Agenda Memorandum

Date: 18 June 2019

Memorandum to

Chairperson and Members

Taranaki Civil Defence Emergency Management

Group Joint Committee

Subject: ECC Development Project update – flat pitch roof issue

Approved by: Sven Hanne, CEG Chair

Purpose

The purpose of this memorandum is to update the Taranaki Civil Defence Emergency Management Group Joint Committee on issues recently discovered during the Emergency Coordination Centre (ECC) development project, and for the Joint Committee to consider options and determine the way forward.

Executive summary

Detailed design for the ECC development project has revealed a structural and waterproofing risk for the flat pitch roof due to method of construction, and as a result the roof does not meet current or previous building code standard. Repair or replacement of the flat pitch roof is required, however is beyond the scope of the current project, and any intervention will require additional budget. The matter is therefore brought before the Joint Committee for consideration.

Considering the post disaster use of the ECC as an IL4 building, it is prudent to consider design enhancement for the ECC to withstand known risks from the Taranaki hazardscape, specifically potential ash accumulation and associated weight loading. This is also consistent with risk reduction as part of the 4Rs of comprehensive emergency management.

Five options are presented, and the Taranaki Civil Defence Emergency Management Group Joint Committee are requested to consider options, risks and budget impacts, and determine the way forward.

Additional budget will be through capital funding arrangements, with debt servicing funded over the 20-year life of the asset. A $200,000 spend will result in annual additional costs of approximately $10,500, funded through operational budget or reserve accumulation.

Option D, enhance the existing design by building a new low pitch roof over existing roof structure, is recommended.

Recommendations

That the Taranaki Civil Defence Emergency Management Group Joint Committee:

1. receives the Memorandum, *ECC Development Project update – flat pitch roof issue*
2. notes the options, budget impacts and risks identified in this report, and in regard to the issues detailed within Appendix A and B of this report
3. approves that option _____ (select from options below) will be progressed and instructs officers to pursue this.
    a. Do nothing, accepts the risks identified, and notes the relocation of equipment;
    b. Internal structural strengthening of flat pitch roof through cross beams, estimated at $20,000, and accepts residual risks identified, and notes the relocation of equipment;
    c. Replace existing flat pitch roof design to modern building code, and accepts ash loading risk, estimated at between $150,000 to $200,000;
    d. Enhance the existing design by building a new low pitch roof over existing roof structure, designed to carry the ash loading, and estimated up to $200,000 (recommended);
    e. Abandon existing ECC and build new or purchase and retrofit an existing building, at an unspecified cost.
4. approves that funding for the option determined will be by way of additional capital debt funding, serviced over 20-year life of the asset, and funded by operating reserve. Additional budget for debt servicing will be considered within long-term plan budget 2021-31.

Background

The Robe St facility (Emergency Coordination Centre or ECC) was commissioned in the 1980s as a purpose-built facility for Civil Defence Emergency Management. A project to upgrade the facility has been approved, and a detailed project scope and outcomes developed. Design, planning and consenting (phase 1) is occurring in the 2018/19 financial year, funded from capital budget. Construction (phase 2) is planned to occur within the 2019/20 financial year, with completion by October 2019.

Project progress is reported within the 'Quarter Three Performance Report 2018-19' agenda item as follows: "*ECC Development Project has progressed well, with the appointment of NPDC and Opus project managers. Various assessments are completed, including: detailed seismic assessment; importance level 4 post disaster facility assessment; asbestos survey; fire scheme assessment; accessibility and building code compliance; air-conditioning and heating condition assessment*". It is noted that the flat pitch roof issue was not known at this time.

Discussion

Roof repair or replacement is beyond the scope of the ECC Development Project, and any intervention will require additional budget. The matter is therefore brought before the Joint Committee for consideration.

