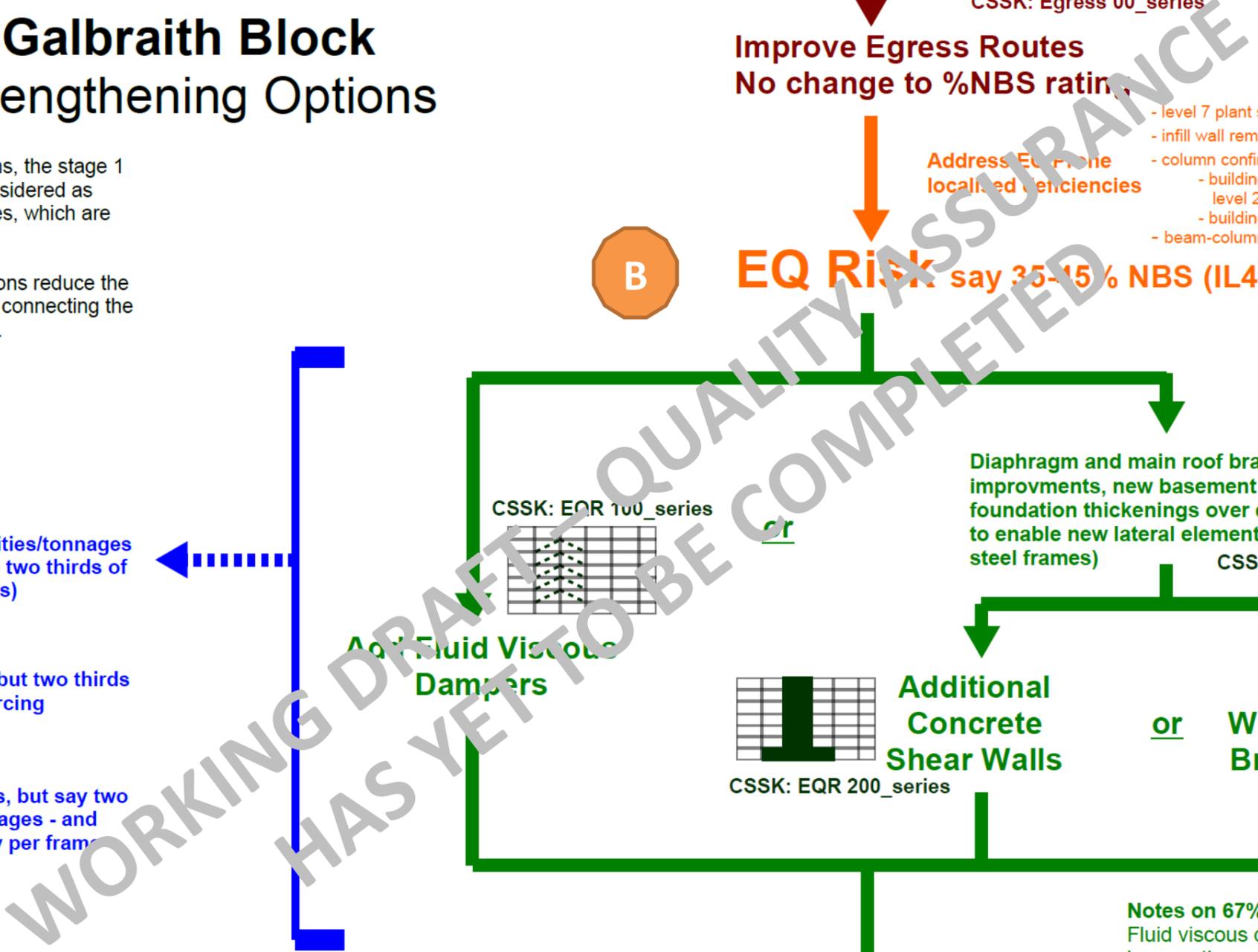
Additional Walls and Steel Braced Frames (BRBFs)
 CSSK: EQR 300_series



~67% NBS (IL4)
~100% SLS2

Notes on 67% NBS options:

Fluid viscous dampers are being put forward as the base option, with a reasonable level of detail included. As noted in the DSA report Section 6, shear walls and braced frames still carry a greater amount of unresolved design risk. Less detail is included, as their concept development appears to be leading towards quite an extensive and challenging implementation. The detail included is sufficient for order of magnitude pricing and comparison with dampers in terms of price, disruption and usability constraints on the final product.