Detailed design to determine HVAC placement, post the above assessments, has revealed that construction of the flat pitched timber framed roof was not built to current or previous building code, and that the structural strength and water proofing of the roof is compromised as a result. Specifically, rafters of 800mm spacing have been used (400mm spacing is required), now confirmed by inspection with removal of ceiling panel, and the ply sarking on which the butynol seal sits is specified in plans as 12mm thick and appears nailed (18mm thick and screw fixing is required). Confirmation of 12mm Ply is not possible, as this will compromise the weatherproof seal. Further investigation of the existing butyl roof cladding reveals areas peeling off the substrate, and other areas where foil tape has been used as a band-aid (foil tape is not designed for external applications). Roof weather tightness is further compromised by the number of communications equipment affixed to the flat pitch roof as a mounting surface. This is summarised in Appendix A Minutes from ECC Development Project meeting.

This issue was not picked up in the Detailed Seismic Assessment (DSA) because a DSA does not look at structural roof loading as it focusses on seismic risk. Structural drawings and site inspection of interior and exterior for roof construction inspection is not possible without removal of ceiling or roof linings and is not nominally undertaken.

The compromised flat pitch roof structure has the following impacts and risks for the ECC and the Taranaki Civil Defence Emergency Management Group:

- Does not meet current building code requirements;
- Roof under strength and unable to support HVAC or other loading forces;
- Risk of roof leaking (note that a leak has been repaired in the last 12 months);
- Relocation of HVAC and roof mounted equipment required.

Considering the post disaster use of the ECC, the facility should be designed to withstand known risks from the Taranaki hazardscape. The design of the flat pitch roof, regardless of structural strength, is problematic considering potential ash accumulation and associated weight loading. This is exacerbated with ash accumulating on the high pitch roof of the ECC, and secondary fall onto the flat roof, creating additional point loading at the eaves. Therefore, an additional impact is:

- Risk of collapse with ash loading.

It is noted that neither the current, nor the previous, building code requires a roof to withstand possible loading of ash resulting from a volcanic eruption, and is not required under the New Plymouth District Council Operative District Plan rules for the ECC location. Furthermore, the DSA does not consider dead loads from ash accumulation on the roof.

As detailed in previous reports however, the ECC is classed as an Importance Level 4 (IL4) building, meaning that it must be operational immediately after an earthquake or other disastrous event (i.e. volcanic eruption). IL4 buildings include emergency operation facilities, emergency shelters and hospital operating theatres, triage centres and other critical post-disaster infrastructure. IL4 classification places special building code requirements on the building, which are detailed in the building code handbook, specifically "*B1.3.4 Due allowance shall be made for: (a) The consequences of failure, (b) The intended use of the building…*". Taken with New Plymouth District Council District Plan 12.2 hazard reasons, it is the "*responsibility of the developer to ensure the potential for hazard events is considered*".

With the flat pitch roof issue now known and roof repair and strengthening considered, it is prudent to consider the option of risk reduction through improving the roof design and increasing building structural resiliency. Risk reduction is one of the 4Rs of Comprehensive Emergency Management under the CDEM Act 2002, and the Taranaki CDEM Group Plan 2018-2023. The use of the facility as headquarters for Civil Defence and Emergency Management within the Taranaki region, and role of regional coordination for a significant volcanic eruption, enhancement to existing design is warranted for consideration.

Quantifying volcanic risk

To help give context of the volcanic risk for the ECC, Appendix B: Quantifying ash risk, contains the most recent hazard forecasts from scientific studies. It is noted that this research will drive substantive changes to the Taranaki Volcanic Unrest Plan 2015 when this undergoes review in the coming years.

Ash forecasts indicates that the ECC roof should be structurally designed as an IL4 building to handle up to 150mm of ash accumulation, and any subsequent accumulation from point loading at the eaves.

Options assessment

Five options are considered reasonably practicable, ranging from do nothing (which carries all risks identified), to complete replacement of the ECC (which will carry unspecified but expected high costs). One repair option, one replacement and one design improvement replacement, are considered, and benefits and risks are identified for each option.

Option A (do nothing)

Option A involves deciding to do nothing. This will require the Joint Committee to note and accept the risks identified in this report. Relocation of the HVAC and communications equipment will be required.

The following cost, benefits and risks are identified:

Costs	Benefits	Risks
• Additional costs for relocation of HVAC and communications equipment (unspecified, and to be incorporated within existing ECC development)	• Nil	• Roof not to building code • HVAC relocation required • Communications equipment relocation required • Leak risk and future repairs • Roof collapse with ash loading • IL4 structural standard not achieved

Option B (repair)

Option B involves repair of the existing roof through internal structural strengthening by the inclusion of cross beams. This option will deal with one of the two issues with the flat pitch roof not being to building code, achieved by increasing the structural strength. The issue of ply sarking (12 mm instead of 18mm) and nail fixing remains. The existing butynol seal will be largely undisturbed.

The following cost, benefits and risks are identified:

Costs	Benefits	Risks
• Estimated repair at $20,000 • Additional costs for relocation of communications equipment for weather proofing (unspecified, and to be incorporated within existing ECC development)	• Increased roof structural strength • HVAC relocation avoided	• Roof not to building code (12 mm ply remains) • Leak risk and future repairs • Roof collapse risk with ash loading • IL4 structural standard not achieved for ash loading

Option C (replace)
Option C involves removal and replacement of the existing roof to modern building code. This option will retain the existing flat pitch roof design, and while achieving building code compliance and leak prevention, it does not address the underlying design issue with ash loading and IL4 structural standard.

The following cost, benefits and risks are identified:

Costs	Benefits	Risks
• Estimated replacement at $150,000 to $200,000 • Additional costs for relocation of communications equipment for weather proofing (unspecified, and to be incorporated within existing ECC development)	• Roof meets building code • HVAC relocation avoided • Leak risk avoided	• Roof collapse risk with ash loading • IL4 structural standard not achieved for ash loading

Option D (replace with improved design) - RECOMMENDED
Option D involves retaining the existing flat roof and building a low pitch roof over the top that will meet ash load IL4 structural design. There are additional project benefits through essentially creating a ceiling cavity in which HVAC ducting can be routed and ceiling insulation installed. A low pitch roof replacement will require relocation of the HVAC system to the ground floor, with associated costs of replacing ducting and security for plant, but with maintenance and safety gains. Communications equipment will also be relocated.

This option will require additional design work and structural Engineering input, however this can be incorporated through the current ECC development project and consultants already engaged for this project for this financial year.

The following cost, benefits and risks are identified:

Costs	Benefits	Risks
• Estimated replacement between $150,000 to $200,000	• Roof meets building code • Leak risk avoided • Roof risk collapse mitigated	• Nil

• Additional design work costs (to be incorporated within existing ECC development project for FY18/19) • Additional costs for HVAC relocation	• Associated building improvements with ventilation ducting and ceiling insulation • Relocation of HVAC to ground floor required (safety and maintenance improvements) • IL4 structural standard achieved	

Option E (abandon and build new) – NOT RECOMMENDED
Option E presents the most extreme option in that the existing ECC building is abandoned and rebuilt, a new facility purchased and retrofitted to IL4 standard, or a new IL4 facility is built somewhere else. Given the wide variance of this option, and expected significant costs, no further investigation has occurred and is not considered reasonably practicable.

The following cost, benefits and risks are identified:

Costs	Benefits	Risks
• Unspecified, but expected to be significant.	• New purpose built IL4 facility	• Uncertainty of rebuild on existing Robe St site, given sensitive nature of site for Iwi and Historic Places Trust • Funding cost impact on Councils.

<u>Capital funding</u>
Decisions to repair or make improvements to the flat pitch roof are outside of scope for the current ECC development project, and therefore are additional costs for the CDEM Group that require budget decision.

As covered in previous reports, capital spend is to an approved programme, funded through debt. Costs are paid off over the life of the asset and include finance charges (interest).

Roof repair or replacement is for building asset with a 20 years life, therefore, an additional spend of $200,000 for example would result in annual debt servicing costs of approximately $10,500. This would be funded through operational budget.

As noted in the Quarter three Performance Report, a forecast budget underspend is expected for the 2018/19 financial year, which is to be accumulated in an operational reserve. The first several years of debt servicing could be funded through this reserve. Ongoing additional costs could then be incorporated within the Long-Term Plan 2021-2031 budgets.

<u>Recommendation</u>
It is noted that should options B to D be selected, the additional project will be incorporated within the existing ECC development project build, albeit with additional budget requirement.