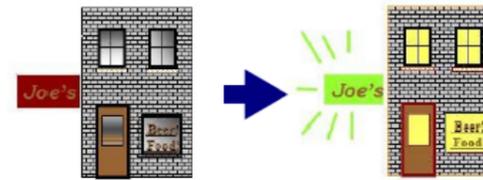


Middlemore Galbraith Block

How each strengthening option affects your life safety and operational risks

Performance Level

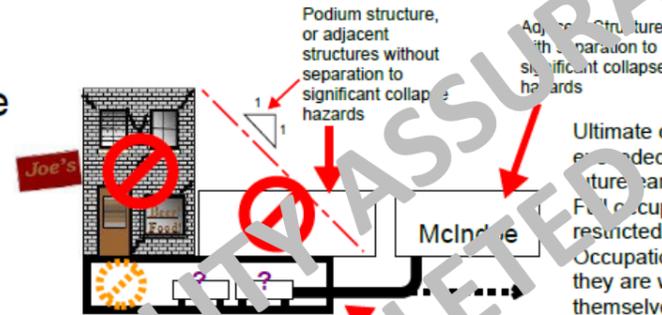
1. SLS2



General performance expectations specific to Galbraith Block

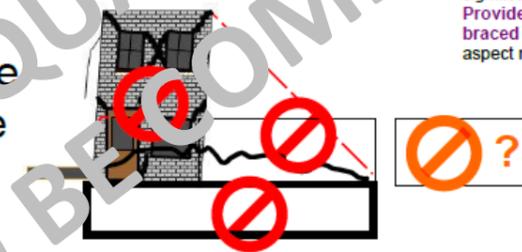
Up to this point, cleanup and some repair likely to be required. Minor structural damage only, some structural repairs may be required but should not significantly affect ability to keep using the building from a structural perspective. Operational continuity, subject to an assessment of robustness and bracing of services.

2. Ultimate Capacity



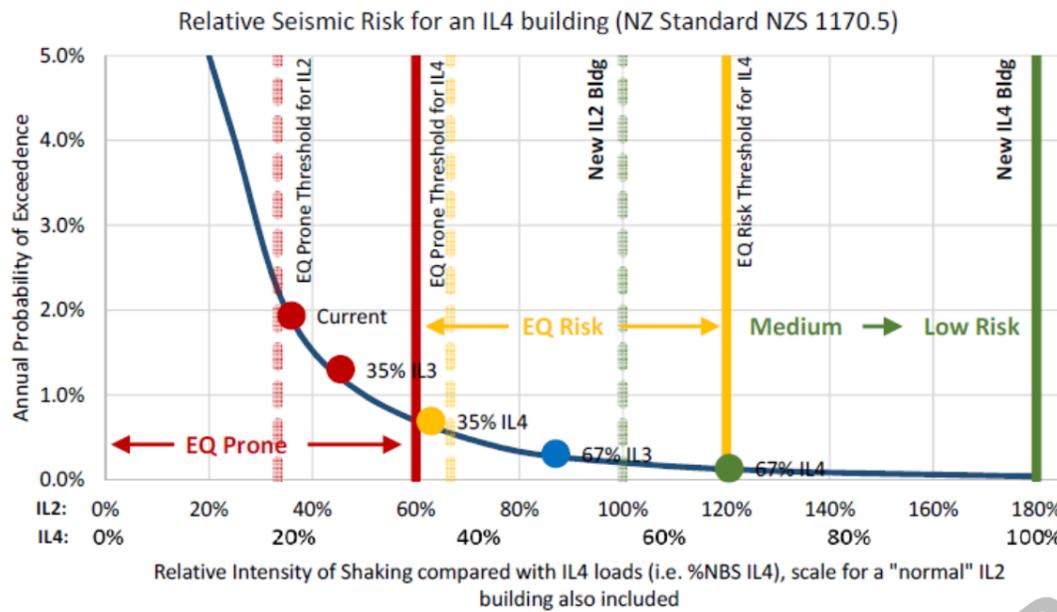
Ultimate capacity of superstructure (primarily towers) exceeded, structure significantly damaged, capacity to resist future earthquakes reduced, repair unlikely to be practical. Full occupation of Galbraith not appropriate, however restricted/controlled access to plant spaces possible. Occupation of adjacent structures also appropriate provided they are well separated from primary collapse hazards and themselves have low levels of damage.