In consideration of the options identified above, the role of the ECC for the Taranaki region, and forecast volcanic risk, option D (replace with improved design) is recommended.

Decision-making considerations

Part 6 (Planning, decision-making and accountability) of the *Local Government Act 2002* has been considered and documented in the preparation of this agenda item. The recommendations made in this item comply with the decision-making obligations of the *Act*.

Financial considerations—LTP/Annual plan

This memorandum and the associated recommendations are consistent with the CDEM Group's financial policies and its members' adopted Long-Term Plans and estimates. Any financial information included in this memorandum has been prepared in accordance with generally accepted accounting practice.

Policy considerations

This memorandum and the associated recommendations are consistent with the policy documents (such as the Group Plan) and positions adopted by this CDEM Group under various legislative frameworks including, but not restricted to, the *Local Government Act 2002*, the *Resource Management Act 1991* and the *Civil Defence Emergency Management Act 2002*.

Legal considerations

This memorandum and the associated recommendations comply with the appropriate statutory requirements imposed upon the CDEM Group listed in Section 17(3) of the *Civil Defence Emergency Management Act 2002*.

Appendices/Attachments

Appendix A: Memo from ECC Development Project board meeting
Appendix B: Quantifying volcanic ash risk

Appendix A: Minute from ECC Development Project meeting

5	**Structural Strengthening of Flat Roof:** During the architectural Detailed Design phase it has been revealed that the construction of the flat roof has not been built to current or previous building code standards and therefore the structural strength is compromised. From the existing photos we believe the construction consists of rafters spaced at 800crs with 12mm plywood under a bytonol finish. The risks that this currently propose are: - Does not meet the current building code requirements - Unable to support the proposed HVAC unit - Risk of collapse and potential risk of leaking.	All	Note
	It was discussed that the following will be required to complete some initial investigations: - Remove a section of ceiling and/or roof linings to confirm the plywood thickness and fixings. - Check the member sizes and spacings. If it is agreed that strengthening is required a CE will be raised to cover the following: - Input from Structural Engineer to provide a strengthening scheme - Architectural additional details and drawings. - Additional project management *Possible Saving:* $20,000 *(from this budget)*	PK	18/06/2019

Appendix B: Quantifying volcanic ash risk

Volcanic ash is the most widely distributed product from volcanic eruptions. Volcanic ash consists of fine (less than 2 mm), fragmented volcanic rock which is highly corrosive and abrasive. In the atmosphere, volcanic ash can travel long distances from the volcano and blanket large areas with thin layers of ash (decreasing in thickness from source). Close to the volcano, the weight of thick ash coatings can cause structural damage to buildings and infrastructure. Ash thickness tends to decrease exponentially away from the volcano, but non-structural damage and clean-up operations can cause significant disruptions to communities and economies. While direct damage is not as intense as other volcanic products, the large footprint of ashfall increases exposure, and critical facilities such as water supply, wastewater, transport and electricity networks are vulnerable to very small thicknesses of ash.

Ballistics are large rock and lava fragments ejected from the vent of an erupting volcano at high velocity. They form a very localised, but high impact hazard to buildings and infrastructure close to the vent. Ballistics are unlikely to travel further than 5 km. The impact of ballistics depend on the size, fall angle and level of protection available.

The Taranaki CDEM Group Plan 2018-2023 details volcanic risk as follows:

> *"A volcanic eruption of Mt Taranaki (Egmont Volcano) has been assessed as a moderate-very high hazard for the Taranaki region and as one of three regional hazards with national significance.*
>
> *An eruption of Mount Taranaki is not a matter of 'if', it is a matter of 'when'.*
>
> *There are no indications that Mt Taranaki is about to erupt, however, its unbroken geological history of activity tells us that it will in the future. We are in an unusually long (although not unprecedented) lull in activity. Recent research (2014) estimates an 81% probability of at least one eruption by 2065."*

And in relation to ash hazard in the Volcanic Unrest Contingency Plan 2015:

> "*<u>Roofs</u> The possibility of roof collapse, especially for large flat industrial roofs, and other community facilities in close proximity to the mountain, should be considered when ash accumulates at depths over 10–15cms.*
>
> *<u>HVAC</u> Aside from damage to both private houses and commercial buildings, heating, ventilation and air conditioning systems (HVAC) and interior plant and equipment are also susceptible to damage and breakdown. HVAC failure can also impact the electronic systems of refrigeration units."*