3. Collapse Limit State



Galbraith on verge of collapse, or collapsed. Unlikely to be appropriate to operate out of adjacent structures until situation stabilised, which could take considerable time. Campus infrastructure in Galbraith or its basement fully compromised.

Figures adapted from R.O. Hamburger



Approximate probability of the following outcomes occurring in a 50 year life		As-is building 2% NBS (IL4)	Strengthen to 35% NBS (IL3) ¹	Strengthen to 35% NBS (IL4)	Strengthen to 67% NBS (IL3) and 80-100% SLS2	Strengthen to 67% NBS (IL4) and 100% SLS2
1	Shaking leading to structural damage significantly affecting usability of Galbraith building, its plant spaces (i.e. SLS2). Robust/well braced ⁴ campus infrastructure within or adjacent Galbraith may still be operational with restricted/controlled access for essential maintenance.	75-90%	60-70%	50-60%	15-20%	10%
2	Shaking exceeding ultimate capacity (but with some margin against collapse). Robust/well braced ⁴ campus infrastructure within or adjacent Galbraith may still be operational, however life safety risks to controlled/restricted plant access increasing.	5%	50%	30%	15%	5-10%
3	Shaking leading to collapse of Galbraith (little to no margin), campus infrastructure within or directly adjacent Galbraith fully compromised, and operation in vicindoe/Brae buildings compromised ³ .	20-40%	10-20%	5-15%	<10%	<5%

New IL2 Building	New IL3 Building	New IL4 Building
nc ²	nc ²	10%
10%	5%	2%
2%	<2%	<1%

¹ If the building remains designated as IL4, then this would not fulfil legal obligations to strengthen so that the building is not EQ Prone within 35 years of notice being issued (note that an EQ Prone notice has not yet been issued).
² "nc" denotes that this limit state is not considered by the currently cited design standards.
³ With reference to section 5.2 of Revision 1 of our DSA report, these collapse probabilities can also be taken to represent significant risks to ongoing use of adjacent buildings, and also risks to basement structure containing campus infrastructure. However we caution that it may be unsafe to enter the basement. This "ongoing use of basement infrastructure and Acute Hub" scenario is considered to be a Serviceability Limit State 2 consideration, for which the maximum acceptable probability for a new building would be 10% over a 50 year life.

⁴ "robust/well braced" means that the plant itself (its internal workings) have robustness against shaking, and that plant and services are well braced so that they are not dislodged or excessively strained by the shaking/building movements. This consideration is not included in this report, which is focused on whether structural damage affects plant spaces.

Notes on calculation of approximate probabilities:
 Probabilities are calculated using the seismic demands and annual exceedence probabilities from the New Zealand Seismic Loadings Standard NZS 1170.5:2004, measured against damage, ultimate, and collapse capacities defined as follows. Ultimate capacities are based upon the %NBS ratings calculated in accordance with the Engineering Assessment Guidelines. Collapse probabilities are calculated using the capacities at the CP or "Collapse Prevention" performance level from ASCE 41-13 (applied as cited under the Engineering Assessment Guidelines). SLS2 probabilities generally use the IO or "Immediate Occupancy" limit state from ASCE 41-13. An independent peer review of our Detailed Seismic Assessment work is in progress.

Holmes PROJECT: Galbraith Strengthening Long List
 JOB NO: 135113 DATE: 27/03/2018
 CSSK: 002 REV: 1