Most damage to buildings from ashfall occurs when the load of ash exceeds the strength of either the roof-supporting structures or material used to cover the structure (sheet metal, plywood, etc.). Dry ash has a weight of 400-700 kg/m3 (880-1,545 lb/yd3), and rainwater can increase this by 50-100 percent if the ash becomes saturated. For a dry layer of ash about 10 cm (4 in) thick, the extra load on a building can range 40-70 kg/m2 (120 to 200 lb/yd2); a wet layer might reach 100-125 kg/m2 (300-350 lb/yd2).

Multiple eruption scenarios are likely from a Taranaki volcanic event, however a small and large eruption has been previously modelled by researchers and these are presented to give context of the ash accumulation and associated roof loading risk for the ECC. It is noted that

ash direction and accumulation is highly variable and dependent on prevailing wind direction during the eruptive event.

Figure 1: Small scale Taranaki eruption

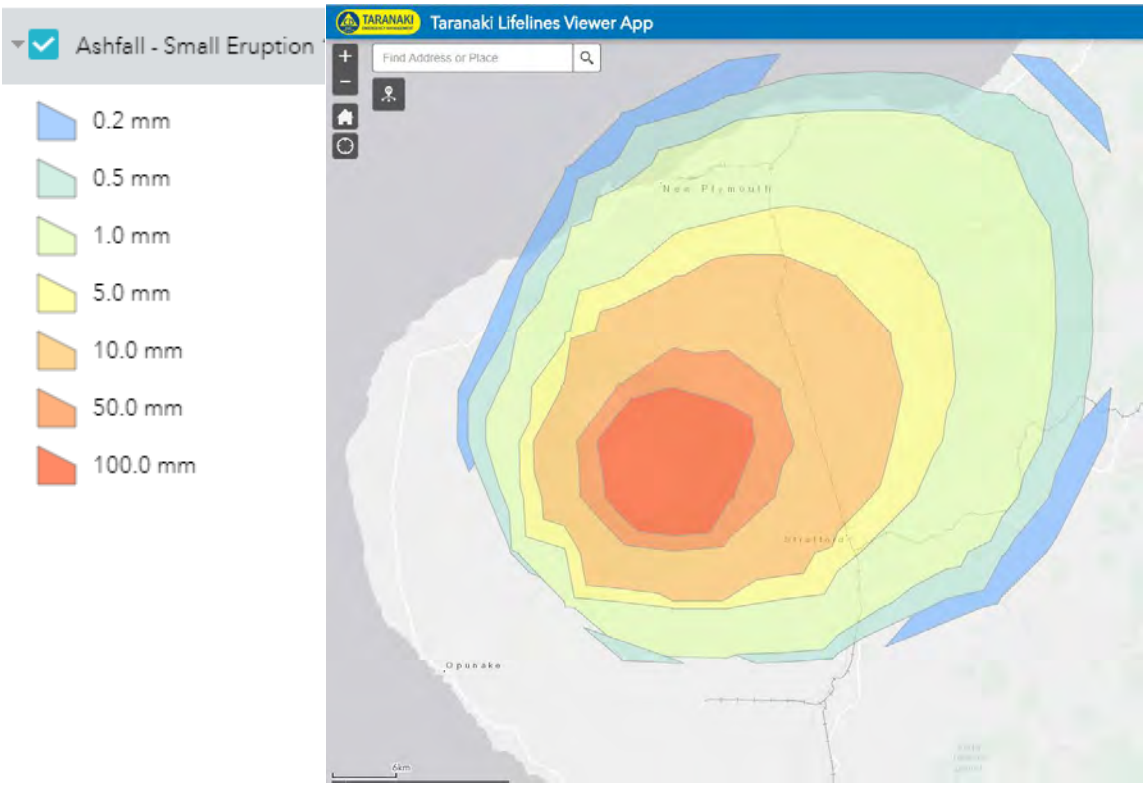

Figure 2: Large scale Taranaki eruption